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Swansea University
Prifysgol Abertawe

Implementing Large-Scale Healthcare Information Systems

The Technological, Managerial and Behavioural Issues

Taghreed Justinia

Submitted to the University of Wales in fulfilment of the requirements
for the degree of

Doctor of Philosophy

2009

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ABSTRACT

This study investigated the challenges that a national healthcare organisation in Saudi Arabia had to overcome in order to achieve a nationwide large-scale healthcare information system implementation. The study also examined the implications of those issues on the applicability of organisational change management models in healthcare systems implementations.

The project's focus on the implementation process directed the methodology towards a qualitative approach. Semi-structured, in-depth interviews were used. Thirty-two participants were interviewed. They were members of the organisation who were directly involved with the implementation either as Information Technology executives and managers, Information Technology analysts and implementers, senior hospital executives from clinical areas, and other stakeholders from various departments.

The data were systematically analysed using an original 'five-stage analysis framework'; specifically designed for this study. This led to the inductive identification of forty codes, that were further refined and structured through additional stages of analysis influenced by Grounded Theory. Finally, as observed within the interviews, the most significant challenges were categorised under three broad interconnected themes; Information Technology and Systems (internal and external issues), Managerial Affairs (managing the project and resources), and Behavioural Issues (leadership and change management structures). These three themes were further structured leading to a detailed discussion on the findings.

While the collection of data was driven by questions on challenges typically associated with healthcare systems implementations, the findings divulged a set of unique problems for this Saudi healthcare organisation. Some challenges were specific to it because of its nature, resources (financial and human), size, distribution of sites, project scale and its regional setting, and political atmosphere, while others were more generic problems typical of healthcare systems implementations. What has resulted from this implementation was a model for leading change in healthcare systems implementations that could be used to guide IT implementations in healthcare organisations elsewhere.

DECLARATIONS

1. This work has not previously been accepted in substance for any degree and is not being concurrently submitted for candidature for any other degree.

Signed

Date

.....*December 2009*.....

2. This thesis is the result of my own investigations, except where otherwise stated and other sources are acknowledged by giving explicit references. A list of references is appended.

Signed

Date

.....*December 2009*.....

3. I hereby give consent for this thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

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Date

.....*December 2009*.....

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DEDICATION

I must first thank the Almighty for all the blessings and for giving me the strength to complete this journey...

I would like to dedicate this work to my father; Dr. Essam my source of inspiration and motivation; and for teaching me by example how to do it. You are the reason why I did this work, and I devote every word to you...with all my love.

My mother Hayat, thank you for your prayers, for taking care of the boys, for your unconditional love, for instilling in me the need to do this and for believing in me ever since I was little.

My husband Wail, I cannot thank you enough for your endless support, for your many personal sacrifices, and for taking care of me and holding my hand every step of the way. For all that you have done, I am forever grateful.

My son Faiz; my rock, thank you for being the strong young man that you are, for supporting me when I was away, for always asking about me and for taking care of your brother. I could not have done it without your love and your big heart.

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University

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I would especially like to thank each and every one of my 32 participants. This work would not have been possible without their valuable input.

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ABBREVIATIONS

ABBREVIATION	DEFINITION
CEO	Chief Executive Officer
CIO	Chief Information Officer
CIS	Clinical Information Systems
CMO	Chief Medical Officer
COO	Chief Operations Officer
CR	Central Region
DAS	Data Analysis Software
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
ER	Eastern Region
ERP	Enterprise Resource Planning
HI	Health Informatics
HIS	Hospital Information Systems
I&CT	Information & Communication Technology
IM&T	Information Management and Technology
IS	Information System
IT	Information Technology
KSA	Kingdom of Saudi Arabia
MI	Medical Informatics
MIS	Medical Informatics Systems
MODA	Ministry of Defence and Aviation
MOH	Ministry of Health
MOI	Ministry of Interior
NGHA	National Guard Health Affairs
NHS	National Health Service
NHS CfH	NHS Connecting for Health
NPfIT	National Programme for IT
PHC	Primary Healthcare Centre
RFP	Request for Proposal
SISP	Strategic Information Systems Planning
STC	Saudi Telecom Company
UK	United Kingdom
VPN	Virtual Private Network
WAN	Wide Area Network
WR	Western Region

CHAPTER 1 THE NATIONAL GUARD HEALTH AFFAIRS INFORMATION SYSTEMS PROJECT

1.1 Healthcare in the Kingdom of Saudi Arabia

1.1.1 Saudi Arabia; the country

Saudi Arabia hosts the two Islamic holy sites in Makkah and Al Madina. Worshipers congregate to them all year round, and during the month of Hajj the country annually hosts millions of pilgrims flocking to perform their religious duties. Situated in the southwest corner of Asia, it is right in the heart of the Arabian Peninsula. A vast country, it covers an area of 2.25 million km² almost a fourth the size of the United States and almost nine times the size of the United Kingdom. The country is hot and dry, but has the Red Sea running along its western border and the Arabic Gulf on its eastern one.

1.1.2 Oil and Saudi Arabia

An energy superpower, Saudi Arabia has the largest reserves of petroleum in the world, and is its largest exporter. With proven crude oil reserves of 264,310 million barrels; oil is the major contributor to the Saudi Arabian economy and global oil production. Saudi Arabia is central to smooth functioning of the world oil market, and by extension, arguably the entire world economy. Saudi Arabia's general budget for the fiscal year 2006 was estimated at \$89 billion, the country's highest recorded budget at the time. This huge budget has advanced items of infrastructure in the kingdom, which has already witnessed a massive improvement in socioeconomic development over the past 30 years. Startling progress has been made in health, education, housing and the environment. There is now an extensive network of modern roads, highways, airports, seaports, power, desalination plants and huge industrial complexes. Advances in healthcare services and delivery are also evident and continuing to prosper.

As with the rest of the world, there is a pertinent need to implement health information systems in the Kingdom of Saudi Arabia. A rapidly developing country with economic prosperity, Saudi Arabia as a nation has taken vast measures to

implement a solid national infrastructure. This includes significant investment in communications infrastructures and IT projects across all government sectors and government healthcare institutions.

1.1.3 The structure of healthcare in Saudi Arabia

Saudi Arabia has a national health care system in which the government provides health care services through several government agencies. The Ministry of Health (MOH) is the major government agency entrusted with the provision of government funded preventive, curative and rehabilitative health care for the Kingdom's population. The Ministry provides primary health care (PHC) services through a network of health care centres throughout the kingdom. It also adopts a referral system, which provides curative care for all members of society from the level of general practitioners at health centres, to advanced technology specialist through general and specialist hospitals.

The MOH is considered the lead government agency responsible for the management, planning, financing and regulating of the health care sector. The MOH also undertakes the overall supervision and follow-up of health care related activities carried out by the private sector. Therefore, the MOH can be viewed as a national health service for the entire population.

There are also three other smaller organisations funded by the government, but not to serve the general population, which finance and deliver primary, secondary and tertiary care to specific enrolled security and armed forces populations. These are the Ministry of Defence and Aviation (MODA), the Ministry of Interior (MOI) and the Saudi Arabian National Guard (NGHA). These operate under what is sometimes referred to as 'semi-government' operation. In addition to these agencies, there are several autonomous government agencies which are responsible for the delivery and financing of some level of health care services in the KSA, like the Ministry of Education (primary care for students), the Ministry of Labour and Social Affairs (for special needs), the General Organization for Social Insurance and General Presidency of Youth Welfare (sports related), the Royal Commission for Jubail and Yanbu (for employees and residents), the Saudi Arabian Airlines (for its employees), and the Kingdom's universities provide through their medical colleges or hospitals,

specialist curative services and medical education and training programs. The Government also finances and provides care on a referral basis in its major specialised national tertiary care referral hospitals; King Faisal Specialist Hospital and Research Centre and King Khalid Eye Specialist Hospital.

1.1.4 The National Guard Health Affairs

The organisation under investigation; the NGHHA is a large healthcare organisation providing modern medical care to the Saudi Arabian National Guard employees and their dependents, as well as to Saudi Nationals with tertiary health problems. It is divided into three regions; the Central Region where Riyadh-the capital of Saudi Arabia-operates as the central or corporate site. There is the Western Region with a 'sister' site in Jeddah, and then the Eastern Region with hospitals in Dammam and Al Ahsa. The NGHHA is constantly growing and expanding its services, but at the time the study was conducted, under the umbrella of the NGHHA were two medical cities; King Abdul Aziz Medical City in Riyadh and King Abdul Aziz Medical City in Jeddah, as well as two hospitals in the Eastern Region; King Abdulaziz Hospital in Al Ahsa, and Imam AbdulRahman Al-Faisal Hospital located in Dammam; including around sixty primary and secondary healthcare centres around the Kingdom.

1.1.5 The NGHHA healthcare information systems project

The Saudi Arabian NGHHA decided to implement a national healthcare information system through a project carried out over a few years. Implementations of such magnitude are not commonly carried out for various logistical, legislative and tactical reasons, and when they are in fact done, there is little research done to refer to. The NGHHA had decided to carry out a project that few healthcare organisations in the region are capable of taking on.

The system inauguration was phased upon three stages starting on Wednesday the 29th September, 2004. These systems have been used in all clinics and departments of King Abdulaziz Medical City in Riyadh, and were planned to be implemented in all hospitals and health centres of the NGHHA.

The project is authentically a quality improvement initiative for the health sector in the Kingdom where information technology is used to improve the provision of quality care to patients.

1.2 The Origins of This Study

The Information Services and Informatics Division (ISID) oversaw the implementation of the NGHHA national healthcare information systems (HIS). As a proud employee of the NGHHA, and a member of the ISID, I was in a unique position to explore the milestones and trials of the project as it progressively unfolded. With the encouragement and support of my division, I was sponsored by the NGHHA to carry out this study. Its main purpose is to investigate the challenges of implementing large-scale healthcare information systems; while exploring the technological, managerial and behavioural issues.

Many reasons drove me to pursue this line of study. I often wondered why many HIS projects fail. Systems are difficult to implement, but could it be that the people who implement, operate and use these technologies are the ones who fail and not the technology itself? Having worked in IT myself, I could appreciate the technological difficulties routinely faced, but as a manager I was also intrigued by the organisational aspects of implementing IT solutions. This study does not focus on the success or failure of the system. Conversely, it does not focus on technological advancements either. The field is satiated with hi-tech systems and equipment that many are all too eager to blame for any/all downfalls in systems' implementations. I thought it would be useful to examine the underlying reasons behind the problems of implementing HIS.

Whether a system has succeeded or failed there are always lessons to be gained. This study is not an evaluation of a particular system or product. It does not propose or test new technology either. What this study does is to draw some lessons from a unique experience with the broad view of investigating the managerial and behavioural aspects as well as the technological ones.

I also think it might be misguided to label some IT systems as failures, when not every facet of the system implementation failed. Surely, in a 'failed' system there must have been some successes, and then again what are the criteria for defining failure? The word failure is so broad and depressingly finite. Before even beginning to discuss the issue of 'failure' it feels like one has already started with a negative connotation and by merely using it, the damage may spread in the discussion without any resolve. I thought instead to focus my research not on IT failures-or successes for that matter-but on the challenges that everyone can agree do take place no matter what level of success or failure these implementations are fated with.

Each and every implementation has its challenges, even the very successful ones. One can learn from those successes and should admit to (and also learn from) any failures that are bound to come with the implementation. Consider larger scaled healthcare information systems and the challenges/lessons exasperate.

This study aims to highlight the most crucial challenges that this healthcare organisation needed to address when implementing their system. By taking on this study I hoped to answer the question that I always asked myself; why are healthcare information systems so difficult to implement? Maybe if implementers and government legislators had an answer to that question it could help them to better plan for and implement these systems leading to more success.

Providing a study that focuses on implementation challenges is just as important as perfecting the technology. Many implementers of such projects invest heavily in purchasing the best systems and strive for the most technologically advanced tools. It might be wise to give equal attention to addressing implementation issues and just as worthwhile to invest in the best implementation strategies.

The broad purpose of this study is to investigate the challenges of implementing large-scale healthcare information systems in a nationwide organisation in Saudi Arabia taking into consideration the technological, organisational and behavioural issues. It can be considered a study on healthcare informatics projects with a focus on organisational behaviour.

In a country like Saudi Arabia, the challenges were expected to be unique. As the world's largest oil exporter, the financial implications alone set it apart from any other healthcare organisation. As an Arabic and Muslim country, its cultural standing sets it apart. With international political events like '9/11' affecting the world as this healthcare organisation attempted to progress with their new systems, the timing could not have been worse. Equally, with the boom in oil prices the timing could not have been better.

This study adds notable knowledge to the field, contributing where there is interest in the difficulties associated with implementing healthcare information systems in large-scale organisations, and more specifically within Saudi Arabia in this nationwide initiative.

1.3 The structure of the thesis

This thesis is presented in ten chapters. It begins with a review of the relevant literature on the challenges of implementing large-scale healthcare information systems and places this study amongst others in the field. Chapter 3 describes the research design, the data collection methods and highlights ethical concerns. Although data analysis methods are usually discussed alongside the data collection techniques, I chose to devote a separate (and quite lengthy) chapter for my analytical procedures for reasons that are later disclosed. Chapter 5 is a preparatory chapter that describes the structure and conventions of the following four chapters where I discuss the evidence. The final chapter of the thesis is reserved for limitations, implications, reflections and (more obviously) my concluding remarks.

In designing the research for this study I took on a novel approach. To begin with, I used a qualitative methodology using semi-structured in-depth interviews, in a mainly positivist field. With most of my colleagues concerned with structures, experiments, equipment and numbers I found myself somewhat isolated in my approach. I myself am a 'techy', but decided to wear the hat of a social scientist in this endeavour, and the lessons I have gained from this approach have left me profoundly changed, as were my ideologies about truths and knowledge.

Conversely, I was at an advantage in this exploration. I am a member of the organisation at hand and so had considerable support, freedom and opportunity to be creative in the course of the interviews. Granted, I was in a curiously ‘biased’ position. While being an insider created an opportune situation for extensive data collection, that fortune almost turned into misfortune when I was faced with such a large corpus of data that I could not begin to fathom how to analysis it.

I was left to my own devices, because I never found the book on ‘how to analyse unruly material when you have an IT brain’. Heavily influenced by my technical background I was guided by my tuition to apply a rigorous, painstaking, time-consuming (and at many times physically painful) approach to analysing and interpreting the data. From this process (that took more than eighteen months) emerged a new framework for analysing large qualitative dataset. I present this process as ‘the Five-stage Analysis Framework’.

The data were systematically dealt with using the analytical procedures mentioned above, and yielded a ‘colourful’; ‘evidence-rich’ discussion on all aspects of the implementation. These were described through the words of a cross-section of 32 carefully selected respondents from the very heart of the implementation. The data were collected using in-depth, semi-structured interviews. The interviews lasted on average one hour and four participants were interviewed twice giving a total of 36 interviews, and 900 pages of transcripts that had to be rigorously analysed.

The findings, are discussed under three broad; interconnected themes, and laid out in detail in four (lengthy) chapters; Internal Technological Issues, External Technological Issues, Managerial Issues, and Behavioural Issues.

To conclude the study, a model for managing change is presented. Although the NGHHA did not follow a specific change management model in their endeavour, what has emerged from this experience can be employed as a model for change driven by HIS implementations.

Learning is fundamental to successful exploration, and it is expected that the investigation within this study involved a process of continual learning. All those

lessons are shared and reflected upon. Nonetheless, the most important knowledge gained from this study is the revelation of the challenges associated with implementing large-scale HIS and informatics projects, and more specifically what those challenges were for the NGHHA of Saudi Arabia.

CHAPTER 2 THE CHALLENGES OF IMPLEMENTING LARGE-SCALE HEALTHCARE INFORMATION SYSTEMS

2.1 Introduction

In this chapter the relevant literature on the challenges of implementing large-scale healthcare information systems will be reviewed while highlighting the overall trends in what has been published. This chapter is organised into ten sections, beginning with an introduction to healthcare information systems and informatics terminology. These are related to the complexity of healthcare organisations.

The gaps in research and scholarship are also addressed. The criteria used in analysing and comparing literature for this study is also described as certain literature were excluded because they were outdated, or did not cover the breadth of all the various disciplines that the research topic draws from. These issues made it difficult to find relevant publications to review and established the need for further research in this mostly neglected area. Another difficulty was that many available studies are not based on empirical evidence or do not investigate large-scale implementations.

The general themes that presented themselves as the main challenges can be described as either *Technological* issues such as confidentiality, IT standards, infrastructures, and service providers; *Managerial* issues covering matters like project management, projects scale, delays, costs, implementation approach, and political issues; and *Behavioural* issues concerning change management, resistance, leadership approaches, and champions. All three themes will be discussed by drawing on examples from relevant publications. Specific examples on implementations from the UK and the US will be discussed and the state of affairs in Saudi Arabia is also addressed.

Some propose that introducing technological change within healthcare can be achieved through strategies of applying change in a 'managed' manner. Some of these suggested models and strategies are presented. These include the emergent

approach to change, Kurt Lewin's planned approach to change, the four-stage model, Kotter's eight-stage model, or by creating a project management office.

2.2 Introduction to Information Systems

Information Technology (IT) is a very complex topic. Healthcare is a very complex topic. Put the two together into healthcare information systems, and it seems that achieving efficiency is such a complicated undertaking that it is almost impossible to resolve (Beaver 2003). Information is a vital element in this drive for efficiency and a key challenge for policy makers and healthcare professionals is to harness information to balance demands and costs (Norris 2002) .

The term information system (IS) is often used to denote a computer system, or more broadly, an interrelated mechanical system of information and communication technologies (I&CT). However, more formal academic definitions recognise the socially embedded nature of these technologies. Hirschheim, Klein (1995) describe it in terms of two perspectives; one relating to its function and the other to its structure;

From a structural perspective, an IS consists of a collection of people, processes, data, models, technology and partly formalised language, forming a cohesive structure, which serves some organisational purpose or function.

From a functional perspective, an IS is a technologically implemented medium for the purpose of storing, and disseminating linguistic expressions thereby facilitating the creation and the exchange of meanings that serve socially defined purposes such as control, sense-making, and argumentation.

In either of these two perspectives of IS, it should be noted that humans are included within its boundaries. This means that the services provided by an IS in part depend upon human capabilities and contributions and any problems associated with them and their implementations will very likely involve human behaviour. It is therefore important to emphasise the role of human behaviour when evaluating problems associated with using, applying, advancing, and maintaining these systems.

Any detailed investigation on the discipline and the nature of IS as an emerging field is beyond the scope of this thesis. However, some discussion of the field is appropriate for the purpose of clarifying the need for taking on this research. Broadly speaking, the field addresses computing and communications technologies in their social contexts, thus distinguishing it from the technical study of computing (computer science) and related natural science subjects.

2.2.1 Information systems terminology

The study of information systems is a multi-disciplinary subject and addresses the range of strategic, managerial and operational activities involved in the gathering, processing, storing, distributing and use of information, and its associated technologies, in society and organisations.

For the purpose of this thesis, Information Systems (IS), and (IT) are taken to include the hardware and software components which go to make up I&CT and the social system which orchestrates the organised provision of information. The important point to emphasise is that a ‘socio-technical’ network is formed. Speaking in more specific terms, the Information Systems referred to or investigated in this study are related to healthcare, or more commonly referred to as clinical information systems (CIS), healthcare information systems, or medical informatics systems (MIS).

2.2.2 Health Informatics

The term Healthcare Informatics (HI) is also commonly used throughout this study, and at times the terms HIS, HI, and Medical Informatics (MI) are used interchangeably. However, in technical terms and in some other studies, hospital information systems are usually one instance of an HIS, or one part of a larger network of interrelated systems under the broader HIS and should not be confused (Haux 2006). When referred to as such, the hospital information system is connected to and/or is part of other systems coming together for patient-related information forming all or part of the broader electronic health record (EHR)-otherwise referred to as the electronic patient record (EPR) or electronic medical record (EMR). For continuity purposes, throughout this paper, I will consider an EPR, a computer patient record (CPR), and an EMR as descriptions of the same thing when referred to in other work, and I would prefer to use the term EHR when referring to it myself.

Health informatics however, is an emerging discipline with no clearly distinctive boundaries. Norris (2002) explains that information processes fundamental to healthcare define its scope that encompasses a broad spectrum of clinical, administrative and managerial functions. Information management and technology drives and contributes to healthcare development by facilitating the acquisition, storage, and management of health information, and by improving its flow. He describes health informatics as the systematic application of information management and technology (IM&T) to the planning and delivery of high-quality and cost-effective healthcare, making it a powerful tool in this process.

Greenes and Shortliffe (1990) argue that MI is emerging as a distinct academic entity that affects organisational functions and many healthcare institutions are making large-scale commitments to information systems. They describe it as the field that concerns itself with the cognitive information processing, and communication tasks of medical practice, education, and research, including the information science and the technology to support these tasks. They depict it as an intrinsically interdisciplinary field of highly applied focus that addresses research problems as well as planning and policy issues.

More broadly speaking, MI emphasises clinical and biomedical applications of various healthcare information technologies with the added possibility of integrating these clinical components either among themselves or to more administrative-type hospital information systems. In this regard, the field of health/medical informatics and telematics has evolved very rapidly over the past several years (Beaver 2003).

2.2.3 Healthcare information types

Wyatt and Sullivan (2005) describe information (in the health care context) as the data and knowledge that both human and artificial intelligent systems use to support their decisions. They explain that HI helps healthcare professionals with their decisions and actions, and improves patient outcomes by making better use of information; making more efficient the way that patient data and medical knowledge is captured, processed, communicated, and applied. They go on to explain these challenges have become more significant now that the internet has made access to

medical information easier for patients; adding a completely new dimension to information processing.

There are so many different types of information involved in the health care environment and it is important to appropriately represent, interpret, display, and describe the different types of information (Wyatt and Sullivan 2005). Understanding this adds to the complexity of HI, possibly adding a layer of difficulty to implementing, or understanding how to work with this information.

In the clinical world, it is important that each item of information is captured and represented in a form that helps each user of that information to find and interpret it (Wyatt and Sullivan 2005). This will determine how easy it is for users to retrieve this information. One article focuses on designing architectures to best encapsulate and retrieve this information in order to improve interoperability of components (Geissbuhler 2003). Considering and understanding these issues when implementing HI systems might be a key to easier transition, assimilation of information, and user acceptance.

2.2.4 Healthcare is complex

Across all disciplines, at all levels and throughout the world, healthcare is becoming more complex. The traditional ways of understanding problems are no longer appropriate. Plsek and Greenhalgh (2001) argue that new conceptual frameworks that incorporate a dynamic, emergent, creative and intuitive view of the world must replace traditional 'reduce and resolve' approaches to clinical care and service and that includes healthcare organisations.

A complex adaptive system is a collection of individual agents with freedom to act in ways that are not always totally predictable, and whose actions are interconnected so that one agent's actions changes the context for other agents (Plsek and Greenhalgh 2001), much like the dynamics of information technology where there are many interwoven intricacies and various hardware and software levels ranging from access levels, security, modules and networks. Norris (2002) suggests that technology can add its own level of complexity caused by multiple inputs, functions and users, and integration complexity due to interfaces across sector boundaries and between

disparate systems. This view may explain much of the radical dynamics of IT systems in healthcare and how they sometimes seem to take on a life of their own in an ever-evolving manner. Understanding the nature of IT systems in healthcare is important for allowing these complex systems time to grow and to allow the people using them the time they need to adapt to them. Introducing IT into this increasingly complex world is no easy task making it something that develops incrementally over a number of years (Protti 2002).

2.2.5 A necessity not a luxury

Information technology has become the core of workflow and drives processes in healthcare settings. The healthcare industry has understood that when successfully implemented, information technology can improve quality, patient safety and may improve the cost effectiveness of care (Joachim 2004). The common goal however, is to discover ways to harness an investment in computer technology to provide better quality of care and to reduce costs (Martin 2004). Attempting to present an exhaustive account of the potential and perceived benefits of implementing HIS and informatics projects in healthcare is beyond the scope and confines of this study, but that is not to say that discussing these benefits is not important and should be included in other studies where the benefits are the focus.

More healthcare organisations are seeking the support of information technology to improve their services and to provide better and safer patient care. These investments are becoming more of a necessity than a luxury and once this necessity is established, the implementation, development and successful operation of these systems must be carried out. With so many issues to address, like what systems to deploy, which vendors to select, what resources are available, and how the workforce will react to this change, healthcare organisations face a major challenge when taking on these initiatives. Even knowing the great potential that lies with implementing successful HI projects, many healthcare organisations are still reluctant to adopt them; discouraged by potential barriers like financial repercussions, limited evidence linking adoption to improved outcomes, and disruptions during implementation (Littlejohns, Wyatt et al. 2003).

Beaver (2003) also advocates the need to implement healthcare IT solutions, describing them as necessary to support administrative functions and to track patient information. With the technical aspect of medicine alive and well, there is a move to manage medicine from the financial perspective, thereby adding layers of administrative functions that require the support of IT solutions. IT has also rapidly progressed over the past 40 years, yielding smaller packages with greater power and more versatility at lower costs making it more available as the need for it rises. There has also been a push for completely digitalising patient records. The need to be able to track patient data for utilisation statistics is pushing the development of electronic medical records (Beaver 2003). Along with government legislation, the move to a universal medical record and absolute patient portability seems a reasonable possibility in the near future and is the goal of many healthcare organisations and governments.

2.2.6 Improving Safety with Information Technology

With fully accessible and integrated electronic medical records, and with instant access to medical knowledge, faulty decision-making resulting from lack of information can be significantly reduced (Ash, Sittig et al. 2007). The potential to improve the quality of patient care is a major impetus for electronic health care information systems. It is recognised that the amount of information currently available is beyond the capacity of clinical providers to access and absorb. Electronic systems are required to help clinicians synthesise and use the information to improve outcomes and quality. Health information managers are faced with a growing need to manage data content and to create content libraries for their organisations (Wing and Langelier 2004) and there is a need for an electronic record, because the static, paper-based record has been a significant barrier to advancement and any new ways of working (Brennan 2007).

Given the complexities and inefficiencies in the traditional approach to prescription management, one can see the potential benefits of automation. Improvements in efficiency, accuracy, and appropriateness of medication prescribing would yield many benefits to patients, prescribers, and payers (California Healthcare Foundation 2001). Electronic prescribing of medication has also proven to both reduce medication errors and makes prescribing safer with improved efficiency and added

financial savings. For example, the UK Department of Health (DoH) has emphasised its commitment to the importance of medicines management through the dissemination of its Medicines Management Framework (Audit Commission 2000).

Bates and Gawande (2003) explain that in the past decade the risk of harm caused by medical care has received increasing scrutiny and the growing sophistication of computers and software should allow information technology to play a vital role in reducing that risk. This can be achieved by streamlining care, catching and correcting errors, assisting with decisions, and providing feedback on performance. Given the potential risks and benefits as well as the costs involved information technology is a must in healthcare in this day and age.

After anaesthesia, medication safety has perhaps been the most closely studied domain in patient safety. Efforts to reduce the rate of medication errors have involved all the strategies discussed above. Nearly half of serious medication errors have been found to result from the fact that clinicians have insufficient information about the patient and the drug. Other common factors include a failure to provide sufficient specificity in an order, illegibility of handwritten orders, errors of calculation, and errors in transcription (Bates and Gawande 2003). All of these issues could be avoided with electronic prescribing and electronic patient records.

Not only is there a concern for patient safety in prescribing, but also in working with and managing patient data. In the newly emerging patient-centric environments, digitalising patient information is fundamental to clinical decision making, to determinations about therapeutic interventions, to business processes, and most importantly, to quality outcomes. As information grows in importance, and as improved knowledge is linked to quality decision-making, HIS are becoming increasingly important for both clinical effectiveness and administrative efficiency. It is around these systems that the most visible and most profound changes are occurring (Wing and Langelier 2004). However taking a massive plunge into the technology era is no simple deed, especially for organisations as complex as those dealing with healthcare provision.

2.2.7 Necessary but difficult to implement

Implementing large-scale public sector IT projects in the UK and other countries has in the past proved difficult to achieve (MORI 2005). Information systems have become an integral part of healthcare in the modern world, however getting this support is not an easy task and does not come without a price which is not always a financial one. With large-scale implementations, the difficulties grow exponentially. Many agree that implementing healthcare information systems is not easy (Lorenzi and Riley 2000; Berg 2001; Englebardt and Nelson 2002; Norris 2002; Protti 2002; Joachim 2004; Hendy, Reeves et al. 2005; Heeks 2006; Ash, Anderson et al. 2008; Berner 2008). The reasons for this difficulty are poorly understood and research reported later in this thesis aims to contribute to this understanding.

In the past, health and clinical information management systems have not been included in enterprise IT strategies. Typically, this has hindered the movement away from managing paper-based systems, and resulted in a severe lack of automation in health information management departments. However, with more industry-wide focus on installing IT systems and the goals of healthcare organisations of becoming completely digitalised, clinical information management systems are being included in the enterprise IT strategies that guide design, planning, procurement, and implementation of all forms of medical information.

Many large-scale healthcare organisations are now considering the benefits of implementing information systems to improve processes. Because of this increased awareness in the healthcare field, many healthcare information international initiatives are currently under way. One significant project is the United Kingdom's (UK) National Programme for IT (NPfIT); deemed the largest civil IT programme worldwide with an estimated technical cost of £6.2 billion over 10 years (Brennan 2007; Clegg and Shepherd 2007; Currie and Guah 2007).

In Saudi Arabia, with significant progress of the Saudi Health sector one would expect the same level of advancement in the health informatics field. However Altuwaijri (2008) explains in his instructive paper where he reviews the advancement of the e-health field in Saudi Arabia that there is still a need for advancement of e-health in the world in general and in Saudi Arabia in particular.

Recognising this need, the Saudi Ministry of Health announced the allocation of SR 60 Million (around USD 18 Million) of 2009's budget for an e-Health Project. The Ministry of Finance supported the e-Health project by allocating up to SR 4 Billion (around USD 1.1 Billion) over four years in order for the Ministry of Health to execute the project expected to save between 10-15% of the annual budget of the Ministry of Health (AlHaider 2008). This financial support should enable the ministry to implement a totally integrated health information system.

Implementing healthcare information systems in any healthcare environment is a major feat. Implementing such systems on a large-scale, national level is even a bigger challenge (Protti 2002). Many variables need to be taken into consideration and countless difficulties can arise. Although it has been established that it is difficult to implement healthcare information systems in healthcare environments, pinpointing what those challenges are is not an exact science. Different organisations in different contexts, introducing different types of solutions on different scales are all faced with diverse circumstances and problems, however more arguments are being made that the behavioural and socio-cultural challenges are as daunting as the technical and logistical ones, if not more significant (Hendy, Reeves et al. 2005). That is why research reported later in this study focuses on the technical, logistical and behavioural challenges.

2.3 Scoping the Literature

2.3.1 Search strategy

Although the purpose of this chapter was not to present a systematic literature review of all published material on the topic, the area was researched in a systematic manner. Many search engines, databases and journals were used and different combinations of keywords were tried. Details of the search strategy including keywords, journals and databases used are specified in Appendix 1.

2.3.2 Criteria

This was not an easy area to research, and I placed stringent criteria on what publications were used. Many were discredited because they were outdated, not empirically sound or robust, or because the authors lacked credibility; by examining

the author's credentials, objectivity, persuasiveness, and the value of the author's arguments. Other publications were anecdotal and many lacked scope. I was also limited to the publications I had access to through the university, and only those written in English. Further to that, many of the searches in the previously mentioned strategy did not yield scores of results, despite the many combinations of keywords I had used. Ultimately, I was left with a limited collection to review which lead me to believe there is a recognisable need for this type of research.

2.3.3 What is published on the topic?

Others agree that this is not an easy area to research;

This is not a simple, straightforward area to examine or discuss, because implementation covers such a broad variety of issues...because the field is so large, relatively few common themes have emerged (Lorenzi, Riley et al. 1997, p. 85)

I scoped the literature trying to strike a balance between being thorough, and being concise without digressing from the research problem. Attempting to show the depth of available knowledge on the challenges normally associated with large-scale IT implementations in healthcare settings, while addressing the technological, organisational and behavioural problems was not straightforward.

2.3.4 Many disciplines

With this focus, the research topic draws from various different disciplines. One must examine, for example, the organisational and social issues surrounding these implementations to fully understand their potential benefit and impact on healthcare delivery (Sittig, Hazlehurst et al. 2002). In their article 'IT project implementation strategies for effective change: a critical review', Kurupparachchi, Mandal et al (2002) argue that when formulating effective change management strategies to support the introduction of IT, it may be useful to integrate and use concepts and practices drawn from disciplines such as traditional project management, organisational/product innovation, and change management theory and practices.

The IS field is an applied research discipline, but its academic roots are in the social sciences and in business schools, which draw from economic, psychological, operations research, organisational, computer science, and sociological theories

(Chiasson, Reddy et al. 2007). Organisational issues coupled with medical informatics are a blend of many disciplines. In an article where Lorenzi, Riley et al. (1997) examine the organisational aspects of medical informatics, they argue the same explaining how people and organisational issues are critical in both implementing medical informatics systems and in dealing with the altered organisations that these new systems can create.

The academic disciplines of psychology, sociology, social anthropology, organisational behaviour and organisational development, management and cognitive sciences are rich with research that can ease the introduction use of IT in today's complex health systems (Lorenzi, Riley et al. 1997). There are also the more technological disciplines, like computer science, engineering, and software development amongst others. These disciplines can help us to better plan for and manage complex change processes by applying effective strategies for involving individuals and groups in the informatics effort; thereby successfully managing the changed organisations (Lorenzi, Riley et al. 1997). Additionally, drawing upon lessons from the wider fields of IT and business change projects where there has been a great deal of research have a valid application in health research (Clegg and Shepherd 2007). Finding literature that encapsulates all of the above and within a healthcare context is not easy, as all of these disciplines must be examined together to explore implementation challenges of healthcare informatics projects.

Although it would have been straightforward to critically review and analyse each of these disciplines individually, it is difficult to do so for all of them together. The problem is that each discipline-in relation to IT implementations-either discusses issues in isolation from the other disciplines, or only addresses some of the issues associated with the other disciplines without having a comprehensive overview of all of them combined. Describing a process where all of these disciplines come together is a rarity in the literature.

Take for example the argument made by Kurupparachchi, Mandal et al. (2002) that IT literature does not exhibit serious attempts in studying the implementation aspects of IT projects. They explain that there are hardly any attempts to relate conventional project implementation methodologies and success factors to change management

strategies or how various IT project management implementations contribute to change management in organisations. They boldly describe this as a 'neglected area'. What is even less common is literature examining this already 'neglected area' in a healthcare context. Heeks (2006) also argues that some studies are overly specific; focusing on a single case study of IT failure where it is difficult to generalise conclusions, or when there are studies with strong conceptual foundations, they only offer limited practical guidance. IS studies have also been known to be static, usually concerned with factors underlying success and failure and the ones that are dynamic are concerned solely with the process of IS implementation that ends up with either success or failure (Heeks 2006).

2.3.5 Not empirically sound

The other problem I encountered while scoping the literature is that even with the few examples that may discuss many of the disciplines mentioned earlier with each other; most are not based on empirical evidence. Granted, there are some useful research-based articles to draw from (Hendy, Reeves et al. 2005; Scott, Rundall et al. 2005; Currie and Guah 2006). This is not to dismiss any of the thorough and insightful review papers that I have come across, but to simply imply the need for more research in this area. When investigating a clinical information system research landscape. Sittig, Hazlehurst et al. (2002) propose that vigorous research is still needed on all aspects of CIS for healthcare. Furthermore, as observed by Currie and Guah (2007), there are virtually no studies that systematically and rigorously examine how change management programmes are adopted and diffused throughout the healthcare sector, and most available studies are descriptive, lack historical context and are not supported by robust theoretical frameworks, focusing instead on examples of best practice.

2.3.6 Scope

There is also an abundance of published studies on implementations, successes, or failures of computerised physician order entry systems (CPOE) or picture archiving and communications systems (PACS). All of these studies however, focus on only specific functions or modules of a HIS and neglect to examine the full organisational impact of implementing a completely electronic medical record system across a large-scale organisation. One quick search on the Web of Science with the keyword

CPOE returned 220 results, many of which were well presented and useful articles, but not comprehensive enough for the focus of this study (Ash, Stavri et al. 2003; Ash, Stavri et al. 2003; Berger and Kichak 2004; Altuwaijri 2008; Wolfstadt, Gurwitz et al. 2008; Campbell, Guappone et al. 2009). I cannot conclude that there are no studies as such; there are just not enough research-based studies on large-scale implementations that focus on both the technological and organisational issues.

2.3.7 Published books on the topic

Scott, Rundall et al. (2007) suggest that books about the implementation of information systems in healthcare organisations are also quite rare medical informatics as a discipline is fairly new with not much material that can be defined as historical. Consider the lifespan of any system that has been successfully implemented in the past and you will not find that there have been that many, and the ones that are alive and well have not been around for so long. In the only book portraying a detailed account of the actual implementation of an electronic medical record system in a large-scale healthcare organisation, Scott, Rundall et al. (2007) focus on how a 'one size fits all' approach does not work for everyone. Their book also focuses on the importance of organisational culture and leadership, using qualitative methods to report the experiences of clinicians, managers and implementation team members (Scott, Rundall et al. 2007).

In their book 'Managing Technological Change: Organizational Aspects of Health Informatics' Lorenzi and Riley (2004) discuss human reactions to change brought about by introducing new IT systems in healthcare organisations. They focus on the human and organisational aspects of HIS by addressing practical implementation strategies and post-implementation issues. Enlightening as this book was-because it link Informatics with change management-it is not an empirically based study and research in this area is badly needed.

A more recent book; 'Project Management for Healthcare Informatics' addresses the logistical and project management issues related to healthcare informatics. In it, Houston and Bove (2007) give a detailed explanation of the project management process using real healthcare examples. However, many of the principles they discuss are heavily drawn from those given by the 'Project Management Institute'.

The book is also devoted to applying those principles to the practice of nursing, although many generalisations can be applied within other healthcare professions.

There also seems to be a negative bias against publication of failures found in healthcare literature more broadly and medical informatics literature specifically. That may be why there are only a small amount of publications claiming significant numbers of HIS failures. The current evidence base on HIS success and failure rates is weak (Heeks 2006).

Couple the previously mentioned issues with the fact that this is a fast moving discipline where the technology changes very quickly and a product can become obsolete not much longer after it is applied, and there is no surprise that there is not an abundance of books on this topic. Further to that, books on medical informatics tend to highlight concepts in informatics, discussing trends and innovative strategies from a contemporary, mainstream perspective, without special attention to systems implementation issues (Englehardt and Nelson 2002). Moreover, literature on managing healthcare information systems typically focuses on security, strategic planning, governance and management and management's role in IT initiatives (Wager, Wickham et al. 2005).

2.3.8 Scholarly publications

It is worthy to note to however, that two papers by Currie and Guah (Currie and Guah 2006; Currie and Guah 2007) are particularly insightful. The authors examine the inter-organisational relationships between different constituents in the adoption and diffusion of IT systems. Their accounts give useful analysis, providing a theoretically rich and empirically robust account of the UK's IT healthcare programme. Similarly, the study by Hendy, Reeves et al. (2005) was quite discerning. It describes the context for implementing the NPfIT, while describing the barriers and opportunities to facilitate the implementation. The findings were based on empirical evidence, through case studies and in-depth interviews.

In a different continent, the work published by Scott, Rundall et al. (Scott, Rundall et al. 2005; Scott 2007; Scott, Rundall et al. 2007) was also useful and is based on empirical findings, that also gave a detailed account of healthcare IT

implementations in the US, although the CIS they investigated eventually failed. These studies will be referred to throughout this chapter, and some examples will be drawn from them.

2.3.9 What are the challenges?

It is not necessary, practical, or plausible within the confines of this thesis to cover in any level of detail any of the disciplines on its own. I will instead to focus on literature where the different disciplines are brought together when it comes to large-scale IT information systems implementations in healthcare, identifying what the typical implementation challenges in the literature are and I will draw some of the lessons learned from the organisational behaviour/development and project management literature as they relate to the research topic.

Compiling a definitive list of the challenges that healthcare institutions face when implementing large-scale IT healthcare implementations is not possible. Healthcare providers are faced with IT projects of varying sizes and technical complexity and ensuring their success is crucial for organisational leaders and IT project managers alike (Guah 2008). It is difficult to point to a definite array of the challenges ahead for IT implementers in healthcare (a fact that in itself is a problem for implementers and stakeholders). I will however, discuss some of these challenges examined in actual implementations like the NPfIT and Kaiser Permanente. Other lessons could be gained by also exploring branches of different disciplines like project management, change management, leadership, and organisational behaviour/development.

Some refer to the challenges as barriers to the implementation; others call them reasons behind success and failure. However they are labelled, one constant is that the challenges do exist and there is no one easy way to go about introducing large-scale IT systems in healthcare institutions. Some have argued that a one-size-fits all approach is not always suitable even for implementing different parts of the same system in different locations (Currie and Guah 2006), so generalising is not always possible when discussing these issues.

Developing an approach that suits everyone is not possible, as every implementation is unique. What works and does not work for one organisation might not have the same impact in others, however many lessons still can be learnt keeping in mind the context of each experience when applying it elsewhere (Scott, Rundall et al. 2007). There have also been attempts at devising IT implementation strategy models for healthcare. Some are change management strategies, others are project management approaches, but all have useful application when it comes to large-scale IT implementations in healthcare. Some of these models will be discussed in detail in later sections of this chapter.

2.4 Regional Examples of Challenges

Although this is not a study about the implementation of national IT programmes in the UK nor is this an attempt at a comparative study, I thought it would be useful to use examples from real cases where healthy discussion and debate is evident in the literature about large-scale IT implementations in healthcare. Many of these examples happen to be on the healthcare system implementation in the UK. There are many valuable lessons to be gained from this experience.

2.4.1 The United Kingdom

Early in 2004, the British Government announced the award of eight major IT contracts with a combined value of more than £6 billion due to run for seven years until December 2010. The companies selected were contracted to implement new IT systems to Europe's largest public sector organisation, the National Health Service (NHS) in England. The scale of this project is far greater than anything the UK public sector has ever seen; it is actually the largest civil IT programme in the world (Hendy, Reeves et al. 2005; Brennan 2007; Clegg and Shepherd 2007; Currie and Guah 2007). This programme is known as the national programme for information technology (NPfIT) delivered by the new agency NHS Connecting for Health (NHS CfH). The fact that there is no mention of IT or information in the title implies the recognition that this agency is more about change and integration than it is about IT (Brennan 2007).

There have been many criticisms and problems with this initiative over the years such as the changes in the structure of the NHS, the struggle people are facing in keeping up with the pace of the constant changes, project delays, record overspending leading to job-cuts, and lack of clarity in the contracts that were awarded (Brennan 2007).

In their qualitative study, Hendy, Reeves et al. (2005) explore the challenges of the NPfIT in four acute NHS trusts in England. In it they conclude that implementing large-scale health service IT projects in the United Kingdom has proven difficult such as problems in achieving effective information flow between users, confidentiality issues and security issues. They categorise the findings of their study under six main themes; *multiple sites, communication, financial circumstances, performance, supporting legacy IT systems and timetables*.

Hendy, Reeves et al. (2005) conclude their study explaining that the *socio-cultural* challenges to implementing the NPfIT are as daunting as the *technical and logistical* ones and that senior NHS employees feel that these problems have been neglected. They make strong recommendations to improve communication with, and to gain the cooperation of front line staff. The immediate hurdle, as they reported was to convince users that the disruption and changes that they must experience are worth the potential benefits. They also reported that, gaining users' acceptance was at least as great a challenge as the technical one (Hendy, Reeves et al. 2005).

Much research has been focused on identifying the key factors for electronic health record (EHR) implementation success. Protti (2002) explains in his 2002 report on the UK's NPfIT that over 150 factors have been identified, but the only two that are constantly associated with successful IT implementation are top management support and user involvement

In the report, he also identified several additional elements that have been repeatedly identified. The buy-in of the organisation is important, and there must be clear understanding that significant change occurs in multiple stages, and that errors in any of the stages can have devastating consequences. Furthermore, champions must actively and enthusiastically promote the system, build support, overcome resistance,

and ensure that the system is actually installed and used. Finally, it must be recognised that it can take at least six months of EHR usage before any decisions about the success of the technology introduction can be made.

It is increasingly evident that change management and organisational development approaches must accompany the introduction of an EHR (Protti 2002). Stressing the role of senior leadership, Protti (2002) recommends that organisations should not give up before the journey is over. He also explains that the trade-off between the healthy changes introduced by the EHR and the increased risk that its implementation will fail must be managed skilfully.

In a nutshell, it is people, not technology, that make the difference between success and failure. When end users want to make IT tools work for them, even 'poor' tools can deliver real business value (Protti 2002, p. 53).

The challenge for the future NHS is to translate an increasingly greater knowledge of the relationship between social, clinical and technical issues into effective patient-centred systems that operate across transient organisational boundaries and it is not an easy task (Protti 2002).

2.4.2 The United States

Scott and colleagues (Scott, Rundall et al. 2005) discuss the implementation problems of a failed electronic patient record system. Seven key findings emerged on the implementation of the CIS electronic medical patient record in the Kaiser Permanente Hawaii that they researched. Many users perceived the initial selection of the CIS to be detached from the local environment. Software design and development problems increased local resistance. CIS reduced clinicians' productivity. CIS initially clarified and then changed roles and responsibilities. Culture had varying effects, as cooperative values minimised resistance to change early on, but also inhibited feedback during implementation. Leadership had varying effects as participatory leadership was valued for selection decisions, but hierarchical leadership was valued for implementation and an overall effect was a counter climate of conflict, which the unfortunate withdrawal of system finally resolved (Scott, Rundall et al. 2005).

Scott, Rundall et. al (2005) clarify the implications of their study for other healthcare organisations. They explain that a participatory process in selecting the system and in fine-tuning its capabilities is important and a grass roots approach is important to generate commitment. In their view, there may never be a perfect software system for all users, or which will achieve specific local goals although determining the system's adaptability to local needs is important before implementation. They also highlight that users' frustration with software problems can quickly escalate and result in resistance to implementation.

In the Health Information Management Society's 19th Annual Leadership Survey (HIMSS 2008), the main barrier to successful implementation of IT healthcare projects in the US was reported as lack of adequate financial resources. The lack of budget continues to be identified most frequently as the most significant barrier to a successful implementation of IT; it was selected by 26% of respondents, citing the eighth consecutive year that this issue has been selected as the top barrier.

Rounding out the top three issues identified as a barrier to implementing IT were lack of staffing resources (13%) and vendors' inability to effectively deliver products and services to the expected level (12%). These two items also rounded out the top three issues in the 2007 survey.

At the same time, the issues least frequently identified as a barrier were constraints at higher regional, policy or government level and concerns about the ability to secure data. Each of these options was selected by 1% of respondents (HIMSS 2008).

2.4.3 The Kingdom of Saudi Arabia

As for reports from the Arab world, according to Altuwaijri (2008), the adoption and implementation of large-scale e-health solutions depends on the organisation's ability to overcome various knowledge barriers. He categorises these 'barriers' to e-health adoption as project/economic barriers, technical barriers, organisation barriers, and behaviour barriers. He highlights the current situation of e-health in Saudi Arabia explaining that although Saudi healthcare providers have been increasingly relying on advanced IT systems; this has not been rivalled with similar effort to establish a unified national patient record. What currently exists is a large number of

different healthcare systems used independently and no single patient identifier amongst all healthcare institutions.

In the 2008 Saudi E-Health Conference held in Riyadh, Behbehani (2008) described in his presentation the challenges in planning effective national e-health strategies by stressing the critical issues which are; the need to address governance and financing issues, the effect of new technologies, the problems with citizen-centred healthcare systems, and explains the need for capacity building, management skills, managing change, learning networks, research and development, information sharing, and a knowledge based society.

2.5 Summary of the Challenges

There is no consensus on the list of the difficulties that healthcare organisations are challenged with in the face of new IT implementations. I will discuss however some of the general themes that typified most of the areas of concern within three broad topics:

Technological

- Information technology and systems
- Service providers

Managerial

- Project management
- Managing finances and human resources

Behavioural

- Leadership and change management
- Empowerment, resistance and user involvement

Each of the three topics above is a very broad area to discuss. Although these are the general themes, it was not possible to describe the literature on each of them in any detail due to limitations in word-count. I have reserved the following sections to only mention briefly some examples of the technological, managerial and behavioural issues as they appear in literature focused on implementing HIS projects. Particularly I tried to focus on examples from closely related studies on large-scale HIS

implementations when possible-preferably those with empirical findings; bearing in mind that there were not that many studies to refer to. As such, there is no lengthy discussion on each of these issues, and the purpose is only to highlight some central themes.

2.6 Technological Issues

Healthcare and IT professionals must focus on issues as how introducing IT would affect them as facilitators of IT and as consumers of healthcare. In the first case, issues of concern include the design and development of applications to capture, organise, store, rationalise, and present health information, the integration of existing and emerging technology, acceptance testing, and others; while in the second case, these include confidentiality, ethics, privacy, security, and user-friendly interfaces (Beaver 2003).

2.6.1 Infrastructure

As with any infrastructure, information technology infrastructure does not provide direct business performance. Rather it enables other systems that do yield business benefits. IT infrastructure is strikingly similar to other public infrastructures such as roads. They are long term and require large investments. They enable business activity by users that would otherwise not be economically feasible. They are difficult to cost-justify in advance as well as to show benefits in hindsight. They require a delicate investment balance as too little investment leads to duplication, incompatibility, and sub-optimal use, while too much discourages user investment and involvement and may result in unused capacity.

It is important to note that the provision of infrastructure services is only an enabling mechanism. The infrastructure itself will deliver some benefits, but the main outcomes will be achieved by the provision of additional applications and services.

Traditionally, government-run healthcare services have not received large funding for IT, and this has led to a situation in which desperate IT systems have produced pockets of efficiency alongside serious shortcomings in organisational processes and services, however the UK's NPfIT initiative invested heavily in the infrastructure

and commissioned a project to develop the infrastructure for a national electronic health record (EHR) over a ten-year period. (Currie and Guah 2006).

It is important to design a solid infrastructure to host any IT project. Take for example the NPfIT. It is an essential element in delivering the NHS plan for reform over a period of ten years, and has therefore created a multi-billion-pound information infrastructure that should improve patient care by increasing the efficiency and effectiveness of clinicians and other NHS staff (Hendy, Reeves et al. 2005) by establishing an infrastructure based on the development of the web services architecture. This provided an IT platform to facilitate inter and intra-organisational data networks that enabled this initiative.

2.6.2 Security and confidentiality

Whereas national institutions in most countries are usually perceived as trustworthy, users' attitudes about having their medical records available online may be more cynical. This is why IT service providers must ensure that security of their systems is a top priority. Achieving an acceptably high level of security however, is not easy.

Healthcare institutions must deal with complex confidentiality issues. Lorenzi and Riley (2004) stress the challenges that healthcare institutions face in their efforts to protect patient confidentiality while providing sufficient access to information that is needed for quality care. Furthermore, they highlight the added risks that errors present significant legal liability. Faced with this healthcare organisations invest heavily in data security.

Security of patient data within healthcare institutions is a crucial issue that cannot be compromised with the adoption of IT solutions. If these solutions do not help securing patient data, at the very least they should not jeopardise them. Maintaining efficient and highly secure HIS has proven difficult. It has been noted that one of the causes of healthcare IT system failures is neglecting of security and privacy issues associated with transmitting confidential health information over networks (Norris 2002). Managing access in health is challenging and to protect patient's privacy control, monitoring and tracking are required and must be applied without interfering in daily activities (Lovis, Spahni et al. 2006).

Take for example, the many problems with the NPfIT implementation relating to the protection of personal information with opponents suggesting that NHS patients' records would be connected to a more controversial E-government initiative requiring all citizens to carry ID cards on their person. However, the NHS has insisted that access to the system would be limited according to the requirements of the individual member of staff (Currie and Guah 2006). Some have even suggested such measures as implementing institution-wide policies for access to rights to computerised patient records (Lovis, Spahni et al. 2006). Granted, deciding on patient security and confidentiality issues is as equally challenging as it is important.

2.6.3 The electronic patient record

Beaver explains that over the past 30 years the definition of an electronic medical record or electronic patient records (EPR), has evolved considerably, in parallel with changes that have swept through the healthcare industry (Beaver 2003).

Because medical information is stored in many places, by many entities, the definition naturally depends on the stakeholder's perspective. To a physician, it would be an electronic replacement for the manila folder used to keep physician notes, lab results, and external exports pertaining to a particular patient. In the hospital however, the physical; paper medical record has traditionally been admission centred, but the electronic record presents an opportunity to move beyond that to create a more longitudinal, patient-focused database. To an enterprise it is about attempting to combine several of these entities into one, thereby forming an integrated system (Beaver 2003). Some however, choose to define the record as an electronic "health" record as an inclusive collection of every bit of data regarding the patient's health, including billing and reimbursement.

It is important to realise that EHRs are not merely automated forms of today's paper-based medical records, and we will need to arrive at a clear definition of what it is exactly. According to the Healthcare and Information Management Systems Society (HIMSS) (Handler, Holtmeier et al. 2003; HIMSS 2004), the EHR is a secure, real-time, point-of-care, patient-centric information resource for clinicians. The EHR aids clinicians' decision-making by providing access to patient health record information

when they need it and incorporating evidence-based decision support. The EHR automates and streamlines the clinician's workflow, ensuring all clinical information is communicated and improves delays in response that result in delays or gaps in care. The EHR also supports the collection of data for uses other than clinical care, such as billing, quality management, outcomes reporting, and public health disease surveillance and reporting.

EHR systems have great potential to improve the quality of health services. However, few service providers have adopted them for varying reasons. These systems may challenge beliefs about how healthcare should be organised and in some cases, using physicians to enter data may be inefficient or perceived negatively, and clinicians and managers may need to learn how to use specific software, which may cause resentment or frustration (Campbell, Guappone et al. 2009).

2.6.4 Computerised Physician Order Entry

With fully accessible and integrated EHRs, and with instant access to the latest medical knowledge, faulty decision-making resulting from lack of information can be significantly reduced. Medical error is an international issue, and a potential means to achieving it is the adoption of computerised physician order entry (CPOE) systems. Based on the results of a hospital survey Ash and colleagues (2004) conducted, they found that CPOE did not enjoy widespread implementation across the United States. There were approximately 6,000 hospitals in the United States, yet they estimate that only 9.6% have CPOE completely available. In those few hospitals that did have CPOE, its use was in fact frequently required and physicians did use them in making orders.

Furthermore, Ash and colleagues (2004) consider errors caused by overemphasising structural and complete information entry or retrieval. As they explain, professionals need fast access to data that are relevant to the case at hand. Simultaneously, they need to be able to record a maximum amount of information in a minimal amount of time in the most efficient manner to help other health care professionals. They argue however, that requiring professionals to enter data in more structured formats can be beneficial and is necessary for research or managerial purposes but does not come

without cost. They clarify that such formats usually take more time to complete and read.

Physicians need to prescribe drugs daily without having to worry about interactions themselves. With the information systems however, physicians will need to acknowledge and sometimes over-ride drug interaction alerts, which can occur repetitively when a drug is ordered. This can become very annoying to a physician. Shabot (2004) explains that one hospital's solution for CPOE was to show drug interaction alerts only to pharmacists as they verify medications, as they are more proficient in this than physicians.

Another important issue is the need to respect physicians' sense of autonomy. A recent study reported that "related-drug" CPOE alerts were false or not useful about 95% of the time. Writing an order by hand does not take much time and will not distract or annoy the physician with false alerts (see Shabot 2004).

Most practicing physicians are very busy. These physicians have already optimised their workflow just to get to the end of the day. Something that slows down their work becomes a major problem. Most studies in the literature show that entering orders into a computer can be time consuming for physicians (Shabot 2004; Campbell, Sittig et al. 2006; Campbell, Guappone et al. 2009).

Still, with all the problems and difficulties, CPOE systems are necessary and play a crucial role in adoption of complete EHR system, and what may seem like an unnecessary hindrance today, may well be the only way to do things tomorrow. In 1834, the following quote appeared in the London Times: "*That it will ever come into general use, notwithstanding its value, is extremely doubtful because its beneficial application requires much time and gives a good bit of trouble, both to the patient and to the practitioner.*" The statement refers to the introduction of the stethoscope into medical practice, but I will leave it to the reader to see the irony here (see Shabot 2004).

If CPOE does not create demonstrable value for practicing physicians, adoption by the physician community will not be easy. CPOE is not just about letting physicians

enter their orders directly. It has a more important role in providing decision support (Martin 2004). Using physicians to enter data may be inefficient and perceived as demeaning, and clinicians and managers need to learn how to use specific software, causing frustrations (Scott, Rundall et al. 2005). The challenge for IT systems' implementers is to convince physicians of the benefits that healthcare institutions stand to gain by successfully adopting them, and to make it an easier transition for the physicians to get on board by improving system interoperability and use.

2.6.5 Lack of standards

There is a lack of standards in healthcare today for representation of most types of key clinical data, including conditions, procedures, medications, and laboratory data. The result has been that most applications do not communicate well, even within organisations, and the costs of interfaces are high. Another highly charged issue is that standards for some important types of data are privately held¹. Examples of privately held standards are diagnosis codes that are licensed by the College of American Pathologists and procedure codes that are licensed by the American Medical Association (Bates and Gawande 2003). There also needs to be a unification of standards within healthcare organisations' IT systems to make it possible for various systems to seamlessly interface with each other. One example is Health Level 7 (HL7) compliance to make interoperability amongst various systems possible.

2.6.6 IT skills

In the UK, vacancy rates among NHS informatics staff are very high. A survey in 2008 by the Association for Informatics Professionals in Health and Social Care found vacancy rates across the NHS ranging from 16% for clinical informatics staff to 6% at senior level. The health informatics review in England likewise identified shortages of key professionals, including people who specialise in data security. Working to resolve these shortages, the NHS Institute is piloting a health informatics-management-training scheme (Carlisle 2009).

¹ Privately held standards are standards which are in general use but are licensed by a company or organisation

In a presentation at the 2008 Saudi E-Health Conference, Haux (2008) stresses the need for healthcare professionals who are well educated in healthcare informatics to systematically process information in medicine and healthcare and for the responsible application of IT. He advocates the need for health informatics education worldwide and proposes structures for Health Informatics educational programmes for Bachelors, Masters and PhD level degrees.

The above mentioned points highlight the need for medical informatics professionals who have specialised expertise that are needed to implement HIS and informatics projects. The call for further educational programmes in this field also emphasises the need for honing and streamlining these specialised skills. The research reported later in this thesis aims to examine some of the implications of these shortages in skilled healthcare informatics staff.

2.6.7 Service providers

External service providers also have a critical role to play, which extends beyond one of merely implementing new IT systems. It is important to assess the capabilities and skills of these firms before contracting them. Many IT service providers do not have an extensive knowledge of healthcare products and services, and more importantly, they may not understand the cultural values in healthcare service providers (Currie and Guah 2006). If not addressed, these issues may lead to implementation difficulties. Healthcare organisations must be careful when selecting their service providers.

The competitive advantage of a service provider operating in the health sector is determined by its ability to adapt its competencies to the needs and capabilities of the specific technology and to utilise available local resources in the best possible combination with its own core competencies. Therefore, the service provider's choice of a service provision model is also crucial for developing a resource mix that enables it to compete in the healthcare organisational context (Hendy, Reeves et al. 2005).

2.6.8 Ethical and legal issues

Bioethics, the consideration of ethical problems in medicine, has grown enormously in the last 25 years as a consequence of medical technologies and more recently as a result of the introduction of computers into medical practice (Norris 2002). Various philosophies and theories of bioethics have emerged to provide guidelines and rules for making ethical decisions. The book, *Ethics* edited by Goodman (Goodman 1998) summarises these approaches and provides an introduction to the ethical and legal aspects of IM&T. As Goodman points out, the dilemma is that new technology is slowly being adopted at the same time that it is being tested and evaluated. Standards evolve and become more rigorous as the technology matures and practitioner understanding and practice improve over time. The critical ethical challenge for health informatics is now to maximise the opportunities and benefits whilst minimising the risks arising from new technology and practices. (Ash, Berg et al. 2004).

2.6.9 Quality of data

Clinical information also needs to be of adequate quality to be able to be useful. Wyatt and Sullivan (2005) contend that information only exists to support decisions and actions and that if it fails to do this then it is irrelevant. If the data are full of errors, are incomplete, or cannot be interpreted by the user they are unlikely to be helpful. Moreover, if useful data items are present but vital context is omitted, then it is still difficult to use the data, so attention should be made to the quality of captured information to ensure its usability.

2.6.10 Technological considerations

Although the implementation of IT in healthcare settings entails numerous technical, social and political challenges (Chiasson, Reddy et al. 2007), there is not much published evidence that directly links HIS and MI project failure or success to technological issues. It is important to realise that technical competence is necessary, but not a condition for implementation success (Lorenzi and Riley 2004). Perhaps this indicates a need for more focus on the social and managerial aspects of HIS and MI implementations.

2.7 Management Issues

Managerial issues and project management are critical factors in HIS implementation success. Norris (2002) maintains that the most frequent causes of failure in IM&T implementations are inexperienced project managers, inadequate methodologies, insufficient resources, low user involvement at the design stage, specification creep and a poor awareness of the cultural and organisational, rather than technical issues.

There is a need to recognise that IT problems are usually the result of bigger business challenges and these business challenges should be the focus, not only the IT itself. Using the label “IT failure” to describe an unsuccessful program or project creates a perception that, if only the technology had worked, then the result would have been successful. Such a perception tends to excuse management from any responsibility that the IT failure was a result of their lack of proper project management (Currie and Guah 2006).

The project management process (PMP) should also be incorporated in HIS project implementations (Lorenzi and Riley 2004; Houston and Bove 2007). The PMP describes how a project should be managed to decrease the risk of failure. It also provides a standard way of managing projects using a consistent methodology that is an important step toward project success.

2.7.1 Project managers

Houston and Bove (2007) describe the role of the project manager in HI projects whereby the project manager in a system selection is more a facilitator than a manager. This role means coordinating various tasks internally within the organisation and externally with vendors. There are defined phases that each project must go through; from initiating and planning the project to execution and control. The project manager is responsible for all these phases and the logistical issues in planning until the project is closed. Project managers also need leadership skills to help them plan activities effectively and efficiently.

2.7.2 Training

Training and properly qualified personnel is another critical factor in implementing HIS projects. Poor project performance can arise from inadequate skills within the

organisation resulting in personnel being asked to perform jobs for which they have received little or no prior training (Norris 2002). Further to that a key finding in a report from the National Coordinating Centre for NHS Service Delivery and Organisation Research and Development (Crawford, Rutter et al. 2003; Rose, Fleischmann et al. 2003) is that front-line staff require training to help them appreciate why and how service users are being involved, calling for more research into how such training can be delivered most effectively. End-user training and staff expertise are issues later addressed in research reported for this study.

Although communication about the system must begin as soon as possible, the actual training to use the new systems should be delayed as long as possible (Lorenzi and Riley 2004). It should be planned to occur as close as possible to the time when the staff will need to use the system on a regular basis so that the skills they gain are not forgotten by the time they have to actually use the system. Training also requires careful planning; development and staffing and traditional classroom training may no longer be suitable and can be substituted with web-based training or follow-up tutorials (Lorenzi and Riley 2004).

Lorenzi and Riley (2004) also caution that when the training is not professionally done, it can result in boring, ineffective training sessions. Equally important are training materials that are usually produced at the end of the project without much interest and more attention should be given to these.

2.7.3 Incremental 'phased' approach

Project managers and implementers must decide on what type of implementation approach best suits HIS and informatics projects in healthcare. They must decide between an incremental/phased or radical approach. In a phased approach a project is implemented in stages often spread out over a lengthy period of time that may take up to a few years to fully implement. In the more radical approach also referred to as the 'big bang' approach, the IT system in its entirety is implemented all at once. The system would completely go live at one point in time. This approach is more applicable for implementing systems where a previous system did not exist.

For the NPfIT, Brennan (2007) advocates a phased approach stemming from the local level; gradually phasing away the old electronic patient record model by applying an incremental approach.

2.7.4 Project scale

Implementing large scale public sector IT projects in the United Kingdom and other countries has in the past proved difficult (MORI 2005, pg 9).

Brennan (2007) reasons that the scale of the NPfIT project was a challenge and may just have been too big. He suggests that taking on smaller clusters and dealing with smaller contractors would have been better seeing how the existing clusters are *“huge and unwieldy”* (Brennan 2007, p. 211).

In terms of IT projects, it may be better to take on bite-sized chunks, rather than attempting to build the whole project at once. This also makes the project more flexible because future requirements can be adapted as political conditions change (Currie and Guah 2006).

2.7.5 Improve processes

Shabot (2004) argues that clinical information systems are planned not as cost-saving measures, but rather as improvement measures in the health care setting. He also believes that the use of computers must fit into the user’s workflow and warns that new systems may sometimes slow down processes instead of improving them. He maintains that processes should not just be computerised, but rather improved.

When implementing healthcare systems or functionalities such as CPOE, the presentation of information should be optimised and the time required by the users to access the systems should be minimised. Shabot (2004) also contends that clinical information systems strive to become adequate if not good and technology is not the issue. The process of implementation with issues such as how a system is phased in and how the employees are prepared for it is most important.

2.7.6 Focus on the grassroots

There is a need to recognise that IT problems are usually the result of bigger business challenges, and these business challenges should be the focus and not only the IT

itself (Currie and Guah 2006). The manner in which the focus is delivered to end-users is also important. People must feel ownership of the system to appreciate the direction that they receive with regards to decisions about the project. For example, some may argue that the NPfIT is led by a centralist approach and may be unable or unwilling to drop other work to spend large sums on a national scheme for which they feel no ownership (Currie and Guah 2006).

2.7.7 Project delays

Most large-scale IT-enabled change programmes experience delays. These delays have been identified as threatening the overall success of these programmes (Currie and Guah 2006). Although delays are sometimes described as technology problems, Currie and Guah's (2006) study found that most delays could loosely be described as cultural issues. These included differences in political objectives, poor communication, the problem of implementing new IT in conjunction with doing routine work, issues of security and confidentiality and the time lag between technology implementations and user training.

For example, the process of implementing the NPfIT has been suboptimal, leading to reports of low morale among NHS staff responsible for implementation. This is because the overall timetable for implementation was unrealistic, and trusts continued to face uncertainties (Hendy, Reeves et al. 2005).

2.7.8 Costs

Health care spending accounts for a substantial and growing portion of the gross domestic product in many countries. Policy makers and health care leaders are faced with the challenge of increasing access to quality healthcare services while managing the rate of growth of healthcare spending. Increasingly, they are looking to IT to play an important role in improving quality and access and managing costs (Chiasson, Reddy et al. 2007).

The general perception that the use of information technology in healthcare is ten to fifteen years behind other industrial sectors, and is a rapidly changing field. Healthcare providers faced with the unprecedented era of competition and managed

care, are always exploring the opportunities of IT in improving the quality, while simultaneously reducing the cost of health care (Beaver 2003).

Implementation of HIS usually cost much more than the hardware and software itself. The implementation timeline (and therefore the budget) is very difficult to estimate accurately. Because so much money is usually involved, hospital administration need accurate numbers and wants the implementation to remain on budget and on schedule. When unforeseen glitches occur, fixes need to be made, and additional training or staff may be required. Problems arising during such implementations are highly unpredictable. Sometimes a system will work flawlessly in one area of the hospital but poorly in another due to differences in workflow, staff, or patients. Time is usually needed to work through the problems, so flexibility as well as adaptability are both key to success (Shabot 2004).

IT projects can result in considerable financial losses for the organisations that implement them, especially when they fail. Guah (2008) observes one pattern of failure that has rarely been studied in IT projects; that is, that they continue to absorb valuable resources without reaching their objectives and intended benefits. These are lead by project managements' belief that that allocating additional resources will eventually lead to goal attainment or their desire to demonstrate rationality by ignoring evidence that proves that previous decisions may have been wrong.

As Norris (2002) has indicated, the purpose of health informatics is to achieve an optimum balance between quality and cost effectiveness and this is only possible if the investment provides value for money, however he maintains that the return on investment in healthcare information systems is often very poor. As he explains that simply automating existing processes will not release the full benefits of IM&T. Instead it is necessary to identify the stages involved in a process, remove stages that add no value and reconstitute the modified process using IT. Hammer and Champy (see Norris, 2002) refer to this decomposition / reassembly sequence as business process re-engineering (BPR). Norris explains that BPR has been associated with decreasing headcount and downsizing of organisations, which can lead to reduced effectiveness and costs.

2.7.9 Contracts

Project managers must ensure that IT contracts are negotiated well with their vendors. Contracts must be clear and serve the best interest of the healthcare organisation. In the case of the NPfIT, although contracts lacked clarity, they were negotiated well and protected public funds by only paying vendors when the contractors delivered completed products and services that are fully accepted by the NHS to be safe, reliable, and fully functional (Brennan 2007).

2.7.10 External factors: Politics

On occasion problems external to the organisation can affect the internal implementation of HIS projects. Political agendas are one example of external influences as they can be a major driver of IT projects (Currie and Guah 2006).

External (political) problems with the potential to disturb HIS projects may come in the form of imposed rules that public sector bodies are forced to follow. As an example, Currie and Guah (2006) explain that within the European Union (EU) projects must be put out to tender through the Official Journal of the European Commission. For a UK project, the NHS has to advertise to the whole European community and the IT procurement process becomes highly bureaucratic. All requests for proposals (RFPs) have to be advertised across the entire EU and any EU IT service provider can apply. This may not provide the best outcome, especially when the cultural and procedural elements of IT procurement within the EU are not effective in getting the best deal.

External political impositions can lead to complications and can be quite problematic, but are beyond the control of the implementing organisation. Healthcare leaders and project implementers must learn to deal with these challenges.

2.8 Behavioural Issues

As increasingly powerful informatics systems are designed, developed, and implemented, they inevitably affect larger, more heterogeneous groups of people and more organisational areas. In turn, the major challenges to system success are often more behavioural than technical. Successfully introducing such systems into

complex health care organisations requires both technical and organisational skills. People who have low psychological ownership in a system and who vigorously resist its implementation can bring a "technically best" system to its knees. However, effective leadership can sharply reduce the behavioural resistance to change and to new technologies to achieve a more rapid and productive introduction of informatics technology. (Lorenzi and Riley 2000).

Today's informatics implementations and especially the larger scale ones are becoming increasingly dependent upon how well the people and organisational issues are managed." (Lorenzi, Riley et al. 1997, p. 79)

In the first stages of information revolution in healthcare, technical hardware and software issues understandably received more attention than people and organisational issues. Many of the early implementations were often of limited scope, affected relatively few people and were characterised by hierarchical management structures (Lorenzi, Riley et al. 1997), unlike more recent flat or matrix structures in healthcare organisations that have become more complex and where larger systems are being implemented impacting more people and processes.

Currie and Guah (2006) argue that although there is a need for highly skilled professional IT suppliers and consultants, the technology should not be the primary focus of such a massive project; that will just create a greater chance of ending up with another failed e-government initiative. Government IT strategies need to address the wider cultural imperatives and the extent to which the organisational climate and people are predisposed to adopting new IT-enabled working practices.

2.8.1 Involving Users

Involving service users in the process of change is seen as central to improving the quality of care, although initiatives to involve service users have proved difficult to implement (Crawford, Rutter et al. 2003). According to a recent survey (MORI 2005), it is useful to develop a system of staff involvement in the implementation of HIS projects; particularly when clinicians do not exercise high levels of involvement. Training and education have also been identified in the survey as the leading barrier to the full implementation of the programme.

The best way to involve users is to train them to help them to appreciate why and how they are involved, and to guide them through the process. Allowing users time to adjust is also useful and continuing to work to change services based on users' iterative input is needed. Senior managers have a responsibility to be sensitive and to present information to users in a way that they can understand, and allow them adequate time and resources to support their involvement (Crawford, Rutter et al. 2003; Rose, Fleischmann et al. 2003).

Service providers are often good at involving users at the start of a process, but not always good at feeding back to the people who have been involved about what the outcome of their involvement has been. One of the major obstacles to involving users is the reluctance of health professionals to embrace change suggested by service users (Crawford, Rutter et al. 2003; Rose, Fleischmann et al. 2003). Moreover, the implementation process is usually driven by senior management, however managers, physicians, nurses, allied health professionals, and daily operations people from all parts of the organisation should be included (Englebardt and Nelson 2002).

Further to that, users should not feel alienated by new systems. The top-down approach for IT adoption and diffusion is likely to engender feelings of resentment and frustration among healthcare workers, rather than a willingness to adopt and adapt to these changes (Currie and Guah 2006, pg 15).

Another important aspect of involvement is not to involve service users until there is a clear idea what the aim of their involvement is going to be and it is equally vital, to understand that involvement is not an end in itself. Instead, it should be a means to an end, with the end being to better develop quality services (Crawford, Rutter et al. 2003).

2.8.2 Empowerment

Rose, Fleischmann et al. (2003) argue that there is a critical need to involve stakeholders in healthcare IT projects so that they feel ownership of these systems and are therefore less inclined to resist them. She suggests that involving users in decisions and processes should be meaningful and empowering. User involvement is

a powerful tool that can change the philosophy of an organisation and all the roles within it. When done right it can yield much better services

If managers get the processes right, users will be involved in the new changes and will have ownership of these changes. Users can become empowered because the process itself may bring about a change in the power of differentials of the various actors involved (Rose, Fleischmann et al. 2003).

Other studies have reported concern over lack of empowering stakeholders. Brennan (2007) reports that lack of clinician engagement in IT projects can result in feelings of apathy. Currie and Guah (2006) have also reported that lack of clinicians' support has led to project delays in the NPfIT.

2.8.3 Resistance

Most people are comfortable with the status quo, and therefore resist any changes to what they are accustomed to. Lorenzi and Riley (2004) explain that it may be impossible to introduce new IT systems into healthcare organisations without the people working in them feeling the impact of this change. They suggest that the challenge is to acknowledge the stress that change will bring to people and the organisation.

In their study, Scott and colleagues (2005) found that the introduction of an electronic medical record system to a non-profit healthcare organisation created several challenges including resistance. Many users felt the selection of the system was detached from the local environment, sparking doubt and resistance. Problems with software development also increased local resistance, as did clinicians' reduced productivity.

Others, like Protti (2002) suggest that implementation failures are rarely caused by the technology used, and relates implementation failures to resistance from people not motivated to work with the new technologies. He argues that HIS projects cannot succeed without the support of the people using them. He urges governments to clearly identify strategies, methods, and techniques for winning the approval of

users, rather than pursuing top-down policies by imposing IT-enabled change on people.

This pragmatic approach would require public sector officials to closely monitor organisational and behavioural issues of IT projects and not just the technical ones. Identifying issues and risks early on and reacting positively to problems both within IT and across other project areas where any changes will have an impact is therefore critical (Currie and Guah 2006).

2.8.4 Communication

Whether talking about leadership or staff involvement, communication is a cornerstone of success when implementing HIS projects because the process is so complex and extensive (Lorenzi and Riley 2004). Currie and Guah (2006) argue that an increasingly bureaucratic approach is no substitute for winning the hearts and minds of the people who are affected by changes to working practices. They also suggest that better communication channels are required to convince healthcare stakeholders that such changes are necessary and worthwhile.

Given the complexity and scale of a large-scale health care IT systems, it is necessary to address the different levels of communication needed between different groups. For example, it may be useful to break down the communication strategies by ensuring that frontline clinical professionals and management have their own communication channels and that administrative staff and management also have proper communication channels for their daily operations. Having clear lines of communication can ease the implementation of the IT project (MORI 2005).

There are many avenues for healthy communication channels when implementing HIS projects. Frequently disseminating information about the project and its milestones is an effective way to ease staff concerns about the project (Lorenzi and Riley 2004). This information can be shared through simple tools like letters, memos, newsletters, flyers, posters or Intranets.

2.8.5 Change management

Governments have realised that they cannot introduce change by edict, structural reform, or even by persuasion. Attempts to introduce change have backfired because they have been too mechanistic. So, instead, there is some recognition that change has to be managed. Planned change represents an intentional attempt to improve, in some important way, the operational effectiveness of the organisation by modifying the behavioural patterns of its members; and improving the ability of the organisation to cope with changes in its environment (Mullins 2007).

The relationship between technological change and organisational change is interesting in the classic which is the chicken and which is the egg sense; which one of them drives the other or if they can be accomplished in parallel (Lorenzi, Riley et al. 1997; Beaver 2003). Anyone can easily be overwhelmed by any type of change, (Kotter 1996; Lorenzi, Riley et al. 1997; Lorenzi and Riley 2000; Audit Commission 2001; Crawford, Rutter et al. 2003; Rose, Fleischmann et al. 2003; Paton and McCalman 2006; Hayes 2007) especially when this change occurs in large-scale healthcare organisations.

However, change management is about people, not about computers. Those who have had success with their current way of doing something will be hesitant to try a new process. This is especially true in health care, where patient lives are at stake. Without a reason to change, clinicians and physicians are reluctant to change (Shabot 2004).

Although there is a need for highly skilled professional IT suppliers and consultants, the technology should not be the primary focus of massive HIS projects as that will just create a greater chance of ending up with another failed initiative (Currie and Guah 2006). IT strategists need to address the wider cultural imperatives and the extent to which the organisational climate and people are predisposed to adopting new IT-enabled working practices. Although this may seem self-evident, research in the area shows that the top-down approach for IT adoption and diffusion is likely to engender feelings of resentment and frustration among healthcare workers, rather than a willingness to adopt and adapt to these changes (Currie and Guah 2007).

Given the HIS research background, HIS is much more than a simple installation of a computer system within a healthcare organisation, it represents a significant change in the way healthcare is delivered (Sittig, Hazlehurst et al. 2002), and healthcare organisations must be equipped to handle this change from both logistical and behavioural aspects. Problems associated with change are in a way timeless and can be associated with the implementation of IT at any time, although the technology itself is constantly evolving and at a very fast pace. This ‘timelessness’ of change management issues in an ever-changing and complex field is one of the reasons that drew me to explore it in detail as much of the reported findings discussed later in this study address these issues.

Failing to acknowledge the need for HIS project implementations as ‘change’ projects can be problematic. Currie and Guah (2006) argue that the failure to implement a large-scale management change program in conjunction with the technical changes will only intensify the implementation. They further contend that there is no such thing as an “IT failure” because all technology failures are more appropriately described as “management failures”.

2.8.6 Business process reengineering

In the very beginning, information systems were not designed or implemented with the intent of changing organisational processes. Rather, they were installed with the intent of simply automating existing processes in order to improve them (Beaver 2003). IT then went on to have a more evolved role of supporting processes; but not actually improving the initial process. An example of this is automating a billing system where the newly automated billing system will calculate and print the bill, but the bill is still sent to the patient the old way via mail.

It was not until the late 1980s that comprehensive business change was coupled with new information systems and for the first time, automation combined with business process change was producing dramatic changes in business processes. It was during this era that the electronic patient record was introduced dramatically impacting the delivery of care to patients. Beaver (2003) maintains however, that this is not

business process redesign, but rather the elimination of traditional business processes and replacing them with more business-to-costumer interaction.

Beaver (2003) describes the “classic” approach to improving a business process (i.e. business process improvement, reengineering, or process redesign among many other names) and he explains that this type of process is characterised by methodical, detailed, and lengthy analysis of the existing process followed by an effort to invent or redesign an improved process. In this frameset, information technology can be invented or adapted to whatever the new optimal process will be. Beaver (2003) cautions however, that although this approach is known to work quite satisfactorily, it is almost always expensive and lengthy.

2.8.7 Strategy

There is a need to understand the wider theoretical and historical context within which organisations operate and the pressures and options they face for change and organisational change and cannot be separated from organisational strategy, and vice versa (Burnes 2004). Implementing electronic records must be planned strategically. It takes a long time to implement them. *“Electronic records cannot be rushed, and an overnight courier cannot deliver them”* (Protti 2002, p. 11). One of the five lines of development in HIS that Haux (2006) considers as important is the need to shift from technical to strategic information management strategies. Governments need to clearly identify strategies, methods, and techniques for winning the approval of those affected, rather than simply pursuing centrist (top-down) policies by imposing IT-enabled change on people. This would require public sector officials to closely monitor the various IT projects from end to end, and not just the IT implementation (Currie and Guah 2006).

Every large program, like the NPfIT, notably has problems and things that will go wrong. Identifying issues and risks early and reacting positively to problems both within IT and across other project areas where any changes will have an impact is therefore critical. Failure to identify and delineate between the perceived and actual benefits from E-government initiatives is often at the heart of many failures (Currie and Guah 2006).

2.8.8 Leadership

It is important to keep people motivated, and leadership is key to large-scale improvement. Due to the changing nature of organisations; flatter structures, advances in social democracy and the changing nature of management; moving away from close control of the workforce towards an environment of coaching, support and empowerment; strong leadership is recognised as necessary for change, improved quality and better performance (Mullins 2007).

In healthcare; for example, many efforts are underway that recognise the need for leadership to modernise or change healthcare institutions. Amongst many others worldwide, there is the UK's Centre for Health Care Leadership (UK), the Health Leaders Network in Australia and New Zealand, the National Leadership and Innovation Agency for Healthcare in Wales, and the US's Advanced Health Care Executive Leadership Development Institute (Shortell 2002).

Delivering positive change and continuous service improvement is the biggest challenge facing public services. Managers and non-executives also face a major task in balancing national priorities alongside the concerns of local communities (Audit Commission 2001). The challenge is for leadership to operate under rapidly mutating circumstances, which require a rethink of paradigms of leadership both in theory and in practice (Avery 2004).

Both excellent leaders and excellent followers will be needed to make new clinical information systems a success (Shabot 2004, pg 269). Or as Bryman (2004) explains, some studies on leadership and change are concerned with how leaders and their styles of leadership promote change and how leadership styles themselves change in response to particular circumstances. He also explains that there is a recurring theme on the need for leaders who are leading a change process to secure commitment to the change process, address multiple constituencies (external and internal), convey a sense of the need for change, and instil a vision of how change should be implemented and what the future state of the organisation will look like.

Implementation involves several critical components, including perceptions of the system selection, early testing, adaptation of the system to the larger organisation, and adaptation of the organisation to the new electronic environment. Throughout, organisational factors such as leadership, culture, and professional ideals play complex roles, each facilitating and hindering implementation at various points. A transient climate of conflict was associated with adoption of the system (Scott, Rundall et al. 2005).

2.8.9 Leadership and change agents

Health care is an information intensive service. Automation and the use of technology provide an effective and efficient means to manage the large volumes of data and information with knowledge and wisdom. However, the move from a manual to an automated world is changing every aspect of healthcare. This degree of change brings excitement, anxiety, resistance and pride. Health care informatics specialists function at the very core of this change by taking on the role of change agents. They play a major role in implementing, planning managing and leading health care organisations as they move forward with automation. To play this role, they work directly with clinical, administrative and technical personnel in the organisation. For health care informatics specialists to provide effective leadership, they must understand the institutions, the people, and the processes within the organisation (Englehardt and Nelson 2002).

2.8.10 Champions of change

Change champions are the early adopters who want the change implementation to succeed, and believe that the change will be beneficial to the institution. The change champions can be members of staff affected by the change who do not have to have management responsibilities. They are the natural marketers for the organisational change and act as catalysts for others. They will speak positively about the change, show that it can be done and support colleagues at an informal level. Project managers must decide how to make use and reward the enthusiasm and support of the change champions.

Englehardt and Nelson (2002) explain that effective change requires champions with a clear vision, a culture of trust, an organisational sense of pride, and the intense

involvement of the people who must live with the change. The champion must also have the institutional resources to support the change process. These resources include leadership skills, personnel, finances, and time.

2.8.11 Transformational leadership

There are many different leadership approaches and styles that can be applied to affect positive change. Bryman (2004) explains, some studies on leadership and change are concerned with how leaders and their styles of leadership promote change and how leadership styles themselves change in response to particular circumstances.

For example, while transactional leadership is premised upon motivating followers by some form of instrumental exchange, either a monetary or symbolic reward system, transformational leadership conversely, asserts that leaders can transform followers by persuading them to subordinate their individual wants to the needs of the collective (Wager, Wickham et al. 2005).

The focus of the transformational approach is on exploration, innovation and effective business performance in a modern, ever-changing business environment. It is as much about inspiring others as it is about maintaining the organisation's competitive advantage.

Achieving the transformational change that leads to excellence demands a relentless focus on a small number of key priorities, as well as commitment by public service bodies to maintain this focus through the inevitable highs and lows of the change process. The Audit Commission's 2001 (2001) report explains that governments can support this focus by setting out clearly its priorities for improvement, and giving local service providers the space and freedoms to deliver them. Above all, leaders of local services play a crucial role in maintaining a commitment to major change initiatives, by mobilising and sustaining support for change among staff and local stakeholders.

A participatory, consensus-building style may lead to more effective adoption decisions, whereas decisive leadership could help resolve barriers and resistance during implementation (Scott, Rundall et al. 2005). Tong (1990) also promotes using

a participatory management style in implementing complex healthcare capital projects.

2.8.12 Path-goal leadership

Leaders encourage and support their followers in achieving the goals they have set by making the path that they should take clear and easy. The Path-Goal Theory contends that the leader must motivate subordinates by emphasising the relationship between the subordinates' own needs and the organisational goals; and by clarifying and facilitating the path subordinates must take to fulfil their own needs as well as the organisation's needs, and by removing any obstacles that stand in the way of the goal. This theory also emphasises the relationship between the leader's style and the characteristics of subordinates and the work setting. It also takes into account the effect that structuring behaviour will have under different conditions. (Evans 1970). This type of leadership style might be well suited for IT implementations, especially in healthcare settings where there are always many obstacles to overcome and where there are always varying organisational conditions.

2.8.13 Skills approach to leadership

The skills approach to leadership (Katz 1955) is a leader-centred approach that focuses on skills & abilities that can be learned and is based on the premise that knowledge & abilities are needed for effective leadership and that a leader's effectiveness depends on the leader's ability to solve complex organisational problems. It is a comprehensive skill-based model of leadership that could be applied when considering the skills of the project managers, implementers, change agents and others involved with HIS project implementations.

2.9 Suggested Models for Organisational Change

The association between information systems and change cannot be ignored. The two have almost become inseparable in the way they interchange across the implementation of healthcare systems. It would be difficult or impossible to discuss implementation of IS in healthcare without acknowledging the impact of change this process would have on an organisation (Beaver 2003).

While in the past information systems and change were at best loosely linked, today it is the combination of the two that produce the benefits for which most information systems investments are made. In order to achieve those benefits, a rational approach to managing the changes in both information systems and process is necessary (Beaver 2003, pg 352).

With the need for change management skills to help smooth the transition of new IT enabled healthcare delivery, some formal organisational model should be applied to strategically focus the implementation within tried and tested methods. The EHR is not about technology but more about a long-term cultural change programme, the technology can enable that cultural change to occur (Protti 2002). Typical project management delivery models usually designed for the business world may not take into account the nature, complexity, and culture of healthcare institutions. That is why some have proposed new models for the type of deployments required in healthcare IT.

2.9.1 Kurt Lewin's 'Theory of Planned Change'

An understanding of change theory makes it possible to effectively plan and implement change in organisations and in other social systems. Healthcare information systems have a major impact on the structure and functions of health care delivery systems. They bring about significant change. The approach used to manage the change process may result in a more effective and efficient health care delivery system or it may result in increased dissatisfaction and disruption. Healthcare informatics specialists play a major role in planning for, guiding, and directing these changes. In other words, healthcare informatics specialists act as change agents (Englehardt and Nelson 2002).

Planned change is to distinguish change that was deliberately and consciously planned by organisations as opposed to changes that come about unintentionally or unwanted or that might be forced upon an organisation. Kurt Lewin's theory of planned change divides change into three stages: unfreezing, moving, and refreezing (Schein 1996). This approach to managing change focuses on the process by which people and social systems make changes. Research in this area has demonstrated that people in various cultures follow a similar pattern when incorporating innovation and

change. This view of change provides a framework for understanding how people react to change and for guiding the change process (Englebardt and Nelson 2002).

Englebardt and Nelson (2002) explain how Kurt Lewin's change theory can be applied to health informatics implementations. According to this theory, systems expend energy to stay in a steady state of stability. A system will remain stable when the restraining forces preventing change are stronger than the driving forces promoting change. Initiating change begins by increasing the driving forces and limiting the restraining forces, thereby increasing the instability of the system. This is the unfreezing stage. The first stage in the lifecycle of an information system involves evaluating the current system and deciding what changes need to be made. The pros and cons for change reflect the driving and restraining forces. If changes are to be made, the restraining forces that maintain a stable system and resist change must be limited. At the same time, the driving forces that encourage change must be increased. For example, pointing out to users the limitations and weaknesses with the current information management system increases the driving forces. Asking for user input early in the process before decisions have been made decreases the restraining forces. Once a decision is made to initiate change, the second stage-moving-begins (Englebardt and Nelson 2002).

The moving stage is the implementation of the planned stage. By definition this is an unstable period for the social system. Anxiety levels are increased. The social system attempts to minimise the impact or degree of change. This resistance to change may occur as missed meetings, failure to attend training classes, and failure to provide staff with information about the new system. If the resistance continues, it can cause the planned change to fail. Healthcare informatics specialists, as change agents, must anticipate and minimise their resistive efforts. This can be as simple as providing food at meetings or as a planned program of recognition for early adopters. For example, an article in the institution's newsletter describing and praising the pilot units for their leadership will encourage the driving forces for change (Englebardt and Nelson 2002).

Once the system is in place or the change has been implemented, additional energy is needed to maintain the change. This is the refreezing phase, and occurs during the

maintenance phase of the information system's life cycle. If managed effectively by the change agent, this phase is characterised by increased stability. In this stage, forces resistant to change are encouraged. Some examples include training programmes for new employees, an annual review of all policies and procedures related to the change, and continued recognition for those who become experts with the new system (Englehardt and Nelson 2002).

Some have criticised Lewin's model for not being applicable to today's dynamic organisations (Dunphy and Stace 1993; Burnes 2004). With healthcare and IT amongst the most dynamic of organisations, Lewin's approach may not be the best-fit approach to introducing these systems. That is because IT systems are neither stable at the start, nor stable at the finish; with a constant need for ongoing support, maintenance and enhancements. Moreover, it is a machine metaphor type theory; leading to a focus on 'friction', conflict and resistance.

2.9.2 Emergent change

The emergent approach to change (Burnes 2004), which starts from the assumption that change is a continuous, open-ended and unpredictable process of aligning and realigning an organisation to its changing environment, has taken over from the planned approach as the dominant approach to change. Advocates of emergent change argue that it is more suitable to the turbulent environment in which organisations-such as hospitals-operate, because unlike the planned approach it recognises that it is vital for organisations to adapt their internal practices and behaviour in real-time in changing to external conditions. Furthermore, it sees change as a political process whereby different groups in an organisation struggle to protect or enhance their own interests. It is argued that (Burnes 2004), although the emergent approach has a number of distinct strengths, like the planned approach, it is a partial and flawed approach to change.

2.9.3 The 'Four-stage Model'

When examining three examples of medial informatics implementations in different healthcare settings, Lorenzi, Riley et al. (1997) argue that the implementers in all three examples given did not consider an organisational change model or the people and organisational issues associated with these implementations. Although this

review paper was intuitive and highlighted some organisational and behavioural issues, the examples used were from small-scale implementations; one was on a CPOE within a hospital, the other, a system within a medical centre, and the last was a dispatch system in an ambulance service.

In the same paper, they went on to suggest an organisational change model for healthcare informatics. In it they argue that their 'four-stage model of organisational change' applies to the general level as well as for the implementation of change through informatics systems. Granted, perhaps research on applying this model within large-scale MI implementations would be useful.

Lorenzi, Riley et al. (1997; Lorenzi and Riley 2004) explain that in their 'four-stage model for organisational change', the initial steady state is affected by some impetus for change (technical or non-technical), like a visionary perception or even a delayed reaction to environmental to change. In the second stage the organisation conceptualises the desired outcome, and in the third stage it applies the change. In the fourth stage, if the change is not trivial, the organisation itself is altered in various ways by the change. Finally, if the organisation is altered over time, it will become the new initial state for the next change.

In a complex organization functioning in a volatile environment, various portions of the organization are passing through various stages of the process at varying rates. There is a continuous cycle of change that organizations are constantly managing (Lorenzi, Riley et al. 1997, p. 81)).

Although it was refreshing to examine informatics implementations through a proposed organisational model, this particular model seems to draw heavily upon Kurt Lewin's 3-stage process (Schein 1996). It does however; seem to accommodate complex, and constantly changing environments.

2.9.4 Kotter's 'Eight-stage Approach'

Perhaps John Kotter's (1996) eight-stage approach may be a more suitable change management model for health informatics implementations, especially the incremental ones. He suggests that change should be 'lead' not 'managed' and that leading change is incredibly difficult although absolutely essential and can only be

achieved through strong leadership. He also explains that transformation is a process; not an event, that advances through stages building on each other and taking years to achieve.

The eight-stages he proposes are summarised as; establishing a sense of urgency and driving people out of their comfort zones, forming a powerful guiding coalition with a shared commitment and enough power to lead the change, creating a clear vision and strategy, then communicating that vision, empowering others to act on the vision, planning for and creating short-term wins, consolidating those improvements and producing more change, and then institutionalising the new approaches by anchoring them in the organisational culture.

2.9.5 The ‘Project Management Office’

Strategic information systems planning (SISP) requires significant outlays of increasingly scarce human and financial resources. Yet, there exists very little understanding of how the success of this planning activity is measured (Segars and Grover 1998). Some have suggested using project management tools to help in the strategic development of IT systems in healthcare. One proposed model for organisational change in IT healthcare projects is through establishing a project management office (PMO). When IT change is implemented through a separate department within the organisation completely dedicated to the implementation of any type of change, this could potentially ease the transition for users where at least all changes they go through are done through a similar approach. Drawbacks of this would be that it is a one “size-fits-all” approach and too focused on standardising where some diversity and discretion of some areas may be required.

Some organisations create a project management office (PMO) to provide best practices and support for managing projects. A PMO is an organisational group responsible for the coordination of all projects managed in an organisation. This office should provide a standard methodology for managing projects, including standardised plans and document templates. The office can also provide education, coaching, and mentoring as well as project management resources. Although PMOs have been around for quite some time in other industries, they are relatively new to healthcare. With the Federal Directive for increased healthcare information

technology in the United States, the healthcare industry has begun the challenging task of implementing more and more information technology systems. With this increase in projects there is a greater need for project management and consistent methodology for managing projects (Houston and Bove 2007).

Developing a project management office (PMO) is a project in itself. The PMO is more than just a group of project managers; it is a methodology for how projects will be managed. It may begin with only one person. The purpose of establishing a PMO is to develop the methodology and project templates for all projects, not only to hire and develop project managers. The most important point in developing a PMO is to understand the organisation's existing state (Houston and Bove 2007).

Altuwaijri (Altuwaijri 2008) proposes a new model for successful implementation of IT projects by exploring the potential gains of creating of an e-health programme management office using the implementation of a CPOE system as an example. Altuwaijri (2008) suggests that the purpose of the PMO would be to translate the organisation's strategic plan into e-health projects. It would also be accountable for enterprise-wide distribution of best practices; facilitating the strategic alignment of projects, management of relations between projects, and the ability to better understand the challenges of IT success factors.

2.9.6 The 'no method' approach

Organisations and managers can and do exercise a wide degree of choice in what they change, when they change and how they change (Burnes 2000). It could be that leaders decide not to employ any specific change models in their implementation strategies at all. It is likely that implementers' varying organisational backgrounds, training, qualifications, expertise and orientations will have an effect upon how the technology adoption process unfolds and is shaped from the initiation stage onwards (Mullins 2007) without necessarily adopting an exact or certain methodology.

Mullins (2007) argues that it is the experiences and knowledge that these people bring that can dictate how the new technology is introduced, and what the strategy of adoption will be. This makes the introduction of new technology; as Mullins (2007) explains, an iterative, contested and political process that could be the culmination of years of experience, skills and knowledge.

Whichever one of the above approaches is chosen, it is important to recognise the need for strong leadership and experience to guide successful IT change within healthcare organisations and not to leave the success of these implementations to chance.

2.9.7 Which approach is best?

Despite the large body of literature devoted to the topic of change management, and the many tools and techniques available, there is a considerable debate and little agreement regarding the most appropriate approach. Though it is clear that neither the emergent approach nor the planned approach is suitable for all circumstances and situations (Burnes 2004).

Burnes (2004) argues that there is a strong tendency to present the various approaches to change as being limited in number and mutually exclusive.

Conversely, in practice, the range of approaches is wide and they can be and often are used either sequentially or in combination. The appropriateness of each of the available approaches is dependent upon the type of change being considered and the constraints under which the organisation operates although these constraints and objectives can themselves be changed to make them more amenable to an organisation's preferred approach to change or style of management.

2.10 Summary

When implementing complex IT systems in even more complex healthcare environments there is little surprise that attempting such a task will lead to considerable challenges. It has been agreed upon in much of the scholarly literature that implementing HIS and Informatics projects in healthcare organisations is challenging. However, unravelling those exact challenges is not straightforward.

Scoping the relevant literature on the challenges of implementing large-scale HIS was a cumbersome task. On top of the conscientious criteria I had placed, most of the searches I had used did not yield satisfying results. Moreover this topic draws from various disciplines, such as organisational behaviour, organisational

development, project management, change management, economics, psychology, and more technical fields like computer science and engineering. Additionally, all of these had to be examined within a healthcare context and publications as such are quite rare.

With the literature that was reviewed there were some common themes, mainly that implementing large-scale HIS projects presented both technological as well as organisational issues. The themes construed from the literature generally discuss challenges as a combination of technological, logistical and managerial or behavioural issues with more emphasis on the organisational factors.

A detailed investigation of this study was aimed at unravelling the different challenges of implementing HIS and informatics within a large-scale implementation while specifically addressing the technological, managerial and behavioural aspects of the implementation. With particular consideration of the organisational aspects of implementing HIS and Informatics projects in healthcare, there are many change management and organisational development models for introducing them. These include the planned and emergent approaches to change, the four-stage model, Kotter's eight-stage process, or through project management offices. Some have challenged Lewin's approach as not suitable for dynamic institutions, and the four-stage model draws heavily from Lewin's approach. Kotter's approach and project management offices might be more suitable approaches to managing change in IT driven healthcare projects, however there is little agreement regarding the best approach. Some suggests that a combination of different approaches can be used, while others suggest that implementers with their varying backgrounds and orientations can utilise their own experiences to guide the necessary change. As part of the reported research presented later in this study, the type of organisational models used (or not used) in the organisation under investigation are also discussed.

CHAPTER 3 RESEARCH DESIGN

3.1 Introduction

In this chapter the methodological approach is described. The focus will be on the research strategy and how the data were collected, however a detailed description of how the data were systematically analysed will be described in a subsequent chapter dedicated to analytical procedures (Chapter 4).

A qualitative methodological approach was used in this study. The decision to design the study relying solely on qualitative methods was only reached after much thought and careful consideration into the aims of the study and what was to be gained from conducting it.

The study's focus on the implementation as a process over a time directed the methodology towards a qualitative approach. Semi-structured, in-depth interviews were used as the main method for collecting the data. An interview guide was designed and further refined after a pilot interview. A combination of purposive and snowball sampling were used until theoretical saturation was achieved. The final sample consisted of 32 participants; four of which were interviewed twice resulting in a total of 36 interviews that were transcribed in preparation for further analysis. The respondents were members of the organisation under investigation who were directly involved with the implementation.

Being an inside researcher facilitated unprecedented access to the project, however being an employee with the organisation under investigation justly raises questions about bias. These are discussed in this chapter; however reliability and validity concerns will be discussed in the chapter on analysis chapter (Chapter 4).

3.2 Qualitative Methods

Quantitative and qualitative methods are different ways of conducting research. Quantitative researchers seek generalisation of findings, while qualitative researchers seek explanation and understanding. Thus, qualitative analysis results in a different

type of knowledge than quantitative inquiry does (Corbin and Strauss 1990) . The choice between them is purely a technical one and should be made in terms of their appropriateness in answering particular research questions and the aims of the study (Bryman 2008).

In this study qualitative methods were chosen over quantitative methods simply because they better served this type of investigation where the focus was to arrive at the challenges as the people involved with the implementation of the project experienced them. Bryman (2004) suggests that change and connections between events over time tend not to surface in quantitative research and qualitative research is more attuned to the unfolding of events over time and to interactions between the actions of participants of social settings. Therefore, qualitative research may be a better method to use when evaluating a process that has unfolded over time; such as the course of implementing a healthcare information system over a few years.

Another advantage of qualitative research is that it is more fluid and flexible and, therefore, it allows space for discovering unanticipated findings or even to change the objectives of the research problem due to unexpected occurrences (Bryman 2004). This presumption was another reason that this method was chosen. The study was planned with the aim of gaining more insight through interaction with key players in the researched area with the inclination that new (and unforeseen) knowledge may emerge. This interaction provided valuable information that could not have been acquired through quantitative methods. Ultimately, new and unexpected questions were raised that had to then be pursued for further examination.

3.3 Research Design

Careful research design is a necessary requirement for all research of whatever style, although that does not mean that all possibilities of flexibility and spontaneity in future decision-making are ruled out (Brewer 2000). One of the virtues of qualitative research is that it allows for unanticipated changes of plan. Many considerations shaped the design of this study, starting with its aims, accessibility, availability and willingness of respondents, not to mention time and

scope. Still, it was not possible to follow the initial design precisely and some alterations had to be made.

3.3.1 Triangulation

Convinced that a research strategy was needed, and consoled by the idea that later flexibility would be allowed, the early methodological strategy was designed. I wanted to support the findings by not relying on only one method by incorporating triangulation. Triangulation implies that results of an investigation employing a method associated with one research strategy are cross-checked against the results of using a method associated with the other research strategy (Bryman 2004). A major assumption of the triangulation strategy is that looking at an object from more than one standpoint provides more knowledge (Silverman 2006). I planned to triangulate the findings by using a combination of *interviewing*, *participant observation* and by collecting *documentary material*.

3.3.2 Documentary material

I planned to gain access to documentary material in the form of project plans, correspondence and distributed memos to support the findings from the interviews (Green and Thorogood 2004). Unfortunately, when I was actually in the field, I came to realise that the documentary material I had hoped to collect were not available to me, and that method of data collection as was abandoned.

3.3.3 Participant observation

I had also planned on incorporating some participant observation (Hammersley and Atkinson 1995), by observing phases of the implementation, rollouts or meetings when possible. Coincidentally, there were no planned go-lives or rollouts for me to observe during the time I was in the field, and that methods also had to be abandoned.

3.3.4 Interviews

I came to realise; only while I was in the field that I had to reassess the previously chosen methods and rely solely on the method of semi-structured interviewing that has become a popular form of qualitative research (Davies 2002); particularly, in-depth, semi-structured interviews. These were ultimately used to collect all the data for this study, because they provide a means for exploring the points of view of the research subjects themselves (Silverman 2006). Others, like Bryman (2008) agree that when qualitative interviews are the primary data collection method, researchers are able to get closer to the people they are investigating and by using interviews in this study I was able to capture what the interviewees feel, perceive, think and do in natural situations. This also gave the interviewees freedom to convey their own feelings, moods, ideas, beliefs, perceptions and emotions; allowing them-as Brewer (2000) describes it-to define the meanings of what is being described from their own standpoint and through their interpretive processes as they themselves articulate them.

These changes also lead me to re-examine my sampling techniques, where I felt it was necessary to continue to sample until I felt satisfied that I had reached convincing answers to the research questions. Initially I had planned to interview a total of 22 respondents, but after actually beginning to sample-and by relying only on one method for data collection-I felt that more respondents were required.

3.4 Sampling Strategy

This was an investigation aimed at finding the answers to the research questions through careful selection of the 'right people' who could potentially provide the 'right information'. A combination of purposive and snowball sampling guided by theoretical saturation were used to decide the final sample.

3.4.1 Purposive Sampling

Silverman (2006) recommends using purposive sampling in research based on interviews, whereby the researcher samples on the basis of wanting to interview people who are relevant to the research question. Because I had firsthand knowledge

of the organisation, I was able to make a predetermined list of potential participants; or people I thought would have useful insight before I even went into the field.

3.4.2 Snowball Sampling

Bryman (2004) explains that the sampling of informants in ethnographic research as with this type of research is often a combination of convenience sampling and snowball sampling, by formally asking for names of others who might be relevant and who could be contacted. For this study, I sought diversity and tried to cover people with different experiences in the implementation. I asked the interviewees that I had ‘purposively’ selected to assist me by suggesting participants from the different departments that they had worked with throughout the implementation.

3.4.3 Theoretical Sampling

In a theoretical sampling approach, the researcher carries on collecting data (observing, interviewing, collecting documents) until theoretical saturation is achieved and a category has been saturated with data (Bryman 2004). In this study the sampling process began and continued in an iterative cycle until I was convinced that that all the research questions had been answered satisfactorily. By that I mean that either the highest authority on a particular issue (the person who in their capacity would have the most knowledge on an issue) was consulted and provided convincing answers (for example, the Chief Information Officer), or enough respondents gave convincing explanations for a given issues. More on theoretical sampling will be discussed in Chapter 4.

Granted, this does not always mean a consensus had to be reached to prove a certain point. In cases where there were conflicting views, both arguments are presented and the reader can make a personal judgement. Sometimes there is meaning behind the fact that there are conflicting views. Examples of this can be found in the Discussion chapters (Chapters 6-9).

3.5 Qualitative Interviews in HIS Research

In practice, the flow of healthcare work is often much less linear than it is in other areas, with overlapping roles and a need for flexibility. Because of this complexity, standard quantitative research methods sometimes fail to expose the subtle problems. Statistical research may not be able to take full account of the many interactions that take place in social settings (Cronbach 1975). Conversely, qualitative research techniques can provide deeper insight and can both identify problems and answer the in-depth questions that quantitative studies cannot answer (Ash, Berg et al. 2004). Many researchers of healthcare services and several researchers in the HI field understand this need and have applied qualitative methodologies in their studies.

3.5.1 The Kaiser Permanente study

In their evaluation of Kaiser Permanente's experience of implementing an electronic patient record, Scott, Rundall et al. (Scott, Rundall et al. 2005) examined the experience of implementing an electronic patient record system in Kaiser Permanente Hawaii using semi-structured interviews. They were able to identify the critical events in the system implementation, the impact of organisational culture and leadership, and the effects on clinical practice and patient care processes as perceived by the system's users. They held 12 semi-structured; recorded interviews with twelve clinicians and five managers in four teams, located in four clinics and the Kaiser Permanente hospital, and with nine clinical information system (CIS) project team members. In the 60-90 minute interviews they sought respondents' views on four implementation issues; critical events in the implementation of the CIS, culture, the roles played by organisational leadership and the CIS related changes in clinical practice. The interviews were transcribed and analysed inductively and thematically. Responses were coded and collated to create themes. They had also held regular discussions to review themes and clarify facts (Scott, Rundall et al. 2005).

3.5.2 The NPfIT study

In another similar study by Currie and Guah (2007), for their primary data collection they held 120 open-ended semi-structured interviews during the first four years of the NPfIT project. The majority of their interviews were with health service professionals engaged in the implementation of the NPfIT. An interview schedule was used while allowing the interviewees to discuss their points without too much

structure. This also allowed interviewees to raise additional themes, issues and concerns that they felt were important to the research study (Currie and Guah 2007).

3.6 Conducting the Study

3.6.1 Gaining ethical approval

This research was approved by the Swansea University School of Health Science Research Ethics Committee (SHSREC), which was sought and gained before conducting the study. Gaining this approval involved a rigorous process of demonstrating that all ethical issues would be taken into consideration prior to collecting any data. This process involved filling out a very lengthy form as a proposal that required providing detailed information on the aims, justification and background to the study, a summative literature review, explicit details of the research design, and ensuring compliance with all aspects of the Data Protection Act. Issues of confidentiality, anonymity, harming participants and consent were also clarified in the application for ethical approval. A committee convened and granted approval without the need to make any changes to the research design or proposal.

Both confidentiality and anonymity of the participants were safeguarded and respected during and after the study. I made every effort to ensure that anonymity was preserved. All the original data were securely stored in a safe, and a password-protected computer was used to store electronic data and findings.

I also recognised that the interviews sometimes took up the time of the staff involved and every effort was made to minimise the disruption that may be caused to the people involved.

3.6.2 The participants

As previously mentioned, semi-structured, in-depth interviews were conducted. Based on the type of involvement in the project, the participants were categorised into three distinct groups:

- **IT Management:** IT Executives, directors, and managers
- **Medical Application Team:** IT systems analysts and implementers

- **Stakeholders:** Hospital executives and directors, physicians, nurses, and other clinical workers from various departments

3.6.3 IT Management

The ISID at the NGHA guided the implementation. Headed by the Executive Director of ISID, this division took charge of the strategic planning and long-term vision of the HIS implementation. As a previous member of this group and having been sponsored by them, I had full access and support from the ISID and the NGHA to conduct this study. More on my experience as an inside researcher is discussed at the end of this chapter and in Chapter 4.

Executive Directors and Directors who had direct involvement with the implementation were selectively approached. All ISID managers who were involved with the implementation were also contacted and asked to participate. Altogether ten ISID managers/directors/executives were approached and out of those ten **nine** agreed to participate.

3.6.4 Medical Application Team

All members of the medical application team received an email asking them to participate. They are the technical people who worked under ISID to do the actual technical aspects of the implementation. Their involvement was critical to the study, as their main job role was the implementation and support of the system. Some were additionally contacted by phone and others were also asked in person to participate. In all there were a total of twenty members of this team. Out of the twenty contacted **seven** agreed to participate.

3.6.5 Stakeholders

The word ‘stakeholders’ is used here when referring to the hospital executive directors and directors, physicians, nurses, department heads and other clinical workers who were directly involved or affected by the HIS implementation.

In an organisation such as the NGHA with staff numbers well over 15,000; the involvement of stakeholders in such a study was crucial. However, it was not practical or necessary to involve every single stakeholder and it was decided to

purposefully seek stakeholders from different areas/departments who were actually involved with the implementation. The departments/areas that were approached were recommended by members of the Medical Application team (through snowball sampling) and were as follows:

- Medical Services (Executive Directors, Directors, Chairman, Management)
- Nursing Services (Executive Directors, Directors, Chairman, Management)
- Clinical Nursing (Directors, Managers, key/super users)
- Laboratory (Directors and Managers)
- Laboratory key/super users
- Pharmacy (Directors and Managers)
- Pharmacy key/super users
- Cardiology
- Medical Records (Directors)
- Physical Therapy key/super users
- CCU key/super users
- Patient Services
- Physicians (Consultants and key/super users)
- ICU key/super users

A total of seventeen potential respondents were referred, and out of those **sixteen** agreed to participate. There were four cases where more time was needed and second interviews were scheduled. In total this provided a final sample of 32 respondents. By the end of the interviews I felt I had enough data and no longer sought recommendations for more respondents.

3.6.6 Distribution of sites

The distribution of the sites and the diversity in their size, location and the services that they provide was considered in the research design. Respondents from the various regions were targeted. Some participants were situated in different regions in Saudi Arabia, so some travel was required, however it was not always practical to conduct face-to-face interviews. As such, some participants were interviewed by telephone, but only when I was not able to get access to conduct a face-to-face interview and after every effort was made to have a face-to-face interview first. There were also opportunities where some of the respondents were able to travel for other business and we were able to meet face-to-face without my having to travel to them. More on this is discussed in Chapter 4.

3.6.7 Bias in research

Acknowledging that biases exist and taking precautions to avoid them is necessary and expected of any researcher. Accusations of bias are not uncommon in the social sciences, even though the term 'bias' is not straightforward in its meaning. Unlike its traditional meaning (i.e. predisposition, partiality prejudice); in research, it means deviation from the truth (Hammersley and Gomm 1997; Grimes and Schulz 2002).

Brewer (2000) makes a controversial claim that research methods do not get their authority and legitimacy from particular theories of knowledge, but that researchers choose the data collection techniques because of a prior commitment to a methodological approach. This is based on the assumption that researchers believe one set of methods and techniques to be more scientific than another; or it can be subjective and personal. For example, the researcher may lack the competence or knowledge to understand and apply some techniques that may require a certain level of computer knowledge. Since some people are wary of computers they might avoid any data collection methods that involve a lot of computer interaction. Other researchers may not be comfortable talking to other people or may lack certain interpersonal skills that make it difficult for them to carry on a decent level of interaction that is involved with interviewing (Brewer 2000). They might try to avoid those methods that involve their shortcomings. But whatever the reason is, Brewer (2000) argues that researchers have their biases.

For me, perhaps it was my IT background and affinity for computers and structures that pushed me towards my analytical techniques, but they did not sway me towards favouring a quantitative approach. In fact, I experienced quite the opposite of what Brewer (2000) suggests some researcher encounter. A challenge for me was to train (re-programme) my brain to work in a more meaning-making (less structured) manner. My way of thinking was challenged by taking on this methodological approach, but I knew that this was the only way to gain the insight that I needed. I can now say that I am an advocate of applying qualitative methods in a largely scientific or quantitative IT field (WenShin and Hirschheim 2004).

When the research was designed, the plan was to investigate the implementation in the three regions of the organisation; in the two medical cities and the two hospitals. Since the primary healthcare centres did not have any individual or separate services and relied on receiving all their services remotely from the main sites, their experience of the implementation (was transparent) and their involvement in the project was the same as the other departments within the hospital sites and medical cities.

3.7 The Interviews

“Interviewing is perhaps the most used method to study the social world” (Davies 2002, p. 94),

My aim was to formulate questions and provide an atmosphere conducive to open communication with the interviewees (Gubrium and Holstein 2002). The purpose of most qualitative interviewing is to derive interpretations, not facts, from what respondents say and my aim was to understand the meaning of respondents’ experiences by carefully listening so as to hear and interpret the meaning of what was being expressed (Gubrium and Holstein 2002) . During the interview, the respondents were encouraged to digress or even ‘ramble’ (Bryman 1992) and it was my role to find meaning behind all the stories told.

3.7.1 The interview guide

Semi-structured interviews come half way between the two extremes of structured and unstructured (open-ended and without any pre-empted questions) interview styles. Although, in semi-structured interviews there are some pre-empted questions or cues in the form of an interview guide (Gubrium and Holstein 2002; Bryman 2004).

The interview guide was only used as a loose guide with memory prompts or general areas to discuss and not as structured questions normally associated with the structured interview (Gubrium and Holstein 2002). As an opposing stand from structured interviews, the wording and order of these questions may be changed or even deleted (Davies 2002). There was also freedom to introduce new topics and

supplementary questions that were not originally included in the list. Respondents were also encouraged to expand on or digress from a particular response. They were even encouraged to go off the particular topic and introduce their own views. Most importantly, their responses were open-ended, in their own words, and not limited to any of my preconceived notions (Davies 2002). The interview guide used in the interviews can be seen in Appendix 2.

3.7.2 The pilot interview

When the interviews were actually started, there was much to consider. I decided to conduct the first interview with one of the ISID Directors with whom I previously worked with for many years. I was comforted by the fact that I knew that person and I asked if it would be possible to repeat the interview if anything went wrong. In the end there was no need to repeat it, but the pilot did help resolve some of the technical issues with the recording equipment and sound quality. It also made me realise that I was saying too much in the interview and sometimes, I was not listening enough. Perhaps the most important thing I gained was that it helped to formulate the questions that developed the interview guide. I went into the pilot interview with an interview guide consisting of 26 questions. I left with ideas that helped me devise a new guide consisting of 38 questions, and some of the 26 initial questions were modified or omitted completely. Having run out of time, and equipped with the new interview guide (and more confidence) I scheduled a second interview with the same respondent and we were able to discuss the remaining issues. Looking back, that first interview was one of the most valuable interviews and was a source of rich information about the project.

I also used the pilot interview go through the whole analytical process before moving on to the next respondent. I transcribed the two contacts with that first respondent and attempted a full analysis of that transcript. That was a valuable process that helped me on many levels, like improving my transcribing techniques. I also gained an understanding of what was needed to analyse the interview. This exercise started me on a cycle of interactive and iterative thinking and reflection that became a theme throughout all my interviews and a facet of my analytical approach as discussed in more detail in Chapter 4.

3.7.3 Second interviews

Qualitative research interviews can last many hours and re-interviewing is not unusual (Bryman 2004). Before the interviews, the respondents were promised that the interview would last between 30 minutes to one hour. This is to respect the respondents' time and to ensure that their concentration span and mine were not compromised.

I was also aware of the time restraints and limitations of the respondents, as they were in full-time employment with busy schedules and were mainly interviewed during working hours. The option to be interviewed after working hours was available to them (within reasonable times) whenever that was their preference. Whenever the interviews went over the planned time; the respondents were asked if they would like to continue with the interview at a later time by arranging a second interview. Sometimes, we had to stop and the interview was continued after a prayer² or lunch break, or if the respondent had to attend to some urgent business or other obligation. In this sense, I was flexible with time to suit the interviewees' convenience and I was constantly sensitive to the value of their time and constraints.

There were four cases, however where the interview had reached one hour while there were still many questions to be asked. With these four respondents, their interviews were stopped and reconvened. A second interview was scheduled at a later time at the convenience of each interviewee. In the end this resulted in a total of 36 interviews for the study with the 32 respondents.

3.7.4 Flexibility and presumptions

All participants were interviewed individually at their convenience. The interviews were all conducted in English as all staff members of the NGHA are required to speak English based on the organisation's recruitment policy, and so I was relieved that no translation was required.

² Saudi Arabia is an Islamic country and during prayer times a 10-15 break is taken to wash up and pray. During work hours, there are only two prayers; one around midday and another in the afternoon.

The interviews were opened with general questions (name, job title, role in the project) that did not require much thought or reflection, followed by the more essential questions. The respondents were allowed the freedom to elaborate and articulate their own views on the matter. The 'interview guide' was used in every interview. It was important that the formulation of the research questions in the interview guide were not so specific that alternative avenues of inquiry that might arise during the collection of the fieldwork data are closed off. This would be inconsistent with the process of qualitative research that emphasise the importance of not starting out with too many preconceptions (Bryman 2004).

Flexibility was another important issue throughout the collection of data in this research. Alan Bryman (2004) explains that qualitative interviewing tends to be flexible, responding to the direction in which interviewees take the interview and perhaps adjusting the emphases in the research as a result of significant issues that emerge in the course of interviews. This was in fact the case in this study, where the initial interviews opened up and lead to other areas of interest in the study. The insight from the very first interviews provoked many critical points that would not have been otherwise anticipated, and for that I am forever thankful to my participants.

It is important when conducting this type of research to experience and observe what is happening naturally rather than making assumptions about it beforehand (Brewer 2000). I did not have any preconceptions nor did I make any presumptions about the findings before actually speaking to the interviewees.

It might help to explain how the data collection process was in fact a process and not a series of isolated events. The more interviews I held, the more insight I gained and as the investigation progressed I felt like I knew more and more where to look and what to look for. This progression may be evident in the interview guide. In it, the 38 questions were refined and developed over the course of the study. As more people were interviewed, I gained more 'knowledge' about the questions at hand, and my questions evolved into 'informed questions' as I went along. These progressions also lead me to make more 'informed' decisions about when the questions reached a point

of saturation. Before actually conducting the interviews I was not sure how much would be enough, but with time I literally felt the point of saturation.

3.8 Ethical Considerations

3.8.1 Blending in

There is an issue of how the interviewees respond to us based on who we are as well as the social categories to which we belong (Silverman 2006). Some scholars have argued that when conducting research interviews, researchers should be members of the groups they study, in order to have the subjective knowledge necessary to truly understand their experiences (Silverman 2006). Having the familiarity of being a member of the organisation allowed the respondents to see me as a colleague not as an outsider or intruder. Having this type of relationship with them also helped the interview process and (I felt) made them more comfortable during the interviews. Granted, having been a member of the organisation at hand and researching an area I had previously worked in, I felt an added responsibility to ensure that I was neither biased in collecting the data nor in reporting the findings.

Moreover, I made every effort to ensure that all participants were at ease and comfortable while participating in this study. I wore a white lab-coat during the interviews. This was the normal dress code for female staff in the hospital. Wearing the hospital uniform put the participants more at ease during the interviews where they were able to relate to me more as a colleague. I was also provided with office space, a networked PC with internet/intranet access, a telephone, an identification card, and official access to hospital grounds, and an NGHHA email account. This helped in situating me very close to the people involved in the implementation. All these measures were taken so that I could blend in with the ISID staff, and would not be in an imposing or intimidating position for the people involved with the study. After each interview was conducted, a thank you email was sent out to the participants. All correspondence with the participants was conducted via my NGHHA email account.

3.8.2 Consent

I sought and gained a letter of support from senior management at the NGHHA (see Appendix 3) that allowed me to carry out the research in the manner that I had clarified in my information sheet (see Appendix 4). This letter was presented to all respondents when approached for participation along with the information sheet. Issues of participant selection, expenses/payments, confidentiality, anonymity and the storage and disposal of research findings were detailed in the information sheet. The respondents had as much time as they needed to review the information sheet before they decided on their participation in the study. All participants approached were also asked to sign and return a consent form (Appendix 5) after reviewing the information sheet.

All interviews were digitally recorded using a small non-intrusive recorder with a small microphone hooked up to the interviewees (recording issues are discussed in detail in Chapter 4). Field notes were also taken during each interview. These were taken mainly to note initial reactions and to highlight salient points. All data were transcribed and to protect the anonymity of the participants, each transcript was given a code (see codes list and corresponding descriptions in Chapter 5). All participants were also informed of their right to withdraw from the study at any time through the information sheet, and were informed again on the consent form.

3.9 Reflections

3.9.1 Considerations

Before commencing with the data collection; ethical issues were considered from three different aspects. First, as mentioned earlier, the Swansea University SHSREC criteria had to be met. Second, considerations of the NGHHA and their standing on research carried out in the manner proposed within their organisation were acknowledged. Last, I had to consider ethical questions pertaining to me personally and my own reasons for seeking and then accepting a scholarship from my employers. This acceptance entailed taking study leave from work, followed by everything that had to be accommodated in order for this to happen. Things like deciding-by taking on the PhD-to relocate to the UK for the duration of my studies,

which meant either leaving my family behind, or relocating them with me. From an ethical standpoint, I needed to justify to myself, my family, my employers and sponsors that taking this on must be for reasons beyond my personal gain of a degree. Something more had to come out of it.

As for the NGHHA, I did not feel that I was taking away from the organisation by taking time from the staff during the interviews, because I knew that this time was an investment in research yielding findings that could potentially improve the organisation in some way, or at the very least shed some light on the pertinent issues. The fact that the research would add to the general field of knowledge made me feel that taking this on had a bigger meaning and was more than just a means of getting a degree.

I also had to consider the motives of the participants in willing to be interviewed, and to ensure that they in no way felt any coercion on my part. Although I am not a mind reader and will never know their intentions, I had to be sensitive and intuitive at all times. Being an inside researcher and former colleague of many of them must have put some pressure (although not deliberate) on them. Surely, they must have felt some form of obligation to help out a former colleague. I do not know if that was the case for any of them, however I did caution them against this formally (in the information sheet) and informally through discussion. I explained to each and every one of them that I understood their pressure for time, and would in no way be offended if they were not able to participate. Some former colleagues actually did decline to participate, and that only reassured me that there was no coercion on my part.

Finally, I had one last personal concern; I chose to do my research in the organisation that employed and sponsored me. Was I biased in doing so? That is a question I asked myself many times, but I came to the conclusion that the only way to truly benefit my sponsors and to justify taking leave from my job, leaving my family and leaving my country was to be as impartial as humanly possible.

Moreover, the fact that I chose to observe the challenges-and not the success stories-of the implementation was a premeditated choice that helped to defuse any personal

biases. The nature of the research problem was a self imposed deterrent. Choosing to deliberately examine only the difficulties, barriers, obstacles and shortcomings meant probing about the problems and exposing them. The interview guide clearly depicts the nature of the questions that were asked. Many of those questions prompted a line of investigation with a focus on issues with implied negative cogency. A biased researcher might have focused on the success stories, or overly indulgent anecdotal and self-serving tales from stakeholders, when actually all participants were quite frank and their candid views are represented in their own words in the Discussion chapters (Chapters 6-9).

Finally, I know that a biased piece of research would not have benefited anyone. I had to make sure that the resulting study was the best that I could make it. I was aware of the potential biases in any research and I did my best to avoid them. In doing so I hoped to benefit the organisation in particular, and to add knowledge to the field in general. I hope that by doing so I was bettering myself as a person and as member of the organisation.

3.9.2 Looking back

No one person could have experienced or witnessed the process of implementing a clinical information management system from each and every perspective, but I felt that having gone through the process of interviewing so many people, I gained so much insight that gave me a 'new perspective' that I do not think is possible to replicate by anyone else. Gubrium and Holstein (2002) explain that in most texts on qualitative interviewing, the perspective of the interviewer is taken to be that of the discipline she or he is interviewing in order to write, publish, and contribute to a body of knowledge and literature.

All research is selective and knowledge is not always absolute. It is not possible for any research to capture the literal truth of events. All research depends on collecting particular sorts of evidence through the prism of particular methods, each of which has its strengths and weaknesses (Mays and Pope 1995). It is only fair to acknowledge that the whole data collection process was not very straightforward from the beginning and many things changed once I was in the field.

In reflection, I now feel good about having to rely solely on interviewing for this study. Silverman's (2001) view is that asking people what they think and feel appears to have an immediacy, or even authenticity, which is believed to be absent in observation data. I cannot say whether or not triangulation would have definitely given more reliable results, but I feel very confident with the methods that I have chosen. By not being able to triangulate I felt a strong (uncontrollable) need to be as comprehensive as possible in my investigation; not leaving a stone unturned because the interviews on their own had to stand as the sole source for answering all my research questions. I tried to find 'all' the answers, although I know that there were no absolutes and the best I could do was to find convincing answers to my questions. This resulted in a significant amount of interviews (36) that were far more than I had originally anticipated. I also believe that by focusing on the one method, I tried to 'perfect' my approach or at least get as close to perfecting it as possible. By focusing on interviewing only, and by doing so many of them, I was able to improve my interviewing skills, my transcribing proficiency, and my analysis techniques.

Going into a qualitative study one should expect an element of uncertainty. Some abstraction should be welcome and considered part of the freedom that qualitative researchers have to modify their approaches in a way that will help them to gain better insight. It is also somewhat naive to assume that everything will go exactly as planned. This uncertainty should be welcome as an opportunity for flexibility and creativity, and should not be a discouraging aspect of qualitative research. For me, it was perhaps the most enjoyable part of all. Letting the research process lead me, by allowing the data to guide me in an iterative process of reflection, collection and analysis until I finally reached the clarity that gave me the confidence to justify what I had to report.

CHAPTER 4 FIVE-STAGE ANALYTICAL FRAMEWORK

4.1 *Introducing the Five-stage Analytical Framework*

Qualitative methods could be accused of being anecdotal, descriptive and biased, but it is only the poorly designed qualitative studies that should be described as such. Qualitative researchers regularly try to go beyond pure description and to provide analyses of the environments they examine with substantial attention to detail in such research (Bryman 1992). Reliable and valuable evidence rich with interpretation and proper analysis can be readily achieved. However, to attain valid and reliable inferences, qualitative analysis should involve a set of systematic and transparent procedures for processing data; measures that normally require a significant amount of time to achieve (Miles and Huberman 1994). The time required to analyse qualitative data can be roughly two to five times as long as the time required to originally collect the data (Miles and Huberman 1994). For this study, I spent six months in the field collecting the data and then I exhausted another eighteen months effectively processing and analysing them. For a full-time PhD study, this was a significant period. Nonetheless, I felt that the effort was justified because *“the strength of qualitative data rest very centrally on the competence with which their analysis is carried out”* (Miles and Huberman 1994, p. 10). With that, I also believe it is only fair to explain the details of my analytical processes in a dedicated chapter.

Before I get into the particulars of analysis, I would like to clarify that analysis was not a rigidly defined ‘phase’ or a mere ‘step’ within the study. It was in fact a lengthy and iterative ‘process’ better described as a state of mind than a procedure. The resulting analytical process was not tightly bound by a set of predetermined tools. It was not contrived or preconceived. There were no detailed plans from the beginning; only an initial notion that the data would be transcribed and then analysed thematically. It is only through being an instrument in the study that the structure of the analysis began to emerge. What may come across now as quite organised only transpired after having to deal with the ‘messiness’ of qualitative data.

The analytical framework eventually developed through a series of thought processes and decisions driven by the evolving circumstances of the study and my particular

epistemological beliefs about truth and knowledge. I was compelled by my personal concerns-about reliability and trustworthiness-to be as methodical and systematic as possible. I am not sure if my decisions stem from a need to satisfy some self-indulgent idiosyncratic views about precision, or if I was influenced by my IT background. I am sure however, that it was the only convincing way (for me) to guarantee impartiality when analysing the data. I assumed that it was also necessary to ensure the integrity of the findings. Ultimately, it was a developing concept that started with the sampling techniques and ended with writing up and reporting.

Much of these processes are the result of my reflections on early decisions, as those first choices formed the beginning analytical stages. The outcome (and not the plan) of the evolution of this analytical process is what I describe as the **Five-stage Analytical Framework**. The five stages can be illustrated in five simple words; *collect, transcribe, code, reduce and report*. I will explain the five stages here in brief, followed by a detailed section on each:

Stage-1 *Collect*

Sampling and Interviewing: an Iterative Process

Purposive, snowball and theoretical sampling guided by analysis of interview content set the stage for the first stages of analysis. This requires engaging in an iterative process of sampling and investigating until theoretical saturation is achieved. The information gathered from the interviews must be analysed even if at a basic level to guide further sampling. This process also includes structuring (and restructuring) of the interview guide, revisiting the field notes, and initial first reactions to each interview.

Stage-2 *Transcribe*

Transcribing: a Key Part of the Analytical Process

Producing a good transcript entails making decisions as to what levels of detail are taken and where most attention is given based on careful consideration and analysis of recordings. Transcribing provides an opportunity for immersion in the data. When the researcher carries out transcribing firsthand, a great deal of imperative analytical insight can transpire during this stage.

Stage-3 Code

Generating Inductive Codes

Before the dataset can be reduced, it must first be systematically organised through inductive coding (influenced by grounded theory in this approach). The coding process can be assisted by data analysis software (DAS). Codes are not predetermined, rather each code must 'earn' its way into the analysis. Each transcript is coded individually. Units of text from every transcript are assigned codes. As analysis progresses, more codes emerge and earlier transcripts are revisited. Through further analysis the codes are reassessed and subsequent grouping, regrouping, merging and deletion of codes may arise; all of which requires careful thought and attention.

Stage-4 Reduce

Reduction: Analysing Generated Reports

After all transcripts have been coded, each code has enough data assigned to it to generate a comprehensive report. These reports are readily available to print (with the assistance of DAS) for further analysis. All reports are analysed one by one as whole pieces, inspired by thematic content analysis techniques. The reduction process can begin after the reports are refined and restructured into broad, more general themes. Traditionally broad themes emerge after analysing the transcripts, however this process is delayed to a later stage where the broad themes emerge after processing the reports.

Stage-5 Report

Reporting and Writing Up

In qualitative research, reporting is very much part of the analytical frame of mind. Results are not neatly displayed in a separate section, and more commonly the evidence is presented within a discussion. Deciding on how and what evidence is discussed requires much consideration. As these decisions are made, more clarity about what is presented occurs. Only after the evidence is presented and adequately discussed can the analysis be considered as complete.

Two things set this framework apart from other analysis frameworks. First, the inclusion of the transcription process as a fundamental part of the analysis is key.

Second, analysing the generated reports (as well as the original transcripts) in a manner traditionally performed only on the transcripts using conventional content analysis techniques is what distinguishes this approach. It involves a rigorous evolving process, whereby the validity of findings are ensured through the method itself.

Stage-1 Collect

4.2 Sampling and Interviewing: an Iterative Process

4.2.1 Sampling

Qualitative content analysis often begins at an early stage of qualitative data collection. This early involvement helps researchers move back-and forth between concept development and data collection with theoretical reflection. This helps to direct the new data collection toward a more meaningful way of answering research questions (Miles and Huberman 1994; Bryman 2004).

Purposive, snowball and theoretical sampling were used until theoretical saturation was achieved³. To feel saturation of concepts, codes or themes, one must engage in some form of analysis. The analysis element goes hand-in-hand with the concept saturation element. The key is to ensure to sample so as to test the emerging theoretical ideas. In a theoretical sampling approach this process entails sampling interviewees until the categories achieve theoretical saturation and selecting further interviewees on the basis of the researcher's emerging theoretical focus (Bryman 2004). The approach is an iterative one with extensive theoretical reflection. In this type of research, the researcher carries on collecting data until theoretical saturation is achieved and a category has been saturated with data (Bryman 2004).

Theoretical sampling is mostly used in research aimed at generating theory and it requires that collection, coding and analysis of data occur simultaneously (Glaser and Strauss 1967). In grounded theory it is impossible to engage in theoretical sampling without coding and analysing at the same time (Glaser and Strauss 1967). It is by

³ The data collection methods are described in detail in the Research Design chapter (Chapter 3).

theoretical sampling that representativeness and consistency are achieved.

Representativeness of concepts, not of participants is key. The aim is to ultimately build a theoretical explanation by specifying phenomena in terms of conditions that give rise to them, how they are expressed, through the interaction, the consequences that result from these contacts, and variations of these qualifiers. The aim is not necessarily to generalise findings to a broader population. Consistency is achieved because, once a concept has 'earned' its way into a study through demonstrations of its relationship to the phenomenon under investigation, then its indicators should be sought in all subsequent interviews (Corbin and Strauss 1990).

In my approach however, I reserved actual coding for a later stage, and saturation was based on analysing feedback from interviewees about various research questions. The focus was not on generating codes. I would continue to inquire and discuss certain issues that were important to the aims of the study until the same issues were being repeated by many of the interviewees and a theme or topic became apparent and did not require further clarification. I also kept perusing participants until enough people from within a certain group were interviewed and no new themes or concepts were emerging from interviewing people with similar experiences with the implementation.

For example, nine IT analysts were interviewed out of a total of twenty who made up the entire team. When I realised that I was not getting any new information from them, I thought it was no longer necessary to try to recruit more participants from this group. Continuing to recruit participants who I believed could no longer add much depth to the study would have been a waste of their time and mine, and in my opinion unethical to do. One also must know when to draw the line.

Knowledge is not absolute even at the point of saturation, but one should be able to know when ample evidence has been noted on a certain topic and when enough people belonging to a certain group have been interviewed. Ultimately, "*data collection is inescapably a 'selective' process, that you cannot and do not 'get it all' even though you might think you can and are.*" (Miles and Huberman 1994, p. 55)

4.2.2 Interview Guide

Structuring, restructuring and refining the interview guide⁴ also require some analysis and reflection on the researcher's part. It is expected to (and welcome) to make revisions to the interview guide during the data collection stage. It is as it is called; a 'guide' and should be used as such. The questions or memory prompts should be used to roughly guide the interview. The guide is useful in reminding the researcher what to ask about. It is not a replacement for intuition and knowing when or where to probe. This is something that the researcher should understand instinctively. If any analysis is done at all during the data collection stage, one can expect the questions or prompts within the interview guide to change. As more knowledge is gained on a topic, it can be better questioned, or even abandoned to make room for other questions.

I was only able to refine the questions in my interview guide after analysing the responses that I got to questions I had previously. I also followed 'leads' from the interviewees. Their responses often raised new questions that had to be pursued and were then included in the interview guide; issues that I did not think to inquire about beforehand. All of these decisions demand deep thought processes synonymous with analysis.

4.2.3 Field Notes

One should not go about interviewing participants in a 'mechanical' manner. It is more useful for the researcher's state of mind to be that of a key instrument in the process and not a mere bystander. What questions are asked, and how they are followed up requires careful attention to what is being said during the encounter. This ability can be enhanced by taking field notes and jotting down initial (instinctive) reactions to what is being said. I found that most of my first 'gut feelings' about issues and the notes that I jotted down to express them later served as solid foundations for later discussion.

This analytical state of mind does not stop once the encounter is over. This is one of the reasons that recordings are useful. After each interview I was able to easily go

⁴ Discussed in more detail in the Research Design chapter (Chapter 3).

back and listen to it before attempting to transcribe it and before moving on to the next one. The sooner this is done the better, because it gave me a chance to go right back to the interviewees in case I needed to clarify a point that I had missed out on during the interview. It also gave me a chance to immediately reflect upon the encounter and to take notes on what areas I still needed to pursue with other respondents or who my latest interviewee suggested I should interview next. This can also be seen as a productive way to utilise the time between interviews, but I found it especially valuable to help keep me in that ‘investigative’ state of mind.

Stage-2 Transcribe

4.3 Transcribing: a Key Part of the Analytical Process

4.3.1 What constitutes the raw data?

In this section I will explain the role of transcribing in the analytical process, however I will digress some and take this section as an opportunity to elaborate on my experience with transcribing as a complete process.

Before discussing transcribing and the significance of the transcript within the analytical framework, I must clarify what I mean by it. The recording should be considered a supplement to the actual encounter and the transcript should be considered a supplement to the recording; not a replacement. To understand this approach one must consider the interview itself as the raw data. To describe the transcript as the raw data is an erroneous assumption. *“A transcript is not a substitute for the recording, but rather is an essential analytical tool to be used along with the recording”* (Bryman and Hardy 2004, p. 593). Taking on this approach is based on the premise that the encounter itself is the raw data and any steps taken thereafter are only stages in the analysis process; not other forms of the data. Recording the interview (on tape, digitally or on video) is only a means of capturing the encounter in a manner than can later be revisited. After that, the transcript should only be considered a tool. It is only a means to facilitate further stages of analysis. However, the act of transcribing the encounter requires the thought and insight of the researcher, as *“the transcription process itself is part of the analytical process”* (Bryman and Hardy 2004, pg. 593).

4.3.2 Planning it

I could have never anticipated what transcribing my interviews would involve. It turned out to be a laborious, protracted and time consuming task. The first thing I could say about my experience with transcribing is that I did not know where to begin. I had to make decisions about transcribing very early on in the study, even before I actually collected any data.

A list of my early questions and ones I would recommend any researcher to ask looked like this:

- Do you need to transcribe?
- Will you use Data Analysis Software (DAS) packages like NVivo, HyperResearch, Ethnograph and Atlas amongst others?
- Do you use digital or analogue recordings?
- Do you do it yourself or do you delegate this task to a professional?
- How do you transcribe?
- What is a transcribing machine and how do you transcribe from digital recordings?
- How long will it take?
- Do you have the time to do it yourself?
- How much detail is required?
- Can you be selective about what sections to transcribe?

4.3.3 Conventions

The type of study you are doing, how you plan on analysing it and what you hope to gain from it all dictate your decisions on transcribing. I began by looking for the ‘step by step guide to transcribing semi-structured interviews in social research’, but I did not find one. What I first came across in the literature about transcribing mostly focused on transcribing for discourse or conversation analysis studies. I found the level of detailed transcription described in these studies very intimidating. Some described examples of phonetic verbatim accounts. I felt undue pressure (that I exerted upon myself) to produce transcripts of that accuracy or quality for my research. Much to my relief I realised that I did not need to apply that level of detail, leaving room to focus on decisions about how I wanted to transcribe. I had to ‘listen’ to and ‘process’ what was said to enable me to filter out what I did not need to transcribe, like a comment on the weather or a side discussion that had nothing to do with the interview. Again, I had to carefully consider what it was I was excluding,

because I always said to myself it is easier to not think about it and include everything than to think about what to include and exclude.

“Transcription of tapes can be done in many ways that will produce rather different texts” (Miles and Huberman 1994, p. 9). It was not really necessary within the scope and purpose of this thesis to capture every utterance, pause and enunciation with the level of detail required for conversation analysis. So, I shifted my focus to literature on qualitative research analysis. Still, there I found little attention to conventions for transcribing within the context that I needed.

Although it would help to look at some of these conventions, I decided it would be more useful for my study to only use them as a ‘rough’ guide as I did not see the need to stringently apply them. So, I looked at some of the available conventions, and adopted only what I found particularly useful for my study. I came up with some of my own personal styles too. I experimented with different things and I had to strike a balance between how much detail I wanted to capture and how much detail was needed for the purpose of my study. I always kept an open mind without worrying about having to conform to any of those conventions. I did consider using these conventions for certain excerpts of the recordings where I thought it was possible to actually read more into what was being said by the manner it was said or by the gestures evoked. For me personally I did not attempt to record every hand gesture or vocalisation, but I did at times feel I needed to make it clear that when the interviewees pointed to something with an overly animated manner that I felt necessary to capture. For example, I noted laughter, chuckles, sighs, raised voices, some hand gestures and exaggerated movements.

4.3.4 Do you need to record?

There was a hierarchy of detailed decisions that I had to make even before collecting a single piece of data. I had to decide if I wanted to record the interviews, and why. I also had to decide how I wanted to record them and what I wanted to do with the recordings. If I wanted to transcribe, there were decisions about what to do with the transcripts afterwards. Then, there were decisions about recording equipment, backups, digital versus analogue and audio versus video.

I used the aims of my study to guide my decisions about transcribing. There is no concrete rule that says a researcher absolutely must audio or video record all encounters with participants. In most ethnographic studies recording may not even be an option and the researcher must rely on field notes to capture the encounter. I wondered what is to say that in interview research the researcher cannot make do without recordings? Must one record all interview encounters? Even if the encounter is recorded, is it really necessary to transcribe every word that transpired? It might save a lot of time to simply replay the recordings and take notes, similar to field notes or to only transcribe certain segments where more attention is needed.

4.3.5 Why transcribe?

In the end I decided I should record and transcribe all the interviews. In much of the literature on qualitative methodology, it is recommended and considered good practice to record and transcribe interviews when possible. Transcripts make features of the recording more transparent and accessible, enabling one to 'see' the vocal and non-vocal activities that unfold on the recording. A good transcript helps the analyst get a picture of the interaction, including its fleeting and momentary features. A transcript allows others to independently assess analytic claims by referring to excerpts from the data themselves (Bryman and Hardy 2004) and the researcher does not have to be too distracted with note taking during the interview if it is recorded. What I hadn't realised was that I had the option of not transcribing at all. There was no hard-set rule about the need to have a verbatim account of every word that was said. What if an entire encounter turned out to be completely useless for some reason and I realised there was no practical use or any evidence in what was said? Looking at ethnographers and how they collect their data, they rely heavily on field notes as their primary source or data. What if during the interview itself I consider myself a participant observer and take notes and only go back to the recording to transcribe some quotes that I signposted? In doing this I have actually begun to analyse right there within the interview itself. Finally, I decide to digitally record the interviews and later transcribe them using a computer, but it is useful to know there are options.

Once I decided that I wanted to record the interviews I had to decide the media that I wanted to use. I had to decide how I was going to actually transcribe them. I did not

want to use one of those transcribing machines that use analogue tapes (and I do not use typewriters either!) and that was what drove me to record digitally.

4.3.6 The time it takes to transcribe

Having decided to use digital recordings for my interviews, I spent four weeks looking at equipment, evaluating software, talking to professional audio typists, and making decisions about how I wanted to record my interviews and ultimately transcribe them. This was all before I even conducted my first interview. I then spent four months transcribing my interviews, so that was a good chunk of my time devoted to transcribing issues. Although I simultaneously did other tasks, my time was pretty much tied up with transcribing and I was not able to move on to other stages of my research until I had that task completed.

The time required to transcribe should not be underestimated, and then even more time should be allowed. One might end up doing more research than originally planned. It might take longer to transcribe than originally anticipated.

The time it takes to transcribe an encounter depends on personal typing ability, software/tools used, recording quality, and speech patterns. However, on average each hour of recording could take 7-10 hours to transcribe. Fuzzy, quiet recordings can quadruple the time needed to transcribe (Bryman and Hardy 2004). In some cases a one hour recording can take up to 20 hours of transcription time (Bryman 2004).

Decisions should be made on how to deal with interruptions, pauses, stutters, overlapping speech, silence, laughter, 'ums' and other similar occurrences. Also, it must be decided how to deal with non-verbal vocalisations; hand gestures, nodding, fidgeting. I did not try to camouflage interruptions/recording problems/muffled phrases; rather I welcomed the opportunity to capture the nuances of a rich, live, human experience with all the disruptions that come with it. If the interview was interrupted with a telephone call, then I would simply state what happened within the transcript with a simple clarification (like telephone interruption) in between brackets.

4.3.7 Clerical task

Because of the amount of time that needs to be committed to transcribing, this task is sometimes delegated to a professional;

Transcribing a large corpus of data does represent a major time commitment, however, so many researchers follow a two-step process in which assistants make initial 'rough' transcripts of a data corpus, which the researcher then refines in whole or in part (Bryman and Hardy 2004, p. 593).

It is also sometimes regarded as a clerical task that does not necessarily require the skills and time of the researcher;

Another view is that typing transcripts is largely a clerical task that can be carried out by someone who is not a researcher (Newell and Burnard 2006, pg. 98).

In situations like this, it might be best to treat those transcripts as a draft that needs to be 're-transcribed' by the main researcher or whoever is going to do the analysis of the data.

In order to reach a level of good analysis the researcher must become very familiar with the data and cannot avoid getting 'immersed' at some stage of analysis. The process of transcribing is big opportunity to become immersed in the data.

If this process is going to be skipped, other ways of making up for the 'time not spent' with the transcripts are needed. Transferring the recordings to a portable digital media player could be one way of getting familiar with the recordings in a leisurely manner.

Playing back the recordings while revising a transcript completed by someone else is not necessarily enough, because in order to transcribe, each segment of recording is usually played back more than once and words, complete sentences or paragraphs are normally listened to several times before one becomes confident that they have been accurately transcribed.

Still, there are issues to consider when delegating this all-important task. One must be selective as delegating could be costly, it might not save much time and the time actually saved might not be worth it in the end. There is also the issue of quality, style, consistency, ethical issues and it might be necessary to sign a confidentiality agreement.

4.3.8 Part of the analytic process

Many agree that the process of transcribing can be regarded as a key step in the analytical process (Tilley 2003; Bryman and Hardy 2004; Bird 2005; Bailey 2008). When transcribing, there is no way of escaping the need to become completely immersed in the data to be able to conceptualise the emerging concepts. The interview is 'relived' by having to listen to it. The type of listening required in producing a good transcript usually means hearing the recording more than once including frequent playback. It is also a process where the whole world is shut out and literally all of the senses are focused on this one task. It is not possible to do anything else (physical or mental) while transcribing.

While this is an ideal opportunity for immersion, it is also a process where many decisions have to be made. Matters like conventions used, the level of detail, what to exclude and what to include, how to deal with interruptions and non-verbal communication, ensuring that what was said is not taken out of context or misunderstood. Delegating this task to someone who is not in a position to decide might compromise the integrity of the transcript, and any work later performed on it. Also, asking someone else-who was not there-to transcribe the recording could be reckless. That person might not understand or appreciate the reason behind some occurrence in the encounter like a pause or lengthy silence. There are also many things that one picks up on during transcribing, and leaving this task to someone else might mean missing out on the chance to pick up on some moments of clarity.

It is recommended that researchers do at least some of the transcription themselves. Often some of the most revealing analytical insights come during transcription as a consequence of the profound engagement with the material needed to produce a good transcript. (Bryman and Hardy 2004, p. 615)

It is a process that could only truly be understood by someone who has experienced it. I have tried many times to convince others of the amount of time, decisions and physical strain this process involves knowing that they can only understand when they have tried it for themselves. I was also disappointed by the way that much of the pain involved with this issue is almost unacknowledged in the literature. I would have liked to see the more attention to the many decisions that must be made when it comes to transcribing.

The transcription process itself is part of the analytical process. For this reason, it is generally recommended that researchers do at least some of their own transcribing rather than delegating the entire task to research assistants (Bryman and Hardy 2004, p. 593).

I took special care and attention to the transcription process. Not only did I transcribe each and every interview myself, but also I transcribed every word and ensured that I had the correct understanding of what the respondents were saying in each interview, but I took measures during each interview to make sure I did not mishear what was said. On several occasions I asked respondents to repeat what they said if it was not clear to me. I also paraphrased all responses that I had an immediate feeling were very significant, or if I felt that the respondent didn't word their response in a clear way that might fall into misinterpretation.

Another option (decision) that could help those who do not have the luxury of time but still want to do it themselves is to transcribe in different amounts of detail.

One practical strategy is to transcribe in varying amounts of detail, reserving the highest level of detail for segments that will receive the most analytic attention (Bryman and Hardy 2004, p. 594).

4.3.9 Tools that facilitate the transcribing process

There are many tools used to assist in the transcribing process, and must be decided on in advance. The list of equipment involved may include some or all of these:

- Analogue tape recorder
- Digital recorder
- Foot pedal

- Microphone
- Headset
- Dictaphone/transcribing machine
- Digital transcribing software
- Computer

4.3.10 Mobility

An audio transcribing machine is a machine is a device that plays back analogue audiotapes with an attached foot pedal used to start, stop/pause, and rewind the tape. The idea is to free up the hands for typing. The first time I saw one I was shocked at how bulky and cumbersome it looked. Not to take away from the importance or utility of these devices as many researchers have relied heavily on them over the years. It just would not have allowed me the mobility that I needed and would have confined me to analogue recordings when I preferred digital.

I decided on digital format for recording my interviews. That would allow the flexibility and mobility I needed. I wanted to be able to transcribe anywhere and anytime without having to be tied down to a clunky transcribing machine.

Although it sounded tempting, I did not even attempt to use a USB connecting foot pedal that could connect directly to the computer. I did not want to learn how to use it, get used to it and then suffer trying to transcribe without it. So I decided to go with the ‘you cannot miss what you never had’ approach and learned to transcribe without a foot pedal. Still, if it is possible to buy or borrow one, it might be worthwhile.

4.3.11 Transcribing software

It is worth mentioning that the software I used after many trials was Express Scribe. There were many advantages to choosing this particular application. First, it was free and downloadable off the Internet with free future upgrades (no catch). The download takes only a few minutes and it is very easy to setup and install. It is user-friendly and does not require any training. The most important feature is that there are versions compatible with various platforms (Windows, Linux and MAC) so I was able to have it on all my computers. It also works with foot pedals and with speech recognition software. It took a lot of trial and error, but finally finding this application was well worth it.

4.3.12 Formatting the transcripts

The format of the transcript depends on personal preference. What is important is to decide on a format and then be consistent. It is best to identify each transcript using a code or standard naming convention. I used double spacing and 4cm margins to give me space to write comments and codes. Although some use line-by-line numbering, I chose not to do so. I also used a spiral binder to bind them and that was another good investment. In the end 36 interviews of approximately one hour each resulted in around 1,000 pages of transcripts.

Many analysts also use ‘memoing’ or writing reflective commentaries on some aspect of the data as a basis for deeper analysis (Miles and Huberman 1994). I applied this while typing up each transcript. If what I was transcribing evoked some thought or gave me ideas, I would include those comments in the transcript’s contact summary sheet (Miles and Huberman 1994). Those were cover sheets that I attached to each transcript. Each one outlined basic information about the interview, like the code, date and timing of the interview, but more importantly it had a summary of salient points, main themes, and some initially selected quotes. This was a useful quick reference guide for each interview. Those were also early analytical steps performed on the transcripts.

4.3.13 Voice/Speech Recognition

While it would be great to avoid the time-intensive task of transcribing interviews, the technology behind voice recognition software has not evolved enough. Although voice recognition has come a long way, these engines are best used as dictation tools rather than for transcribing pre-recorded events. The software has to be trained for each speaker’s voice, and each speaker must speak slowly and clearly to avoid mistakes. They also usually work better in real time and not from recordings. It is best to speak into a microphone linked directly to the computer. The time it takes to train the engine on each speaker’s voice (if that is even possible at all) and assuming that all contacts were conducted in English or the language that the speech engine recognises and that if they do speak English they all enunciate and speak each word clearly enough for the engine to record accurately. One would still have to go over each transcript, and make any corrections. That means simultaneously listening to

each recording while reading the transcript and being able to pause, playback and fast forward (or have a transcribing machine or transcribing software) to help do that.

Because it was not possible to train the voice recognition engine to each participant's voice, I thought I would train the engine to my own voice, listen to the interviews with a headset, and repeat what was said (by me and the respondents) into a microphone. In other words I would dictate what was said in the interview to the engine. Well I tried this with four interviews, and besides the terrible headache I got from doing that, I got a lot of mistakes. I would say I achieved around 75% accuracy, however I did not save much time. Although this technique seemed like a good idea at the time, I would only recommend it to someone who was a very slow typist or had a disability or physical difficulty with typing. For me it was easier to type than to use the speech engine and it took me the same amount of time (minus the headache) to transcribe. However it is something that I tried and someone who might find the advantage in this approach can use it. Some of the examples of voice/speech recognition software are:

- Nuance Dragon Naturally Speaking (Nuance 2009)
- IBM Via Voice (IBM 2009)
- Microsoft Speech (Microsoft 2009)

In my humble evaluation I used Microsoft Speech that came bundled with Microsoft Word.

4.3.14 Recording

The key aspects of reliability involve selection of what is recorded, the technical quality of recordings and the adequacy of transcripts (Silverman 2006).

So, having established that I would make digital audio recordings of the interviews, I purchased a good quality digital recorder and digitally recorded each interview. Each of the interviews lasted approximately one hour. I then used electronic transcribing software to transform my computer into a transcribing machine for digital recordings. After much research and trials of several applications, I used 'Express Scribe Transcription Playback Software'; digital transcription audio player software (NCH Software 2009) as previously explained.

I had to make decisions about the type of recording I wanted to use. Should I use analogue or digital tapes? Analogue tapes provide better sound quality with reduced background noise and are physical media. However, tapes deteriorate over time and they cannot be uploaded in their analogue format to a computer. Making copies is also not as easy as with digital formats. Digital format has its disadvantages too. They can very easily be deleted or corrupted and some just prefer to have a physical tape to lock up. In any case it is always critical to backup and only work from copies. In the end I used digital media, however I did consider using both; to have the analogue recorder as a backup. I always kept spare batteries, and I checked the recording after each interview and immediately backed it up, made extra copies and stored the master copy. I also checked the venue where I was having the interview and I thought about where to place the recorder and microphone.

4.3.15 Interviewing and recording over the telephone

It may be impractical or impossible to interview all the respondents face to face. When I realised that I would not be able to meet all my participants in person because they were in different cities, I was initially very disappointed, but their input was very valuable to my study and I simply needed to find a way to interview them 'remotely' without sacrificing the quality of the interviews. First, I had to deal with the initial shock of something not going according to my research plan. I knew that it was all part of the research process (expecting the unexpected and then dealing with it!). I had to find a way to make it work to my advantage or at the very least not sabotage my whole study. The solution was to interview them over the telephone. For the telephone interviews, I considered using specialised equipment. There were analogue and digital options, however some did not work over PBX telephone systems and I wanted to avoid having to use the hospital telephone system. In the end I invested in a good quality (normal) telephone with speaker feature. I used speakerphone and recorded exactly as I would in a face-to-face interview. The telephone recordings actually turned out to be clearer because I was able to place the recorder so close to the telephone. I also noticed that the participants seemed more relaxed. I suppose it might be something about people being comfortable (and chatty) over the telephone. Three of the four interviews that I had to request a second

interview were done over the telephone and ultimately provided some of the best insight into the study.

I cannot argue that I did not miss out on facial expressions, hand gestures, and other non-verbal vocalisations, but I felt that I was more in tune with the tone of what was being said that I did not miss out on (too) much. It was more the sighs, laughter and grunts-not hand gestures or body movements-that I recorded in the interviews that I did in person. The other option would have been not to interview those people at all, and I am glad that I did, as their input was invaluable.

Stage-3 Code

4.4 Generating Codes Using NVivo 8

4.4.1 Developing a coding structure

Faced with a pile of 1,000 pages of transcribed data, my first question was “how do I analyse this”? I wanted to reduce the data, but first I had to code them into manageable chunks for subsequent retrieval and exploration. The development of the coding structure is an iterative and lengthy process, which begins at the data collection phase and there is substantial diversity in how to develop the code structure (Bradley, Curry et al. 2007). A well-designed and comprehensive coding structure improves the quality of later stages of analysis (Corbin and Strauss 1990; Miles and Huberman 1994). This may be the most critical stage because “*coding is analysis*” (Miles and Huberman 1994, p.56) and I knew I had to get it right.

4.4.2 Who does the coding?

Some experts argue that a single researcher conducting all the coding is both sufficient and preferred. In studies where the researcher is embedded in ongoing relationships with research participants is critical for the quality of the data collected, (Bradley, Curry et al. 2007), whereby the researcher is the instrument and the researcher, data collection and analysis should be integrated in a single person. This type of analysis is not expected to be repeatable by others and disclosure or the researcher’s biases and philosophical approaches are important (Gubrium and Holstein 2002). There are however contrasting views where some experts (Bradley,

Curry et al. 2007) recommend that the coding process involves a team of researchers with differing backgrounds, but that was not possible or practical for this particular study.

4.4.3 Grounded Theory

Within a grounded theory approach to developing a coding structure, the recommended approach to developing a set of codes is purely inductive. This approach limits researchers from erroneously “forcing” a preconceived result (Glaser 1992). Data are reviewed line by line in detail and as a concept becomes apparent, a code is assigned. Upon further review of data, the analyst continues to assign codes that reflect the concepts that emerge, highlighting and coding lines, paragraphs, or segments that illustrate the chosen concept. As more data are reviewed, the specifications of codes are developed and refined to fit the data. To ascertain whether a code is appropriately assigned, the analyst compares text segments to segments that have been previously assigned the same code and decides whether they reflect the same concept. Using constant comparison (Glaser and Strauss 1967), dimensions of existing codes are refined and new codes are identified. Through this process, the code structure evolves inductively, reflecting the experiences of participants (Bradley, Curry et al. 2007).

4.4.4 Influenced by Grounded Theory

While I was greatly influenced by grounded theory data collection and analysis methods, I cannot classify my methods literally under the grounded theory approach. In grounded theory, data collection and coding go hand in hand so, while more information is gathered about the phenomenon, more codes are generated until a point of saturation is reached. Here, I did not attempt to rigorously code the data, however there was a back and forth iterative relationship with satisfying the research questions (and not so much structured codes).

In grounded theory, the analysis begins as soon as the first bit of data is collected. By contrast, many qualitative researchers collect much of their data prior to beginning systematic analysis. While this may work for other modes of qualitative research, it violates the foundations of this method (Corbin and Strauss 1990, p. 6).

It would not have been possible or practical to attempt a rigorous first stage analysis of the data while in the field due to time constraints and also because the data was not yet ready in form. Analysis was not focused on coding, but on concepts. Still, I cannot say explicitly that data collection and actual coding were done simultaneously. Although first stage analysis began while collecting the data and influenced the sequence of data collection and questioning, it was not the only guiding force and many of the questions were formulated beforehand. Also, some of the respondents were selected in advance, or at least a list of potential candidates and their areas of expertise or level of involvement were predetermined.

My initial plan had been to transcribe the data in preparation for thematic content analysis (qualitative content analysis with a focus on finding emerging themes across analysed data). I did not intend to count occurrences of data either. In a grounded theory approach, one does not normally count the times that one observes or reads about an event or action as indicative of a concept. Focus on counting can be distracting and might deter the researcher from noticing previously unidentified events that might be vital (Corbin and Strauss 1990).

I also had preconceived questions and initial themes before I began data collection, because *without some preconceived idea of what is to be described, there can be no description*" (Wolcott 2001, p. 36). The preconceived questions were quite detailed and structured before data collection began, although the pilot interview influenced the way many of the questions were conceived.

Moreover, having worked in the organisation for many years prior to doing the research project would justifiably nullify any attempts to speculate that there was no clear idea about what exactly was to be investigated. I had too much prior knowledge of the problems to warrant my knowledge of only 'some idea of the phenomenon', as made explicit by Corbin and Strauss (1990, p. 8);

Sampling in grounded theory proceeds not in terms of drawing samples of specific groups of individuals, units of time, and so on, but in terms of concepts, their properties, dimensions, and variations. When a project begins, the researcher brings to it some idea of the phenomenon he or she wants to study.

Then based on that gained knowledge, the individuals or an organisation, representative of that phenomenon are selected.

4.4.5 Thematic Content Analysis

One approach to thematic content analysis is to allow the categories or codes to 'emerge' without really looking for them. I wanted to begin coding in my search for emergent themes however the dataset was too big. I divided the 36 interviews into four-more manageable-piles. The selections for each pile were diverse, as I tried to make the groups as representative of the entire sample as possible. I grabbed the first pile and began coding. The notion was if I could properly analyse the first group (one quarter of the dataset), then I could repeat the same process for the rest. I got six different coloured highlighter pens (one for each potential code). I took the first transcript and highlighted the first two lines to the code 'implementation'. Then I found 'project management', 'planning' and 'go-live'. There were also 'technical problems' and 'delays' (at which point I ran out of colours). By just looking at the first transcript, I knew more codes would emerge.

I abandoned the highlighter pens and instead I used just one colour to highlight a segment of text and right down the corresponding code on the left margin (that is why I left some space there in the transcript to begin with). By repeating this type of coding with the first nine transcripts, I had around thirty codes and seemed like the only practical thing to do.

While coding in this manner I also did more memoing on the right margins and on the blank backside of the pages I found room to jot down comments in a 'free-style' manner. I also added detailed lists of thought processes and flowcharts to describe segments of the data. Many of these comments later found a place in the Discussion chapters (Chapters 6-9).

I picked up a different coloured highlighter pen and used that to highlight segments of text that I would later use as direct quotes from the respondents. I spent four weeks manually analysing the first nine transcripts. However, there were several problems with this approach. I knew there were may more codes that would be

generated from the remaining transcripts and it was difficult to group the coded segments of texts together. They were not easily distinguishable without being colour coded or sorted in some manner. I tried to cut-and-paste them using a word processor, but that was very messy and it was difficult to track the sources from where the coded segments came. It was also difficult to go back and reassign portions of text when new codes emerged. Physically cutting pieces of paper or using index cards would have also been difficult because of the volume of data and I knew I had to find a different approach. I had already thought of using NVivo 8 to help with the coding, but I tried to make the manual process work first, as researchers are advised to try to manually analyse their data before getting assistance from software tools. I realised that it was no longer practical to continue without the help of data analysis software.

4.4.6 Data Analysis Software NVivo 8

Data analysis software programmes have been around for a while and there are several to choose from (Miles and Huberman 1994), although the arguments against them seem to outweigh the ones for them (Morison and Moir 1998; Webb 1999; John and Johnson 2000). Perhaps it is the misleading description that is the source of acrimony. Using the word ‘analysis’ in the description implies that these programmes have some capacity to actually perform analytical processes. This is both erroneous and misguided. If computer programmes available to us had the capacity to analyse, then much of our roles as researchers would be redundant. Our computers have no capacity to make intellectual decisions nor do they have the ability to derive meaning from text. No computer package is capable of perceiving a link between theory and data. They do not have the capacity to define appropriate analysis structures. The researcher’s analytical skills cannot be replaced by a machine or programme.

Data ‘management’ software is a better description, as these tools are useful for information management and as data search and retrieval tools. This makes them ideal for organising (and reorganising) large qualitative datasets. Once their purpose is established-and they are seen for what they are and are (not) capable of-they become a more productive tool. In any case, using them with caution and scepticism is warranted.

Some examples of these programmes include NVivo/NUD*IST, Ethnograph, HyperResearch, MECA and ATLAS amongst many others (Miles and Huberman 1994). I used NVivo 8 from QSR, although the formatting and capabilities are different in each programme. NVivo 8 allows the analyst to code a portion of text in any open source; document text, audio, video, transcript entries or picture logs and a portion of a timeline in a video or audio source can be directly coded to themes or linked to free text, annotations or notes.

I was aware of the drawbacks associated with DAS applications and I used NVivo 8 with caution. Acknowledging these problems was the first step towards guarding against them. I had to invest time into learning how to use the programme and get accustomed to its features, something some would not warrant worth the investment. The biggest threat is being overly systematic while coding and losing sight of meaning. The DAS can also make it easy to quantify the data, and the process might become too mechanical. Being aware of the dangers evokes caution and I took measures to avoid succumbing to them. For example, each code had to earn its way to the list, and I did not haphazardly create and assign codes just because it was easy to do so. I remained analytical and attentive while coding. Grouping, regrouping, merging, and deleting codes and allowing room for new codes to emerge was done by constantly revisiting them. Re-examining the codes (and knowing that I would revisit them) diffused the mechanical tendencies associated with DAS coding. I also went through the analysis process manually first to get the feel of what I wanted to get out of the process. Having established a manual procedure in advance helped me to apply this 'guarded' procedure while using NVivo 8.

All transcripts were uploaded into NVivo 8. The coding units were based on sentence or paragraph and not on line-by-line coding. While using NVivo 8 I was still able to use memoing and to make annotations. I was also able to highlight and select quotes (exactly the same as I did with the manual procedure).

Many segments were also coded to more than one code. Sometimes up to three or more codes 'overlapped'. For example, this segment of text from one of my

interview transcripts could be coded to three different codes; *Change Management*, *Users* and *Workflow-Processes*;

Any time you have a change in an area where you have the need for rapid accurate decision-making that would impact care, you want to very carefully introduce change to those areas and you want to understand that you can't always put this on paper, but you want to understand what is the impact on workflow in that area in terms of distress induced with the individuals involved.

4.4.7 The final list

After ten weeks of laborious coding and plenty of recoding, regrouping, restructuring, combining, merging, and deleting, the structure of the code list began to emerge. The final list of 39 codes was complete and all transcripts were coded consistently over these categories. Table 4.1 displays a report generated by NVivo 8. It lists the 39 codes, the number of sources (interviewees) that referred to the code, and the number of times there had been a reference to that code. The codes are listed in order of times referenced. The hyphenated code names are evident of some merging between codes.

S/N	CODE NAME	SOURCES	REFERENCES
1.	Security	4	5
2.	Sunrays	5	14
3.	Availability-Disaster Recovery	5	22
4.	PACS	5	23
5.	Teamwork	11	27
6.	Costs	11	31
7.	Contractual	8	33
8.	Users	15	37
9.	Politics	14	39
10.	Multiple and Remote Sites	14	47
11.	JCI-CAPS	21	48
12.	Networking-Connectivity	6	51
13.	CPOE	15	51
14.	Recommendation	19	53
15.	Resources	22	53
16.	Interfaces & Multiple Systems	13	55
17.	Technical-System Related	19	56
18.	Implementation-Go Live	18	58
19.	Vision	17	61
20.	Champions-Agents	20	64
21.	Phases	19	68
22.	Culture	27	79
23.	Electronic Health Record	25	80
24.	Human Resources	28	90
25.	Leadership	26	93
26.	Awareness-Education	26	97
27.	Benefits	25	109
28.	Momentum-Continuity-Development	23	113
29.	Workflow-Processes	25	120
30.	Vendors- Service Provision	20	122
31.	Training	29	122
32.	Feelings-Attitudes	18	123
33.	Users-Physicians-Nurses	23	124
34.	Expertise-Skills-Knowledge	23	149
35.	Communication	28	150
36.	Involvement-Empowerment	25	161
37.	Resistance	27	165
38.	Change Management	27	186
39.	Project Management & Planning	31	251

Table 4-1 Codes Report

Stage-4 Reduce

4.5 Thematic Content Analysis on Generated Reports

4.5.1 Generate Reports

After I had uploaded all transcripts to NVivo 8 and coded them, it was possible to generate reports for further analysis through NVivo 8's reporting features. I was able to generate different types of reports from the now 'organised' and 'coded' data. These reports were printed through NVivo 8 for further analysis. Each of the 39 codes had enough references from the original sources attached to them to generate comprehensive report ranging from 20-60 pages each. On average, there were about 30 pages to each report. So, in total on top of the 1,000 pages of transcripts I started with, I now had over 1,000 pages of reports to analyse. I had to wonder when the reduction would actually begin. Up until that point all the processing had only been to organise the data (into manageable chunks) but none of the data had been reduced.

4.5.2 What are the reports and what do they look like?

Each report has a name which is the name of the code/category that I had assigned while coding. Within the report all references made to that code from the transcripts, are listed; grouped together for each transcript. So, the report name is followed by the transcript name that had all the references under that code, then the next transcript name with all the references from that transcript and so on until all the transcripts with references to that specific code are listed. For each reference made, the paragraph number is clear which made it easy to track the source of every unit of text.

4.5.3 The codes were examined in two ways

Before reduction could take place, the codes had to be examined in two ways;

1. Each code was studied in relation to all the other codes. I had to observe how each one fit within the bigger picture. Mainly, I asked how the categories (codes) related to each other and what those relationships meant.
2. The content of each individual report was analysed independently. The information in the reports was in effect the same as that in the transcripts (from a content perspective), but organised in a manner to allow a different

perspective. Essentially, at this stage of analysis instead of examining a transcript (what one person said about all the issues), I was examining a category (what everyone said about one issue).

4.5.4 Is it time for reduction?

I wanted to infer broader more general themes or links between the data. The 39 codes were pockets of isolated data. They were too segregated on their own. I had to find what they meant to each other and how they fit together. It seemed like I took the interview data apart only to reconstruct it all back together in a meaningful way. And still, I did not reduce anything, I only changed the perspective.

In an attempt to establish more general themes, I structured, clustered, grouped, and regrouped the codes. Finally, the codes were grouped under three general themes;

1. **TECHNOLOGICAL:** IT and Systems (Internally and Externally).
2. **MANAGERIAL:** Planning and Managing the Project and Resources.
3. **BEHAVOURAL:** Leadership and Change Management.

Some codes did not fall under the three aforementioned themes and were either excluded or reserved for other sections of the discussion like the introduction or conclusion. The final distribution of the codes can be seen in Table 4.2.

TECHNOLOGICAL: IT & SYSTEMS INTERNALLY & EXTERNALLY	MANAGERIAL: PLANNING AND MANAGING THE PROJECT & RESOURCES	BEHAVIOURAL: LEADERSHIP & CHANGE MANAGEMENT
Internal		
Technical	Implementation-Go Live	Champions-Agents
Interfaces-Multiple Systems	Project Management & Planning	Resistance
Sunrays	Phases	Change
Networking-Connectivity	Momentum-Continuity	Training
Security	Users-Physicians-Nursing	Awareness-Education
Availability-Disaster Recovery	Human Resources	Expertise-Skills-Knowledge
PACS	Feelings-Attitudes	Involvement
CPOE	Culture	Leadership
External		
Politics	Resources	Communication
Contractual	Costs	Vision
Vendors-Providers		Teamwork
		Processes-Workflow
INTRODUCTION	CONCLUSIONS/REFLECTIONS	EXCLUDED
Benefits	Recommendation	Primary Healthcare Clinics
Electronic Health Record		Geographical Distribution-Sites
		JCI-CAPS

Table 4-2 Codes Themes

Incidentally, when I moved one of the codes in my table, I was essentially moving around 20-60 pages of data attached to it; something I had to bear in mind while I was moving them. Moreover, it would have taken much more time had I attempted that exercise manually. The labour that went into the coding was well worth it and this table formed the basis for the Discussion chapters (Chapters 6-9).

4.5.5 *OK now is it time for reduction?*

I wanted to analyse each report (and its corresponding code) individually and word-for-word in a manner similar to thematic analysis of transcripts. When I observed each report in its own, only one specific concept was addressed (the code). Being able to look at what all the participants said about a very specific topic in one report provided a new way of looking at the data. I was able to get a truly holistic perspective on each very specific topic that I originally described as a code. It is

almost a reverse process because the data in its entirety is broken down into smaller pieces that are then again reconstructed to produce a new way of seeing the data. However this rearranging does not always equal reduction. Sometimes it just provides a different (and more organised) perspective.

As data collection proceeds, further episodes of data reduction occur (writing, summaries, coding, testing out themes, making clusters, making partitions, writing memos). The data reduction/transforming process continues after fieldwork, until a final report is completed (Miles and Huberman 1994, p. 10).

So, the reports were looked at individually, but at the same time relationships between the codes were established and organised in a manner that could be presented. When I studied each report individually it was finally time for reduction. By looking at the segments of texts together, I was able to select which parts fell together and which were redundant. I read and re-read each report. The more I read the more I was able to omit. It was much easier to examine for instance a report on 'costs' and examine all the different takes that the interviewees had. I was able to focus on that one issue and find clarity in defining concepts. Irrelevant segments began to appear and it was at this stage that I selected all the excerpts I wanted to use as direct quotes. I applied headings, selected more quotes, added more annotations now that I had the holistic perspective. Little by little I began to realise that what I was doing was writing up the findings of the report.

Stage-5 Report

4.6 Reporting and Writing Up

4.6.1 It all fell into place

Once I decided on the structure for presenting the codes, everything fell into place. Finally, I could begin to write up the final report. I spent so many months consumed with organising and segmenting the data that it was refreshing to see it all come together in new form.

The analytic induction of categories, themes and relationships; the explication of meaning, and the understanding of action may all proceed via the writing

itself...the 'writing up' of the qualitative study is not merely a major and lengthy task; it is intrinsic to the analysis, the 'theory' and the 'findings' (Miles and Hiberman 1994, p. 164).

Nonetheless, the analysis was not yet complete and I had to remain in that 'analytical' state of mind. I still had to decide what to include, what to exclude and what I could interpret from it all. First-rate reporting of qualitative research requires more than mere reduction of data to simple explanations, confounding issues by revealing them in their complexity is required (Wolcott 2001).

4.6.2 Reporting is thinking; is analysis

After all the shuffling around and organising, reducing, annotating, and selecting excerpts from the sources I was amidst a first attempt at reporting. I found myself with 70,000 (newly organised) words structured under broad themes and these formed a solid basis for Discussion chapters. Notably, most of that word count went towards direct quotes from respondents. Still, they were organised into their sections and all under appropriate headings. It was a 'systematic' first attempt at discussing the evidence, but even after reaching the stage where I was writing up, further reduction, analysis and 'thinking' were still required. I had to keep that 'analytical' hat on because "*reporting is not separate from thinking, from analysis. Rather, it is analysis. We can adapt the old saying into a new form: 'How do I know what I think until I see what I've written?'*" (Miles and Huberman 1994, p. 164)

Keeping analysis and interpretation connected was a matter of storytelling strategy and personal style (Wolcott 2001) and how I finally told the entire story could not have been done without thinking and rethinking every decision. I could see all the changes that I made while writing up, including the decisions and thought I had to put into every comment. Deciding how to tell the story was part of how I structured the discussion, how I reported the findings; and what I reported constituted further examination of what finally found its way in.

Even after deciding to include something in the final report, I found myself reconsidering my decision while I was actually writing it. What may have seemed critical in the beginning may look redundant once it is added to what was already

written. Every segment of text that went into the final report was scrutinised once again to earn its place in the final discussion.

Editing out and deleting was the true test. The amount of conviction and thought that must go into brutally truncating large chunks of what has already been written can only be done after thinking and rethinking every word. To edit down the first draft of the discussion to a smaller word count while making those the ‘right’ words was one of the most mentally exhausting analytical steps for me. I had to shape and reshape many sections. In the end, and only after the final report was written up, I was able to take the ‘analytical’ hat off. Analysis was at last complete.

4.7 Applying the Framework

4.7.1 The analysis cycle

This framework draws upon traditional qualitative analysis techniques. The way that these techniques were brought together is what makes it original. It is useful to answer the question; when does the analysis begin, and when does it end? More specifically, it is a useful pragmatic solution for analysing large corpuses of qualitative data.

4.7.2 Large datasets

The size of a dataset is an arbitrary concept. It is difficult to describe the size of a qualitative data sample as large, small, or just right and that should be judged on an individual basis. However, it is generally accepted that with a ‘manageable’ qualitative sample it is usually possible to derive meaning by looking at the body of data in its entirety. When the data set becomes ‘unmanageable’ because of its size, then the data need to be reorganised before they can be reduced and conventional data analysis techniques might need to be reconsidered. This five-stage process is a particularly useful solution to deal with large data sets when general themes are not easily derived and a closer look at the data needs to be visited before generalisations can be reached. It is almost a reverse process because the data in its entirety is broken down into smaller pieces that are then reconstructed into more manageable chunks.

4.7.3 A systematic, pragmatic approach

It is a useful approach if generating comprehensive, orderly reports on specific topics is desirable. It is also a way to be sure that the data are analysed in a systematic, methodical and rigorous manner without the need to rely on external validation. Presenting such a detailed account of the analysis is a part of the transparency that ensures trustworthiness, reliability and rigour. Perfection is not the goal, and getting it all right is an unworkable aim, but one should try at least not to get it all wrong (Miles and Huberman 1994).

4.7.4 An evidence-based approach

The discussion presented in this study has purely emerged from the interviews and all offered ideas are based on evidence. A closer look at the discussion chapters (chapters 6, 7, 8, 9) will show that each of the main headings is actually one of the codes that emerged through the coding process and can be found in Table 4-1 or Table 4-2 in this chapter. Therefore, each of the codes that finally made its way into the discussion is expressed in the form of a main heading, followed by a lengthy discussion guided by quotes. Essentially, each heading or topic discussed is literally derived from the emergent codes.

All of the main issues discussed can be traced back to their origins by going back to the reports, and then the transcripts. Additionally, every single issue introduced after the main headings is well supported by direct quotes from the participants.

4.8 Validity and Rigour

The validity of research concerns the interpretation of observations, or in other words confirming whether or not the researcher is calling what is being reported by the right name (Silverman 1998). Some may argue that sufficient findings must be provided and alternative interpretations must be carefully considered so that rigour and reliability of the study can be ensured (Darke, Shanks et al. 1998). Scholars have sought to define what is good, valid and/or trustworthy research, and there is no consensus on quality criteria. These terms seem imposed on qualitative research from the concepts rooted in positivist traditions (Mays and Pope 1995; Barbour 2001; Pyett 2003; Berg 2004). They stem from a conception of knowledge as 'out there' to

be observed or discovered by the researcher, who produces knowledge, which is generalisable, replicable, unbiased, and non context-dependent.

Barbour (Barbour 2001) suggests that uncritical adoption of a range of technical fixes (such as purposive sampling, grounded theory, multiple coding, triangulation, and respondent validation) does not, in itself, confer rigour. Furthermore, Patton (1987) has observed that there are no straightforward tests for ensuring validity and reliability of qualitative research, but that does not mean that there are no guidelines for rigour. There is evidence of established criteria in discussions about validity, rigour and trustworthiness (Lincoln 1995), and those can be demonstrated in qualitative research. These guidelines recommend rigour in sampling, data collection, and analysis; triangulation of data sources as well as methods, investigators, and theories; the use of thick descriptions (Pyett 2003), and detailed reporting in writing up the findings (Wolcott 2001).

Qualitative researchers are also advised to be open, honest, transparent and reflexive (Koch and Harrington 1998). The problem is that the specific processes that researchers actually undertake are rarely described in the literature (Pyett 2003). That is why this study's framework is important. It is because of these assumptions that I was determined to devise a methodical, transparent, detailed and rigorous process for analysing and reporting the findings of this work to the point where it is safe to say that these 'quality' guidelines have been met.

For this study, measures such as triangulation and respondent validation were followed but without success (explained in sections 3.3.1 and 4.8.1 respectively). Peers were also consulted on the coding structure, but were not able to analyse all the data as thoroughly as I have. Nonetheless, here rigour was ensured through the quality of data where careful attention was given to the interview process by being an active, reflexive facilitator and combining the analytical process during the interview. A strong case for rigour also lies in the quality of recordings and the stringent transcription process that went into producing the transcripts. The quality of the researcher (my trustworthiness and objectivity) have also been addressed in Chapter 3; sections 3.8 and 3.9. Still, the strongest case for rigour in this study is the transparent and methodical analytical paradigm that the data were subjected to.

Darke and colleagues (Darke, Shanks et al. 1998) argue that it is important for qualitative researchers to give consideration to their analytical strategies and they address this need in their paper on combining rigour, relevance and pragmatism in qualitative research; that they conducted on computer-based information systems. This reminds us that the same guidelines for rigour in qualitative research in general also apply to research done in the MI field.

4.8.1 Respondent validity

I initially planned to return the transcripts back to the respondents to ensure that each transcript was transcribed accurately, and saw that as a way to partly support their validity. However that was problematic in two ways. First, as part of the pilot interview, I returned the transcript to the interviewee for validation of content, after having given him clear instructions on what the purpose of this exercise was. Unfortunately, he returned an excessively edited; tainted transcript with so many changes that I was not able to use that version at all. I also found it logistically difficult to contact all respondents from all the different regions; many of whom were interviewed remotely. After conducting all the research interviews, I returned to the UK, and by the time all the interviews were transcribed several months had already passed. It was difficult enough for me to get back their consent forms (while I was still in Saudi Arabia) and did not think it would be logistically possible to successfully contact all the interviewees after so much time had lapsed.

I felt I had taken enough of their time already with the interviews and did not want to further burden them with transcript validation. I did not want to offend the respondents or further inconvenience them in any way. The interview was a pure encounter at a certain moment in time, and any attempt to revisit it would have felt rehearsed and spurious. What I wanted to capture was their first unrehearsed response to my questions. Not only did I analyse the talk, but I also analysed their tone, gestures, pauses, hesitation, and eagerness to respond. I wonder how a respondent who had a chance to validate their transcript would interpret an extract such as this:

TJ: Were you happy with the decision to postpone the go live date?

R: Well, of course I was happy; how could I not be ((chuckle))? (said with sarcasm)

Even if the respondent did not intend to be sarcastic in her response, that is what came across to me as the facilitator and interpreter at the time of the interview, and it was exactly that response that prompted me at that point in time to probe and ask more questions about her feelings about the go live date, while I had initially asked the question with no expectation of an emotionally charged response. I thought it would be difficult to deal with the respondent saying that she did not mean to be sarcastic with that remark, when I felt that she was.

The second issue was my analytical approach. I felt that giving the transcripts back to the respondents (for me) was not in tune with the essence of the findings being my interpretation of events. In Chapter 4; section 4.3.1 I clearly explain my standing on what the transcripts mean to the research process. They do not represent the raw data-the actual interviews do-and trying to validate the quality of the transcript only would give it more weight than the interview process itself; how it was carried out and the analysis that occurred during the interview. I decided not to employ respondent validation and to focus my energy on the more commonly recommended arguments for rigour, like trustworthiness, quality of sample data and analysis (Pope, Ziebland et al. 2000). Asking the respondents for their feedback on the way the interviews had been transcribed (later rather than during the interview) is not what would have validated the data or made them any more reliable. I also felt the responsibility of ensuring the quality of the interviews should fall on the researcher.

4.8.2 Peer review

Peer review is the process of exposing oneself to a disinterested peer to corroborate that others can draw similar conclusions and derive similar meaning from the same data. Savage (2000) even suggests that dual or multiple analysis help to elucidate alternative interpretations of the data which might escape consideration with the use of a single approach.

However, because this study was carried out by one researcher and was not conducted by a research team, it was problematic to find someone who was willing to commit to the process of peer review and even more difficult to find someone with enough skills and a background on the topic to provide a useful interpretation of the coding structure. Moreover, in line with my adaption of an analytical process where I

was an active participant within the interview and then transcribed the recordings myself; I had a unique perception that no one else can ever have.

It is not fair to expect a colleague or fellow researcher to take into consideration all the other evidence and events that I have come to know to give their 'informed' and 'immersed' interpretation of events, as I was able to. It is safe to assume that someone who was not actually present during the interview (the raw data) cannot say that they were able to experience the actual encounters with all the human expressions, flaws and interactions, as I was able to. Still, all transcripts were available to my academic supervisor and were discussed with him. Ultimately, he was able to corroborate that the coding list was indicative of the respondents' feedback, which was reassuring to me.

The interview process in itself was a phenomenon that I needed to interpret; that is where my notes and initial feelings came in. It is not possible for the respondents themselves or anyone else to have the complete picture that I have and one must acknowledge that there are multiple realities (Pyett 2003). I have my own knowledge, insight and background on this matter. I was looking at the entire process. My findings were based on a holistic view of what happened. I drew meaning from what they informed me and how it relates to the whole scheme of events while taking into account what everyone else had said and what I knew or came to find out about what happened. The sequence of questions asked, and where I needed to probe were all decided then and there during the interview.

Because the findings are my own interpretation, as the researcher-and a unique individual-I will not claim that had anyone else interpreted the same data they would have yielded the same results. I was an instrument in the research process and I had a unique and critical (yet not necessarily replicable) role (Pyett 2003). There is also the point that this study was in no way aimed to be reproducible. No one else would have asked exactly the same questions I asked, or even designed the interviews in the same manner. No one else could have carried out the exact same study, with the same respondents, and it is unlikely that anyone else would have had the access that I had as an inside researcher.

4.8.3 Quality of recordings

The quality of the recording and the integrity of the interview process itself are what make the transcripts valid. I used a good quality digital recorder, a microphone to record the interviews to ensure the best sound quality, I always kept spare batteries and I developed a reliable backup and filing system for the recording (for more details on transcribing refer to section 4.3 in this chapter).

4.8.4 Checks during the interview

Furthermore, I took special care and attention to the transcription process. Not only did I transcribe each and every interview myself, but I also transcribed every word verbatim and ensured that I had the correct understanding of what the respondents were saying. I took measures during each interview to make sure I did not mishear what was said. On several occasions I asked respondents to repeat what they said if it was not clear to me. I also paraphrased (repeated back) some responses that I thought were very significant. So, I would repeat what I thought they meant by what they said and I would usually get a response from them of a 'yes' and that became part of the interview and recording. Also, whenever I felt that they did not phrase their response in a clear way that might fall into misinterpretation I would repeat back to them what I thought they had said. If there were any uncertainties, I made sure to clarify them with the interviewees then and there.

4.8.5 Listening to recordings

My experience of listening to the recordings is unique to only myself. I had the first encounter (the interview) and took some notes then, then I listened to each interview afterwards and noted immediate feelings and notes that I had if any. Then I listened to each interview individually and had to listen to each word at least twice while transcribing. Sometimes I would have to play them back several times. I also went back to my recordings during analysis if I felt any ambiguity in a sentence or phrase just to make sure that I had transcribed it correctly and I read each transcript so many times that I was sure to pick up on any obvious errors.

4.8.6 Triangulation

When I was not able to use other methods to validate my findings, I was left with the interviews as the main source of data. I embraced this as a positive allowing me more

time to do more interviews and also allowing me to perfect (or at least improve) my interviewing skills and techniques. By the time I had conducted 36 interviews, and ‘methodically’ transcribed and coded them I felt confident that I was not so misfortunate with the other two methods I had hoped to rely on, because the data I had from my interviews were rich and my sample had covered all the areas and topics I was interested in investigating from the onset to the point of saturation.

4.8.7 Reflexivity

The entire analytical framework was driven by a reflexive (Hammersley and Atkinson 1995) process, and necessary to avoid the pitfalls of positivism. Or as Bryman and Hardy (2004) argue, reflexive, self-awareness is fundamental to symbolic interactionism and its view of the social world; the notion that the researcher is actively constructing the world under observation, through practical transactions and engagements, paying attention to the researcher’s own presence and engagement with the research process. In essence, reflexivity entails engaging in critical appraisal of own practice. Reflecting on why we frame issues in particular ways, investigate them in particular ways, and how such approaches lead us to particular kinds of solutions and theories and not others. Having produced a particular interpretation of the data, as researchers we must consider how we arrived at that interpretation.

I was reflexive about method, which is evident in the many methodological considerations that took place. For example, I applied a qualitative approach in a generally ‘positivist’ field; something that lead me to scrutinise my own methodology before even attempting it. There were also times when I had to alter my methodological choices, like deciding to abandon triangulation (sections 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.8.6) or designing a pilot interview and changing my interview guide based on it (sections 3.7.1, 3.7.2, 4.2.2). There were also decisions that were made during the process of collecting and analysing the data, like deciding to use NVivo 8 after attempting to manually code the transcripts first (section 4.4). Moreover, as I have demonstrated in previous sections (4.2, 4.3.1), these were ‘active interviews’ (Holstein and Gubrium 2006) that required reflection and my awareness to the construction of meanings throughout the research process.

I was also reflexive about epistemology (section 4.1) and my own concerns about truth and knowledge compelled me to design a new framework to justly analyse my data. My personal and epistemological reflexivity have been (directly and indirectly) addressed in several sections throughout this and the previous chapter (the last paragraph of section 3.7.4 and sections 3.6.7, 3.8.1, 3.9.1, 3.9.2, 4.8.9, 4.8.10). Still, it is important to emphasise that reflexivity is not a method or validity technique with which one could engage by applying particular mechanistic practices. One must also remember that reflexivity is always a pursuit and never a destination (Davies 2002).

4.8.8 The interview process; my reflections

It was precisely the nature of the unknown and what was to be discovered that guided the interviews and what drew me to this qualitative; interpretative approach. I approached each interview with the excitement of discovering something completely new; something I had not even planned on asking about, and that is what semi-structured interview views were meant to achieve. Although they were categorically semi-structured, during the actual interviews they felt more like open-ended interviews where I barely needed to ask any questions at all. The analysis was taking place during each interview, and some questions were asked only because of the manner in which the respondents answered a previous question (or avoided answering a question for that matter).

I was thinking on my feet all throughout the interviews and I had to filter and target what questions I asked. I had to make sure I was asking each respondent only the questions that that respondent could contribute to the best and I had to know when to probe. While I pursued an issue with one respondent I sometimes did not feel that I would benefit by doing the same with another. The interview guide was exactly that, only a tool to help me guide the interviews, but I had to be thinking and analysing as I was interviewing.

4.8.9 Undeniably a selective process

There is much debate about issues of validity in qualitative research, but there should be no concern for validity in a field that allows; no, encourages us to be subjective. *“Were we not selective, and this subjective, in our focus, we would not be able to construct our accounts at all.”* (Wolcott 2001, p. 36). Every decision was dependent

on my personal choices and discretion-from selecting the problem and place, the people selected to interview; to decisions about what to record and what to include in the final report; to the reporting style- and it is only fair to acknowledge that. Perhaps I should even embrace it all as part of the qualitative process. Yes, every decision I made about the study undeniably *“reflects both conscience and unconscious processes of focus and selection”* (Wolcott 2001, p. 36).

4.8.10 The essence of qualitative research

In the end, I felt I was true to the essence of qualitative research. I was the research instrument. I came with my own biases with a belief that all research is biased and the best I could have done was to give my unsurpassed best. I was careful to select the most appropriate sample, interview them with focus and attention, record the interviews with the best equipment available to me and transcribe and code the interviews thoughtfully; not mechanistically. All while knowing I was in a position to give an overarching view of the entire process that would have only been helped by being completely honest.

CHAPTER 5 DISCUSSION OUTLINE AND TIMELINE OF EVENTS

5.1 In the Discussion Chapters

The purpose of this chapter is to introduce the next four chapters; referred to as the Discussion chapters. In those chapters I will discuss the results of the analysed data. Here I will describe the structure and style of the four chapters.

5.2 Structure of the Chapters

The findings will be discussed within four chapters. These represent the three (technological, managerial, behavioural) themes that embody the main challenges that presented themselves in the implementation of this large-scale healthcare information system implementation. The main challenges unravelled as technological; internal or external, managerial; related to project management and resources, or behavioural; human-related and leadership issues. They are summarised as follows:

CHAPTER 6- INTERNAL TECHNOLOGICAL ISSUES

- Hardware and software
- Infrastructures and interfaces
- Local expertise

CHAPTER 7- EXTERNAL TECHNOLOGICAL ISSUES

- Service providers
- International politics

CHAPTER 8 - MANAGERIAL ISSUES: MANAGING THE PROJECT AND RESOURCES

- Project management and planning
- Managing resources (human and financial)

CHAPTER 9 - BEHAVIOURAL ISSUES: LEADING CHANGE

- Change management
- User resistance and empowerment
- Leadership

5.3 Pseudonyms

At the NGHHA they refer to the HIS that includes the EPR (and CPOE) as the clinical information management system (CIMS). There is also a commercial name for the HIS application that is used by participants interchangeably with the term CIMS.

In the interest of objectivity I favoured using the pseudonym **NG-CPR** instead of the actual commercial name of the HIS application. The external service provider of this system will be referred to as **NG-CPR** vendor, and sometimes the participants refer to the vendor as **NG-CPR** only⁵.

The CIMS does not include the Radiology PACS or the Laboratory information system (LIS). The LIS frequently mentioned is the Cerner laboratory information system, often referred to as Cerner or Cerner Lab for short. A pseudonym was not used to represent this system because it was only mentioned briefly and it was not the focus of this study.

5.4 Interviewee Codes

All the participants in the study had direct involvement with the project. In the interest of anonymity, the participants' names and revealing information are not disclosed. The following three tables (Table 5.1, Table 5.2, Table 5.3) show the codes used for each of the participants and the descriptions of their job titles or roles in the implementation.

The column 'Region' describes whether the interviewee had a position that was 'Corporate'; meaning it covers all three regions, or if the interviewee had a position that was only 'Local' within one of the three regions. For local positions there are normally counterparts in all three regions. This also helps to protect the anonymity of the participants.

⁵ The pseudonyms are fictitious. If by chance any of the pseudonyms used happen to refer to real institutions, applications or cases, they should not be taken to represent them.

The 32 participants are all listed under their related areas, and the ones who were interviewed a second time are indicated in the tables. Meaningful descriptions of participants' job titles were used when referring to extracts from their interviews. This saves from being repetitive throughout the discussion. By using these descriptions I have mostly refrained from saying; for example, 'a senior clinician said, or an IT manager commented' as this is implied through the descriptions that follow each extract.

5.4.1 ISID Management

The Information Systems and Informatics Division (ISID) is the IT division of the organisation. This group were responsible for the strategic management and planning of the project. They were also in charge of providing all hardware, software, infrastructure, and security requirements for the project as well as liaising with all contracted service providers.

5.4.2 Medical Application Team

These were officially members of the CIMS team and reported to the CIMS Director. They fall under one of the divisions of the ISID. Their role involved development of the CIMS application and training the key-users⁶ (or super-users). They also liaised with other divisions of the ISID, the NG-CPR vendor, and other clinical stakeholders.

5.4.3 Clinical Stakeholders

These were non-IT staff that had some involvement with the implementation, either as key-users or as members or chairs of committees involved with the implementation.

⁶ Key-users are employees selected from the various departments who can provide guidance in defining software requirements, in documenting the workflow of their departments and who can liaise with the CIMS analysts for system development and training of their department's staff.

ISID Management

s/n	Interviewee Code	Description	Region
1	IT Exec Director	IT Executive Director	Corporate
2	IT Director-CIMS	Director involved with CIS	Corporate
3	IT Director-PACS	Director involved with PACS	Corporate
4	IT Director-1	IT Director of a region	Local
5	IT Director2	IT Director of a region	Local
	<i>Second Interview</i>		
6	Technical Manager-1	IT Technical Manager	Corporate
7	Network manager-1	IT Technical Manager	Local
8	Technical Manager-2	IT Technical Manager	Local
9	Network Manager-1	IT Technical Manager	Local

Table 5-1 ISID Management

Medical Application Team

s/n	Interviewee Code	Description	Region
1	CIMS Analyst-1	CIMS Application Analyst	Corporate
2	CIMS Analyst-2	CIMS Application Analyst	Corporate
	<i>Second Interview</i>		
3	CIMS Team Leader	CIMS Team Leader	Corporate
	<i>Second Interview</i>		
4	CIMS Analyst-3	CIMS Application Analyst	Corporate
5	CIMS Analyst-4	CIMS Application Analyst	Corporate
6	CIMS Analyst-5	CIMS Application Analyst	Corporate
7	LAB Analyst	LAB Information Specialist	Local

Table 5-2 Medical Application Team

Clinical Stakeholders

s/n	Interviewee Code	Description	Region
1	Dir Clinical Nursing-1	Clinical Nursing Director	Local
2	Associate Exec-Dir Nursing	Associate Executive Director Nursing	Local
3	Cardiac Tech-Supervisor	Cardiac CIS Coordinator &	Local
	<i>Second Interview</i>		
4	Dir Medical Records -1	Medical Records Director	Local
5	Dir Medical Records-2	Medical Records Director	Local
6	Manager Laboratory	Laboratory Manager	Local
7	Key-user Physiotherapy	Physiotherapy Key-user	Local
8	Key-user Inpatient Pharmacy	Inpatient Pharmacy Key-user	Local
9	Key-user CR Nurse	Key-user clinical resource nurse	Local
10	Director Pharmacy	Pharmaceutical Care Director	Local
11	Supervisor Dental	Dental Services Supervisor	Local
12	Senior Physician	Physician-Head of Division	Local
13	Consultant Physician-1	Consultant Physician Key-user	Local
14	Dir Clinical Nursing-2	Clinical Nursing Director	Local
15	Exec Dir Medical Services	Medical Services Executive Director	Local
16	Consultant Physician-2	Consultant Physician Key-user	Local

Table 5-3 Clinical Stakeholders

5.5 Conventions

I would like to have made the full interview transcripts available to readers, but that was neither practical nor possible within the confines of this PhD thesis. However, completely anonymous versions of the transcripts are available to my sponsors, the university and academic supervisors, and each participant has access to their interview transcript. Here, only excerpts from the transcripts will be referred to throughout the discussion.

When quoting any of the excerpts from the interview transcripts throughout the Discussion chapters, a specific convention is used. Each excerpt is followed by brackets containing the interviewee code and the excerpt's paragraph number (taken from its corresponding transcript). The interviewee code and the paragraph number are separated by a colon (i.e. LAB ANALYST: 300). This way, all excerpts can be traced back to their original sources. If an excerpt spills over more than one paragraph in its transcript, the range of paragraph numbers will be added (i.e. LAB ANALYST: 300-302).

5.6 A Compromise

Due to limitations in word count, a compromise had to be made on the level of detail in the discussion. The first draft of the four Discussion chapters came to 70,000 words overall. That had to be shortened, so it was not possible to discuss all the topics in detail within the limits of this study. I had to decide what to edit out. After much consideration some of the topics and many of the excerpts had to be edited out. In some instances I only used one excerpt to highlight a certain point. I hope in this approach the reader will trust my judgement in selection and my own frustration with the compromise I had to make.

5.7 Reporting Style

Considering the amount of time and effort I had put into analysing and structuring the interview transcripts (as discussed in Chapter 4), I felt it was only fair to present as much of these analysed interview excerpts as possible. However limited by

wordcount a compromise had to be made and I had to choose between adding more commentary or more excerpts. I chose to include more from the interviews (the evidence), especially since the evidence was rich enough to help me explicate the most important points and because this shows the coherency between the different participants' views.

I made a deliberate decision to let respondents speak for themselves as much as possible with minimal intrusion on my part. I therefore drifted from the standard convention of using brief excerpts to illustrate points made by researchers. Instead I narrated as little as possible and allowed the extracts (the interviewees) to illuminate the points, using the model of another qualitative study in the same field (Scott, Rundall et al. 2007).

I decided on this style because I wanted to preserve the context of what was said and I did not want to lose any of the nuances that give the discussion character and a sense of reality. I also wanted to tell the story mostly through the words of the interviewees. By doing so, I was able to tell the story and present the evidence at the same time, while not compromising the limit in word-count. I did not feel it was necessary to introduce each excerpt with a lengthy explanation of what was said. I was careful to select the most meaningful quotes; many of which are self-explanatory. This way I was able to avoid being redundant and did not reiterate what was already said.

5.8 Interpretive Role

I do however have an interpretive role. This is evident in my analysis, the presentation of the Discussion chapters, their style, how I brought the different sections together and how they are organised. I have also presented my views within the commentary and later in reflective summaries at the end of each of the Discussion chapters. These concluding remarks highlight the main points and include my personal views and interpretations of the evidence. I've also elucidated my views and conclusions later on in the final chapter of the thesis.

Another point to note is that English was not the first language of many of the participants. This was sometimes noticeable in the vernacular of those non-native (English) speakers. I decided to preserve the authenticity of the excerpts by not correcting any of the slang or grammatical errors. I hope that this will only add to the genuineness of their accounts and not take away from the meanings behind them.

5.9 Implementation Timeline

The purpose of following passages is to chronologically clarify the sequence of events and the ‘story’ of how the project was implemented. This would allow the reader to understand-in brief-how the project evolved sequentially before discussing the findings. There is no particular source for this information. It is the culmination of three different sources; my personal knowledge about the organisation and project as an employee, feedback and stories from my interviewees, and from the NGHHA Internet and intranet⁷ websites. It is difficult to acknowledge where exactly each source is used, as all of the above together helped to create the story of how the project evolved and the way events unfolded over time.

In 1999, the NGHHA decided to upgrade their existing legacy hospital information systems by introducing a new CIMS. After various stages of preparation that included evaluating and selecting vendors, a system was selected and a vendor was contracted. The implementation took a phased approach. The new CIMS system was rolled out over two phases. The different preparation and implementation stages (in brief) included:

- 1. Vendor Selection – 1999**
- 2. Readyng the Infrastructure for all regions – 2002-2004**
- 3. Hardware Systems Deployment – 2003-2004**
- 4. Distribution of Peripherals – 2003 (and ongoing)**
- 5. Phase I – 2004 (go-live: 29th September)**

⁷ Only accessible to NGHHA employees through username and password

The first phase of the project was rolled out in the Central Region only. This included the introduction of the main functionalities, data conversions and interfacing with the old legacy system as well as interfacing with other new systems,

6. Phase II – 2006

This phase mainly consisted of enhancements to the modules rolled out to the Central Region in Phase I, plus the introduction on the Physician Functionality.

7. Phase III - Western and Eastern Regions

At the time the data were collected, the rollout of Phases I and II to the Western and Eastern regions were planned to be implemented at a later stage. More on this is discussed in Chapter 8.

5.9.1 The Implementation Plan

The NGHHA planned for many aspects of the implementation, including the customisation and rollout of CIMS application, interfacing the CIMS application with existing and future applications, readying the infrastructure, providing hardware for servers, desktops terminals, laptops, and printers. They also prepared and trained a CIMS team consisting of a project leader/manager, team leaders, and systems analysts. To liaise with the CIMS team members from various departments, key-users and key super-users were selected. Training was also required for other members of the ISID on servers, networks and other hardware needed in the implementation. Awareness campaigns were carried throughout the hospitals, and the end user training was planned. Some of the aforementioned points had to be done in phases; others had to be arranged simultaneously alongside others.

For the CIMS rollout, their initial plan was to introduce the system in two phases. Phase one of the project was to introduce the Registration and Nursing modules in the Central Region, then the Eastern Region, and finally to the Western Region. Phase two of the project was to introduce the CPOE and Pharmacy modules in the same order. This plan was later changed and it was decided to rollout both phases in the Central Region, then take a ‘clean’ copy to the other two regions. At the time the interviews were conducted, Phase II was being rolled out in the Central Region and the data collected covers events up until that phase of the implementation only.

As this study occurred at a particular time, under particular circumstances; certain factors render the study atypical and unique in its content. Hence when reporting my findings limited generalisation is warranted and certain elements should not be misconstrued as unwarranted generalisation.

CHAPTER 6 INTERNAL TECHNOLOGICAL ISSUES

6.1 Introduction

The purpose of this chapter is to discuss the technological issues as reported by the interviewees, where they have commented on different IT-related aspects of the implementation. The ‘internal’ technological issues that inductively presented themselves through the interviews revolved mainly around technical (mechanical) issues, introducing SunRay devices that were a simultaneous change with the CIMS implementation, problems with interfacing multiple systems (sometimes from various vendors), readying the infrastructure and ensuring constant availability, various security measures, introducing the PACS, and implementing the CPOE. These will be discussed in the following chapter, preceded by a chapter on the ‘external’ issues (Chapter 7).

6.2 Technical Difficulties

Before collecting the data, I assumed that when reporting on this issue there would be endless stories on all the technical⁸ difficulties faced, but there were hardly any to report. This in itself was a noteworthy finding, supported by an overwhelming response from the interviewees that there were no significant technical problems throughout the implementation. There were no functional problems with hardware or software. All systems functioned, as they should. Nothing backfired and none of the acquired systems faced compatibility issues. There were no mentioned emergency shutdowns, no server or hardware crashes, no network failures, no compatibility issues. In short all equipment was fully functional. What is ironic is that I find myself writing about how there were no technical problems when writing a section on the technological challenges of implementing a CIMS.

6.2.1 Technical issues

When asked specifically if there were any technical problems, the general response was that;

⁸ Functional problems or mechanical malfunctions of hardware or software.

The implementation of the system was smooth. (DIRECTOR PHARMACY: 261)

An ICU consultant commented on how easy it was to resolve any technical issues that did surface with the cooperation of the CIMS team;

After starting to implement the NG-CPR we used to have regular meetings with the technology people to try to fix everything. Most of the problems we had before are resolved now. (CONSULTANT PHYSICIAN-1: 116)

What was even more interesting was that the ISID team who were expected to have been the people most challenged with technical problems were the ones who responded that there were not that many or that they were negligible and swiftly dealt with;

Technical issues, there are none, absolutely there are no technical issues. We had some problems with the interfacing; HL7 interfacing, and that has been solved. (IT DIRECTOR-PACS: 113)

Technically from my side, I didn't face any. (TECHNICAL MANAGER-2: 53)

The technical issues from our hospital were good. (CIMS ANALYST-3: 48)

No not really, no. No technical problems. (CIMS ANALYST-4: 104)

On the occasions that they did face technical problems, they were minor and many reflected their view that these problems were promptly dealt with;

Of course there were technical issues from our side, but they were solved directly...good communication and because the project was supported from higher management, so as I said everyone was helping us in that. (CIMS ANALYST-3: 54)

Although the purpose of this study was to highlight the challenges faced during the implementation (not issues that were not a problem), I thought it was important to point out that in an implementation of this magnitude, technical issues were not thought to be a major challenge.

6.2.2 Hardware preparations

The ISID had a technical role that needed to be carried out, but there were not any significant problems in dealing with that responsibility. Their technical duty meant supporting the CIMS implementation by providing the required end user workstations and peripherals, hardware and operating systems, then providing ongoing technical support by ensuring that the servers and operating systems were running smoothly and functioning properly;

But there were some other; I wouldn't say technical, but they are probably technical concerns such as the hardware required to host NG-CPR, the capacity of the operating system, the servers and so on. I wouldn't say they were difficulties, but I would say they were technical requirements. (CIMS ANALYST-1:146)

From the ISID standpoint, their technical concerns were clear and straightforward from the beginning and all hardware requirements were well thought out in advance;

The clinical information system needs to be installed on a server; the server needs to be ready for this system by ensuring that it's running on the right hardware, right operating system, right storage and-um-the system is functioning as it should. (IT DIRECTOR-1: 25)

Ensure that you plan your hardware; whether it's system hardware or any other hardware very well and ensure these do not play a part in making difficulties in implementing the system. (IT DIRECTOR-1: 301)

6.2.3 Printing teething problems

There were some issues that were not necessarily 'technical difficulties' but were technical bugs or teething problems that were soon resolved and had no severe implications for the implementation and did not lead to any severe delays in the project. In the beginning stages right after the go live, there were some problems with printing, but those were resolved quite efficiently and were not a source of difficulty for very long, as observed in Pharmaceutical Care and Radiology;

There were some technical difficulties with printers as far as communicating with the printer and the way that once it started to print the way that it looked; was it legible and things like that but those usually got ironed out fairly quickly. (DIRECTOR PHARMACY: 97)

6.2.4 Technical control over the system

Another problem faced during the implementation that delayed the acceptance of the system by many users was loss of control over the system and the constant need to relay any technical problems back to the vendor (as will be discussed in detail in later sections about service providers). This concern was noted by some respondents who were particularly frustrated because they had full control over the previous (legacy) system, but had lost their control with the introduction of the new system:

So we lost some control over the system...but most of those processes are not in our hands...in the previous system all the control was in our hands and we had full control of the system. (DIRECTOR PHARMACY: 56)

The system has great potential to be more useful, but the main problem is that issues should be solved and also control of the system should be done in house. (DIRECTOR PHARMACY: 261)

6.2.5 Screens and system enhancements

Although the CPR-NG system was a ready-made system (bought over the shelf) it needed a lot of customisations and enhancements. The CIMS team had a responsibility to customise all of the screens to suit the specialty in each department. In some areas, more detailed enhancements were needed. For example, several critical care units within the hospital and each required individualised screens; each with unique and differing different fields. This need for detail meant more exhaustive work for the CIMS team;

Some of the core concepts are the same, but some of the screens are tailor made to suit each area. (DIR CLINICAL NURSING-2: 35)

Although we had designed the system as much as we can towards what we thought we needed but there were major changes to be made on different screens. The screens were not user friendly, the screens were not always applicable, and these types of things, but still there are changes being made. I think that was one significant issue. (DIR CLINICAL NURSING-1: 38)

At times, making all these modifications or enhancements made it complicated for the CIMS team to maintain the required changes; a task further complicated by the shortages in CIMS analysts to do the job;

In retrospect I think that it's um provides a challenge certainly for ISD to maintain the screens, but also we're in the process of changing the screens so we've only implemented this partially; it's a continuing project in the hospital (DIR CLINICAL NURSING-2: 53-41)

6.3 Implementing Simultaneous Changes

It was decided to use SunRay devices instead of desktop computers to lower maintenance and operational costs and because of their compact size, which made them suitable for space-constrained environments. SunRay thin-clients⁹ process only keyboard and screen output, leaving all of the application processing and storage to the server. The user accesses an interface, while the administrator deals with a centrally managed environment. The SunRays are also easily replaceable allowing minimum downtime.

A decision was made to introduce SunRays simultaneously with the new CIMS in the Central region even though the SunRays were a new technology not only in Saudi Arabia, but also worldwide. Looking back, the evidence shows that introducing this new type of hardware simultaneously with a new system implementation lead to difficulties in the technical administration as well as increased resistance from the users who had to deal with learning and working on this new type of hardware along with training for and accepting a new CIMS, which was in itself is a major change to their business processes. On the decision to introduce the SunRays in simultaneously; an IT Director commented that:

Ok, we implemented a new thin-client system called SunRay and this SunRay implementation was the first implementation in the Middle East and it really made the end-user frustrated...he was working with a new system; NG-CPR system, which is new to him and we added to him another headache which is implementing this new thin-client SunRay system, which really was not the right decision I think at that time really. (IT DIRECTOR-1: 115)

If you want to implement a new system like a CIMS or EPR system, don't implement with it another system that is not well-known or easy to set up. Don't work on two complicated projects at the same time. (IT DIRECTOR-1: 301)

⁹ A client computer or client software which depends primarily on the central server for processing activities, Many thin client devices run only web browsers or remote desktop software, meaning that all significant processing occurs on the server.

What we did is we introduced two new products to the end user at the same time; the CIMS as well as the SunRays. You know the SunRays it's not-it's different than the regular PC, so that will confuse the end user. It took us more than a year to overcome the SunRay problem, but now it's working efficiently. (IT Director CIMS: 192)

6.3.1 Resistance to multiple change

The users resisted having this new technology. This had a significant impact on the acceptance of the new CIMS system;

And you know with any new technology you will find sometimes you will have user resistance for this new technology and sometimes you will have also some minor issues or minor bugs within the system itself...so I could say one of the main obstacles we had faced during the migration was the user resistance of the SunRays appliances. (NETWORK MANAGER-1: 132)

Many users were overwhelmed with dealing with two major changes to their work environment and some blamed the SunRays for all their problems. The teething problems they had with the SunRays made them resent these new devices and at times reject them completely. Some of them were so put off by the SunRays that they went to extreme measures to try to get rid of them and have them replaced with desktop computers. A senior network executive explained that they would say things like:

'OK I don't want this machine just take it out and bring me a normal PC'. (NETWORK MANAGER-1: 132)

Some users reported slowness or network problems that did not actually exist. This was done with a hidden agenda of trying to get more desktop computers for their departments. This was a problem for the technical people who were already overwhelmed with the real calls they had to respond to for 'real' problems. This also made it difficult to isolate the real problems and to evaluate the system properly after it went live. When asked about the nature of complaints received regarding the SunRays, one IT manager replied:

I would say a lot of complaints and I could say most of them were not actually valid complaints. (NETWORK MANAGER-1: 138)

The overall experience with the SunRays as far as the users were concerned was reported as off-putting as depicted by two clinicians;

It hasn't been very positive here. For some reason they are very very slow; they freeze a lot and they were got because of space restrictions so that we would have smaller modules there but they haven't worked out the total. We've just been doing an inventory to see how many we still have and what the satisfaction is with people with them and they are still coming back all negative. (ASSOCIATE EXEC-DIR NURSING: 167)

The biggest problem we had at that time was with the SunRay system. The SunRay was very very very slow. It was slow to the point of it being a turn off; I mean you don't want to use it anymore and we were relying mostly on desktops (SENIOR PHYSICIAN: 72)

6.3.2 It's all in the timing

Despite having some technical issues, the SunRays were still a promising solution that actually had many advantages over using a normal PC. Technical administration was easier, they cost less than a PC per unit, they required no operating system or application licenses. It was mostly resisted because it was introduced at the wrong time;

I don't think the SunRay has anything to do with it...because once you open the system; the SunRay is a lot better than any desktop. So I can have them open it for me...and for most physicians they don't really jump between applications, they just go into NG-CPR and that's the end of that. So I think it's a question of just resisting change. (SENIOR PHYSICIAN: 300)

The lesson learned is not to introduce two new types of technology at the same time. People do not need a reason to resist change, so there is no need to complicate the change process by overwhelming the users with too much to take on at once.

6.4 Interfaces & Multiple Systems

All applications need to 'speak' or communicate with each other. To achieve this link the applications must be 'interfaced' with each other. Interfaces were needed between the CIMS and the previously existing systems like the Cerner Lab and the old legacy system that were already up and running. There were also separate

systems that were to be implemented and interfaced at later stages like the Radiology and Dental systems.

It is technically challenging to create these interfaces and the different applications must comply with certain standards and must be designed in a way to make it possible to create these links or interfaces between them;

The technical difficulty will come in interfacing the clinical system with any other system. Now, if the vendor of the clinical system and the third-party vendors are using the same standards, the technical difficulties will be minimised. (CIMS ANALYST-1: 146)

We have too many applications related to too many vendors. Where it will make it difficult to implement the project... So we keep the old one and interface with what we have now for the lab system... So now we are doing an interface for the Cerner at the same time we have to do another interface with our legacy system- the old system- because some modules are not completed or do not exist with our new vendors (IT DIRECTOR-2: 35)

6.4.1 Who's to blame?

Introducing applications from multiple vendors presented a problem with interfacing. If all applications do comply with the standards and it is possible to create the interfaces, the vendors providing the applications that need to be interfaced must work with each other and with the CIMS team to successfully create the interface. Sometimes the interface is not supported contractually and the vendors are under no obligation to work to provide it, or they might not have the resources (skills, human resources, time...etc.) to do so even if they agreed to do the work.

So, one important thing is integration between those systems. So, if we say NG-CPR is the clinical information system, we need to ensure that it integrates with other patient care systems like PACS and Lab information systems and medical imaging system, dentistry system and so on. So integration is a must and this is probably one of the important things that we need to take care of. (IT DIRECTOR-1: 283)

Another issue is that vendors might shift the responsibility and the job of creating the interface gets tossed around between vendors with no one taking responsibility to provide a solution. Usually the ISID find that they have to create these interfaces through members of their own staff. Finding, hiring, training, and retaining qualified

people with the technical expertise to do so is a challenge in itself and the best way to avoid all these scenarios is to try and minimise the number of different providers to begin with;

We found that there are technical people who can do the work; they can do good interfaces. They can do excellent reports. This will help the project; speed up the project, but I wish that to maintain and to keep the valuable people for this project; not to loose them until the project will be completed. (IT DIRECTOR-2: 455)

We have too many interfaces with other vendors...it means we have too much work involved. It will be very complicated or we will have too many boxes on our organisation or in our system. This means in the future we will face too may problems to support our system. (IT DIRECTOR-2: 53)

6.4.2 Running the legacy system

Another problem was introducing the new system in phases. As the modules of the new system were introduced; they had to phase out the legacy system module by module. This lead to difficulties with interfacing the old legacy system with the new NG-CPR system, and also confusion with the users who were then using two systems simultaneously.

Ok, we're supposed to have our new system it should cover all our existing systems. I mean if we go live with our new system, we should not use the legacy system; the old systems. (IT DIRECTOR-2: 59)

6.4.3 Interruption with patient services

There were also network problems related to these interfaces. Sometimes in the network in the same area it gets disconnected and disconnection of the network would cause data not to transfer to the other machine and this created a problem in that the patient would not get the services, because the interface was lost. The patient might have to wait in some cases where there is a network disconnection during a file transfer. For these patients they might not get their medication and the transaction must be repeated between the two servers:

And this is really difficult while they are both servers in the same data centre. (TECHNICAL MANAGER-1: 84)

We have to make some interfaces between the old medical application and the new one to exchange information...there are really a lot of problems to make the interfaces between these two machines, so the data has to be instantly transferred between NG-CPR and the legacy system. (TECHNICAL MANAGER-1: 74-75)

They did not really take their time to cover all the problems while they were writing the interface between the systems. For three months, we had a problem from this interface. Groups from NG-CPR and legacy they sat together, but I think there wasn't a full understanding between these two groups to cover all the possibilities of the problems while they were writing this interface. Now it is stable; yes, but at that time it wasn't and we were always working to fix it. (TECHNICAL MANAGER-1: 89)

6.4.4 The Pharmacy

Not all the modules were immediately transferred from the old legacy system to the new CIMS as the case with the Pharmacy module. This delay proved difficult for the Pharmacy users because they had to use the legacy system and the new system simultaneously;

The Pharmacy people really suffered a lot in this implementation...because they are in the old application and in the outpatient is only in the new system and they are suffering because of the interface between these two systems (TECHNICAL MANAGER-1: 114-118)

We have the system running in Riyadh and it's used by the end user, but it's missing another module which is Outpatient Pharmacy. We are still running Outpatient Pharmacy on the legacy system. (IT DIRECTOR-1: 145)

6.4.5 Single User Interface

Another reason the applications needed to be interfaced was for the convenience of the users. By interfacing the different applications, they can all be brought together so that the user can access all the applications through a single interface without the need to jump between screens when accessing different applications. A user of the Cerner Lab System or the PACS system or the CIMS would all go about accessing these systems through the same interface and users who need to access more than one of these applications can especially appreciate the fact that they do not need to log out and log into a different interface. The CIMS Director explains about the users:

They only see NG-CPR in front of them and ... for the end user they work only on NG-CPR ... the user has only the NG-CPR interface...for Cerner Lab they order on NG-CPR and they get their results on NG-CPR...it will be the same for the

PACS system for both Radiology PACS and for the Cardiology PACS as well as Dental PACS. (IT DIRECTOR-CIMS: 168).

Acquiring a turnkey solution from the beginning is a good way to avoid such problems if it is at all possible to find and agree with a sole provider for all the applications, modules, functionalities, hardware and software required for a complete CIMS solution. It is usually difficult if not impossible to find a capable vendor to provide a full turnkey solution. A more tangible solution would be to at least unify the application provider and end up with a single software provider and a single hardware provider.

If you made your decision that you have one vendor for the application and one vendor for the hardware I'm sure the organisation will be very relieved in this implementation. (IT DIRECTOR-2: 215)

I think there is no way you can find one vendor for the application and the hardware. (IT DIRECTOR-2: 203)

For the NGHHA this was not the case and they had various hardware and software providers. Many reasons lead to this situation and most were beyond their control, like the unavailability of a company that was capable of providing all the required solutions to the required standards of the NGHHA and within the available budget. Another issue was that the system was an evolving project spread over many years where technology, service providers, and the organisations itself have all gone through many changes.

6.5 The Network Infrastructure

Setting up a reliable infrastructure capable of supporting all the IT services provided was a challenge, especially across all regions of a country. Since the NGHHA already had a national infrastructure, their challenge was to upgrade that existing one across all three regions with constant availability and with minimal disruption to the existing IT services.

6.5.1 Why upgrade?

The network was not upgraded specifically for CIMS. They had planned the network upgrade to support several future applications, like the PACS, the Cardiology system, the Dental system, the Cerner Lab system and others. One of these applications was the CIMS. It was a new direction and this was the main reason for the network upgrade;

The upgrade was not mainly for NG-CPR. It was actually for many applications; one of them was NG-CPR. The other application that was really bandwidth consuming and it is well known that it is bandwidth consuming application is PACS. So, we had to plan at that time to upgrade the network to support the future applications which is part of them is NG-CPR. (NETWORK MANAGER-1: 37)

After going live we found out that it is not actually bandwidth consuming and it is um our network was able to handle all the application and we were able to add 30%-40% more clients on top of the old network at that time. (NETWORK MANAGER-1: 31)

6.5.2 Two Major Migrations Simultaneously

The CIMS was not bandwidth consuming, so they decided to go live with the CIMS application on the existing network and then after things were stable they upgraded the network infrastructure. However, this upgrade came at a time when they were in the process of rolling out the CIMS to the users. Introducing multiple changes was not favoured amongst users.

But the issue was we were at the time to upgrade the network and we had a new project in the process. (NETWORK MANAGER-1: 37)

So it was very difficult to start with the migration process where we have in the application side already a migration for the users. I mean the user will already be migrated from one application to another application. So you can't have more than one interruption or more than I could say major upgrade or major migration for the users; I mean two migrations at the same time. So, that's why we had at that time to postpone our network migration to a later stage. (NETWORK MANAGER-1: 37)

6.5.3 Nationwide upgrade; the other regions

The other regions also had to be upgraded, but each region had its own unique requirements and challenges when it came to networking. In the Central Region, they

were rolling out the CIMS application, in the Western Region they had to change the fibre cabling and in the Eastern Region they had to increase the capacity of the existing network;

The migration project was not only for Riyadh, it was for both sites Riyadh-the central and the western provinces...it took us about eight to ten months. (NETWORK MANAGER-1: 49)

So we had actually another project to change the fibre cabling in Jeddah's side to support the new Gigabit project. Once this passive cabling project is done, we did start active components' migration. (NETWORK MANAGER-1: 61)

In the eastern region there is no actually migration. They are already running in top of a Gigabit network. We just increased the capacity. (NETWORK MANAGER-1: 66)

6.5.4 LAN (Local Area Network) issues

The responsibility of planning and supporting the local area network (LAN) locally within each individual site lies with the respective ISD department and this can be compared with any other local services that the ISD departments provide like end user support, technical support for the servers, or support for the local applications.

A network is a network and at the end there is a day-to-day activity; you have connectivity to the end user, which is, say it is local; they are not part of any other site. So yes, again as a LAN site it is actually the responsibility of each site, because it is actually one of the services that we provide to the users. (NETWORK MANAGER-1: 240)

However, when it comes to planning the needs and specifications required for each site, the responsibility lies with the corporate management to be planned for all regions kingdom wide. The general response was that when it comes to designing national infrastructure, the plan had to be one centralised and general plan;

The plan for the migration was done centrally with involvement from each side. I mean there was some discussion about the requirement in each side. But as an implementation is should be the responsibility of each area, because in the end this area will be the responsible area for assuring the availability and accessibility within the LAN. (NETWORK MANAGER-1: 240)

6.5.5 Upgrading from the existing infrastructure

Migrating the network infrastructure means asking for complete downtime from the user where no IT services will be available. This meant that for some departments the migration was done in stages over a significant period of time. This led to some delays mainly caused by the nature of the environment they were working in;

Yes, something from scratch you can set a time and you can meet this time easily, but not to upgrade or to migrate an existing infrastructure where you have live users. In a healthcare environment sometimes you can't afford the downtime of one second, because this downtime could cause a human life... so it is very difficult and very challenging to migrate an existing infrastructure in a healthcare environment, and this was one of our main challenges during the migration. (NETWORK MANAGER-1: 300)

This was also another challenge so sometimes we had to do the migration for a specific department gradually among-one of the departments we did the migration for them in about one month and we had about 200 users only in this department. Why, because we had to migrate I mean we had split this department into parts. So we had to migrate them part by part and each part we tried to minimise the downtime as much as we can. (NETWORK MANAGER-1: 300)

6.5.6 Wireless

The major difficulty with the wireless network implementation was that the network team were not given enough notice to prepare for it. Their frustration was that preparing for a wireless network requires time, and they were not allowed that time to prepare;

No there weren't but there was no um major issue, it was actually very short notice for us to implement the wireless... we had a direction to implement the wireless only three weeks before the go live... and thank God we did implement it in less than three weeks. (NETWORK MANAGER-1: 357-363)

Another challenge was implementing a wireless network in the critical care inpatient areas:

The NG-CPR um one of the challenges we have to make sure that we have to meet is to build a new wireless network in the patient care areas like ICU, CCU, all wards, because the NG-CPR requires mobility and we still don't have this wireless network. (NETWORK MANAGER-2: 48)

There were significant delays in migrating the new gigabit network and initialising the new wireless network resulting in the staff working until the very last minute before the go live on upgrading the network. This was mainly due to poor project management;

Distributing tasks are not well defined. I was in Riyadh when they went live for NG-CPR and we had to work for the last um last minute before go live in doing a very important job which is the wireless network and that was done only three days before going live. (NETWORK MANAGER-2: 128)

6.5.7 Coordinating Downtime

They did a lot of planning to calculate and coordinate downtimes with affected departments, but there were times where only a few hours before the agreed downtime, the department would contact the ISD and ask to cancel the downtime due to some arising pertinent issues. This led to some delays and much frustration for the people in charge of migrating the network;

We did contact the departments and we did agree with them to certain times, but before the migration sometimes they give us very very short notice... three hours before starting the migration I was informed by the department that we cannot do this and we are going to have to postpone it for some other time. (NETWORK MANAGER-1: 306)

6.5.8 WAN (Wide Area Network) Issues

There was no need to deal with the wide area network (WAN)¹⁰ issues during Phase 1 of the migration in the CR, because the migration was local and did not affect the other regions. This gave them time to focus on the CR and plan for the WAN upgrade at a later stage. According to their estimates, they realised that their existing WAN had the capacity to support all users even from the other regions, but the issue with the WAN upgrade was the need to ensure availability and not the bandwidth capacity.

The WAN was not tackled at all in the migration because the migration was only on KAMC-Riyadh which was mainly the LAN side. So the WAN was not an issue at that time. (NETWORK MANAGER-1: 162)

¹⁰ A network that spans a large geographical area such as a citywide network or the Internet.

We found out that as per our existing WAN setup we can accommodate having NG-CPR everywhere with the current number of users accessing the NG-CPR now. (NETWORK MANAGER-1: 167)

Providing a reliable network is not only about acquiring an installing an infrastructure with the required capacity and proper design, it is also about ensuring that the network is always available and reliable and that is the focus of the next section.

So as per the contingency plan for the hospital, this type of service interruption is not affordable and is considered as a disaster. (NETWORK MANAGER-1: 186)

Centralising the IT services was viewed as a good direction that could lead to more efficient administration, and reduced costs, but it was clear from the evidence that one must ensure a national infrastructure to support this direction. Being such a large organisation with IT services centralised in one region has made things somewhat more difficult, but the main difficulty was reported as providing a reliable and available infrastructure;

The main issue was the WAN connectivity. I mean centralising the services is a good direction that will lead to better management, lower costs, but you have to have a reliable infrastructure. (NETWORK MANAGER-1: 192)

6.6 Availability

A high-speed WAN link was needed to connect the three regions and remote sites together. At the time of the implementation, there was only one provider in Saudi Arabia; the Saudi Telecom Company (STC). It was decided that the application could be run on the previous WAN network without the need for an immediate upgrade. They postponed the upgrade until it was needed when there was more traffic to transport between the regions. With Western and Eastern Regions not yet live, there was no need to rush a WAN upgrade;

Well as I mentioned earlier, we found out that the application is not bandwidth consuming; it is very very light on top of the network. So as per our calculations we found that with our existing WAN setup we can accommodate having NG-CPR

everywhere with the current number of users accessing it. (NETWORK MANAGER-1: 168)

6.6.1 Reliance on one provider

They still needed to provide the infrastructure in preparation for the following phases and for the rollout to the other regions and this came with its own set of impediments to overcome;

But the main issue was apart from the capacity; the availability. You know we are running our WAN connectivity on top of one telecom company which is STC and for the time being there is no other company so as one of the main roles in WAN redundancy you should have two different links from two different providers. Currently we have actually two different links from each site, but from the same provider as we have no other choice. (NETWORK MANAGER-1:168)

They did seek alternate solutions as new providers were emerging. They needed less dependence on STC to minimise their risks and give them more options;

There are now new providers in Saudi Arabia, we had already contacted them almost one year back and we have a plan with them to support us and to provide us with additional WAN links so in this case we will have two links from one provider and one additional link from another provider. This way we will increase the number of links for the WAN which will lead to better availability for the services. (NETWORK MANAGER-1: 168)

6.6.2 Downtime

In a healthcare environment downtime cannot be afforded, especially in critical areas like the emergency room, the laboratory and the pharmacy where any delay in service delivery can have life threatening affects. One respondent explains;

I mean we could lose a human because of this downtime. So it is very difficult and very challenging to migrate an existing infrastructure in a healthcare environment. And this was one of our main challenges during the migration. (NETWORK MANAGER-1: 300)

Departments that were rated as highly critical like the ER and LAB and Pharmacy and some other areas, so those types of areas can't afford downtime, even if we have to delay the migration by say three weeks, four weeks, one month we have to comply. They are really critical. (NETWORK MANAGER-1: 301)

It was thought to be important for the CIMS to be online and available all the time, especially after rolling out to the other regions. The respondents thought it would not be possible to run a system like this across so many regions with a centralised location without providing redundant and extremely reliant network links 24/7;

We cannot afford something like that. This is mainly considered as a disaster; as the whole system will be down in a hospital that serves more than 300 beds... Exactly, yes. So as per the contingency plan for the hospital, this type of service interruption is not affordable and is considered as a disaster. (NETWORK MANAGER-1: 180-186)

I think one of the major obstacles is-two things are perhaps challenges to healthcare environments. One is you're working on a live system and so you are going through a learning curve at the same time that you are on a live system and that can be a bit frightening for people and a bit challenging for people. (TECHNICAL MANAGER-1: 63)

As a large organisation that provides centralised services matters became more difficult. When asked about the difficulties of centralising services, a network manager responded his main concern was the WAN;

The main issue was the WAN connectivity. (NETWORK MANAGER-1: 192)

6.6.3 Reliable national infrastructure

Although centralising the services is a good direction that will lead to better management and lower maintenance and logistical cost. The ISID technical managers address the challenges of having a reliable national infrastructure, however there was definite optimism that by the time the system goes live in the other regions, most issues would be resolved.

In the past years we didn't actually have a reliable national infrastructure in terms of networking. I hope in 2007 and 2008 this type of infrastructure will be much better than before as there will be three additional companies involved in providing the data services kingdom wide. (NETWORK MANAGER-1: 192)

It will be an issue, but it will not be the same as before. I mean now we have better availability...Now we have dual links and we will have very soon God willing a third link with a different provider, so I hope this will increase the availability and a good factor. And again, with the new companies we have already actually informed them that we need a type of SLA. So we need an SLA agreement to say what the availability of the provider is. So also with an SLA you

*can at least have a clear figure of what you can offer to your end users.
(NETWORK MANAGER-1: 198)*

6.6.4 Planning the migration

Upgrading and migrating networks requires careful planning. The project plan for the upgrades and migrations was done through the corporate site in Riyadh to devise a coherent national plan for all regions. Still, input from each region was valued because responsibility for daily activities and maintenance for each region was held done locally;

The plan for the migration was done centrally with involvement from each side. I mean there was some discussion about the requirement in each side. But as an implementation it should be the responsibility of each area, because in the end this area will be the responsible area for assuring the availability and accessibility within the LAN. (NETWORK MANAGER-1: 240)

6.6.5 Project delays

The plan seemed straightforward at the time, but the users did not always comply and would sometimes need to stop the migration in some areas because they were not prepared, or because they could not have an interruption in services at that time and so the migration would be postponed. This led to delays that were not anticipated and were not included in the initial three-month project plan;

Sometimes they would have some immediate or urgent tasks that need to be done during this time, so we had to delay the migration for another week or so...and we had a noticeable delay time as a result of these types of incidents. (NETWORK MANAGER-1: 240)

Although the delays were not major and did not have a detrimental affect on the implementation, they were noticeable:

So yes, actually during the migration we had some delay. It was not a major delay, but was mainly caused by the nature of the environment we are working in. (NETWORK MANAGER-1: 240)

6.6.6 The Western and Eastern Regions

In the Western and Central regions the significance of high availability was a concern for management and the end users. The geographical distribution of the sites and the vastness of the implementation made it difficult to ensure availability;

This is the difficulty because you have to take care of the networking and the connectivity between the cities and to guarantee you that it is always available...the problem here [referring to the Western Region] is with the connectivity between the cities and the high availability...for the system to be always available for the end-users and for the patients to get the information. (IT DIRECTOR-2: 16-18-24)

If there ever is a problem in the data centre they can switch the users to the alternative sites; the 'disaster recovery site'. Setting up a disaster recovery site usually involves third party applications. Usually contracted through service providers these applications do not always provide the optimum solutions, because they do not have the knowledge to deal with the existing hardware or they come up with solutions that are not very practical. That was the challenging part;

This is the difficulty here for the disaster recovery [dealing with the third party providers]. (TECHNICAL MANAGER-1: 69)

Sometimes the high availability needs other third party programs to do this high availability. (TECHNICAL MANAGER-1: 30)

6.7 Security

Technical security was applied on many levels and this required, time, dedication and planning. There was security for the hardwired and wireless networks, workstations and desktop computers, printers, servers, operating systems, applications and physical access to computer equipment on hospital grounds. Although this aspect of the implementation was not a real barrier and did not jeopardise the project's success, it was an important issue that they had to address.

6.7.1 Securing the hardwired network

For the hardwired connectivity, ensuring security was not an issue from the network administration side at all. There were so many layers of security even before having

any network accessibility. There was security on the network accessibility level where the Help Desk must verify who the user is and the configuration will be statically applied to the machine assigned for usage so that that user will not be able to user another machine. After that there was security on the application level where only authorised users were granted access and their privileges were only for specified levels and modules of the application as needed. As explained by a network administrator;

There were many layers of security before even having the network accessibility. So it had a better security-I could say-configuration compared to the wireless. (NETWORK MANAGER-1: 369)

6.7.2 Securing the wireless network

There was more concern for the security of the wireless network as opposed to the hardwired network. Securing a wireless network is important and requires more attention as it is easier to breach wireless security. The major challenge they had with the wireless security was in optimising the connectivity according to the vendor's recommendation. They took measures to encrypt the traffic¹¹ and enforce user authentication for access;

With wireless the main issue for network engineers is the security or the main concern is security. You know with wireless there are a lot of security concerns compared to the wired. (NETWORK MANAGER-1: 363)

After doing the migration we started optimising the security for the wireless connectivity until we finalised the security configuration as per both vendors' recommendations. (NETWORK MANAGER-1: 363)

6.7.3 What did the users think?

The user on the receiving end had a different perspective on security. Ensuring optimum wireless network security at times had an adverse affect on the users because of the security precautions taken by the network administrators;

We have a lot of technical problems now...for security reasons they disrupt the wireless connection if the screen is not used, but they are sorting that out and

¹¹ The payload and the header for any type of traffic for the uses within the wireless network

what happens is that we have to restart the computer every time and that takes time especially if we are busy. So, that at moment is a big problem for the staff, but we are currently working with the NG-CPR team to get that sorted out. (CLINICAL RESOURCE NURSE: 110)

6.7.4 Securing physical patient files is more difficult

From an application standpoint, a medical records director found a security advantage with electronic files over physical files because they are theoretically easier to secure and are less likely to be misplaced;

Maybe it would be much better with information systems with passwords and tracking people who breeched or violated or printed part of the patient records...I think it would be much better; there would be more control. (DIR MEDICAL RECORDS-2: 230)

6.7.5 Operating system security

Many measures were taken by the ISID to ensure security on the operating system (OS) level. All the users were created on the database level to ensure that nobody could login directly to the system. They also had a Raw D5 database which meant that nobody could see the files even on the level of the OS;

And the other level of security is from the operating system level and for our side it is secure. (TECHNICAL MANAGER-1: 265)

6.7.6 Application security

The next level of security was on the application level whereby the end users' access rights were controlled and users were only given access to modules that they needed.

There is also another layer of security which is the application layer...there were many layers of security before even having the network accessibility. (NETWORK MANAGER-1: 369)

6.7.7 Physical security

Perhaps the best level of security was on the physical level. All NGHHA staff is required to wear clearly visible identification badges at all times. Users have access only to areas they should have access to, so only authorised personnel could even get close to the computer equipment. The hospital grounds were very secure as armed

military police guarded all entrances and patrolled the hospital grounds round the clock. No one was allowed to move equipment without written permission. The ISID also had surveillance cameras and staff continuously monitoring the data centre. In short, they did not take their security measures lightly and every security measure was coordinated by them;

There are so many levels super users and I don't know what the other level is and those people that they have to coordinate the they're coordinators between their departments and the ISID . (TECHNICAL MANAGER-1: 267)

6.8 Picture Archiving and Communication Systems

A director in charge of PACS described in his interview many of the benefits of implementing a Picture Archiving and Communications System (PACS) that enable images such as x-rays and scans to be store electronically and viewed on screens. This enables doctors and other health professionals to access the radiology information and compare it with previous images;

I believe the PACS will provide better quality for the patient within minimum time for the radiologist and the technologists. (IT DIRECTOR-PACS: 245)

However, achieving a successfully integrated PACS does not come without its difficulties as will be discussed in this section.

6.8.1 PACS are more challenging

A senior IT executive explains that the three major components in HIS implementations usually involve three main components, one is the enterprise resource planning (ERP) solution, the other is the clinical information system, and then there is the PACS. However, he explains that the PACS implementation is more challenging than the other two;

In PACS the issue is different because in PACS it's really totally isolated in one department in the clinical imaging and you are relying a lot on the modality and on the hardware fetching the image and then storing the image so the amount of automation there is minimum compared to a clinical. (IT EXEC DIRECTOR: 50)

Because of these difficulties, there needs to be an institutional commitment for it;

But you see the difference that the PACS for the Radiology; there is an institutional commitment for it. The whole institution is geared towards the PACS system. (SENIOR PHYSICIAN: 156)

6.8.2 The bandwidth

The main challenge of implementing a PACS is proving a network with enough bandwidth to support its massive load;

The other application that was really bandwidth consuming and it is well known that it is bandwidth-consuming application is PACS. (NETWORK MANAGER-1: 37)

They had to provide a solid network infrastructure on both the LAN and WAN levels. With the WAN it is even more of a challenge because they had to rely on an external provider who was the only WAN provider in the Kingdom at the time;

For the NG-CPR it's not, but for the PACS...it's a big issue to have PACS implementation over WAN connection. As you know, the only service provider for data communications is only one company...and we must rely on their infrastructure that is not guaranteed to provide the bandwidth we want, so we cannot get what's needed for PACS traffic; which is huge...not enough bandwidth and not reliable; not enough support for image transfer. (NETWORK MANAGER-2: 84)

The provision of a reliable WAN infrastructure was also important to make it possible to expand the PACS to the remote primary healthcare clinics;

And so this will stop PACS from being live for the remote clinics so we are looking for alternatives. (NETWORK MANAGER-2: 90)

6.8.3 The planning stage

Planning for the PACS began with organising a committee that includes all the stakeholders involved with the PACS;

We started the planning for the PACS by organising a committee which includes all the stakeholders involved with the PACS; network, archiving, or technical support, biomedical engineering, radiology, staff from the radiologist to the radiographer to the physics contract office. (IT DIRECTOR-PACS: 53)

And there were other preparations; like assessing the readiness of the radiology department and training the technicians while also assessing the financial implications;

We have to investigate the financial assessment in order to see if we have a sufficient budget or not. (IT DIRECTOR-PACS: 53)

6.9 Computerised Physician Order Entry

6.9.1 Engaging the physicians

The main challenges of implementing a computerised physician order entry (COPE) were not so much technical problems as they were people-related or highly dependant on gaining support and ownership of the physicians. The success of the CPOE was dependent on them and failing to recognise this is what makes it challenging to successfully integrate CPOEs'

If we didn't involve the physicians in the beginning and the physicians didn't gain the ownership of the system they would feel that it's a system that we need to implement but they will not value it. (CIMS TEAM LEADER: 19)

Now we have a very difficult phase; it's how to implement direct order entry through the physicians. One of the reasons is to engage the physician. (CIMS TEAM LEADER: 169)

Believe me if the chairman or the physician especially the higher level; the consultant level; if they didn't gain the ownership and leadership of the system I can tell you they will fail the system period. (CIMS TEAM LEADER: 169)

They were scared actually. They cannot understand 'how can I order medication directly in the system'? So in order to have a good system implementation again we need to have the physician champion to lead their part with CIMS help. (CIMS TEAM LEADER: 169)

6.9.2 Medication safety and the prevention of errors

Medication safety is critical for patient safety. The clinical participants appreciated that implementing a CPOE could noticeably improve overall patient wellbeing. It can reduce medical errors, provide drug allergy warnings and track adverse reactions. Many of these safety features were not available in the legacy system;

The legacy system previously did not do any checks. It just basically created a medication profile and labels. It did not do any of the clinical checks that we require, the drugs, drug allergy doses... the legacy system gave no warnings and alerts. (DIRECTOR PHARMACY: 205)

Illegibility of handwritten orders is another common contributor to medical errors and why it was so important for them to get this functionality running;

If the nurse can't read the doctor's handwriting properly we get improper referrals, which cause problems for us. (Key-user Physiotherapy: 308)

With its successful rollout, the physicians were in fact on board with it and had nothing but praise;

NG-CPR is in general I think is a good one and is comparable at least or is even better to most of the electronic ordering systems in the United States. (CONSULTANT PHYSICIAN-1: 62)

It was positive as I said. The goal is to improve patient safety. (CONSULTANT PHYSICIAN-1: 219)

Just having the positive experience in the intensive care unit clearly is going to make things better. (CONSULTANT PHYSICIAN-2: 336)

6.9.3 Saving costs

Not only was it beneficial for the safety of patients, but there was an added cost-saving benefit, as errors or mismanagement in dispensing medications and radiology or lab orders could be a major cost to the hospital;

It is commonly said in our professions that half of a hospital's expenses are made by the doctors' pens... Thankfully the system now controls the dispensing of medications, which can all be monitored and controlled heavily by the system so that errors can be avoided. This ends up saving the hospital a lot of money. (IT EXEC DIRECTOR: 129)

6.9.4 The rollout strategy caused frustrations

The CPOE was implemented first in the ICU as a pilot. There was much debate and no consensus on what the success of that pilot meant on how to proceed with the implementation. Some thought it was not the best decision to rollout the CPOE in one department and not build on the momentum of the success by quickly getting it rolled out to the other departments;

We're now at a significant period after that and we only have the Intensive Care Unit that is CPOE live. I think that's one of the biggest problems...the momentum should have been maintained and get the rollout while everyone is excited and do it all in one shot. (DIRECTOR PHARMACY: 67)

There were frustrations I think because the momentum seemed to be waning and they could see that we weren't progressing quickly enough for the CPOE. (DIRECTOR PHARMACY: 229)

The Physicians very much like it...so it wasn't like the physicians didn't like it or there were problems with it... this is the one thing that they should be prioritising is the CPOE rollout. (DIRECTOR PHARMACY: 133)

There was also debate about postponing the CPOE rollout to Phase II and not going ahead with it from the start;

One of the things I would say I think the organisation has learned...is that it's best to go live with CPOE from the beginning and not have it down the road. (DIRECTOR PHARMACY: 157)

Part of the frustration was that there were significant periods of time between phases. Improvements were also at time considered slow;

I am talking about the second phase, which is the CPOE; it should have been started one year after we went live with our system, and we are now three years since our go live and we only just started in the area to be direct CPOE. (KEY-USER INPATIENT PHARMACY: 195)

There were also frustrations by users whose functionalities were implemented, but felt frustrated because they did not feel progress and were carrying on more roles because other functionalities like the CPOE had not yet been implemented;

I think the frustration from me as the director of clinical nursing now is the fact that nursing, well the nurses are doing order entry and doing this and that in place of the physicians so that the nurses haven't progressed. So that's the frustration. (DIR CLINICAL NURSING-2: 384)

6.9.5 Spreading the good word

The ICU team gave a good impression about their experience with the CPOE implementation and were vital in spreading the good word to physicians in other departments. This seemed to have a ripple effect and the hospital physicians were

soon buzzing with excitement over the new CPOE. Most physicians are happy with the implementation and many could not fathom working without it.

The ICU people now love the system. They are full of praise. They are truly a happy lot. I mean they are—they are um they say that we wonder how we survived without it. So the experiment of the experience of the ICU is extremely positive. The feedback I get as their medical director is that this has been an overwhelming success. (EXEC-DIR MEDICAL SERVICES: 187)

The fact that there was debate about the CPOE is evidence of its importance and the clinical community's interest in it. It also shows the willingness of the physicians and pharmacists to embrace it. The only negative feedback was that they did not have it soon enough. After the successful pilot rollout there were staggering requests to the ISID to have the CPOE fully integrated throughout the hospital. This will be discussed in detail in later sections about project planning in Chapter 8.

The problems with the CPOE and the obvious impact the ownership of the physicians had on this part of the project also lead to many questions about resistance, user involvement and change management, which will be discussed in detail in Chapter 9.

6.10 Summary and Synthesis

The evidence reveals that there were no significant technical problems throughout this implementation that could be described as a barrier to the innovation process. All hardware and servers worked properly. The network infrastructure supported its load. Some technical problems did arise, but were all resolved promptly. None were reported as major nor did they cause significant delays. Any reported issues were considered 'teething' problems that were quickly resolved. There were problematic issues like 'interfacing' between systems, however those were not classified as technical problems, but rather as difficult procedures that had to be addressed. Eventually, there were no technical problems with any of the interfaced systems and all were able to communicate with each other. All levels of security were addressed and even the most challenging of modules; the CPOE seemed to have earned praise after the pilot rollout. In short, this study confirms that the internal technological

issues were not the main implementation challenges even within a large-scale project as such.

Still, there is one NGHA technical issue that was more problematic than others, despite them not deeming it as an implementation barrier. Because the implementation was incremental, they ran the old legacy system alongside the new CIMS and found initial difficulties. Although this approach can lead to problems with interfacing, it is not an uncommon approach. In more radical implementations, the old system is literally 'unplugged' in one instance and the new system takes its place without the need to interface between the old and new systems. However, in complex healthcare environments it is rarely possible to do so and new systems are usually phased in incrementally over a period of time while running the old system. Hendy, Reeves et al. (Hendy, Reeves et al. 2005) reported a similar; 'incremental' experience in their study, as did Protti (Protti 2002) in his paper on the NPfIT despite the associated interfacing problems with this approach.

Overall, the technological challenges reported here are not uncommon with those reported in other related work, such as the challenges associated with designing these complex projects. Many have argued that commissioning massive IT infrastructures for national electronic health records require significant investments and careful planning (Hendy, Reeves et al. 2005; Currie and Guah 2006) as mentioned in Chapter 2, section 2.6.1. Yet, although careful technical planning is required, there is a general consensus in the field that the organisational and human factors have contributed to the success or failure of many IT projects more than the technical ones. Much of what has been published suggests that the technological issues are no longer at the forefront of problems leading to IT implementation failures, and the real causes need to be better understood (as discussed in section 2.6).

In a quantitative baseline study on the NPfIT conducted by MORI Social Research Institute for NHS Connecting for Health (MORI 2005), the general focus of their study was on 'human' factors. They only investigated five areas; awareness of NPfIT, favourability towards NPfIT, attitudes towards NPfIT, involvement with NPfIT and communication strategies. This absence of a review of the technological issues in such an extensive study shows the field's enlightened awareness of the

organisational and behavioural aspects of large-scale implementations with less focus on analysing the technological ones.

Even in a study on a PACS implementation project, Pare and Trudel (2007) concluded that in order to maximize the likelihood of PACS success, it appears crucial to adopt a proactive implementation strategy, one that takes into consideration all the technical, economic, organisational, and human factors. They also urge to do so from the first phase of the innovation process in order to ensure that all participants will be committed to the project. Similarly, the findings of the NGHHA experience on implementing their PACS project suggest a need for organisational involvement. Despite the many technical issues involved with implementing PACS (bandwidth consumption, availability, infrastructure), an organisational commitment was still deemed necessary for its success.

From the evidence presented in this thesis it has become apparent that the NGHHA technological experience was no different than other reported practice. Much like Massaro's (1993) study on a US medical centre, which concluded that although there were some legitimate concerns about the user-friendliness of the new system, these concerns were reported as less significant than the cultural and behavioural difficulties they encountered. The NGHHA experience was however on a much bigger scale, and that is why the findings are worthy of note. This study provides a pragmatic confirmation of what many authors on this issue have suggested; that the technological aspects of systems implementations are no longer at the forefront of concerns for IT implementers. This study also contributes a confirmation that the technological factors do not exasperate in large-scale implementations and the issues remain the same even with an implementation that spans across an entire country. Findings like this leave room for implementers and project managers to focus on the more pursuing challenges; recognised as the human factors.

Furthermore, the evidence suggests that technological problems may not be at the root of project failure; suggesting ulterior; non-technological underlying causes. Similarly, Scott, Rundall and colleagues (Scott, Rundall et al. 2005) reported software design problems as one of the difficulties they related to the final withdrawal of the CIS system that they investigated. They also explain that there

may never be a perfect software system for all users, and extensive software testing of the vendor's claims for baseline functionality and the system's adaptability to local needs is important before implementation. However, they also reported that the software related problems they noted lead to user resistance; which is a 'human' issue and not so much a technological one. In their book (Scott, Rundall et al. 2007) on the same implementation they further explain that their respondents did not view the problems encountered with the CIS implementation as purely technical, but were more involved with organisational issues. They deemed the technical problems with the CIS interwoven with the whole adoption process. They also reported that the technology was a factor in the implementation, but only in the wider socio-cultural context, or in their own words;

It seems clear that the technical specification and functioning of CIS was at no point in its development ever a purely technical issue... There is no simple independent technical variable here (Scott, Rundall et al. 2007, p. 122).

This evidence confirms what others have experienced and what has been discussed in Chapter 2, section 2.6.10; that although there is agreement that the technological considerations and competence are necessary, they are not a condition of project success (Lorenzi and Riley 2004).

Additionally, as noted in section 2.7, pg. 38; there is a need to recognise that IT problems are usually the result of bigger business challenges and the focus should not be on the IT itself. What is more important and recognised in the field is that technical success does not necessarily translate into implementation success. As Protti (Protti 2002) explains; implementing an electronic health record is not about technology but more about a long-term cultural change programme. He explains that the technology is merely a tool that can enable that cultural change to occur. This suggests a complete paradigm shift in the way IT projects should be perceived by those who implement and use them within healthcare. Many have even changed the terminology associated with IT projects, shifting focus from the more technical terms, and using instead terms like 'culture change' (Protti 2002) and 'innovation' (Tsiknakis and Kouroubali 2009) to describe these projects. Furthermore, as mentioned in section 2.4.1, the agency responsible for implementing the UK's NPfIT was deliberately coined "Informing Healthcare' (Brennan 2007), without any

mention of the word technology. Although the NGHHA still referred to their project as the CIMS, they took other measures to draw more focus to it as an organisational (non-technical) commitment. These and other organisational issues will be discussed in detail in Chapters 8 and 9. With what has been presented in the field, it is no surprise that the implementers and users of the NGHHA CIMS system perceived the technology as a less worrisome issue and were more concerned with the organisational and managerial issues that are later discussed.

CHAPTER 7 EXTERNAL TECHNOLOGICAL ISSUES

7.1 Introduction

In this chapter I will move on from the internal issues to consider some external factors, and in this case it is the unexpected contingencies of an uncertain world. The 'external' technological issues as revealed by the participants had a direct (and often detrimental) affect on the project. The main issues revolved around international political events, expertise of the local workforce, service providers, contractual issues and the client-vendor relationship.

One of the external issues was the international political upheaval over terrorists' acts that affected the implementation of the system. The September 11 2001 (9/11) attacks, the subsequent international response and later terror attacks in Saudi Arabia in 2003 and 2004 had a definite affect on the local atmosphere and international relations. It became difficult (or unsafe as regarded by some) for American and British workers to come to Saudi Arabia. These events all came at a crucial stage of the implementation and the affects were evident with lengthy delays, changes in project plan, impeded vendor support, setbacks in local training and loss of morale.

7.2 International Political Events

Overwhelming views from the respondents were that this was the most significant setback that hindered the implementation. Some of the consequences were delays in the implementation; the need to retrain staff, a strain on resources and most significantly; the original project plan was drastically affected.

The go live had been delayed many times and it was during the implementation that the company who was involved in implementing the new project was from the United States... at that time we were having many issues in Saudi Arabia with bombing and so our zone was rated as a red zone or as a dangerous zone, so the expert data analysts from the States were not able to come on site to do the migration. So this caused us to delay the go-live for a long time. (NETWORK MANAGER-1: 204)

Well the most major setback is the situation in the region. The Iraq situation as well as the bombing in Saudi Arabia. (DIRECTOR-CIMS: 108)

One of the setbacks was the um-the implementation was affected by the events of 11th of September, and the political atmosphere worldwide, because the support team of NG-CPR was unable to travel to Saudi Arabia to support the implementation at the time, so that resulted in a delay of the implementation so there was rescheduling. (CIMS ANALYST-1:67)

The general feeling amongst participants was that it was a matter of a completely unanticipated circumstance and sheer bad luck, not bad preparation;

It was bad luck. (IT DIRECTOR-2: 419)

There are some complicated factors...there were political problems within that organisation and there were world political problems, so when the NG-CPR team were here there were bomb scares or things like that. Because of the insurance stand point of the international company the NG-CPR team would be pulled out back to the UK and we'd be kind of left hanging and dry. (DIRECTOR PHARMACY: 67)

We're still facing some difficulty in enhancing the system. The reason is that the company is not housed here in Saudi Arabia. They are outside the Kingdom; they are in the UK. This is one of the difficulties related to implementing this NG-CPR. (IT DIRECTOR-1: 49)

A vivid account portrays some of the turmoil that affected not only the CIMS implementation at the NGHHA, but all areas in the organisation where foreigners were involved;

It was a real one. It was very serious-at one point during the explosions...I remember in May of 2003 when there was a succession of explosions here in Riyadh and Saudi Arabia was in the news, there was zero people [referring to American and European expatriates] and it's not just our system; it was the conferences and symposiums, and CME conferences. (EXEC-DIR MEDICAL SERVICES: 97)

7.2.1 Lack of local support

There were many consequences to this problem. There was no finger pointing or trying to offload responsibility for these consequences. The general attitude was that it was a difficult situation and no one was to blame, but everyone had to suffer. The political problems affected the vendor's support. The communication diminished to remote solutions and the only way they could get support was remotely;

Mostly through conference calls and emails (DIRECTOR-CIMS: 120)

Remote communication with the service provider without their physical presence locally had its disadvantages;

There were some communication problems again with the stand by because ...the NG-CPR people you know they weren't here all the time and there was this communication back and forth between the UK and the U.S. and I think that hindered and slowed down things some. I think if there were dedicated NG-CPR people here...for the first month or two after the go-live that would have assisted greatly you know or even if there if there is an office in the Kingdom or somewhere in the Gulf region. (DIRECTOR PHARMACY: 175)

As I've mentioned, it was 9/11 and they were scared to come and instead of allocating, for example sixteen people in-house they would only send six or four...so there were periods when things were slow. (EXEC-DIR MEDICAL SERVICES: 85)

7.2.2 Training

The global events had even hindered the training of the CIMS team. The end result was that company could not get their trained analysts to travel to Saudi Arabia to support the implementation locally, and the local employees in Saudi Arabia had no training so could not support the implementation either;

There was no formal training by NG-CPR Systems to CIMS analysts and that was a major problem. (CIMS ANALYST-1:152)

Unfortunately we didn't get the training. Actually we were promised to get that training in the early stage of the project prior to the implementation, we should have had three months' intensive training, but according to 'special circumstances' we didn't get that training. (CIMS TEAM LEADER: 103).

My team from day one were supposed to have twelve week's training...because of the 11th of September we were not able to go. (IT DIRECTOR-1: 588)

The problem that I faced was that we did not have any formal training from NG-CPR so it depends mainly on our colleagues either for questions or for the formal training we have and then we have to read the manuals... we do it by trial and error. (CIMS ANALYST-3: 126)

Faced with this unanticipated predicament, the NGHHA management was forced to deal with an impossible situation. They were already years into the implementation

and abandoning the project was not a viable option. An 'ad-hoc' on-the-job training program for the CIMS team was arranged by NG-CPR Vendor. They teamed up the CIMS analysts with their respective NG-CPR Vendor analysts. They had close communication with them and whenever the NG-CPR analysts visited the site (which was a rarity) the CIMS analysts got their on-the-job training;

Yeah, so what we did was on-job training. Also we tried to get the benefit of the NG-CPR management team when they were visiting us. We tried to sit with each module analyst and we tried to get as much as we can from them. (CIMS TEAM LEADER: 109)

In the end, the ones who reported suffering the most were the CIMS analysts who had to bear the burden of trying to acquire training and skills that they did not have appropriate training to do. In the end they did persevere and they managed to get their skills up, but this took more time than if they had received the planned training. The end result was a capable team whose members could handle the job;

To be frank we are still paying the price of not getting the training, but if anyone saw the implementation or saw how we reached in the system so far they would be surprised that these analysts didn't get that training, but they reached a good level in the system. (CIMS TEAM LEADER: 109)

7.2.3 Affects on the Project Plan

Due to the delays and staggered support from the NG-CPR team, many project management problems emerged;

Of course we have project planning...but it will not always it will work because sometimes there is a delay most of the time because you know NG-CPR people did not arrive. They're supposed to come at some time and they don't... that's why they delayed the project. (CIMS ANALYST-2: 341-344)

The project has been delayed for years...the support did not exist for a short of time and this delayed the project because of our management crises for the last few years when we had people from the States who cannot stay in the kingdom or people from Europe who cannot stay in the kingdom so they have to leave the country and they come back again...so this affected our project and the project was postponed very long time...as I said before we started with the project in 1999 and we went live the end of September 2004. (IT DIRECTOR-2: 89)

We were facing the problem of postponing the start of the system...it was postponed because you know the situation when we started the system it was not

you know safe for the experts to come from the US. (KEY-USER INPATIENT PHARMACY: 74)

The implications were that the project faced years of delays, people lost interest in the planning because of all the delays and countless accounts of re-training and turnover because of time or because of loss of interest in the project;

For many reasons...the project took too long and as we mentioned before, the political reasons, why people they're losing trust or they're losing interest in this project, so they leave the project. (IT DIRECTOR-2: 257)

Project management and planning issues will be discussed in more detail in a forthcoming section devoted specifically to project management.

7.2.4 Loss of morale

The sporadic support from the vendor (although out of the vendor's control) affected not only the training, but also the moral amongst NGHHA staff. There was an unstable workflow and this created a difficult cycle;

They [NG-CPR support team] were forced to leave the organisation as well as other people who were selected as key super-users. Other staffs that support this project have been trained and retrained; many times they had to be trained, because they go back, then they come back and they start training the users. Just after they start the process again, they leave the country, and then they come back again, so the users suffer through the process more than one time. (IT DIRECTOR-2: 425)

They're supposed to come; those technical people, for the installation and configuration and they're supposed to do a lot of training from before and at the time of the go live you know at that time I think the Kingdom was in the 'red zone' and the American people, it was difficult for them to come to Saudi because they're afraid of the bombings. This was one of the obstacles that delayed our work...nobody came from America and everybody who wanted to come, he will come at his responsibility (TECHNICAL MANAGER-1: 195)

The number two issue is the company itself; the vendor with all the political and the distance and the inability to get the right number of people; the technical experts from the U.S. to come and help us at the different phases. So, there were delays and those delays again sort of contributed to the um to the clinicians not buying in to the system. (EXEC-DIR MEDICAL SERVICES: 49)

As I've mentioned, it was 9/11 and they were scared to come and instead of allocating, for example 16 people in-house they would only send 6 or 4 and um

some pieces; the physician functionality was supposed to be prepared and it wasn't. To there were periods when things were slow. (EXEC-DIR MEDICAL SERVICES: 85)

A senior medical executive explains his views on how the situation caused delays and loss of morale and some resistance;

With all the political mayhem and the distance and the inability to get the right number of people; the technical experts from the U.S. could not come and help us at the different phases. So, there were delays and those delays again sort of contributed to the um to the clinicians not buying in to the system. (EXEC DIR MEDICAL SERVICES: 49)

7.2.5 Insurance Cost

Not only did the NG-CPR support team fear for their safety, but also there were additional costs to the vendor. Even when the employees agreed to travel to Saudi Arabia, high insurance costs prohibited sending them to Saudi Arabia to work for prolonged periods of time;

Also the insurance was very very high for the people to come...they come and they sit for one week and they go back again (TECHNICAL MANAGER-1: 197)

They cancelled their visits so many times. One time they came on Wednesday, the bombing happened...Saturday morning they left Saudi Arabia. We did not even see them until Saturday morning when they came to us and said they had been ordered by their company to leave. You know that their insurance will go up; their liability insurance goes up, so the company does not want that...this is the only setback we have. (IT DIRECTOR-CIMS: 108)

They would come to the NGHHA for very short visits, usually only a few days. They were always under the threat of being pulled back at any moment;

If there is any distribution from the USA ministry that some problems will happen; the next day you will not find them. All the teams that will travel back to USA. It's really difficult because we could not find the technical people to come to our site and work with them together to set up the configuration...always by phone. (TECHNICAL MANAGER-1: 199-206)

Here in Saudi Arabia I would say really the difficulty was in the security. You know in the previous years there was some issue with expat security in the country and that really affected the project big-time, because it happened when the team came to Saudi Arabia on Wednesday and something happened on Thursday and everybody left on Friday. And that is; you could see this has really happened on a

few occasions, which really affected the project as a whole. (IT EXEC DIRECTOR: 36)

7.2.6 Different Working Days

With the challenge of getting both training and support from NG-CPR remotely, an additional dilemma presented itself. In Saudi Arabia, the business working days are Saturday to Wednesday while Thursdays and Fridays are non working days (weekends). The NG-CPR support team working from the United States have a different schedule; their weekends are Saturdays and Sundays. Between the weekends of both cultures, the only remaining working days left were Monday, Tuesday and Wednesday;

They are in the States and we are in Saudi Arabia. They have only Tuesday and Wednesday; two days to work with them, because they come on Monday and when they come on Monday it's the end of the day our time ok? So we have Tuesday and Wednesday and then Thursday and Friday, which is off for us. So what we did is we come on Thursday and work with them through our emails. When you are in a situation like that, you have to make it a win-win situation you know. And we tried our best and it was sufficient enough. Looking at the circumstances and the situation we were in because we don't have any other choice. (IT DIRECTOR-1: 126)

I told you the external difficulty that we faced was the time with Saudi Arabia; we only had two days with them. Either we work their days and their hours or they work our days and our hours to benefit from the whole week or five days. (IT DIRECTOR-1: 240)

And then all the frustration of the NG-CPR people aren't here, they're in the U.S. the UK, how to contact them, how to wait for that response, if it's Saturday the offices are closed in the States, it's the weekend, we'll have to wait until it's Monday. (DIRECTOR PHARMACY: 229)

7.2.7 It made things difficult but not impossible

One thing about all the comments on this issue was that although there was an overwhelming cause for concern, for the most part they spoke about what measures they took to overcome these problems;

It took quite a long time. There was quite a few variations of the implementation plan shall we say and some of it was because of things out of the control of the project leaders such as the political situation, since we ended up having to retrain our staff because there was a delay in the go live, which meant there was quite a strain on our resources. (ASSOCIATE EXEC-DIR NURSING: 29)

One of the difficulties that we faced in implementing this clinical information system was the company itself...they are outside the kingdom and this made it very difficult for us to easily implement this system...and it was during that time that bringing someone from the west; either Europe or the USA to the kingdom of Saudi Arabia was not easy. (IT DIRECTOR-1: 49)

7.2.8 Training local expertise

The challenge as explicated by the interviewees was the need to become less reliant on foreign expertise and more focused on equipping the local talent with the tools needed to support their own systems in Saudi Arabia;

That would also serve the purpose that even if there were something political to happen in the region these individuals; would also be ok for them to continue working and be independent of the political situation. (IT EXEC DIRECTOR: 65)

The participants reported that the challenge was to transfer as much knowledge from the NG-CPR people to the CIMS team and have a local team equipped with the required skills, thereby eliminating the heavy reliance on external talents;

We would also like to change even our mode of business with NG-CPR that we cannot be heavily dependent on you for a very long time. So what we would do really is to utilise NG-CPR for training us. We would like to transfer as much of the knowledge to our team ... 'Train us, let us be dependent on ourselves and reduce the dependency on you and your team'. (IT EXEC DIRECTOR: 77)

You are depending on a well qualified trained team to be in Saudi Arabia and that did not happen so that will have a huge effect. (IT DIRECTOR-CIMS: 498)

The Chief Information Officer explained how the ISID already had a plan to overcome those issues. A plan had already been established years before the implementation;

The only solution is to be independent and that can only be done really through proper training for a local team. And I think that is what we have been doing for the past three-four years. We have established a unique setup. (IT EXEC DIRECTOR: 77)

We were the first to start such a setup where creating a department of health informatics that is composed of people from the business units; not only IT, but people from a pharmacy background or even a physician or Lab technician or radiologist to come and work under one umbrella for the sake of implementing a system in various departments. That setup I think is working fine and I think by

adding very good IT people to this group I think we have established a lot. (IT EXEC DIRECTOR: 77)

Local expertise will be discussed in more detail in a later section specifically devoted to expertise and skills.

7.3 Service Providers

The participants reported issues relating directly to service providers amongst the challenges of the implementation. Some reported issues that stem from the very early stages when vendors were selected and others were about training, the actual provision of services as well as support and communication with the vendors. The interviewees also mentioned planning issues. In all fairness though, no representatives of any of the service providers were interviewed for this study and what is presented in this section could be considered a one-sided view of events.

7.3.1 Vendor selection

The first reported challenge when it comes to vendors is choosing the right one by going through the vendor selection and bidding process. The approach that the NGHHA took was to form a multidisciplinary committee with departmental representation to participate in making these decisions. Finally, after a site visit to an NG-CPR reference site in the United States with a similar infrastructure to the NGHHA, they found that the system offered what they were looking for and were then selected. The Chief Information Officer explains the process;

We made site visits to the US and Canada and we actually liked the system ... for the competitive pricing they offered to us, and for the simplicity of the system as we have seen the system working in New York...and it's really something around eight hospitals that are connected using one infrastructure; which is similar to our vision. (IT EXEC DIRECTOR: 18)

7.3.2 Communication

After the vendor was successfully selected, channels of communication had to be decided and agreed to between both parties. Given the political climax and the lack of local support the communication was affected and the mode had to be

readdressed. This involved a review of escalation procedures and day-to-day support. Setting up a proper escalation procedure under those circumstances was difficult but necessary as portrayed by the people involved;

There were some communication problems...NG-CPR people you know they weren't here all the time and there was this communication back and forth between the UK and the US and I think that hindered and slowed down things some and I think if there were dedicated NG-CPR people here-not just for you know that initial go live, but for the first month or two after; that that would have assisted greatly you know or even if there if there is an office in the Kingdom or somewhere in the Gulf region but yeah there were some problems because of communication lags. (DIRECTOR PHARMACY: 175)

7.3.3 Vendor experience and skills

The skill levels of the vendor analysts were also a reported difficulty. According to the respondents, the vendor lacked previous experience and technically qualified people from the hardware side;

The other project management issue is the need to have a team from the vendor who had previous experience in the same clinical system. (CIMS ANALYST-1:171)

They need some people to be high-tech really... and I don't think they have those people in the company; in NG-CPR... they don't have that knowledge; enough knowledge... to come up with a solution and they gave us some traditional very old solutions...and it's not really a practical solution. (TECHNICAL MANAGER-1: 50-53)

During the implementation NG-CPR did not involve any of the technical people (people from the ISID or people with backgrounds working in IT). The strategy from NG-CPR was that they requested to train a group of people from NGHHA to be selected by the ISID to form the CIMS team who would then work with NG-CPR on building and enhancing the NG-CPR application. What is interesting is that the skills these people had to have as prerequisites to working on the CIMS team were clinical backgrounds only (i.e. physicians, pharmacists, physiotherapists, lab technicians, nurses) without the need to have any experience or training in IT. Their view was that it would be fairly easy to train someone with a clinical background how to use IT, but it would be extremely difficult to train someone with only an IT background on clinical processes and the workflows of various clinical departments. This approach was not favoured by everyone, especially the people with IT backgrounds;

During the implementation the company NG-CPR they said you don't need any technical people to participate in the implementation. We only need to collect people from the medical departments; they will be trained and they can participate in the implementation and this is really not right this is also another obstacle of the implementation because most of the application analysts they weren't IT people and they accept whatever comes from the company they don't know if this is right or not. (TECHNICAL MANAGER-1: 421)

Other respondents working with ISID, believed that this approach created an obstacle whereby these CIMS analysts who had no IT background could not question any technical decisions made by the vendor and would readily accept what was dictated by the vendor. Even with the support of the ISID department, there was no direct role or official delegation by any of the technical people working with them.

This first problem has been overcome; to be honest with you one analyst within the NG-CPR Vendor will carry more than module. So, most of the problems they were overcome by the hard work and commitment of the CIMS National Guard Health Affairs team, not by NG-CPR, it's by our strong effort to work remotely and to work under any condition, so see the whole project a success. (IT DIRECTOR-CIMS: 390)

7.3.4 Access Level

Participants from the IT Management group described some of the difficulties they had in dealing with the restricted access levels and their privileges on the NG-CPR system. They reported that they did not have enough freedom to make changes without consulting the vendor first. To them this was not only problematic, but also frustrating and a major issue that hindered their progress;

NG-CPR, we don't even have the access. So the problem is not that the vendor is located in the US, the problem is that the level of access that we have on NG-CPR is too restricted. (LAB ANALYST: 413)

Any people from NG-CPR, we inform them that we want these changes to be rolled out to the live environment, so they will do it. We don't have any access to do that ourselves and that's a bit time consuming sometimes because you have to wait for them. (LAB ANALYST: 425)

I think part of this problem is because the control of the system is not under our support team here, because know that whatever issues we report to get resolved they have to discuss it with the team in the US... to find a solution...the key parts of the control are not here. (KEY-USER INPATIENT PHARMACY: 92)

I'll go back to the main issue that when you don't have full 100% control of the system then you cannot say that you know the system because even our guys here in the CIMS team who have worked with the system since and before they go live up until now there is a missing link in that they have to refer back to the outside experts. Sometimes they find out that they have to realise that this is a hard coded issue and they cannot fix it by themselves and they have to wait to see who will fix it. (KEY-USER INPATIENT PHARMACY: 165)

Yes, but in relation to the system running; it's running yes, no question about it, but we want to be sure that our staff can generate this system support. For example, if I have an emergency, let's say a fire in the computer room this means that I cannot shut down the system, I have to call USA to shut down the system. This is not right. Or a fire in the computer room, I have only seconds sometimes to shutdown the system so I should be able to shutdown the system, the NG-CPR system, then shutdown the hardware, then leave the computer room. And this is one of the issues that we raised to NG-CPR Vendor. (IT DIRECTOR-1: 103)

7.3.5 Regional branch

The main issue with the absence of the vendor locally was their inability to provide local onsite support. The respondents contributed much of the early problems to a lack of support, even though this was an uncontrollable issue outside the realm of the vendor's control;

The major thing is the support from the company itself; from NG-CPR itself... we don't have anyone here; we have only to use emails...you know we don't have any people here; any people supporting us, any people giving guidance on any obstacles we may have, what we should and should not do and other things related to the technical issues also. (CIMS ANALYST-3: 48)

The NG-CPR Vendor did not have a regional office or branch to help with the support issues; something that might have helped them to get regional support;

What I know is usually from the past any company that comes to the kingdom to provide any services; they should have local support, except this company. (IT DIRECTOR-2: 407)

We requested a lot of technical support from the company to ensure that we can do our support ourselves. We required a lot of training, to install the system, to maintain the system, to shutdown the system, to start the system and we were not supported. The company said 'we will do it for you through remote support'. Not even local support. They were not going to bring their staff here. They will login to our system and just start the system or shut down the system or maintain the system or load the system and so on; which is really not the right thing. We requested that our staff start the system, load the system, update the system and so on, but it seems that we still did not get this issue. (IT DIRECTOR-1: 97)

We're still facing some difficulty in enhancing the system. The reason is that the company is not housed here; the company is not in Saudi Arabia. They are outside the kingdom; they are in the UK. This is one of the difficulties related to implementing this NG-CPR. (IT DIRECTOR-1: 49)

As depicted by some respondents, there is a need to have local vendor support when initialising a new IT project to help sort out the beginning teething problems. These problems need to be observed through local onsite support from the vendor to give them a chance to experience the problems firsthand before attempting to fix them. Evidently, and as expressed by many interviewees, even when the vendor's team did make their occasional visits, these were usually for short fixed periods with no time to address all the little hiccups or bugs with the system. One IT manager stated that:

They are remote; they are remotely doing everything and this is very difficult. Sometimes this delays the project and in case you have any small problems and when you deploy any new application sure you will find some bugs to fix...but if the technical people are not on the site they cannot fix it, or if they come on the site for specific reasons and then they leave it will be difficult to really fix everything. (TECHNICAL MANAGER-1: 400)

Some reported that it could have been useful to have vendor support onsite for moral support and reassurance. Their presence could have helped boost users' confidence, as the following stakeholder observed:

Of course, any company when they introduce a system to you they will tell you about their strong support for maintenance, so they should be apt to what they have promised. Meaning, they really should be committed, they should be really available when the end users use it. Usually the first year of the implementation; they could overcome the anxiety and fear that comes when using something new. And even like having um an in house maintenance availability that's really useful. (DIR MEDICAL RECORDS-2: 170)

Some of the IT Management interviewees made recommendations to utilise partner companies to avoid these support issues;

If you want to buy any medical application you have to get it from a partner here in Saudi Arabia. You have to have a local partner; local support people not like what we did from NG-CPR. We don't have any local partner for them and we don't have any local support. (TECHNICAL MANAGER-1: 393)

They are not here all the time so whenever we have a problem we have to send it back to the US and wait for their reply then they have to study the issue first and

then resolve the solution then take it back to the users so it takes a long time until we give the user whatever they asked for. (CIMS ANALYST-5: 70)

A setback was from the company supporting us to implement this clinical information system. We were facing a lot of difficulties from the company to provide us implementation support and system support even. So in the first days or first months of the implementation one of the difficulties came from the company itself; the NG-CPR company. (IT DIRECTOR-1: 67)

7.3.6 Managing the project

The external problems were dealt with the best way possible given the circumstances. The NGHHA and NG-CPR Vendor worked together to resolve the problem. They set up a Virtual Private Network (VPN) link between them to allow the NG-CPR analysts to access the system remotely;

They had no choice; they tried-like for example-remote support...through VPN lines. (IT DIRECTOR-2: 431)

However the VPN solution was not reported as an ideal solution;

It was not ideal, because I think the project required to have both teams to work together...so, yes they tried many ways to complete the project, but there was a time that they stopped the project and this had a big affect. (IT DIRECTOR-2: 443)

NG-CPR themselves they have issues; they have people who have left their company, because they are also dependant on certain people within NG-CPR who left the company and they are in a very difficult situation. (IT EXEC DIRECTOR: 77)

ISID management reported that there were insufficient incentives for analysts from the vendor's side to come to Saudi Arabia, so many left the vendor and it was difficult to replace them with people with the same skills and experience, which they are obligated to do under the terms of the contract with the NGHHA. This coupled with other problems the vendor had with the changes in their own project managers proved difficult. Allocating and retaining people with the required technical and project management skills was not only a problem for the NGHHA but also for their project vendor.

Changing um project manager, and at the same time people leaving the project, analysts from the vender's perspective and it is very difficult because within the

contract with them they have to provide somebody with the same experience or better and education and this is very difficult, because as you know it's not easy to recruit somebody and send them to Saudi Arabia. They want to go to Europe...I've been talking to the higher management of NG-CPR and it is difficult to recruit people to come to the region. (IT DIRECTOR-CIMS: 384)

The vendors have kept changing project managers...and now they don't have a project manager. They are recruiting another project manager, but this kind of an unknown. A new project manager will come into the picture any time and say 'what's going on'? (IT DIRECTOR-CIMS: 378)

This first problem has been overcome; to be honest with you one analyst within the NG-CPR Vendor will carry more than module. So, most of the problems they were overcome by the hard work and commitment of the CIMS National Guard Health Affairs team... it's by our strong effort to work remotely and to work under any condition, so see the whole project a success. (IT DIRECTOR-CIMS: 390)

7.3.7 Service providers in summary

The service provider issues are summarised in this excerpt by one of the interviewees;

Choose a very reliable company that you can phone and get support from at any time. That's one of the main issues you have to be careful with then you are selecting any system, because you can have a perfect system, but the support could be very poor. And if we don't have proper training for the people who will work on it, it would be useless even if it were the best system. So that was one of the main issues we were arguing about in NG-CPR. The system is not bad; it's good, but the training and the accessibility to the administrators of the system we have nothing. (LAB ANALYST: 389)

7.4 Contractual Issues

Some respondents reported concerns relating to contractual issues that had a direct affect on service support levels. They conveyed issues in clarifying the terms of the contract and the client-vendor relationship.

7.4.1 A contract is binding

Some participants how it would have been difficult to change the terms of the contract once it has been signed, explaining that any changes thereafter would be costly. This highlighted that not only was it important to realise this for the application and modules, but it was also important for hardware purchases. The

evidence points towards a need for planning of both hardware and software well in advance of signing the contract;

It should be passed by us, so at least you know what machine is coming, you can talk to the vendor, you can ask whatever you want, you can have answers, but you know after signing the contract no one cares; it's your machine now; solve your own problems. (LAB ANALYST: 311)

7.4.2 Flexibility

Because IT is dynamic and fast-paced, many interviewees reported how it was difficult to foresee future IT needs and services and some issues cannot be incorporated in the contract because they were simply never anticipated. They explained that the challenge was trying to ensure the best interest of the organisation when it comes to unforeseen situations;

No matter how clear you are on the contract, but still you have to always lose some things that you are not aware of...you'll lose the way you communicate with, or the way you are expecting support from your vendors, because your expectations are not what you had in the contract. You made something a year ago and then you find out that there are more applications, more hardware, more this more that, so you end up losing the services from your clients, from your vendors, because the contract is not clear. (IT DIRECTOR-2: 209)

An ISID director stressed the importance of post-implementation support and the need to try to anticipate the future changing needs while maintaining the standards un support;

What's more important is ensuring that the company you are contracting is fully capable of supporting you after implementation and they can provide you with the updates and maintenance because I am sure any system will need to be maintained and it will change over time because patient care is changing and you want to ensure that they can change with time. (IT DIRECTOR-1: 295)

7.4.3 Client-vendor relationship

An ISID director discussed the need to maintain the client-vendor relationship. He explains that the relationship can be maintained by clarifying the terms of the contract from the beginning to protect all parties. A well-defined contract is the key to a successful relationship;

You are putting more pressure on them, they are putting more pressure you, so now you lose the good relationship between each other because the contract it's not clear from the beginning so you end up saying, 'what can I do? Whatever I had in my contract, the contract is not going to help me' ... the vendor may say 'I have lost my clients, and also I lost the support.' (IT DIRECTOR-2: 209)

Yes, and it should be very clear [referring to the contract] and as I said before it's not easy to make it clear. (IT DIRECTOR-2: 215)

7.4.4 Forced circumstances

The evidence shows that there was a clause in the contract that protected the vendor in case of forced measures, as with the political situation. It was not possible to force them contractually to stay in Saudi Arabia under those political circumstances, which was understood by the NGHHA;

Within the contract there is the forced measure. If something like that happened in the region it's not the fault of the vendor, because they cannot control it...if something happens in Saudi Arabia and they leave they cannot control it and if somebody doesn't want to come to Saudi Arabia they can refuse to come. (IT DIRECTOR-CIMS: 402)

The NGHHA were the ones who eventually suffered on many levels, starting with the training they lost;

My team from day one were supposed to have twelve week's training... because of the 11th of September we were not able to go. (IT DIRECTOR-CIMS: 588)

7.4.5 Summary of contractual concerns

The contractual concerns are best summarised by a senior ISID director;

You need to ensure that you have a solid contract that is clear and to ensure that you get the best support and even if you take a long time in preparing and finishing this contract with the company, even if it slows your implementation make sure that the contract is clear; what you are expecting from the company and what the company are expecting to do for you and this will ensure that your implementation will go smoothly which is the most important point. (IT DIRECTOR-1: 295)

7.5 Summary and Synthesis

The unexpected contingency of an uncertain world is the issue that prevails louder than any of the other issues within this chapter. The evidence shows that the international political atmosphere was the most significant, original revelation and the most unexpected implementation challenge. This led to unanticipated problems with supporting the project go-live, and later problems with the ongoing support of the system. It also affected the training that the CIMS team received on the system, but most of all, it affected moral and impeded momentum. These problems ultimately lead to changes in the project plan and significant delays in implementation. Although the 'political' situation was in itself quite unusual, the resulting problems (delays, training issues, changing the project plan, tensions in client-vendor relations, loss of moral) are all normal issues typically associated with IT implementations. The literature on these 'managerial' issues has been consulted in Chapter 2 (section 2.7), and a detailed discussion, lessons and conclusions are visited more thoroughly in Chapter 8 and correlated with the literature again in section 8.9.

As discussed in section 2.6.7, the competitive advantage of a service provider operating in the health sector is determined by its ability to adapt its competencies to the needs and capabilities of the specific technology and to utilise available local resources in the best possible combination with its own core competencies. Therefore, the service provider's choice of a service provision model is also crucial for developing a resource mix that enables it to compete in the healthcare organisational context (Hendy, Reeves et al. 2005). As mentioned in section 2.6.7, external service providers have a critical role to play, which extends beyond one of merely implementing new IT systems. It is important to assess the capabilities and skills of these firms before contracting them. However, it is not fair to expect too much from the service providers because they will only truly understand the technical aspects of the system. Many IT service providers do not have an extensive knowledge of healthcare products and services, and more importantly, they may not understand the cultural values in healthcare service providers (Currie and Guah 2006). Realistically, an external vendor does not understand the internal culture, norms and behavioural concerns of the organisation and should only be expected to provide the technical support and expertise. They should not be relied upon in

planning or managing the project. Any advice they provide should be taken only as guidance, not because of lack of trust, but because these decisions must be made by those people who are the stakeholders and ultimate owners and beneficiaries of the system.

As such, all internal organisational issues should be planned and dealt with from within the organisation. Setting up a team capable of handling this task is a major challenge; especially when there is a need to enhance the local cadre's expertise to enable them to make these judgements. In light of the political situation, the NGHA wanted to become independent and less reliant on foreign support. This can be achieved by training a local autonomous cadre with the necessary skills. This was in itself an implementation barrier and the details of the training challenges are discussed more thoroughly in sections 8.6 and 8.9.

The NGHA worked closely working with their service providers to gain the knowledge and technical expertise to do so for their organisation. The lesson is to minimise service providers and to minimise dependence on external service provision. Continuity of service provision must be ensured under any circumstances. Project managers and decision makers are encouraged to explore alternate solutions from the onset by planning for worst-case scenarios.

The NGHA could have dealt with their premised problem and the culminating support issues by completely withdrawing the NG-CPR system. This was the case with Kaiser Permanente's experience (Scott, Rundall et al. 2005; Scott, Rundall et al. 2007) amongst many others who were forced to surmise their IT projects as failed. It is difficult to make these decisions. Implementers are sometimes forced to cut their losses and deem a project as failed when faced with adversity, but the NGHA decided to persevere and continue with the project despite of all of the restraints. The valuable lesson here is that unconventional solutions might be the answer to dealing with the challenges of these complex healthcare organisations. Making these decisions requires strong leadership coupled with tactical leadership skills. Unfortunately it is rare to find a strong, qualified, transformational leader with project management skills and the clinical/medical background required to understand and appreciate the intricacies of healthcare and the will to make these

sensitive decisions. A more detailed discussion on leadership styles and skills is presented in Chapter 2 (section 2.8) and again revisited in Chapters 8 and 9.

Although the political problem may seem unusual, it is accepted that external issues can affect internal organisational matters. As previously discussed in section 2.7.10, problems external to the organisation can affect the internal implementation of HIS projects. Political agendas are one example of external influences as they can be a major driver of IT projects (Currie and Guah 2006). External, political problems with the potential to disturb HIS projects may come in the form of imposed rules that public sector bodies are forced to follow. As mentioned in Chapter 2, Currie and Guah (2006) give one example. Within the European Union (EU), projects must be put out to tender through the Official Journal of the European Commission. For a UK project, the NHS has to advertise to the whole European community and the IT procurement process becomes highly bureaucratic. All requests for proposals (RFPs) have to be advertised across the entire EU and any EU IT service provider can apply. This may not always provide the best outcome, especially when the cultural and procedural elements of IT procurement within the EU are not effective in getting the best deal, and is a good example of external interference on routine operations of healthcare organisations.

External political impositions can also lead to complications that can be quite problematic. For example, governments can interfere in markets by restricting levels of investment, location of facilities, and choice of local partners (Doole and Lowe 2004). Saudi Arabian legislation; on matters like these, is quite stringent when compared to other world markets, although there was no reported interference with the NGHHA CIMS project from the local government. Then again, that does not mean that these issues should not be taken seriously. Doole and Lowe (2004) use Microsoft as an example of local government interference. When Microsoft opened its Beijing office, it planned to use its Taiwan operations to supply a Mandarin language version of Windows. The Chinese government interfered and insisted on designing the coding standards for Chinese characters in China. Microsoft was forced to comply with the Chinese government for something that they had done independently everywhere else in the world.

Then there are the international external influences that are even beyond the control of local and international governments. These usually come in the form of political events such as terrorism and war. For example, Doole and Lowe (2004) confirm that the events of 11 September 2001 made many companies that operate in international markets aware of the impact political events can have on global markets and they explain that one sector where this impact is evident and widely discussed is the airline industry that until recently was still reeling from the aftershock of the 9/11 events. This study is important because it showcases that those political events also had a similar impact on healthcare organisations, and more specifically on IT implementations within healthcare. This is a significant issue that significantly affected the Middle East.

The instability in the Middle East and the continued threat of global terrorism have served to heighten the awareness of firms of the importance of monitoring political risk factors in the international markets in which they operate (Doole and Lowe 2004; Thompson and Martin 2005). The impact of the political situation on the CIMS implementation however, is quite a unique experience and no similar disruptions have been reported in the literature within other healthcare organisations and their MI projects. It was difficult to situate this problem within a wider field that has no previous reports of such challenges; thus, literature from other disciplines was consulted. The situation can be correlated with literature on organisational behaviour, strategic management and more specifically with marketing research, where one can find analogous sensitivity to the implications of the international political atmosphere.

The political environment of international marketing includes any national or international political factors that can affect the organisation's operations or its decision making (Doole and Lowe 2004; Thompson and Martin 2005; Dicken 2007). It is safe to say that politics has come to be recognised as the major factor in many international business decisions, and the political arena is often the most volatile area in international marketing (Doole and Lowe 2004). One can consider the volatility of the politics in the former Yugoslavia, Russia and in China over the past few years to appreciate the need for organisations to monitor political risk factors (Doole and Lowe 2004). With the evident global political influence on the NGHHA CIMS

implementation, I am able to conclude from my study that the exact same argument applies to healthcare environments. The findings of this study demonstrate that it is crucial for healthcare organisations to recognise international politics as a major factor in their business strategies and organisational initiatives, especially initiatives as ambitious as massive IT systems projects.

For example, when assessing international markets in marketing research, a system needs to be designed to evaluate opportunities and try to reduce the options (like the number of targeted countries) to a more manageable number. Therefore marketing managers can employ mechanisms such as marketing segmentation, geographical criteria or transnational segmentation to assist them in assessing their strategies on an international level (Doole and Lowe 2004; Scholte 2005; Dicken 2007). Some similar type of analysis (more comprehensive than a feasibility study that is typically associated with project management approaches) would be useful in assisting implementers of MI projects to better understand the wider; global environment. Devising, understanding, employing, analysing and testing of such a model is beyond the scope of this thesis, but is an endeavour worth examining in the future. Although international marketing forecasts and projections are not normally associated with IT projects in healthcare, perhaps the ideas rooted in international marketing strategies should be. This lack of a business/market-oriented outlook could be why healthcare information systems many times fail.

Human behaviour in organisational settings cannot be easily explained, because these topics overlap and interact. Organisations do not operate in vacuums, but are influenced in various ways by their wider context (Huczynski and Buchanan 2007). When faced with obstacles, we cannot think of organisations as static entities. It is tempting to assume that the individual is to blame, but in reality one must look beyond the person, and consider factors at different levels of analysis: individual group, organisations, management and the wider context. It is also tempting to look for the single or main cause of organisational behaviour, when actually behaviour is influenced by many combined factors to contribute to organisational effectiveness (Hirschheim, Klein et al. 1995). It is also easy to deal with these factors separately for explanation and analysis, while in actual practice they are often linked. Thankfully, there are tools that can help us to better understand and analyse

situations in the organisational context. Context analysis mechanisms must be adopted as part of the technological change. Equipped with these tools, healthcare organisations can be better prepared to deal with the uncertainties that accompany massive IT change projects.

What is missing perhaps from many healthcare IT project plans is an assessment of the organisational and environmental context at the present and how it can affect the future. A SWOT analysis (Thompson and Martin 2005; Huczynski and Buchanan 2007; Mullins 2007) for example, is useful to assess the current state of affairs, because it is used to analyse the **Strengths, Weaknesses, Opportunities and Threats** to an organisation. However, a more comprehensive analysis that takes into account both the internal and external context with a future projection might be needed. The external political problem encountered at the NGHHA needed to be understood in the context of its affect on internal organisational behaviour and its affect on the change process. Understanding the implications of environmental trends can be achieved through 'environmental scanning'.

One popular approach to environmental scanning is PESTLE analysis (Huczynski and Buchanan 2007), which explores the **Political, Economic, Social, Technological, Legal and Ecological** issues affecting the organisation. For example, under the 'P' for Political factors matters like government policy, ideology, war, civil unrest, terrorism, interest groups, and trade union activities are analysed. It is a method of reducing the complexity of the task by providing a simple structure. The point of analysis is to identify external environmental factors, their interrelationships, and their impact on the organisation. Huczynski and Buchanan (2007) explain that organisations, which fail to respond to external factors, will quickly run into difficulties. They also stress that the implications of such an analysis can affect all levels of an organisation's functioning, including its strategy, structure, management style and working practices.

Still, it is not necessarily safe to predict and assumption may not serve proactively. Environmental planning is not an exact science and the range or relevant factors out in the world can be very wide. Identifying which are most significant, and then predicting their impact can be difficult. Environmental planning has become a field

in its own right, with its own texts, tools and techniques. A fuller treatment of these can be found in corporate strategy literature and is discussed in more detail in this study in discussions on planning in dynamic organisations (Sections 8.7.11 and 8.9). Here, I focused the discussion on environmental planning tools (such as PESTLE analysis) that take into account the organisational context.

Huczynski and Buchanan (2007) explain how environmental complexity makes prediction hazardous. For example, demographic and economic trends can be predicted with some accuracy in the short term but not beyond, while trends in politics and technological innovation cannot be predicted with much confidence. In other words, environmental scanning requires a lot of informed guess work and judgement. So while PESTLE analysis has its strengths in encouraging the consideration of external influences and is useful in organising complex and bewildering factors, it still has its own flaws. Identifying which of a wide range of factors is relevant is difficult. It is also difficult to anticipate 'defining events' such as wars, terrorist attacks, new discoveries, economic collapse or major political upheavals, which can radically change governments (Huczynski and Buchanan 2007). It is also an expensive and time-consuming exercise, which may inhibit the very trends being researched. Some have suggested 'scenario planning' (Huczynski and Buchanan 2007) which combines environmental scanning with creative; out-of-the-box and 'blue skies' thinking. The only solution to unpredictable situations like these may be 'creative' organisational decision-making. This is where the leadership role comes into play, as a strong, transformational and informed leadership with the intuition and flexibility required under such circumstances is crucial for making these corporate strategic decisions (Leadership is discussed in more detail in Chapter 9).

So, the argument stands that because such analysis is necessary when planning for massive IT change, it is therefore an additional implementation challenge not normally addressed in the literature and should be included in future MI strategies. What is most important is to realise the need to look beyond the local barriers when strategising massive IT change in healthcare settings.

CHAPTER 8 MANAGERIAL ISSUES: MANAGING THE PROJECT AND RESOURCES

8.1 Introduction

In this chapter I will move on to discuss the managerial issues as reported by the interviewees. I will discuss; through presentation of the different interviewee accounts, a discussion on those reported issues. Many suggested that in large-scale IT projects the managerial challenges manifest themselves mainly in the logistical implementation problems. These include project management concerns, devising the project plan and seeing the plan through to the end. The managerial issues also include deciding on what type of approach to take, as well as making decisions on details of the different phases and smaller stages of the project. Project management concerns also revolve around matters of managing the available resources within available contracts as dictated by the current plan.

Matters of organising staff levels, training the workforce and budgeting the financial project requirements are also essential. Moreover, finding, electing, training and retaining a project manager with the necessary skills are necessary for project success. These issues will all be discussed in detail in this chapter.

8.2 The Implementation

Before I get into the details, I wanted to capture how the interviewees felt about the implementation itself. They were asked if they thought if it was difficult to implement a CIMS in a healthcare environment. Some reported that it was not difficult and there were no major difficulties to mention, while others reported that it was a challenging issue not to be taken lightly. Although there was no consensus, 55% of the participants thought it was not difficult, while only 40% thought it was, and 5% had a more neutral attitude. These responses depict a generally positive attitude towards the project.

8.2.1 It was not difficult

The following from a few interviews depict some of the positive impressions from respondents when asked if they thought it was difficult to implement CIMS in a healthcare environment;

I don't find it difficult to implement. (CIMS ANALYST-2: 104)

Some explained that it was not difficult to implement such systems provided certain criteria are met, such as having experienced people working on it who want to it to succeed and who have the necessary skills to do so;

Well it is not difficult but you need to have the elements to make it right. Most of the systems we used to have are not clinical based systems and to switch from the idea of having a legacy system to a clinical based system you need to have people who know and distinguish the differences between the two who trained very well in order to not to have a drop in the level of healthcare services for the patients, because it is not that difficult but it needs a great effort to do. (KEY-USER INPATIENT PHARMACY: 32)

If you know the process it's easy... it's not difficult. (CIMS ANALYST-2: 94)

8.2.2 It was difficult

These interview excerpts depict the views of those who had a more sceptical view of the challenges ahead of such implementations, some citing communication between various stakeholders as a major concern;

I think it's really extremely difficult and in general employment in any system is not really an easy task... it's a really a difficult task because it entails a lot of communication and integration between various departments. (IT EXEC DIRECTOR: 30)

When directly asked if they found it difficult, some responses were as follows;

Yes I think it is difficult. (CIMS ANALYST-3: 32-36)

Yes, sure it is difficult and there are a lot of obstacles when you are going to implement any new system in a health environment. (TECHNICAL MANAGER-1: 5)

Yes. Very. I think one of the major obstacles is-two things are perhaps challenges to healthcare environments. One is you're working on a live system and so you

are going through a learning curve at the same time that you are on a live system and that can be a bit frightening for people and a bit challenging for people. (ASSOCIATE EXEC-DIR NURSING: 61-65)

It is a huge process. It's a huge process yeah and it's difficult to see and understand and determine how things will go; I mean you run into all these things. And I think one of the major issues is that it takes too long before we wreak the benefits. (DIR CLINICAL NURSING-1: 411)

It is difficult especially um it's difficult to implement any system in any institution, especially if you want to implement it in one area of the hospital and not in the whole hospital at one time. (CONSULTANT PHYSICIAN-1: 80)

I would say it was a challenge for the nurses. (DIR CLINICAL NURSING-2: 336)

Oh heavens no. It is not an easy process; computer systems are not made in heaven. They come in kits and they have to be built. You have to grow with them. (SENIOR PHYSICIAN: 456)

8.2.3 Not that easy but not that difficult

A physician articulated how although there were obstacles along the way, those hurdles did not prevent them from reaching their goal. His message was that there are challenges, but whatever can be gained from those difficulties should be taken in stride and used advantageously;

There are always the glitches here and there that need to be fixed. On the one hand I think it has been a slow process, but on the other hand I think we've come a long way; we've come a very long way. (SENIOR PHYSICIAN: 90)

There were also those with a more neutral view;

From our experiences it was not easy, but it's not that difficult. (IT DIRECTOR-1: 37)

I can say it's not really difficulties; it's a matter of a process that we need to do and I can say it's normal in any project implementation. (IT DIRECTOR-1: 133)

8.3 A Phased Approach

A 'phased' rather than 'radical' approach was taken to implement the project. This meant they had to decide how to continue defining the plan for the next phase, and certain elements of each phase had to be fulfilled before moving on to the next stage;

Because there are still some things I think we have to complete in Phase I before we start Phase II. (KEY-USER PHYSIOTHERAPY: 62)

Despite the advantages to taking this type of approach (as discussed in the literature review and as will be revisited in a later section on Momentum and Continuity) implementing the project in phases has its own set of challenges. For one, many explained that there was some level of vagueness in the plan;

Now we almost finished 2006 and the plan is not clear for the rollout and still from Phase I. (IT DIRECTOR-2: 89)

The details of each phase were outlined in the previous introduction to the Discussion chapter. Following is the plan described by a CIMS analyst, followed by a summary of each phase;

NGHA approached NG-CPR and they acquired the system and then there was the planning phase that the users; i.e. do work assessment; human resources needed and data collection of what they do. So we had to map the clinical process of patients within the hospital as an organisation and afterwards those requirements were sent to NG-CPR its requirements and then took up an approach on how to fulfil these end-user requirements and the implementation followed the phasing approach rather than the big bang. So rather than the big bang, the phasing approach was followed. So, we started with Phase I; that's the basic functionalities and we started in Riyadh; the main site and the systems as well as the hospital are broken down into modules. So, NG-CPR is divided into physician functionality, nursing, pharmacy, radiology, laboratory, order communication management, and so on. (CIMS ANALYST-1: 19)

8.3.1 Phase I

The project had been initially designed in two phases; Phase I and Phase II. Phase I was rolled in the CR first and mainly comprised of replacing the previous legacy system with the new EHR. The functions implemented included medical records, patient scheduling, order results management, medical imaging, nursing, patient administration, and an interface to the NGHA's existing lab system. Data warehousing and an integrated Pharmacy module were also implemented at later stages of Phase I.

So, we started with Phase I; that's the basic functionalities and we started in Riyadh; the main site and the systems as well as the hospital are broken down into modules. So, NG-CPR is divided into physician functionality, nursing, pharmacy, radiology, laboratory, order communication management, and so on. (CIMS ANALYST-1: 19)

8.3.2 Phase II

This consisted of rolling out the next set of functionalities to the CR. These functionalities included Enhanced Nursing, Emergency Medicine, Clinical Pathways, Media Manager, as well as enhancements to previously implemented functionalities like Medical Records (including transcription), and Respiratory Care. There was also the CPOE functionality. The rollout of the modules of Phase I to the Western and Eastern regions was also a part of this phase;

Yes, actually the project still it's going... because now it's implemented in Riyadh only. The project is still now in phase I, phase II is still not finished and the rollout to east and west is still not completed, so I can say the project is still in its first phase. We did not go through second phase or we did not finish the first phase I can say. (IT DIRECTOR-1: 139)

The rationale was to continue with Phase II in the central region, resolve all issues, fix all the bugs and get a clean system up and running and then rollout to the other regions;

You know when we were talking about the planning and the project management, because when you started Riyadh-the central region Phase ,I and it's like as I mentioned trial and error. We started and we said that we are going to rollout to the other regions after we finish Phase I. (CIMS TEAM LEADER: 341)

8.3.3 The other regions (Phase III)

The NGHHA also had plans to extend the system (Phase I and Phase II that had been implemented in the CR) to the remaining National Guard sites in the Western and Eastern regions;

Now we have resources, we have the team that came from Jeddah and we are working together. Now we can move to Phase II and at the same time we can rollout to the regions, but with specific modules that are not integrated with the clinical phase. For example, registration and scheduling; we can start it from

now because it's not a problem if we start it there because there is no Phase II for registration and scheduling. Second, we have the resources now and we are going to hire more resources in order to maintain these two in Phase I and also in order to rollout to the other regions. This is like a summary of how we are going to deal with it... we are working on it and we have like a plan-a new plan to rollout to the other regions and Phase II. (CIMS TEAM LEADER: 349)

All the data collected for this study were obtained before March 2006. Implementing Phase I and Phase II modules in the other regions (Phase III; as I will call it) was a later stage of the project that had not yet been defined in detail at that time and the system was not yet rolled out in neither the Eastern nor Western regions. Any later decisions, achievements, failures or changes in plan for those regions are beyond the scope of this study and are not addressed here.

8.3.4 Different sites, different needs

The requirements of each site were different. It was difficult to plan an approach flexible enough to accommodate each site's individual needs;

I think very important part of it is how you approach the implementation, because in each site you will have different requirements. Um the ah-the readiness of the hospitals to implement the clinical system will be different from one site to another. (CIMS ANALYST-1: 46)

8.3.5 Continuity throughout all phases

The challenge with planning this project was the maintaining momentum. They applied a phased approach; however a sense of continuity was to be maintained throughout all the phases. They emphasised a need to avoid fragmentation of stages, as they had to maintain each phase without it being isolated from the others;

And it just takes an extreme, extreme amount of dedication and planning to ensure that it happens smoothly and then it takes a lot of support afterwards to maintain it and to educate new people that come in... it's not a one-time kind of thing. (DIRECTOR PHARMACY: 61)

8.3.6 Leadership support for each phase

A continuous cycle of leadership support was also needed for each phase. The challenge was to maintain support for all phases equally and regardless of turnover or changes in management. As a senior IT analyst explains, the most senior members of the organisation should maintain the same level of support throughout all phases of the project;

My point here is the support and the engagement of the change should be continuous, not only in the beginning because if the user or the departments feel that you are done from the first phase maybe we cannot get anymore help or any contribution from the user. What I'm trying to say for each phase or for each um new component like CPOE; for each important phase we need to get the support of the Chief Executive Officer. I can recall that for example here the CPOE... it was sponsored by the executive director of the medical services and also it was directed and supported by the chief medical officer CMO... but again the support is important to show how important this phase is and so you need to gain their support continuously. (CIMS TEAM LEADER: 337)

The interviewees also highlighted the need to maintain a constant communication loop between the implementers and senior management by updating them with the progress of the system; thereby gaining their support for further stages of the implementation;

I think it's a formula if you want to gain support you have to do the education, the evaluation and it's a lifecycle for each phase, because you have the project lifecycle; you have also the requirements for each phase. So again this is the support that I'm talking about for successful implementation. (CIMS TEAM LEADER: 343)

Organise the project team. Make sure that the project team is in place and the team and the top management support of course is one of the important things. If you have like for example a project management team reporting to the steering committee of the project; reporting to the CEO at least to have access to have support, to have finances, everything. (IT DIRECTOR-PACS: 335)

8.3.7 Pressures from end-users

Some users, and especially physicians were eager to get the system running, which put pressure on ISID to implement the modules quicker. For example, the physicians who had used the CPOE in the pilot were very eager to see it rolled out in all departments;

No the Physicians very much like it, and their intensivists also take care of our IMCU patients step down and they were saying 'well why can't we be using it out there with IMCU we are the same group of Physicians so it wasn't like the Physicians didn't like it or there was problems with it. (DIRECTOR PHARMACY: 133)

Some interviewees reported how physicians liked the new system and many were eager to see the CPOE implemented across all departments;

They were wanting it...I'd like to see a fully CPOE done in the next six months. (DIRECTOR PHARMACY: 133)

At times this eagerness even translated onto frustration, which put added pressure on ISID to rollout the CPOE across the hospital;

There were things that were identified 'well this is a program change we'll have to wait for the second rollout for the second phase of the implementation'. I think it was an upgrade or something like that. I think it was that kind of a frustration. (DIRECTOR PHARMACY: 229)

The difficulty that was not always obvious was that there was pressure on the ISID from these eager users waiting for the rollout of more functionalities of the system;

I would agree if this were just a single hospital... I would not worry about the time. But the reason that time is important for us is because the other regions now are looking for the system to be implemented and I think they are not happy about the strategy in the way that we will fix our issues in Riyadh until we kick-off to Jeddah or the Eastern Province. So that is really the pressure that we are facing; the other regions, them wanting to have the system. (IT EXEC DIRECTOR: 156)

8.3.8 Long time to implement

The phased approach also takes a long time to implement, which some viewed as a challenge;

Apparently the project has been planned and worked on for the last three years, so it took them a long time really to make it work and to try to start to implement

it...apparently it takes a long time to prepare it and to launch it. (CONSULTANT PHYSICIAN-1: 140)

However, the application analysts showed a more positive attitude towards the phased approach, as it gave them more time to ‘perfect’ the functionalities they rolled in one region before taking it to different sites and also it gave them the time they needed to get the work done;

No, that was not a problem; we’re just going through it step by step... it part of the process and it’s just one other thing that’s going to be done. (CIMS ANALYST-4: 131-140)

The general attitude was that phases of the system were rolled out ‘slowly, but surely’, as many interviewees commented;

Now we have used this now for oh two years I would think um very slowly increase in the involvement of other disciplines as well. (DIR CLINICAL NURSING-1: 32)

They also did small changes that were more of an evolution of the system than an immediate change, which was taken as another advantage of the phased approach;

The go live for all departments for Inpatients and the debriefings on the go live there enabled the Outpatient to go live quite smoothly... so the whole organisation didn’t go live at once; it’s actually planned and staggered. (DIR CLINICAL NURSING-2: 137)

8.3.9 Views on rolling out in phases

There were different views on how the system should have been implemented. It was not possible to conclude what the best approach would have been;

My biggest recommendation would be that you do not allow disciplines to start as what we did is nurses started before the physicians. I think the nurses and physicians should start at the same time. (DIR CLINICAL NURSING-1: 345)

Being dynamic, the plan always changed and those changes impacted other aspects of the workflow. Their decision, for example not to rollout out the CPOE alongside the Nursing functionality negatively impacted Nursing;

Another issue was that the original plan was adjusted. There was supposed to be physicians and nursing and would go live at the same time and then that didn't happen and it meant that nursing were taking on a component of the physician role at the same time as they were taking on the new scope of the nurses with a new role related with the CIMS... and so again resources and coordination with the other departments to see how we could do that and still maintain workflow. (ASSOCIATE EXEC-DIR NURSING: 29)

Because NG-CPR is an integrated system, some believed that the full benefits would only be realised if all functionalities were rolled out simultaneously or as close together as possible;

I said simultaneous implementation, yeah I think that the other one the thing is that the process of implementation should have been in such a way organised that we could have learned quicker and correct issues with the system quicker than we have done so. (DIR CLINICAL NURSING-1: 375)

8.3.10A homogenous system

Ultimately, the goal was to implement a homogenous system that was uniform and seamless throughout all phases and within all regions. The challenge was not to allow the phased approach to leave a staggered impression on the system;

We do an assessment of their workflow within their department, and we go ahead and implement it to meet the standard of NGHHA. What we are planning to do is standardise the system throughout all NGHHA; one system; one standard with minimal customisation. We don't want to implement a system in Riyadh, a different system with a different standard in the Eastern Region, and a different system with a different standard in the Western Region. One system, one standard. (IT DIRECTOR-CIMS: 66)

8.4 Maintaining Momentum

IT projects usually take a long time to implement. This made it difficult to maintain the momentum and excitement of the users about the system throughout all phases of

the implementation. It also raised pressures on the implementing team to push through different stages of the project because of the excitement over previously implemented stages or functionalities.

8.4.1 Slowly but surely

Some respondents reported were happy with the time it took to implement the project and saw it as an opportunity to allow users to adapt to the new system;

It took quite a long time but that was good in a sense that there was enough time for people to feel involved and it was enough time for people; at least key users to be aware of all the details. (MANAGER LABORATORY: 23)

8.4.2 Building on positive momentum

Advantages of the phased approach were that they could build on the success and lessons of one phase and then apply those lessons in the next phase;

Generally speaking if you move from Riyadh to other regions I think we have enough experience to handle these projects, so I think it will be somehow smooth. (IT DIRECTOR-2: 84)

Now we have it live, we have it real; it's not like what we imagined before. This actually will also enhance and will motivate them and at the end you'll have more cooperation and you'll find their ownership would be high... we thought that the problems that we faced in the first pilot will impact negatively on all of them, but actually we worked a lot on this and we understand the super-user aspects that affect the CPOE itself as a system. (CIMS TEAM LEADER: 181)

People they want to have some improvement, because they can see now; yes we have-we did some improvement... I think its time now-this is an excellent time for us to speed up the project. (IT DIRECTOR-2: 305)

Many respondents revealed that more emphasis on maintaining momentum should be factored into an implementation like this, although it was a challenge to always keep the momentum going;

It is very difficult for us to keep them motivated and keep them on track and keep them believing in the system. (DIR CLINICAL NURSING-2: 95)

We're still not where we need to be but I think we're a step closer. We just have to maintain the momentum and finish this CPOE completion and rollout. (DIRECTOR PHARMACY: 205)

8.4.3 Losing momentum and moral

The difficulty in maintaining the momentum was that people lose excitement with time, and this implementation took a relatively long time;

I think people do lose momentum as they go on. But I just think it's because people get frustrated with the double work. (CLINICAL RESOURCE NURSE: 392-398)

I think that's going to be something that people will have to work very hard on um if they are going to continue using it and continue to develop it they are going to have to work hard on re-motivating people and putting faith back into the system again. (ASSOCIATE EXEC-DIR NURSING: 179)

A Pharmaceutical Care Director explained how the delays caused frustrations amongst the Pharmacy staff;

There were frustrations I think because the momentum seemed to be waning and they could see that we weren't progressing quickly enough for the CPOE. (DIRECTOR PHARMACY: 229)

Some nurses also lost faith in the system because of the many changes in the project plan that lead to loss in momentum;

I think that the main challenge we had in the actual process was that the planning kept changing and with that it was very hard to maintain the motivation. (DIR CLINICAL NURSING-2: 89)

It was important to them to build on this sense of need and positive momentum that may otherwise be lost in this type of 'phased' approach.

8.4.4 A continuous cycle (not a one-time thing)

Respondents illustrated a need for a continuous loop of implementation, support, evaluation, monitoring, then enhancements and upgrades; a never-ending responsibility. Once the system goes live, it will need continuous support;

You know it's a continuous path, from the beginning till the executed project; how to monitor it. If you don't have this part how are you going to close the project later? (CIMS TEAM LEADER: 223)

The EHR will never end; it's a continuous enhancement; upgrading versions, enhancing technologies, enhancing systems, enhancing third parties. (CIMS TEAM LEADER: 241)

The support and the engagement of the change should be continuous. (CIMS TEAM LEADER: 337)

The improvement of the system is an ongoing process. (CONSULTANT PHYSICIAN-1: 201)

I would like to see the support to be continued during the project and after the project. This is very important. (IT DIRECTOR-2: 461)

For ease of understanding, a graphical representation of what was discussed is shown in Figure 8.1;

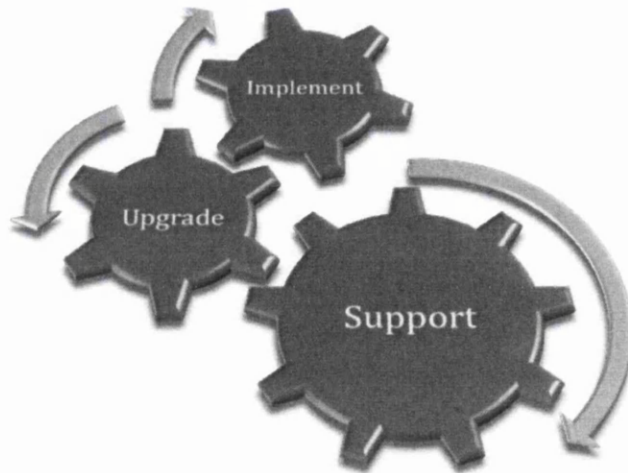


Figure 8-1 Evaluation Cycle

8.4.5 Benefit Realisation Cycle

Having a phased approach also meant delaying benefits until the final phase is implemented or at least until more phases of the implementation have been achieved. They would first contact the departments to document their workflow using the

scope definition documents. After that the system is modified and improved based on the workflow, they can go-go live. Once the system goes live it must be constantly supported, maintained and upgraded. Only after they reach this stage can they begin to realise the benefits of the system. After the go-live, if a new functionality is needed they must go through the whole cycle again starting from the scope definition stage, as an IT director explains;

Usually the benefit realisation comes after the implementation. Benefit realisation, to tell you the truth, it's in the final phase; in the improvement phase. And as I indicated earlier, this phase is the maintenance phase, the go-live; when we go-live there is another phase that starts which is called the maintenance including-as I indicated earlier-the upgrades, the user preference and after that the improvement comes where we have our benefit realisation. (IT DIRECTOR-PACS: 299)

It's an ongoing process, but I believe it's usually six months after the go live that you will see; you will realise the benefit as a return of investment. (IT DIRECTOR-PACS: 305)

Figure 8.2 summarises the interviewees' explanation of their benefit realisation cycle.

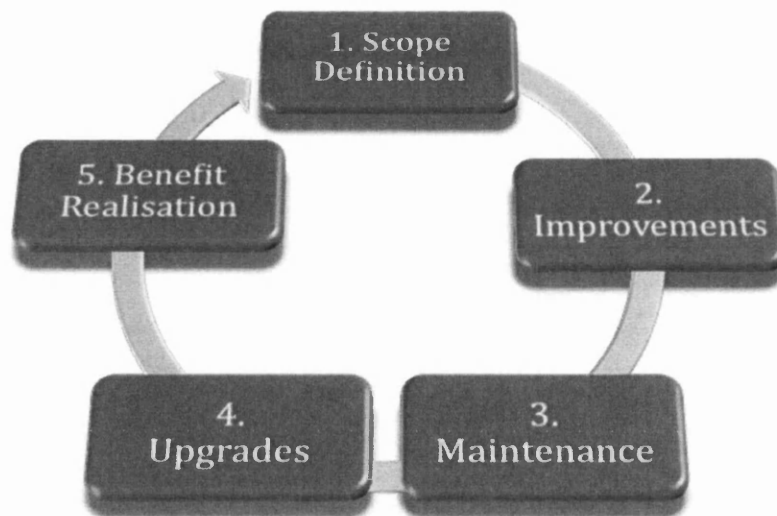


Figure 8-2 Benefit Realisation Cycle

The interviewees noticed that the change was not immediate; it was gradual and it occurred over time, so they had to wait until they could evaluate the actual benefits

of the system;

Actually in order to get the real benefit we should give it some time let's say 3-5 years...especially when you involve all phases, all enhancements, all project phases... also when you involve all users, all physicians in the online system, all primary care centres outside the hospital. When you really involve all these and you are now trying to close the project, but now can you can't rate it. (CIMS TEAM LEADER: 277-283)

8.4.6 Better with time

When asked how they felt about the system now as opposed to when it was first launched, the general responses were that it has become better, so the challenge was in overcoming the obstacles of the early stages to reach a point where it was easier to deal with the system;

It is a lot better. The new system is a lot better however it has a lot of problems, but it is a lot better. (MANAGER LABORATORY: 149)

Things are getting better now with time. (SUPERVISOR DENTAL: 67)

So again everybody is still enthusiastic about implementing the system and training is still going on, on a regular basis... So things are getting better. (CONSULTANT PHYSICIAN-1: 201)

With time it got better. In time it got much better. (EXEC DIR MEDICAL SERVICES: 121)

I think the performance has improved overall significantly with NG-CPR and it will even improve more, just give it a couple of three more years it will improve more. (SENIOR PHYSICIAN: 342)

8.4.7 A blessing in disguise

The interviewees did not necessarily view the delays that had occurred and the 'slow' pace at which the implementation took place negatively. Many explained that it is not always in the best interest of the organisation that an IT system is implemented in a short period of time. Some respondents; mostly physicians and senior executives expressed that it is a good thing that the project did span over a few years' time, because that gave people more time to adjust to the system;

I think we have done a lot better than anticipated. And the slow implementation of the system may have been a blessing in disguise, because it helped people to sort of grow slowly with the system. I'm complaining, maybe a few people like me are complaining, but for the average user I think there is a high level of satisfaction. (SENIOR PHYSICIAN: 186)

It takes time getting used to things, but once they get used to it most physicians like it. (SENIOR PHYSICIAN: 216)

Probably it was a blessing in disguise, because people sort of grow slowly with the system. (SENIOR PHYSICIAN: 192)

8.5 Project Management and Planning

8.5.1 The need for project management

Project management involves defining the scope of the implementation, defining the potential risks and then managing them, planning training, hardware, and all aspects of the system. It also involves liaising with vendors, IT staff and various hospital personnel;

It's how to define the scope of the implementation, how to define the risks that could be initiated and how to manage it, to determine a lot of things, how to plan training, how to plan hardware, how to plan all aspects of the system. (CIMS TEAM LEADER: 205)

A reasonable conclusion to draw from this is that there is a need for project management; someone to do a prior assessment for the available resources, timing and planning;

The real need for project management... for prior assessment for the available resources and for the required timing for such projects... someone should spend a lot of time on planning and allocating the adequate resources for any project. (NETWORK MANAGER-1: 393)

8.5.2 Project manager's role

One of the assigned project managers describes his role and involvement in the project as the project manager;

Well my main role's managing the implementing of the CIMS and coordinating the events of the project which include installation, implementation, reliance and self care, project management as well as the higher management.... also allocate and manage the functional and technical support staff assigned to the installation and implementation process, coordinate the participation of departments' representatives in the installation effort, communication with the vendor on behalf of the organisation on matters pertaining to the installation and implementation process, coordinate the resolution of hospitals interdepartmental issues arising as a result of the installation, and implementation process. Last but not least, advise the NGHHA advisor group and hospital user group on matters related to the installation and implementation of the system. (IT DIRECTOR-CIMS: 12)

His involvement as the CIMS Director and project manager came from the very beginning stages, starting with vendor selection and negotiations;

My involvement began since the negotiation with the vendor; the year 2000. (IT DIRECTOR-CIMS: 18)

8.5.3 Stages

Project management was carried out as several levels. There was a corporate project manager for the CIMS team and there was a corporate project manager for the network upgrade and migration project, although no separate job title was assigned to that role, someone within the ISID was assigned inexplicitly assigned that role; liaising with NG-CPR and the other corporate project managers and at the same time local managers within the regions had responsibility for upgrading their own sites. There was also a corporate project manager responsible for hardware decisions and again each site had local managers who made decisions based on their users' local needs;

And they should start from the first stage; from the readiness through planning, selection, implementation, of course later on maintenance and improvement. And after that these staff can go to their departments. (IT DIRECTOR-PACS: 125)

In project management, the project manager and the leaders within the organisation all have a critical role throughout all stages of the implementation. Figure 8.3 shows a summary of the project stages as described by the interviewees;

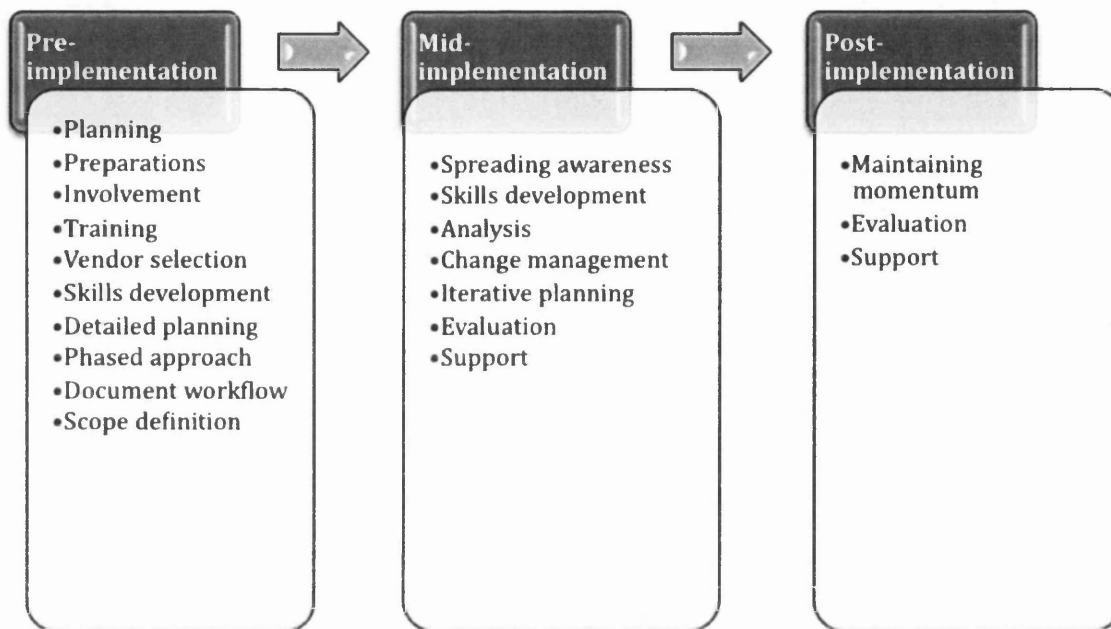


Figure 8-3 Project Management Stages

The project was ultimately carried forward in stages starting with the initiation stage. It was a solid stage of the project, while the project management challenges became evident with other stages of the project;

The good thing here in the National Guard Health Affairs is the initiating. Initiating means that we have a clear vision and objectives about our projects. We know that we will implement the latest and the state of the art projects like the network and the clinical system. We have the budget to do so, so the initiating phase is good, however in the rest of the phases we face a lot of challenges and difficulties. (NETWORK MANAGER-2: 12)

8.5.4 Project management cycle

There was a need to maintain a continuous cycle between project management, planning and change management as depicted in Figure 8.4 and described by an interviewee;



Figure 8-4 Project Management Cycle

And we covered also change management because we need to consider it as a part or as a major component of the project management because they were considering change management as a process during each phase of the project cycle; it's like a requirement design which should have another committee and actually it was initiated eight months prior to Adult ICU...so I think we covered it. (CIMS TEAM LEADER: 355)

8.5.5 Obstacles

It was agreed that planning for and managing the project would be a struggle, but it was an expected difficulty that they understood they had to deal with;

I wouldn't say they are obstacles, I think they are potential obstacles that need to be addressed and these potential obstacles can be overcome by using different strategies. (CIMS ANALYST-1: 79)

More than 95 % projects; especially IT projects are not implemented on time, within the budget, with the required quality...the project management triangle is always not in balance, or we would say in the majority of cases, especially when it comes to software. So, there's no typical measurement. There's no way to benchmark, and there is no standardised methodology to estimate the required time, the required cost, and the only-the only dimension that you can manage is the quality of data. So, based on that I do believe we cannot judge the planning. (CIMS ANALYST-1: 96)

8.5.6 Project Delays

One recurring project management challenge is to avoid (usually unavoidable) delays in deployment. Lengthy delays can lead to many unwanted repercussions. There were many examples from the interviews about project delays and many warned against complications that the constant delays could lead to, from the need to retrain staff to loss of morale and strains on resources;

If you delay the project you might lose a lot. OK? You lose a lot. There are too many issues. You might lose staff. You lose morale. You know people they will not be interested anymore in the project... the bottom line...what I'm trying to say from my experience the more that they speed up the project, it will be; I will guarantee that the project will be successful. (IT DIRECTOR-2: 173)

What complicated that whole process was that the go live date was changed and changed. So nurses were trained then had forgotten what they've learned so we had to bring them back in, so it was quite a long process. (DIR CLINICAL NURSING-2: 83)

Because it took quite a long time there was quite a few variations of the implementation plan shall we say. And some of it was because of things out of the control of the project leaders such as the political situation. Since we ended up having to retrain our staff because there was a delay in the go live. Which meant there was quite a strain on our resources. (ASSOCIATE EXEC-DIR NURSING: 29)

Another issue was that the original plan was adjusted. There was supposed to be physicians and nursing and would go-live at the same time and then that didn't happen and it meant that nursing were taking on a component of the physician role at the same time as they were taking on the new scope of the nurses with a new role related with the CIMS that the nursing had to participate in. (ASSOCIATE EXEC-DIR NURSING: 29)

8.6 Training

With the implementation of a new HIS comes a need to train end-users on using the application and ISID staff on implementing it. All 32 interviewees commented on the training in some way. Some were satisfied with it while others suggested improvements, however the consensus was that training is an integral part of project success and must be planned and managed competently.

The less training you have, the more difficult it would be to implement the system in any institution. (CONSULTANT PHYSICIAN-1: 80)

Training I think it was acceptable for us, but again the more training the better. I think with any new project... training is never enough. I mean the more you do the better with the implementation. (CONSULTANT PHYSICIAN-1: 312)

So we had a major training blitz. So we had about 3,000 nursing and non nursing staff that worked in nursing that we trained. And we did that over probably two to three months I think. (ASSOCIATE EXEC-DIR NURSING: 17)

8.6.1 Train the trainer

As discussed in the previous chapter on external technological issues, the vendor was contractually obligated to train the CIMS analysts on the system. As for the end-users, they applied the 'train-the trainer' scheme. This way the CIMS analysts (who received their training from the vendor) train only the key-users in the departments. The key-users then train the users within their departments. The CIMS analysts only liaise with the key-users for training;

We did have a key-user in each department... and we trained the key-user and the key-user did training for the end-users. So, it's train-the-trainer process. (CIMS ANALYST-2: 222)

I was a key-user as a supervisor in Microbiology, so I had two roles. To train myself first; get used to the system and then filter the applications that were not applicable to our working environment and liaise with ISD to maintain what's applicable to our working environment and then train my staff. (MANAGER LABORATORY: 11)

Usually we don't want to train any user. We usually will train the supervisors and seniors so they can train the regular staff...so it's train-the-trainer. (LAB ANALYST: 26)

8.6.2 The difficulties

It was difficult for users who did not have a good command of English to learn the new system;

One of the difficulties was people who don't know English. We should teach them English first then teach them how to use the system, because it was hard for them-you know-to memorise things in the new system [ok] how the process goes and things like this. (CIMS ANALYST-2: 201)

Training was also difficult for users who were not familiar with previous IT systems and had no prior experience using a HIS;

The problem was that their computer skills were not sufficient to absorb the information of the knowledge as quick as the others. So that was the challenge in fact. There were people who are aware of computing but they were still hesitant or still resistant because of their old experiences with the old system and the others who had no idea but there were ready and they were difficult to train. So we faced difficulties with both; with the prepared and the resistant. But we managed; things went fine, the implementation went fine. (MANAGER LABORATORY: 17)

Some were happy with the training, but felt a need for more training sessions;

The training sessions were well organised. I just think-you know-because the organisation is so big the staff could have benefited from more than one training session, especially the people who are not computer literate. So they are the ones who struggled. (CLINICAL RESOURCE NURSE: 140)

The fact that there were only around 20 CIMS analysts who had to prepare the training manuals, train the users and do their other tasks, some felt the analysts had a difficult time coping;

The people they were teaching us-the ISID were good, but I think their problem was there were so many people that they have to teach and there were so many key-users and there were so many problems that there were not enough of them to go around. (KEY-USER PHYSIOTHERAPY: 404)

Some physicians found the training difficult because of the rotations in different departments;

Efficiency should come with more training and more use of the system. Again the problem with training was having new people every three months. So we are not achieving this goal of effectiveness really at this time because by the time people get used to it as I said and they just leave the intensive care unit. (CONSULTANT PHYSICIAN-1: 104)

The main challenge was the need to retrain staff because of the delays in the rollout and people forgetting the training that they had received;

During the training period we got full training for all staff, but the problem that happened with us is that postponing the go live of the system was more than one

and a half years and that causes people to forget and we always try to insist on the NG-CPR and ISID teams that adequate training will not have any meaning unless we train the people and they start working on the system right away. (HS: 68)

What complicated that whole process was that the go live date was changed and changed. So nurses were trained then had forgotten what they've learned so we had to bring them back in, so it was quite a long process. (DIR CLINICAL NURSING-2: 83)

Because it took quite a long time there was quite a few variations of the implementation plan shall we say. And some of it was because of things out of the control of the project leaders such as the political situation. Since we ended up having to retrain our staff because there was a delay in the go live. Which meant there was quite a strain on our resources. (ASSOCIATE EXEC-DIR NURSING: 29)

Despite the challenges, ISID seniors and other interviewees expressed their content with the overall training structure;

We had a very nice training plan and along with a test plan (IT DIRECTOR-PACS: 65)

It is very efficient. When a nurse trains a nurse; a physician trains a physician; a radiologist trains a radiologist and so on, they speak the same language. For example if I have an IT training a physician and they ask him something related to the clinical; to their own daily activities, the IT person would never understand it and they cannot relate to that. But when a physician is there training them; he or she can relate to them. (IT DIRECTOR-CIMS: 102)

I think with the preparation information that people had; the level of training was actually phenomenal. If you think about putting; I think at time it was about 1,800 nurses that had to be educated in a period of time as the go live date changed twice... we had to do the training; not fully do it again but we had to update. (DIR CLINICAL NURSING-2: 342)

I think it was ok. I don't think there was any problem with the training. (SENIOR PHYSICIAN: 222)

At the end the training was appropriate but it was with difficulties; several difficulties; training difficulties, logistics difficulties. (DIR CLINICAL NURSING-1: 62)

8.7 Project management skills

There is a shortage in suitable qualified project managers in the region in general and in Saudi Arabia in particular. That was a fundamental challenge when it came to project management issues of the implementation, as the chief information officer explains;

People think about the technology but they don't look at the standard way of implementing the project as a project. Starting from where we should do this project until we close the project; moving through the various phases and technology areas of project management I think. I think there is serious lack of such talents in Saudi Arabia. So there are really many many issues. (IT EXEC DIRECTOR: 30)

I think project management is really an issue, and I see the project management issue is not only from our side as a customer of the system but also from the supplier of the product. I haven't come across through my ten years experience in IT in healthcare; I haven't come across strong project managers for IT systems. I don't know why unlike in construction and unlike other fields where project managers are really strong and people because of that you would see it in a beginning and end and to every project. In IT project management is an issue. (IT EXEC DIRECTOR: 36)

I think now we have come to a conclusion to see what would be the best way to utilise our team. I think we're very confident that this team is a good team that we have. The problem really is that this team is spread very thin to meet everyone and everybody's expectations. (IT EXEC DIRECTOR: 77)

8.7.1 Project management experience

At the NGHHA they had experience implementing IT systems prior to this implementation, like the old legacy system that was implemented many years before, the Lab system, the Enterprise Resource Planning (ERP) system and many others, however no healthcare organisation in the region had experience in implementing large-scale healthcare information systems. This lack of experience was felt and had an effect on project implementation;

The problem is that in the planning we faced two problems. We faced a problem in the project management skills; we don't have a-actually we lacked the skills of project management and we lacked the experience of implementing such a system. (CIMS TEAM LEADER: 199)

We don't have the wide experience that helps us to manage implementations of real projects. (TECHNICAL MANAGER-1: 444)

There is a need for a project manager who is certified and is um or has had experience with clinical system. (CIMS ANALYST-1: 152)

8.7.2 IT project manager and clinical project manager

There were conflicting views from interviewees about the skills needed for the project manager. Some reported a need for a project manager with project management skills and not necessarily IT or clinical skills. There is no definitive rule about the skills of a CIMS project manager, and deciding on what skills they needed for this role was a challenge in itself. Deciding on the skills of the project manager and allocating someone with those skills weighed significantly on the success of the project.

A senior analysts explains that it is not the IT or clinical background of the project manager, but it is the project management skills or someone who has the skills or training to be a project manager regardless of his clinical or technical background. It is the project management background that is important.

If I'm the one who's going to select the project manager I'm going to make a strict condition that he should be project management professional certified. (CIMS TEAM LEADER: 187)

The messages conveyed were actually from a clinical project manager and now we have an IT project manager. (CIMS TEAM LEADER: 175)

They allocated different project managers during the course of the implementation, taking into account what they did. A 'clinical' project manager was allocated in the early stages when they were collecting workflow documents and towards the later stages of the implementation an 'IT' project manager was allocated. It might be that allocating project managers with different skills depending on the stage of the implementation is what is needed. Another view was that good project management skills are required regardless of the background the (clinical or IT) of the project manager;

So the project manager should not be clinical and he should not be IT. Any project manager that understands the project...he can understand the vision, he has a good plan, with time and budgets he can implement it. (CIMS TEAM LEADER: 181)

So again this is skills; if the project manager is not technical he can get the benefit and help from his staff who are the technical people. If he is clinical he needs to get the benefit and the help from the IT people. That's why it's a combination, but as a project manager he should have skills. It's not a mandatory issue to have expertise in the field and it's actually very important for the project manager. (CIMS TEAM LEADER: 193)

Another view was that it is important for the project managers to have both IT and medical backgrounds, and it was not enough for them to just have a medical background;

Project implementers should have an IT background and it's not enough for the project manager to have a medical background. (IT DIRECTOR-2: 464)

I think also the project management skills are really another issue. Which is; there is a serious lack in project management talents locally as well as internationally, but I think in Saudi Arabia it's even worse and implementing projects is a difficult task. (IT EXEC DIRECTOR: 30)

8.7.3 The project manager and the vendor

The project manager should also be able to recognise what the requirements are to be able to select a suitable vendor, negotiate the contract, and then liaise with them all throughout the implementation and later on for the support, as explained by a CIMS team leader;

Because after that when the project management level in the implementation he can see what exactly the primary needs after that they can analyse and design the system according to the requirements. So selecting the vendor should be based upon the representative of each department. (CIMS TEAM LEADER: 319)

So I think these factors if I can summarise it; leadership, dedication, project management, proper project management-manager or team-and also the um the um sorry the vendor selection based upon the requirements. (CIMS TEAM LEADER: 319)

8.7.4 Change management skills

It was difficult to define the necessary skills of the project manager, as either technical, clinical, project management skills, or a combination of them all. It was also difficult to then allocate and retain a project manager for the duration of the project.

In addition to the previously mentioned skills, several interviewees emphasised the importance of leadership qualities in the project manager to help him/her carry across and manage the change;

He needs to manage the change (CIMS TEAM LEADER: 247)

So the project manager should understand this role as change management and relay this to the team analysts in coordination with the end user so we are all part in this change management. (CIMS TEAM LEADER: 247)

Change management is a big field for any project and for any change. Not in the project in the change in the work in the real life. Even if you are working with the real life if there is a change you need to manage it otherwise there are consequences. (CIMS TEAM LEADER: 247)

We should have two things, a clear plan, a transition plan and we need to have the social aspects because this will affect the flow of the um we didn't have that clear plan for change management. (CIMS TEAM LEADER: 253)

8.7.5 Leadership role in project management

Many stressed that both project management and leadership skills were needed;

The planning phase is the most important part where you need the leadership and because the role of the leader is to minimise the users' resistance; which is expected in any project that deals with change. (CIMS ANALYST-1: 102)

Yeah usually you face difficulties in implementing system or project. It's part of the challenge you face to find difficulties and to resolve these difficulties, however the main difficulties I think we faced in implementing any system or project in National Guard Health Affairs; I think it's all about project management. (NETWORK MANAGER-2: 12)

A reasonable conclusion to draw from this is that project management skills were required to plan the various stages of the implementation and to oversee the terms of the contract, liaise with the vendors and various departments, manage and plan

resources, and train the workforce. Leadership skills were required to successfully manage the change and related change management issues, to create a clear vision, to motivate people, to minimise resistance and to basically manage people and the related behavioural issues.

8.7.6 Leadership's unique role; vision

Many suggested that strong leadership is necessary for the success of the project; as a competent leader must spread the vision and keep people focused on the project objectives;

First of all, project management has to be spelled out right from the beginning... a lot of people when they implement systems; they forget why they are doing that. (IT EXEC DIRECTOR: 168)

So if everybody focuses on the project and the scope of the project there would be issues, but if these issues are not affecting the big image of the project then at least that would tell us that we are in the right direction. And I see a lot of people really losing focus for implementing systems because we are not using a proper project management. (IT EXEC DIRECTOR: 168)

The chief information officer suggests that the required leadership can be honed through establishing a specialised project management office capable of standardising the processes and by streamlining project management procedures;

That's why I am suggesting that we are now we are in the process to create a project management office for all NGHA. Not for IT, but for any other project. If we have to follow a standard way of approving projects and approving the start of the project, the scope and the key components and all of that. (IT EXEC DIRECTOR: 174)

8.7.7 Was it planned well?

Some reported complete satisfaction with the way the project was planned;

We can say it was planned well, in relation to planning. The clinical team, the ISD team, the company even; the plan was there, but there was difficulty in the plan itself... it was not um the fully accepted plan, but we must go live, therefore the project was planned right I can say... for example, when we planned the project, we planned it and it was negotiated with NG-CPR, with end-users and many beneficiaries, and the project was planned well. (IT DIRECTOR-1: 169)

While others criticised some aspects of the way some stages of the project were planned with most of the frustrations stemming from the politically driven delays that were discussed in the chapter on External Technological Issues;

I think in general very poorly. It's been really there is not a plan...now there is a plan but at the time there was no plan. They started to go on with nursing but how we would then continue was a guess for everybody. And I think that because of the lack of planning it takes such an incredibly long time to actually implement the system. So I don't think there is proper planning. (DIR CLINICAL NURSING-1: 99)

8.7.8 Involving users in planning

User involvement in the planning was considered a positive driving force for successful project management. Some revealed that they had been involved and actively participated in planning;

No, in fact there were a lot of positives in the project planning. We were involved. (MANAGER LABORATORY: 232)

Well it was a conjoined plan. It was arranged with the CIMS team with regards to the computers and switching from the old system to the new system... and smooth transition between the two systems was arranged by us and the CIMS team. (KEY-USER INPATIENT PHARMACY: 80)

The actual go live process went well. It was planned; it was actually planned as a multi-disciplinary venture within the hospital and ISD lead the multi-disciplinary meetings, that meant that Radiology, Pharmacy, Nursing, ISD were the major stakeholders there and we met around the table at least a month before going live to discuss the issues and make plans... we actually met daily so that's helped. (DIR CLINICAL NURSING-2: 137)

I was involved in the CPOE planning; the computerised physician order entry. And we really had a fairly good plan. We covered everything in our plan for the CPOE go live. (CIMS ANALYST-4: 146)

Others revealed that they were not involved in the planning and reported excluding them impacted negatively on project success;

And now it has been around 14 months and we have nothing; not even plans. With the plans I received an email telling me that they are coming in January but they

didn't show up and they postponed it until whenever and they will contact us later. (LAB ANALYST: 335)

For now no idea or we don't have a plan. (LAB ANALYST: 341)

I don't know. We were not a lot involved in this. In project planning itself, we didn't have any input into that, so I cannot help you with that one. (CLINICAL RESOURCE NURSE: 122)

The team that came over that did the layouts of the face sheets and the-they had a lot to do with it, but we didn't. We didn't have a lot of input. (CLINICAL RESOURCE NURSE: 128)

I'm just trying to think how that involvement took place. And also for before NG-CPR even made any plans there was the workflow validation and certainly for the implementation for the first phase of the project the workflow validation was agreed by all the directors and the executive director for nursing. So there was involvement from that aspect in the planning of the project. (DIR CLINICAL NURSING-2: 233)

It could be that the levels of involvement from various departments were different depending on their role and their usage of the system. User involvement is an important aspect of change management and will be discussed in more detail in a dedicated section on involvement in the next chapter.

8.7.9 Planning is a key part of project success

Many respondents stressed the importance of planning the project. They linked many of their struggles, and triumphs to planning and attributed IT project success to proper planning;

And I believe...yes sometimes we don't have to waste a lot of time in planning, but I think the planning phase is the most important part in any project and it is really the key success factor for any project. (NETWORK MANAGER-1: 393)

I really felt the need and I really felt the importance of planning during the project. (NETWORK MANAGER-1: 399)

There should be very very good planning for the project. They should clearly allocate the required resources. (NETWORK MANAGER-1: 417)

To plan things very carefully...yes planning is very important. (CLINICAL RESOURCE NURSE: 467-476)

So I think the planning is; the layout of how the configuration is going to be done is very important. And it has to be thought through very carefully before you design the actual layout. (CLINICAL RESOURCE NURSE: 482)

The go live day went fairly smoothly for us. But I think that's just because there was extensive planning done. (DIRECTOR PHARMACY: 37)

Plan. If you failed in the plan you will face a lot of problems; which is maybe a cost; cost you and cost the organisation; a cost for the whole project and a plan should be there. This is what I learned from our experience. (IT DIRECTOR-2: 395)

8.7.10 Communicating the plan

It is important to communicate the plan well to all parties for it to be successful. It is not good enough to have an exceptionally designed plan if it is not communicated well to all involved parties. Some reported their frustrations with the lapses in communication that may have been an obstacle in the project;

You should have a good plan; you should give people time ah so they should be well prepared....ah for my role here; if I lose this communication ah as I said before, I feel like I'm not doing my role very well. Especially if I lose the trust for whatever I built... if I lose this communication, I lose the project. (IT DIRECTOR-2: 275)

Communication plays a big factor in the project; he should plan it well... the message is not well distributed to the whole team, there is always something missing. (IT DIRECTOR-2: 275)

There's a lot of confusion I have to say. The implementation plan here certainly could have been better and been better communicated and that probably added to some of the frustrations on the nursing side. (ASSOCIATE EXEC-DIR NURSING: 71)

8.7.11 Planning in dynamic conditions

Another difficulty was planning a dynamic process in the constantly changing circumstances of the IT world. Planning became an ongoing part of the process. Circumstances change; from inside the organisation to outside the country, and planning became a process. Their planning had to accommodate a dynamic environment. In the process of planned change, events happen and one plans again.

Preparations do not always go according to plan, so they had to reassess the plan and how they managed the change that the new plan brought about;

I think that the main challenge we had in the actual process was that the planning kept changing and with that it was very hard to maintain the motivation.... and there would be some decision to change it or to delay it and that really did negatively affect the buy in of people. (ASSOCIATE EXEC-DIR NURSING: 89)

That is still not clear, because what we plan today definitely can change tomorrow. And that's why we stopped going to other regions to advertise about when we are coming because nothing is clear. (CIMS ANALYST-3: 174)

As I said technology changed...the project has been delayed for years for other problems... and the project postponed for another couple of; I don't want to say years but another very long time it took us to prepare or to return to the project again. (IT DIRECTOR-2: 89)

Their struggle with these planning issues was evident in the interviewees' accounts of their dilemma;

Now we have almost completed Phase I. The question now is should we go on to complete Phase II and then go to rollout to the other regions or should we go in parallel; continue Phase II and rollout to all regions? Or stop now Phase II and go to the other regions? We are making plans now to be honest with you. We are making new plans to rollout to the other regions. If you ask me what the plan is, still there are no certain dates because we are working on it but I can give you the recommendations or the draft plan. (CIMS TEAM LEADER: 349)

Senior IT directors explain the dynamic nature of planning. What is planned today may very well change or become obsolete tomorrow;

Well the whole project is a dynamic project. When you make an implementation plan today of course some changes will happen, either we will meet the milestones before the time that is intended so we have to go and modify the project plan or the milestone will take a longer time for any reason that I discussed earlier and then we have to go to the project plan and modify it. Some of the milestones within the project plan; we could implement it in parallel and that depends on when we finish a milestone it is-it is the beginning of another milestone, so-so we cannot initiate it unless we finish the first milestone. (IT DIRECTOR-CIMS: 246)

Ok, during the implementation sometimes their requirements sometimes were not that clear, so when you start the project you have some kind of requirements, but after some time you find a lot of changes from these requirements. (TECHNICAL MANAGER-2: 29)

The chief information officer explains that a decision was made to change the plan after implementing the first phase of the project;

We were supposed to rollout the system to other regions, but due to the small number and due to the different issues we have been faced with during the implementation in Riyadh, I think the strategy has changed by focusing first on the central region issues and clearing them all before we even open different sites, because every site would come with their own challenges; with their own difficulties and if you add four of them-four hospitals-it would be very difficult to be handled by a very small number. (IT EXEC DIRECTOR: 77)

It was difficult to plan this project because it was so dynamic. IT healthcare systems or any IT systems are quite difficult to plan, because so many things are unpredictable;

Well difficult; I don't think it was difficult [ok] you know and implementing a system like this-an enterprise system like this what takes is a group of individuals from both parties from the costumer and the vendor and are willing to work together for a mutual goal. So this idea exists that I think the implementation plan will go smoothly. (IT DIRECTOR-CIMS: 252)

The most important thing that most parties must understand is the plan exactly. They must sit in a roundtable and discuss the plan before implementing the plan because we don't want to understand something; it is something to us and it means something different to them. We want to be sure that we have the same level of understanding and we are comparing apples to apples. (IT DIRECTOR-CIMS: 252)

I have more grey hairs than when I started, sleepless nights, but alhamd le Allah we al Shukr le Allah (meaning gratitude and appreciation to God), I think it's a project worth being involved in on all levels of it; yeah. (IT DIRECTOR-CIMS: 630)

There was a that they were too busy to allocate enough time to be trained although I believe that-that it was somewhat cultural; I think the manpower was- I think if we had prepared everybody that this is something that they cannot do without; they would have found the time. (EXEC DIR MEDICAL SERVICES: 271)

The general notion was that there were so many delays that the products and the technology change before they even had a chance to implement them.

8.8 Managing Resources

8.8.1 Financial resources

Most IT projects are not implemented on time, or within budget and not with the required quality. As discussed in the literature review chapter, when reading about implementations similar to this, one will find many problems associated with IT implementations or failures. One of the constantly recurring issues has to do with financial constraints. A company may have the budget for the initial go-live, but they may find later on that they cannot allocate enough resources to sustain the project. It could be argued that they underestimate the costs to gain the budgetary approval and they can bargain for more money once the commitment is made.

Whatever the reasons may be, at the NGHHA, a head of a medical records department explains that funding has always been an issue with many organisations and usually a major obstacle for achieving unanimous national health records. She explains that even if one organisation is ready financially, other organisations might not have the means to go electronic, leading to the reliance on paper for external reporting and hindering the success of a national health record;

As I see it, not all organisations have the funds-you know-it's expensive. This is one of the obstacles I would see in having a complete electronic patient record. (DIR MEDICAL RECORDS-2: 53)

Because of the financial standing and economic strength of Saudi Arabia with its booming economy due to the massive influx in oil prices, some might presume that finances were not an issue for this implementation. However it is not safe to make these assumptions as financing this project was an issue that received careful consideration by the NGHHA.

With the resources of the NGHHA, and the budget provided for this implementation, there did not seem to be many budgeting restraints. Costs were not mentioned as a major issue in the interviews. In an organisation where there was ample support for funding the project, and where there were enough financial resources to procure the

technology needed, the interviewees were asked what the difficulties were;-if any- that were faced with regards to costs and in projects such as this.

8.8.2 Allocating the budget

Implementing a project as such will incur a lot of costs that must be budgeted and maintained before, throughout, and after the implementation. The initial cost of application, the hardware, the network infrastructure, training and many other issues need to be considered to be able to acquire the system and then maintain longevity, support, and future enhancements.

One respondent explained that they had already exceeded their initial cost estimates, because some key costs were not calculated, such as manpower, overtime and training costs;

Yes, if I give you a figure right now, I think the cost is more. Not just because of the clinical system, but you're talking about hardware and you're paying salaries for staff and all these kinds of things. It's not only just the clinical system. It's not just the applications, but you are talking about another cost. (IT DIRECTOR-2: 191)

His recommendation was, when deciding to buy a health information system to involve people from within the IT department with different skill sets, such as the network people, the applications people, the systems people and others and not to rely on the input of only one section of the department for projections and when planning:

I would rather not discuss the cost, because I'm just giving you a hint; it's not clear for me to calculate how much it will cost us to go for; If you say let's go for ah; you should be clear when you go for ah I mean when you buy the clinical system, because the; you should involve all ah; all type of people in the project; especially the IT people; the network people, at the same time the systems, the applications; not just only one area. It should cover the whole area and I'm sure this is just a reminder for anybody; people who think the clinical systems are only the applications (IT DIRECTOR-2: 191)

This issue of financial resources was not always raised throughout the interviews. For the most part, only the very senior respondents touched upon the subject and

usually only when prompted by a question about the financial implications. The less senior and technical staff were not asked specifically about financial resources since they were not in charge of budgets and none of them brought the subject up. All-in-all, financial issues were not a dominating topic throughout the interviews and were not considered by many to be a challenge. This in itself says a lot about how significant of an issue finances were in this implementation.

When many of the senior staff talked about financial resources, their general take on it was that there were no financial problems. It is evident from the interviews that allocating and sustaining finances for this implementation was not a problem;

The organisation was very supportive for this. Anything regarding the NG-CPR project; they are supportive, and it comes immediately. (TECHNICAL MANAGER-1: 309)

We have the budget to do so, so the initiating phase is good, however in the rest of the phases we faced a lot of challenges and difficulties. (NETWORK MANAGER-2: 12)

I can say that finance was not a difficulty...whenever we have a difficulty with financing it can be resolved because we go to higher management and they support us fully. They will not disagree or say no. Usually whenever we have financial difficulties regarding the implementation of the system they fully support us. And this is the nice thing about the National Guard Health Affairs, they fully support automation; never say no to automation. (IT DIRECTOR-1: 121)

Even though financial resources were available, and the budget and running costs for the project were provided this did not imply that there were no repercussions for going over-budget or for frivolously wasting money. During and throughout the implementation, special care was taken not to waste money and to utilise all resources as efficiently as possible. Several interviewees warned of the cost ramifications of poor planning;

If you failed in the plan you will face a lot of problems; which is maybe a cost. Cost you and cost the organisation; a cost for the whole project and a plan should be there. This is what I learned from our experience. (IT DIRECTOR-2: 395)

So this is the problem; planning, planning and planning because if you want to plan it right you also want to ask for resources because when you rollout who is going to maintain here? And when you go there who's going to be there? Who's

going to the eastern region and who's going to the western region? (CIMS TEAM LEADER: 355)

Although the purpose of the implementation was not necessarily to save costs, as detailed in the following section.

8.8.3 Return on Investment

As expected with any project of a similar scale, the capital investment for this project was high. There are many costs to consider; in terms of buying the software, in terms of establishing the infrastructure, in terms of acquiring the recommended hardware, in terms of training people, and so on. As discussed in the literature review; it is a major obstacle for many organisations to provide the capital investment for such projects while allowing several years before expecting any return on the initial investment and the NGHAs were no exception. One issue that had to be considered and factored into the decision to take on the project was the initial investment and anticipated return on investment (ROI). They did not necessarily go into this project with a main goal of saving costs. Their vision was much bigger than that.

Simply put, these systems should not be implemented with expectations of immediate financial gain or ROI:

Cost saving with a high capital investment is basically not what higher management should be expecting. (CIMS ANALYST-1: 84)

Ok, now if we talk financial wise, the capital investment of any such project; especially if it goes to the national scale would be huge. The return on investment in the first years and if not in the minus it would be very limited; very low. (CIMS ANALYST-1: 79)

This does not rule out however that the system was intended to provide some financial benefits.

The system now controls dispensing of medications and it is monitored and controlled heavily by the system so that errors and abuse can be avoided. This ends up saving the hospital a lot of money. (IT EXEC DIRECTOR: 129)

There are also 'hidden' savings. It really differs how one would define costs in a healthcare provision environment. Sometimes there are undocumented costs or savings seen in many organisations in their pharmacies or other departments as discussed in the literature. At the NGHA, these savings are apparent, but not always documented.

But also there is 'soft' cash saving or 'quality' saving meaning instead of the patient waiting 30 minutes he ends up waiting 5 minutes.... There will be cost-saving even though we do not document how much of the cost we're saving... which I believe strongly that this is the case here. (IT EXEC DIRECTOR: 138)

Another point raised by respondents was whether or not the initial investment was indeed necessary. Some respondents advised that all features of the system be fully implemented and utilised in order to gain the benefits that will justify the costs. Otherwise it could end up being a very expensive tool that does nothing much for the organisation;

It is part of the system but um honestly if only I am using CIS system just for computer physician orders I wouldn't really waste all that money to do something I am doing currently and it's working ok. (DIR MEDICAL RECORDS-2: 200)

The interviewees also mentioned the need to consider the expected benefits of the system. When it is used to its full potential then the costs become justifiable;

By looking at all of the benefit realisation studies that have been provided to us from different vendors from past experience with hospitals in Europe and the United States, there is-there is a tremendous decrease of healthcare costs in pharmacy, in laboratory, in radiology. This is I'm talking about money. And there is a tremendous decrease of time waiting for the patient to see the physician and the safety measures is tremendously high. So the benefit is there. (IT DIRECTOR-CIMS: 42)

8.8.4 Was it a cost-saving initiative?

All interviewees who commented on the goal of this project agreed that it was not in fact a cost-saving initiative, but rather a tool to improve patient care. That was the main goal of this project. Saving costs was a goal, but it was not the main reason for implementing the system;

The overall goal is to improve patient care as well as to decrease healthcare costs. Or in other words to control healthcare costs. So before the implementation of the-of the CIMS we have to look at the benefit and cost and loss ratio. We have to look at the benefits and costs. Are we going to-if we pay this much-how are we going to benefit? (IT DIRECTOR-CIMS: 30)

The most important thing is to improve healthcare first, yeah because the healthcare organisation is patient-focused. So the most important thing is to improve healthcare at the same time to control healthcare costs; not necessarily to reduce the cost; but to control it. (IT DIRECTOR-CIMS: 36)

8.8.5 Vendor-driven costs

Having multiple applications supplied through different vendors, or having a different supplier for the application than the one supplying the hardware can lead to logistical problems and financial repercussions;

Ok, now because we have too many vendors, yeah. We have too many vendors for our applications. (IT DIRECTOR-2: 197)

Something else mentioned was how much control the application supplier had over what hardware to use. The application must be run over hardware; a server usually of very high specifications and with equally high costs. In this case, the application vendor put pressure on them to select a certain type of hardware that best suited the vendor, but was not necessarily in the best interest of the organisation. An IT director explains the need to beware of this;

I'm sure this is just a reminder for anybody; people who think the clinical systems are only the applications we just let's buy the applications, but behind the applications there will be hardware, you have to be very careful when you go for the hardware because sometimes we should; this is the problem, the vendor will drive you for the hardware, or the type of hardware. (IT DIRECTOR-2:191)

Another problem was that they could not unify their vendors for both the hardware and the application. It would have been easier if the same company supplied a complete 'turn-key' solution to avoid shifting of blame between the two different suppliers and then running the costs of analysing the problem and paying for solutions to fix them. Had there only been one supplier for everything, they would

have been responsible for resolving any issues without room for avoiding the responsibility.

As I said before it would be better if we had a unified vendor for both applications and hardware. This is what we learned from our experience. If you have too many boxes in your house in costs you more. (IT DIRECTOR-2: 197)

Although this IT Director admits that this is something easier said than done. It is not always possible to find a vendor that can or is willing to provide both hardware and software solutions;

I think there is no way you can find one vendor for the application and the hardware. (IT DIRECTOR-2: 203)

Another problem with having too many vendors providing different solutions, is that if they want to run the applications with different hardware, then they have to choose one hardware; one type of hardware with one vendor, but if they have too many applications with different vendors they end up having maybe more than one type of hardware. So, this was another cost from the technical side and they eventually had to pay more to support the applications or it would have cost them more from the hardware side;

So, this is another cost from our technical side. So you're paying more for-to support the applications. At the same time you are paying or it will cost you more from the technical side. You have too many hardware, too many type of hardware. You have too many vendors running too many applications. (IT DIRECTOR-2:209)

8.8.6 Hardware resources

Resources were readily available for this implementation. The evidence shows that sufficient hardware resources were provided to support the implementation, and any delays or disruptions in the implementation were not due to any lack in these resources.

Yes. No problems with the equipment; PCs, laptops and printers (SUPERVISOR DENTAL: 91)

Yes, we had more than enough equipment to support the implementation. (LAB ANALYST: 236)

The hardware was adequate, much more than adequate, the hardware was adequate. (EXEC DIR MEDICAL SERVICES: 265)

8.8.7 Human resources

Sometimes a difficulty in rolling out or implementing a module of the system has to do with the resources of the department and not the ISID resources. That was a planning issue directly related to project management. It is not just about how many people you have working with ISID to implement the project, but how to manage the available human resources efficiently. There were many reported examples of difficulties with staffing levels that caused excess strain on those working to implement the system and those working on the system;

Make sure that you have-you prepare the-enough manpower that there is enough invested into the workforce not to cut corners in relation to providing the experts and having them on site and I think allocating enough resources; financial and manpower is that critical as buying them. (EXEC DIR MEDICAL SERVICES: 259)

The other thing is when you're implementing the clinical information system human resources is a big issue, because you have to have trained people, trained analysts and team leaders and so on. (CIMS ANALYST-1: 46)

Actually one of the main issues is the manpower at that time... we were actually suffering from manpower; human resources. We did not have enough or adequate network engineers at the department... we were facing a really hard time... in the first three to four weeks of the migration. (NETWORK MANAGER-1: 72)

ISID were good, but I think their problem was there were so many people that they have to teach and there were so many key super users and there were so many problems that there were not enough of them to go around. (KEY-USER PHYSIOTHERAPY: 404)

Despite some shortages in support staff, there was ample management support to ease the strain on staff;

Well actually we had very good support from the upper management and they did understand our status as we have lack of human resources... we were always

compensated for the off-working hours... also to accommodate sometimes additional hardware and software requirements in order to speed up or helping us in the migration process. So we had I could say admin and logistical support from upper management at the migration side. (NETWORK MANAGER-1: 258)

By the time I was here; the team was really-really-really not enough and they did an excellent job. They were like just a few people who were doing the whole systems of the hospital; they did an excellent job, but you need, more staff; they were under a lot of stress. (CIMS ANALYST-5 316)

The ISD people are really overwhelmed. They need um you see they've done a marvellous job given everything that's been going on because the people who are; who developed NG-CPR are not here whether to help us in implementing it and everything is being done or a lot of the stuff is being sort of online or over the phone so it is not like if they were here. (SENIOR PHYSICIAN: 126)

The reported shortages were mostly within the ISID, as most departments reported that they had enough staff either as regular users or key-users;

Yes, actually there was enough manpower. Basically we were two super users in the intensive care unit, which was more than enough to go through all the orders. There were at least for or five people doing the basic training from the technology department. So there was enough manpower basically to do it; yes. (CONSULTANT PHYSICIAN-1: 183)

The main problem with shortages in human resources was that it kept them from expanding services or functionalities to other departments or regions;

The problem really is that this team is spread very thin to meet everyone and everybody's expectations... even during the go-live we were supposed to have 20 people from NG-CPR and we ended up having only three people...and really it was very successful go-live. And I think one of the main issues is to get more people like that... the team, even though it looks big around 20 people, but 20 people is a very small number compared to around 7,000 or 8,000 employees using the system. So the number is really limited compared to the scope and that is really affecting us from expanding the system. (IT EXEC DIRECTOR: 77)

Yes of course we are understaffed. Every module has only one person handling it, so you can imagine the workload in doing so many things for this project... sometimes it will affect the speed of our work, so we cannot deliver sometimes in a timely manner. (CIMS ANALYST-3: 90-96)

Many advocated training and supporting local staff to develop and support the project;

If you plan to utilise and train local staff to carry out the analysis and carry out the process reengineering you must properly support those people with adequate numbers of staff. I think personally utilising local staff to carry out these processes is a great idea. (JF: 300)

8.8.8 Was there enough time?

The general feeling amongst staff was that enough time was planned and allocated for the required steps throughout the implementation. The key to the time element was proper planning. An ISID Director seemed quite comfortable with the time planned for the project;

Well making the deadlines is very important in any project. When we plan any project as I can remember from implementing this project we didn't have any problems regarding the time constraints because there was a plan you can say in many cases. (IT DIRECTOR-1: 313)

If everyone organised his time according to his work then everyone will have the time. If you're not organised there will not be enough time for you ever. (SUPERVISOR DENTAL: 115)

Well making the deadlines is very important in any project. When we plan any project as I can remember from implementing this project we didn't have any problems regarding the time constraints because there was a plan you can say in many cases. (IT DIRECTOR-1: 313)

Others thought that the more time the project took, the better because it allowed people to digest what was happening and to improve their usage of the system;

It took quite a long time but that was good in a sense that there was enough time for people to feel involved and it was enough time for people; at least key users to be aware of all the details (MANAGER LABORATORY: 23)

When asked if time (as a resource) was an issue and if there were difficulties with deadlines, most respondents did not find any problems with time and actually felt that they had enough time to support the implementation. So allowing enough time for the implementation to take place was not usually a source for concern.

We had enough time, yes. (CONSULTANT PHYSICIAN-1: 189)

Yeah, we had enough time for the implementation. (IT DIRECTOR-CIMS: 372)

Even though the CIMS team was spread quite thin, they had enough time to do their jobs;

*For me; for my job its very rare that we postpone some of the requests that we receive unless it's a major issue that we could not solve and wait for NG-CPR for their help; for their comments, but mostly you know we do our job on time. And even with the users are following up on them in order to get what we want to.
(CIMS ANALYST-5: 184)*

Mostly, the reported time constraints were because of the delays;

*One of the problems with the timeframes was that they kept changing and moving and when you have 3,000 people to train and then motivate and then plan staffing too because you wanted to expedite extra people on to support the fact the work will be slower etc. and then suddenly they changed the go-live date; it's a big machine to change it all around and then do it a couple of months later, so the time constraints were related more to delays rather than anything else.
(ASSOCIATE EXEC-DIR NURSING: 155)*

8.9 Summary and Synthesis

The discussion in this chapter was focused on the managerial and implementation; logistical challenges, which are considered by many the difference between success and failure of IT projects (Kurupparachchi, Mandal et al. 2002; Barnes 2006; Aziz 2007; Clegg and Shepherd 2007; Crandall, Brokel et al. 2007; Houston and Bove 2007). These challenges were discussed at length throughout this chapter under several themes, such as project management, planning, training, expertise and skills, resources, momentum and implementation phases. Unfortunately, IT literature does not exhibit serious attempts in studying the implementation aspects of IT projects (Kurupparachchi, Mandal et al. 2002) and especially on projects within the healthcare sector (as discussed in section 2.3). Not surprisingly though, these are the issues typically reported in project management literature. Although the NGHA were confounded with these managerial issues, there was still a generally positive attitude about the success of the project implementation.

The respondents reported implementation challenges on all of these issues, but surprisingly, financial issues were not a dominating topic throughout the interviews and were generally not considered as a barrier to the implementation. This somewhat

contradicts what has been frequently reported in the literature; as budgeting, funding and maintaining the running costs of newly introduced IT projects seems to be a constant implementation barrier (Kurupparachchi, Mandal et al. 2002; Shabot 2004; Houston and Bove 2007).

This inconsistency proves an interesting point. The NGHA experience proves that even when an organisation has ample financial support and the projects is not threatened by lack of funding, it does not necessarily guarantee project success. Simply put, there are some things that *'money can't buy'*. Eliminating financing as well as technological issues (as concluded previously in section 6.10) as implementation barriers reaffirms what has been suggested several times in this paper and within other studies; that is the need for project implementers to focus on the 'human issues' of the implementation. The human issues are those matters concerning the behaviour of leaders and their follows through all phases of the implementation, as well as the manner in which the project was planned, managed, lead and followed.

The planning challenges can be summarised as the need to maintain continuity throughout all phases, deciding how to continue defining the plan for the next phase where there are always changing circumstances and completing one phase before moving on to the next phase. It was only possible for them to work with the immediate plan and it was difficult to foresee too far into the future.

Choosing a phased approach also means the organisation cannot realise all the benefits and see all the improvements immediately, which can be disappointing if a lot of work has been done and there is nothing to immediately 'show' for it. On the positive side, the phased approach could be described as enhancements to a solid foundation that was already in place, and gave people the time they needed to absorb the new changes.

There were also pressures from some users to quickly get the system running after successful pilots, and this sparked the need to build on that positive momentum. The lesson is to strike a balance between the resistance-momentum cycles. So, when there is resistance from users, efforts should be made to remove the causes of

resistance and when there is positive momentum, then energy should be exerted to push through and build on the drive coming from that momentum. Still, it is difficult to devise an implementation model, and the need of such a model has been referred to in the literature (Shabot 2004; Brennan 2007).

Furthermore, and as reported in the literature on most MI projects, it took a relatively long time to implement the project (Kurupparachchi, Mandal et al. 2002; Shabot 2004; Currie and Guah 2006; Currie and Guah 2007; Houston and Bove 2007) and this only added to the complexity of the implementation. Due to these delays, the plan was constantly changed which made it difficult to manage the project. Additionally, they had to deal with maintaining continuity throughout all phases of the project and keeping people motivated for the years it took to carry out the project while keeping the system homogeneous. They also had to be careful not to let the phases segregate the uniformity of the system.

The boundaries between project phases and the main management functions are essentially blurred. It is difficult to describe change management functions in isolation from the main activities of a project (Lorenzi, Riley et al. 1997; Stavri and Ash 2003). This and many other themes throughout this thesis overlap, and change management issues will be addressed thoroughly in Chapter 9. However, in this chapter the issues directly related to the skills that the project managers and implementers should bring to the project were discussed. It is important not to separate change management from project management unless the project management is seen as a purely managerial role, and in this case the project manager is purely logistical and someone else must take on the leadership role. In situations like this it is important not to forget the need for someone to take on the leadership role.

The NGHHA experience emphasises the role of the project manager. Project managers must be able to manage the IT change, have a clear vision and leadership skills, be able to select a suitable vendor, and then negotiate the contract with the organisation's best interest. It is also equally as important for project managers to have both clinical and IT backgrounds. This means that ideally the project should be managed and led by someone who has a combination of project management and

leadership skills; someone who is experienced in healthcare IT implementations, and someone who has both IT and clinical backgrounds. Coupling these requirements with the 'creative' characteristics that enable leaders to handle the ambiguity of the external circumstances encompassing these projects (as previously suggested in section 7.5) makes the task of finding a person with these skills in Saudi Arabia or perhaps anywhere else extremely difficult. What can be deduced is that allocating a project manager with the essential skills is a difficult matter. Ansoff (1979) argues that managers; who have been successful in organisations with 'extrapolative' environments (where the future can be predicted following current trends); are likely to lack skills knowledge, and experience and attitudes required to deal with discontinuous change (where the future is difficult to predict). Success in a discontinuous environment requires entrepreneurial vision, creativity, innovation and anticipatory change. He bluntly argues that managers incapable of developing an entrepreneurial mindset must be replaced. That is what might be lacking in project management or in leaders who attempt to implement large-scale healthcare IT projects.

Training was another theme frequently mentioned throughout this chapter. Training the workforce on a new system is not easy (Hersh and Williamson 2007; Davis and Hikmet 2008). The training alone requires careful planning, and resources. Not only do the end-users need training manuals and qualified people to train them, but they need to have time to take the training and it must be done efficiently and inline with the system rollout. It is not useful to train the users then not provide a system for them to work on. This can lead to a need to retrain them, causing further strains on valuable resources. The key is in planning it well from the start, and that is why it is important to focus on project management and planning for large-scale healthcare IT projects. Training is an issue commonly reported on in the literature as an implementation challenge (see section 2.7.2), however the NGHHA found training to be even more of a challenge because of their reliance on foreign support, and because external circumstances affected their training schedule (as discussed in detail in Chapter 7).

Perhaps the most complicated managerial challenge for the NGHHA was planning amidst dynamic environments. The implementation of a large-scale system may take

years to implement and this happens in a field where technology changes at such a rapid pace that it is difficult to see today where the technology will be in the future. If it takes 8-10 years or even 4-6 years to implement a large-scale project, then it can be extremely difficult to devise a long-term plan for a system when it is impossible to predict its surrounding circumstances and the direction of technological advances. One might argue that it is better to have a long-term vision and aim to achieve it one step at a time; planning for and claiming small achievements as they come along, but that might not actually be a tangible objective in a constantly changing technological world. In healthcare organisations, those changes are coupled with rapidly shifting medical advances that make them even more dynamic environments. If the technology we have today will become obsolete within five years, then it is difficult to decide with any conviction what direction to take. One simply cannot predict, and therefore appropriately plan for such situations with absolute certainty.

The rapid pace of technology causes ambiguity and sometimes organisations cannot afford to tolerate uncertainty. That is the perplexity that healthcare organisations must deal with and it is perhaps the only constant challenge amongst all healthcare organisations when implementing IT systems. It could be more difficult for healthcare organisations than others to condition themselves to work around these planning issues and this could be the reason why many IT healthcare systems fail.

A significant proportion of research has gone into the design of organisation structures and individual jobs have been concerned to find effective organisational responses to those concerns. Most managers feel that the speed of events around them is increasing, and that they lack a sense of direction and a clear view of the way ahead. The perception of change is represented as a contemporary concern. In section 7.5, scenario planning and environmental scanning were suggested as tools that can have a profound impact on organisation strategy and planning, on management decision-making and on triggering creative responses to environmental trends (Huczynski and Buchanan 2007). These tools were suggested because they are useful prediction action planning tools, especially for creative organisational decision-making.

In order to survive, organisations must adapt their internal structures, processes and behaviours to enable them to cope with complexity and the pace of external change. Because of this unpredictability, we are forced to scrutinise the implications of this uncertainty on the way that organisational change is applied.

External pressures on organisations come from globalisation of business, or from developments in information technology and social demographic trends. As discussed in section 7.5; demographic trends can be predicted to some extent, however it is extremely difficult to predict and strategise when it comes to future trends in information technology. It is useful to at least attempt to relate how this unpredictability affects the organisation and decisions on managing technological change. Huczynski and Buchanan (2007) describe environmental uncertainty as the degree of unpredictable turbulence and change in the external political, economic, social, technological, legal and ecological context in which an organisation operates. They further explain that the more the dimensions of the external context are interrelated, the higher the environmental uncertainty.

Robert Duncan (Duncan 1979) defines uncertainty as the lack of adequate information to reach an unambiguous decision, and argues that environmental uncertainty has two dimensions; the degree of simplicity or complexity (simple-complex), and the degree of stability or dynamism (stable-dynamic). The simple-complex dimension involves the number of different issues faced, the number of different factors to consider and the number of things to worry about. The stable-dynamic dimension portrays the extent to which those issues are changing or stable, and if they are subject to slow movement or to abrupt shifts. Based on these assumptions, Duncan argues that an organisation's management decisions are based on management perceptions of the external environment. It is therefore management perceptions; not independent objective opinions, which affect decisions about organisation strategy, structures and processes.

Ansoff (1997) identifies five types of environment, based on the type of turbulence or change being experienced; repetitive, expanding, changing, discontinuous and surprising. Ansoff (1997) argues that we can identify the most appropriate organisation strategy and management attitude for that environment. In a stable

environment, strategy should be based on precedent. What made the organisation successful in the past will continue to work in the future. Also, in a stable (repetitive or expanding) environment, the appropriate management attitude is to seek stability and innovation and change could ruin the business. However, in the surprising, discontinuous and unpredictable environment (like those of IT in healthcare), the recommended organisation strategy is on creative new approaches (as mentioned in section 7.5). In other words, what has worked steadily on the past, cannot work in the future. Ansoff (1997) argues that the management attitude to surprising change must be novelty seeking, helping to shape and influence the environment in fresh new ways. This is the type of management approach and the required leadership that is necessary to cope with the dynamics of massive IT change in healthcare environments.

CHAPTER 9 BEHAVIOURAL ISSUES: LEADERSHIP AND CHANGE

9.1 Introduction

While in the previous chapter I discussed the logistical and managerial aspects of the implementation, here I will discuss the leadership issues about adaptation and constructive change. Still, it is difficult to separate the project management issues from the change management issues, as many of the issues overlap.

Because of the changing nature of organisations; flatter structures, and progress in social equality, organisations are faced with an ever-growing need for leaders not just managers, or managers who can lead. HIS are considered major change initiatives because of the distinct changes they leave where they are implemented. Introducing, integrating or upgrading these systems usually entails significant changes in the business processes and cultures of the organisations that harness them. The first step towards successful implementation is acknowledging that change is going to happen and that leadership is key to large-scale improvement.

There are many elements to producing change, as there are many models and theories aimed at guiding successful change; like those mentioned in Chapter 2. Whatever the chosen model is, change management is a process, not an event, and what I will discuss here are the many processes that came together (and those that did not) to produce this change. Bringing all those developments together was challenging, and many of them had their own complexities.

The NGHAI introduced their HIS and began their journey by spreading awareness and endorsing the new system, educating the users, and involving stakeholders in decision-making. All these steps were essential so that the users felt ownership of the new system and were empowered to act upon the consequent paradigm shifts in their workflows.

There were other issues like harnessing the right skills in the form of project champions, as well as honing the skills of those affected by change. A key challenge

however, was the readiness of people to accept change; or their lack of it, expressed in the form of resistance and opposition.

Ultimately, leadership was acknowledged as necessary for change, improved quality, and better performance and strong leaders with acute characteristics were needed to see the change through. They had to champion the project, define the organisational vision, open communication channels, and inspire and motivate others by leading the way.

9.2 Awareness and Education

Preparing the community, preparing the workforce, preparing the departments for the system; to make them buy in and be eager to have the system with heart... So preparing, education, providing them enough information about it such that they will be asking for it; that would help. (EXEC-DIR MEDICAL-SERVICES: 253)

9.2.1 Spreading awareness

Spreading awareness about the project and its aims before beginning the implementation was reported as the first step in leading the change effort;

The implementer or the IT department should arrange for seminars or awareness days for the end-users to just let them know about the application, take their feedback, take their input and clarify also their needs in the new application; what do they expect from the new application, what are their current issues, what do they want to overcome in the future; these types of things I believe are very very important and they are a success factor in any project, especially a project in a healthcare environment. (NETWORK MANAGER-1: 417)

Before implementing a clinical information system; it's very essential to have a public awareness campaign, to educate physicians and nurses; all clinicians; anyone who's using the system about the importance of this system; why the organisation decided to make the decision to buy a clinical information system and actually the buying in of clinicians, and mainly of physicians is very important before not only implementing the system, but actually before even going into negotiations with-with vendors and I think that's a pretty vital point. (CIMS ANALYST-1: 67)

Going out and team presenting to all the different groups before the go-live was thought to be fairly important and we, when we were out with those people we really did notice an attitude shift. (CARDIAC TECH-SUPERVISOR: 240)

9.2.2 Why promote it?

Many justifications were reported on the need to promote the system, like preparing users, easing the implementation, getting valuable user input, and sharing the values behind it;

We made a lot of promotion before the implementation... before the go-live, during the go-live, after the go-live. All these were promotion for the system... we made awareness to the end-user all over the hospital in Riyadh. (IT DIRECTOR-1: 223-229)

I still think it's very important to promote any system, or any process or anything... months before implementing, because sometimes some comments that come from the end-user might help you in the implementation too. (IT DIRECTOR-1: 253)

The objectives and goals of implementing such systems have to be everywhere in the health system; they have to be disseminated through all people to know this is a major project and without the help of these users or these end-users the system will have difficulties. So if the higher management stress on the values of having such systems and there should be a campaign, there should be presentations to all departments that this is a major change in our organisation and we have to face it and we have to do it in a good manner. (CIMS ANALYST-3: 246)

9.2.3 Was there an awareness campaign?

Having confirmed the need to make the people within the organisation aware of the initiative, the interviewees were asked if in fact there was an awareness campaign for this project. The general responses were that there were numerous and varied awareness and promotion strategies;

There were a lot of awareness campaigns in the hospital. There was presentations in the large auditorium, small auditorium. We had regular meetings with the end-user, and there was a lot of posters and everything throughout the organisation before the go-live... it's been planned many times and presented to them in general and in departments, such as Nursing we meet with them and so on with other departments. It's a public campaign, as I said before every move that we make both the end-user and the higher management are informed... surprises will increase resistance. (IT DIRECTOR-CIMS: 342-354)

Oh yeah, there was a major educational campaign that was done throughout the entire organisation. There were um you know lectures done, there were signs, there were posters, there were emails... there was a lot of information that was out there, there were lectures given all over the hospital, physicians were involved you know to attend some of those, so everyone was aware of it. (DIRECTOR PHARMACY; 151)

There was a big campaign; there were training sessions, there were super-users and presentations everywhere so yeah there was; there was. And a good thing that the end-users; the super-users of those departments were involved heavily in that role in the awareness and the preparation for the system. (CIMS ANALYST-3: 120)

Before going live we used to do lectures and we put posters everywhere... everybody was basically prepared or alert for this new system to be started... so the campaign was very effective. Everybody in the ICU unit was ready for the implementation of the NG-CPR system. So it was not something very strange to them. So it was not a bad experience actually...it was very successful. Again I think the campaign made it much easier for us. (CONSULTANT PHYSICIAN-1: 122-134)

We have the intranet. We have new everyday; new news about when is the go-live date and making people excited about it. With the advertising like brochures and from talking to the people- you know-where people call our department to ask when is the go-live date. (CIMS ANALYST-3: 744)

The build up was there within the hospital as to when the go-live was happening; it was every exciting. (DIR CLINICAL NURSING-2: 161)

9.2.4 A need for more awareness

Despite the reports of all the awareness campaigns that were done, some believed more were needed on the grass-roots level;

We need to have more presentations; more demos so the user really will understand and will understand the vision of the system. So I think this part was not very concentrated on the user. This is one of the-you can say-mistakes or one of the points that we didn't concentrate on. (CIMS TEAM-LEADER: 91)

I don't think enough was done. I mean there were meetings; there were general staff meetings. There were presentations to chairman, but I don't think there was really enough... there wasn't enough campaigning within-down to the grass roots; to the departments; to the clinical people in their workplace. I think they could have done better or they could have done more, but I understand it's the limitation of their manpower that lead to that. (EXEC-DIR MEDICAL-SERVICES: 145)

Moreover, some reported that project delays in a way expunged the efforts that had taken place and a new round of campaigns was called for;

I think that what they did initially was correct. They truly involved the people. There was truly a lot of training, there was truly a lot of raising awareness of what the system was to be about but because of the time-span between raising awareness and the actual implementation of the system these efforts have actually been undone because as I said by the time the system was implemented-the project was implemented a lot of people had already left the organisation that were initially involved. (DIR CLINICAL NURSING-1: 243)

Not as well as we should have really. In the beginning um we did get... the NG-CPR people to come and make presentations; I remember ISD managers making presentations to the chairman's meetings, but that by itself wasn't enough. It needed more and as the system was slow in progressing; the interest wasn't as strong as we liked it to be. (EXEC-DIR MEDICAL-SERVICES: 67)

9.2.5 Educating users reduces resistance

Educating end users was advocated as a means to reduce user resistance and a necessity in achieving a successful implementation;

Well education about the system would help. (IT DIRECTOR-PACS: 347)

So actually in order to get the migration part-if we can say to the fully integrated electronic patient record-the first challenge I think is that we need to educate people. (CIMS TEAM-LEADER: 19)

Part of the change also we actually had to have the education of the student nurses; we have the College of Nursing Education here so we had to ensure that the student nurses and then the interns; and they will be our staff, are also a part of that change. (DIR CLINICAL NURSING-2: 348)

The best way to convince the physicians is education. (CONSULTANT PHYSICIAN-1: 318)

9.2.6 Marketing and sales

There were different suggestions as to how the system should be promoted and what the best approach would be. Many valuable examples were given. One interviewee suggested a focused and individualised approach;

The marketing and sales component is hyper-critical. Now the best way to market and sell something is you can tailor the advertising like Google to the

individual... I think it's very critical to be sensitive when you are doing your marketing and sales to these people regarding the system is to tailor your introductory and as part of these change management exercises we did this... you present something that you know will be very useful to them. This is very very important. If you just show them you know you go here, you do that, without thinking about what they would really like to use it's not useful. (CARDIAC TECH-SUPERVISOR: 85)

We tailored our presentations to our audience yes and I know many of these people on a personal basis so I was able to get feedback from them through various chairmen that I've known. The feedback that I've had directly from them was very positive I mean they felt that that was a big help in terms of getting their staff; many of whom had sort of a negative view of this whole thing on board as more interested now, not as this being an annoying thing but as something that's actually going to help them do their job. So I think that was an important thing to actually engage in. (CARDIAC TECH-SUPERVISOR: 246)

9.3 Involving and empowering users

Involving users was one of the most talked about topics in the interviews with over 160 references made to this topic alone. Although this is neither a quantitative nor content analysis study, significance of this number cannot be ignored. The interest in this topic demonstrates the importance of participatory leadership styles where the stakeholders have significant involvement in decision-making. Mainly, the interviewees strongly felt that the end-users had to be involved.

9.3.1 Involving users is important

It would not have been possible to customise the system to suit the actual workflow of the users without their valuable input;

In our area Patient Services actually I can say that we cannot do anything without their support. So they were talking to us; explaining things so what we are going to do; what we have to do, because they understand their area more than we do. So, being there is a very good idea in order to do the work very well. (CIMS ANALYST-5: 172)

Well again maybe the biggest challenge was the users themselves. Some involved getting their support; their trust was a bit of a challenge. I mean you have to show them something to gain their approval of the system. (CIMS ANALYST-4: 434)

It was widely accepted that user support was necessary for project success;

I believe without the end-user's support you will not have success in your application or in your services. (NETWORK MANAGER-1: 144)

Also the use of the electronic patient record should be user friendly... they should think about when you are viewing the electronic patient record they should be on the reviewer of a hard copy's shoes to do it that way; they should be aware properly about how things really exist with a hard copy so they could come up with a good electronic record and it succeeds when it is implemented. (DIR MEDICAL RECORDS-2: 236)

It was also recognised by many interviewees that it would not have been possible to implement the system at all without the users' support;

People don't realise it in change management is that the educational process and even illustrating some of the problem areas, many of those people that you might involve in the problem might come up with a creative solution. You have hundreds of minds out there that are seemingly agile may think tangentially and may be very creative and help to solve problems and these creative views; different perspectives may come up with a brilliant solution for that problem. So I think it's important to share problems because the solutions could be shared as well. (CARDIAC TECH-SUPERVISOR: 133)

User involvement is one of the important things for any successful implementation... If we have user involvement and top management support from the beginning we-the user will enjoy the system and they will find that the system is useful for them. (IT DIRECTOR-PACS: 383)

If you don't involve the end-users who will use the system and see what would be there needs you won't be able to minimise or will find difficulties you would face when you actually implement the system. Because you need to see the workflow of the departments in the hospital; how things really go. Because I cannot just buy a system really that was made for a culture different than us, like in the United States, and you come and bring it here and you think it's going to work... you should have involved the end-users to see what they can add by giving you information on how they do their work, whether you will modify things for them or you will make them understand how they can modify their work to make the system be user-friendly. (DIR MEDICAL RECORDS-2: 158)

Having the super-users involved with the quality testing of the system and the development... that helped prepare the hospital for change. (DIR CLINICAL NURSING-2: 342)

9.3.2 Involve them from the beginning

User involvement was encouraged from the early stages of the project;

I felt the importance of involving the end-user in any project... we have to involve the user from day one in any project; mainly if you are working in an environment

where the core business for this environment is non IT. (NETWORK MANAGER-1: 375)

I think all departments were involved in some kind of aspect... and then that was used to help select a vendor you... we were involved with some of the interviews with the vendors just to specifically see if it is going to be able to do what we need it to do from again a pharmacy aspect... we want it that when we go to CPOE... we want it to interact with the prescribers... so the pharmacists were working very closely with the NG-CPR people to get that built in. (DIRECTOR PHARMACY; 31)

I'll speak about the pharmacy people because I am heavily involved with them. Yeah, they had meetings before they bought NG-CPR... there were formal meetings and presentations between the Pharmacy department and the NG-CPR people, so the users were heavily involved. (CIMS ANALYST-3: 180)

Despite the importance of early user involvement, some departments reported that they were not involved early on;

Yes all the decisions were made and we were the last to be involved in it, unless they were just saying OK now we are collecting the clinical data information; that's the time we were called; nothing before that. (SUPERVISOR DENTAL; 241)

Yes the users were involved not much with the purchase of the system but with the designing the designs of the screens in the system. So for the admission and the admission assessments screens they were developed with feedback from and input from the end-users. (DIR CLINICAL NURSING-1: 81)

9.3.3 Key-users and key super-users

There was considerable involvement of the users through the super-user and key super-users who were elected from within the departments to liaise with the CIMS analysts;

We contacted all the departments within the organisation telling them to nominate key super-users and super-users... They coordinate, they came to us, we trained them about the system, and they had a good understanding of the system. Of course they are not trained as analysts, they are trained as key super-user and super-user. They understand the system more than the end-user... and they have access to the higher management within their department for decision-making. So whenever we need anything from the department we sit down and discuss it with them. (IT DIRECTOR-CIMS: 312)

Oh yes yes yes yes. When NG-CPR first contacted us through Riyadh they asked for a team from each department so we nominated people and we selected them

and we asked them to collect the raw data. Of course it was an extra job for them but they were a bit excited especially in the lab. (LAB ANALYST: 176)

9.3.4 Building systems based on user requirements

Through the support of the key and super-users, the system was tailored and built around the users' requirements. After the implementation, their involvement broadened to enhancing, testing and supporting the system;

For sure the users need to be involved because actually sometimes you build your requirements based on their needs... the core business is the healthcare so we have to have their input in order to build the new services based on their requirements along with also the strategic planning for the upper management and also with the direction of the upper management. (NETWORK MANAGER-1: 282)

Actually everything we had done was based on as I mentioned based on the users' and the organisation's requirements. (NETWORK MANAGER-1: 345)

9.3.5 Were end-users involved?

A lot of the evidence shows that there was involvement from the end-users' side;

Well, I was a super-user in the cardiac area; I have assisted them with the original specification and that's mostly coordinating with the various sections... it is a relatively complex area to address so when we were working with them we were assisting them to ensure that the various people working in the various areas were properly consulted and worked best to build the documentation for the various areas. (CARDIAC TECH-SUPERVISOR: 12)

Well although it came from ISD, but we were involved. I mean um our lab managers and one of our consultants... we were involved in the project planning from the beginning. At the implementation we were all involved as supervisors and key-users. No in fact there were a lot of positives in the project planning. We were involved. (MANAGER LABORATORY: 232)

However, some reported a need for more involvement by end-users;

I think in an organisation that is so big it is um it's difficult today because there's positive and there are negative effects. I think a lot of people would have wanted to be more involved, because I think it's not as effective as we would want it to be... I just think that if we had more input into the system than it would have been better than what it is. (CLINICAL RESOURCE NURSE: 260)

From my point of view those that were affected were Medical Records, because they were the last people to come you know to the meetings and what happened is

that until now we don't have a pool list¹². (MEDICAL RECORDS DIR-1: 247-259)

9.3.6 Gaining ownership

Not only is it important to involve users to gain their support in designing the system, but it is also important to involve them so that they feel ownership of the system. The system was built by them for them and if they feel that it is in their best interest for it to succeed they will embrace its success as their own and strive to achieve it;

If we didn't involve the physicians in the beginning and if the user or the physician didn't gain the ownership of the system they would feel that it's a system that we need to implement but he will not value the system. So this is actually one of the important factors; it's to engage the user from the beginning... if we go and step back actually the user should be involved prior to the vendor selection. (NETWORK MANAGER-1: 19)

Also the users should gain the leadership and ownership in order to value the system. (CIMS TEAM-LEADER: 319)

The decision-making is an end-user decision-making capability. They have the ownership of the system. We just customise the system to fit their needs. (IT DIRECTOR-CIMS: 312)

IT project success should be for the users; not for the IT department. The feeling of the success should go back to the user and that would make people less resistant to the change and more on-board with implementing... if the project is a success the user gets the credit, but if it's a failure, the IT people get blamed. (IT DIRECTOR-2: 482)

9.4 Expertise, Skills and Knowledge

Skills and expertise are concerns that could have been presented in the chapter on managerial issues (Chapter 8) just as easily as they are presented here. It is not easy to classify and label where every issue falls. Most of them actually overlap, and presenting issues in different sections is only a way to get the story across in a structured manner. I chose to discuss the skills of the project managers in the previous chapter as a managerial issue, while I chose to discuss here the issues surrounding the skills and expertise of the CIMS analysts, the key-users and finally,

¹² A list of all patients scheduled for the next day is printed by ISD then sent to Medical Records to pull the records and send them to the clinics.

the end users. That is because the skills of these three groups had a direct influence on the acceptance (and resistance) levels of the system and how well it was ultimately implemented and received.

9.4.1 Difficult to recruit CIMS analysts

Most of the CIMS team members did not have IT backgrounds, rather they had clinical backgrounds and they decided to use their clinical expertise to contribute their skills to the project;

We need to understand that the implementation of such a system is not like a pure IT project, but rather like a clinical project or a management project. There is a grey area actually, that is why we have the health informatics or the clinical information system management area or any other area, because we need to combine these skills, the clinical, which means the business understanding...as clinical analysts we need to have the background of such areas. (CIMS TEAM-LEADER: 133)

However, it was not easy to find suitable analysts, who had the necessary skills, and who were willing to leave behind their clinical roles. For this role they needed people who have clinical backgrounds, who understand the workflow and the needs of the users and at the same time can understand and appreciate the technical difficulties associated with this type of work;

It's hard to find people with clinical backgrounds to go and work for ISD. (DIR CLINICAL NURSING-2: 119)

Once they find these clinical people, they have to convince them to join ISID and leave their previous routine. This presented an additional layer of difficulty. One analyst shed some light on the challenges of recruiting CIMS analysts for the project;

I wanted to hire two clinical analysts. The problem is that if he is a fresh student he will not be really understanding how can a pharmacist work in the IT department or the Health Informatics department, because he says 'no this is not my job', my job is a clinical background just to work in the medical or clinical department'. These are the fresh students. If we go to the senior pharmacists or senior medical staff, he says 'no I've been working 5-6 years in the field. It's difficult to change my work, my background to the IT, and actually I don't know IT'. So you know this is difficult. (CIMS TEAM-LEADER: 139)

Out of all the clinical analysts, it was reported that it was the most difficult to find physicians to fill this role;

I want this feeling to be cultivated in the physician. Maybe the physician is the most difficult because you know the physician will NEVER leave his job. (CIMS TEAM-LEADER: 157)

9.4.2 CIMS analyst skills

CIMS team members should ideally have good communication skills, an understanding of the end-users' needs and business processes, and also ought to have good leadership and change management skills. Examples of these three criterions were reported in the following interview excerpts;

Communication skills:

So one of the important factors for the CIMS analysts before starting to deal with the users is to have good communication...this is a very very important factor. Communication with the user, educate with the user, understand their needs...so you know communication skills are very important for the team analysts, for the project manager, and for anyone who is dealing with the project. (CIMS TEAM-LEADER: 241)

Change management skills:

If I want to manage the change I need to understand the user expectations and to involve the user and so on. That was about the communication between the user and the CIMS analysts. (CIMS TEAM-LEADER: 241)

Understand the work processes:

Our role was to collect the data, explain the function in the system, train the user and that's it. We didn't look at it from a different perspective as this process is 'changing' the workflow so we need to understand the people's needs, we need to understand their emotional needs sometimes their social needs, sometimes they are working over time so this part should be considered under the change. (CIMS TEAM-LEADER: 253)

9.4.3 Why clinical (not IT) analysts?

It was reported that training analysts with a clinical background on IT skills was much easier than training people with IT backgrounds on the business processes of clinical work. It was not easy for them to teach someone with an IT background how to be a nurse, a physician, a pharmacist because they could not make that person

truly understand and effectively lead change in an area that he or she was not familiar with;

You are dealing with clinicians... if you want to communicate with these people you have to understand their language.... you have to have their mentality... you cannot have an IT background and talk to them. The best thing is to have people with clinical backgrounds. These people can be trained on the role of an analyst, which has a very minimal requirement about understanding IT applications. Most of the requirement for an analyst for the implementation team member is to have the logic, communication skills, speaking the clinical language. (CIMS ANALYST-1: 108)

It would be best to have someone come in who is process oriented and could look at...processes and talk to people and find out how they all fit together rather than separate bills to that. (ASSOCIATE EXEC-DIR NURSING: 239)

IT people cannot do the change management, the change management has to be done by the business people; by the people who know the business and the business flow and the workflow within the business unit. It would be very much easier to bring a pharmacist and train him on how to implement the system and have him lead the implementation than to bring an IT person and have to train him on pharmacy and medicine or radiology or lab and everything without a clinical background. (IT EXEC DIRECTOR:180)

It was there decision to take individuals of intellect and ability within the institution and train them to carry out these activities. Now I think that was a great idea. In many respects I think, it was picking people from you know like admin and others that were working in the clinical areas that were familiar with the workflows in the areas. They understood a lot of what was going on in the hospital, they knew people. So a lot of advantages to that situation... he's also able to communicate with a lot of people and get things done. (CARDIAC TECH-SUPERVISOR: 151)

9.4.4 Key-user skills

After careful selection of the CIMS analysts, the key-users from various departments also had to be selected. They had to have certain characteristics that enabled them to carry out their role. They were selected based on their competence within their departments, their level of computer literacy and their familiarity with the business processes of their own departments:

First thing, before you get it you have to choose people from each area that understand computers and know their jobs. Like, from Rehabilitation, get a person who knows Rehabilitation and understands computers. (KEY-USER PHYSIOTHERAPY: 470)

Part of the our job descriptions are for different levels of nurses to have different capabilities for the computer and for nurses who were going for a promotion; it certainly in the beginning stages of identifying if they were super-users or key super-users. (DIR CLINICAL NURSING-2: 282)

9.4.5 End-user Skills

Lacking basic computer skills made some people reluctant to use the system. There was a direct correlation between a person's level of computer skills and the resistance or excitement about using a new system;

One of the impediments was that the institution wasn't um um physicians and clinicians and so on really aren't that computer savvy to start with so that was a factor. Maybe if they had flooded with the institution with-with some hardware to do whatever it is to search in the literature or-or even to play with their emails and so on, that would have helped... to get people interested into this new technology you should let them play wit hit they way they think their needs are whether it's a game or hotmail or internet or whatever. (EXEC-DIR MEDICAL-SERVICES: 265)

In some cases we had individuals who were recently returning from places like Mayo Clinic and Stanford University... I mean these guys I mean for them it's just like 'yeah it's an electronic record', so for them it's like 'yeah I understand just show me how to use it', and they're totally used to it and they're like OK CPOE, yeah lets do it and there's no problem because they were using those systems. (CARDIAC TECH-SUPERVISOR: 282)

9.4.6 The newcomers

People who recently joined the organisation did not show resistance to the change. For them there was no change because they did not know what it was like before, however it was sometimes more difficult to train them when they did not have basic computer skills and were not familiar with the business processes;

And again that was also um that was difficult because some of them were new; in fact two of them had just joined the lab and they came from non computerised laboratories overseas. Now, that was good in a sense that they don't have um resistance to change because they are not used to our old system so they are open, but the problem was that their computer skills were not sufficient to absorb the information of the knowledge as quick as the others. So that was the challenge in fact. (MANAGER LABORATORY: 17)

It is equally important to recruit people who are familiar with healthcare systems as it is to recruit them on the basis of their ability to provide patient care;

To invest in people who are knowledgeable in nursing informatics rather than just someone who just either has the computer skills or is a good caregiver because you need knowledge of what the system is capable of or what is required as well. (ASSOCIATE EXEC-DIR NURSING: 239)

9.4.7 Command of English

There were also some users who did not have a good command of English, and that was another difficulty;

One of the difficulties was people who don't know English. We should teach them English first then teach them how to use the system, because it was hard for them-you know-to memorise things in the new system how the process goes and things like this. (CIMS ANALYST-3: 199)

Third, is the language barrier. Most of the Physicians; English is a second language to them...I'm seeing that, because I see it now with the hard documents and I see it when they dictate and that's really an issue; it's a painful thing for them. (DIR MEDICAL RECORDS-2: 59)

9.4.8 Technology savvy areas are more compliant

Technologically advanced and educated (who were already comfortable with technology and computers) were reported as less resistant;

The departments that use fast growing technology and have to implement a new thing every now and then; those are the least people who will resist change and are always prepared for change. However, on the other hand when you look at other departments that use papers and just follow on old systems or policies in terms of in their day to day applications, those probably will be more resistant to change and because they-the nature of their work does not actually change much. (MANAGER LABORATORY: 95)

If you are talking about physicians in tertiary or ternary centre like this or like ICU or Cardiac Centre or IMCU; these are super smart and they deal with technology and they deal with-with IT and literature and so on and they relate to what technology can do for them and makes life easier and better for them versus physicians who are in practice for example, who are used doing-handling a certain number of patients, doing it in a pretty efficient way manually. (EXEC-DIR MEDICAL-SERVICES: 199)

9.4.9 Generation gap

Some physicians reported difficulties in getting the older; more senior physicians to change their habits and accept the new system and the changes it brought;

The other thing is there is a lot of resistance to change and fear of computers still, particularly in some of the older staff... who perhaps haven't grown up with computers. (ASSOCIATE EXEC-DIR NURSING: 65)

I think part of it generational and part of it is attitude. But the attitude is probably a reflection of the generation; it's also generational... if you talk to the older generation, they are still; most of them think that this is not a physician's job; this is a secretarial/nursing job. They younger ones; it's part of their lives. (SENIOR PHYSICIAN: 246-252)

Despite the reported difficulties in training older medical staff, they eventually complied and learned to use the new system and became active participants in the implementation;

The younger physicians are keener and more easy to train, but even older physicians are participating actively. (SENIOR PHYSICIAN: 78)

Well the more older; the more senior are-are more set in their way of doing things and somewhat resistant to um to exerting the extra effort or energy in order to learn the new systems. But it really isn't across the board I mean some chairmen are progressive, but I would say that most of the clinical medical chairman they had difficulty with learning the required skills in order to implement the system. (EXEC-DIR MEDICAL-SERVICES: 61)

The older people do want to learn and use the new system, but it might just take them a bit longer to get comfortable with it because they have been practicing a certain way for so many years. It helps if there is an understanding of their needs, to give them extra support so that they can learn something new;

Now some of the other people who maybe did their training maybe 5 to 10 to 15 years ago, obviously there's a longer timeline for them to assimilate the technology... it's always harder for older people; you know. . (CARDIAC TECH-SUPERVISOR: 282-288)

You see eighty-year-old women and men writing emails. I'm sure that they were learning that in their fifties and sixties. So really anyone can learn and most of our people are learning people... and yes it's a little bit awkward for them to

change their practice, but all of them have ultimately come on board. (CARDIAC TECH-SUPERVISOR: 294)

The evidence shows a need to address the generation gap issue, as implementers must show more understanding for users who have worked without computers for most of their careers.

9.4.10A local; independent team

The external technical challenges discussed in Chapter 7 and the support issues caused by the unavailability of local support by the vendor were caused by reliance on the expertise of external vendors and not having a skilled local team. The interviewees expressed a need to rely less on foreign skills by creating a local trained team to become completely independent. That is what the NGHAs were aiming to achieve;

The only solution is to be independent and that can be done really through proper training for a local team. And think that is what we have been doing for the past three-four years. We have established a unique setup...we were the first to start such a setup where creating a department of health informatics that is really composed of people from the business units... that setup I think is working fine and I think by adding very good IT people to this group I think we have established a lot... we would also like to change even our mode of business with NG-CPR that 'we cannot be heavily dependent on you for a very long time'. So what we would do really is to utilise NG-CPR for training us. We would like to transfer as much of the knowledge to our team... 'Train us, let us be dependent on ourselves and reduce the dependency on you and your team'. So we are trying now to really to seek different ways to implement such systems. (IT EXEC DIRECTOR: 77)

When asked how overreliance or independence from the vendor could be avoided, the general response was that they needed to train a local team with the necessary skills in cooperation with their vendor, and that had already been their plan;

It could be by training our analysts and become at least 80% independent of NG-CPR. To train them the same way NG-CPR train their analysts... it's being planned... this is part of a plan that has been agreed between us and NG-CPR to train our analysts as well as to train our IT people. (IT DIRECTOR-CIMS: 414-420)

9.5 Change Champions

Organisational change requires more than management or even leadership. Change will be most effective and lasting when people who believe in and are passionate about whatever the change is champion it and nurture its development. For more effective change, many within the organisation must stop managing the change and began to champion it through the commitment, devotion and hard work of those who believe in the cause and can proactively make the change happen. They motivate people and create a sense of urgency for the cause. At the NGHHA, those champions were the CIMS analysts, the IT project managers and the many key-users and end-users within the departments.

9.5.1 End-user champions

There were many champion users who believed in the cause and proactively influenced the way that the change was implemented by their personal commitment, by leading the projects and by motivating others. There were the physicians, end-users and nurses, amongst many others;

So in order to have a good system implementation again we need to have the physician champion to lead their part with CIMS help. (CIMS TEAM-LEADER: 169)

As I told you there were some super key-users from Dental who worked side by side with Patient Services to help with the go-live. (SUPERVISOR DENTAL; 187)

The pharmaceutical care department said this is a priority whatever it takes over time whatever because we are we believe in it that much that we will do whatever it takes for that. (DIRECTOR PHARMACY; 85)

Oh yes absolutely! You know but I think and we tried within the department to be very very positive because we wanted that to reach down to the staff. You know I would meet with my assistant directors and the supervisors and everything that you know and again when we go-live it's going to be rough but we are going to be there together; we're just going to order in pizza and chicken and whatever and everyone eat together and we'll get through this...we would also share information from the literature about the whole the benefit to the patient care; of why we're you know embarking on this and so we hit it from all the positives. We knew there were going to be negatives, but you don't dwell on that you just keep focused and you keep moving forward. (DIRECTOR PHARMACY; 238-241)

I cannot do anything without the user-you know-I really can't. Like, even if there is a problem I have to go and see what is that problem with the user...that's why in the start, I asked the user to be with me step-by-step, because they are the ones who know the rules, and they are the ones who know the work. (CIMS ANALYST-3: 374)

If you take the chairman of ICU, he is um he's a champion and there are champions in every department; in the Emergency Department there is a guy who runs the um; who is in charge of the Quality Management there and the Chairman of Cardiac Sciences, so there are-there are chairman and the Medical Director here is also, is very much um a champion. (EXEC-DIR MEDICAL-SERVICES: 223)

9.5.2 Super-user champions

There were also the end-users who had the additional role of super-user. Many considered them the true project champions and their efforts were described as important for project success;

I think the people that were specifically used in the beginning to train the others we called them key super-users I think they were the champions to implement the system. And they felt positive about it actually. (DIR CLINICAL NURSING-1: 219)

As super-users of NG-CPR, we tried to be the leaders implementing NG-CPR. We were available all the time so answer all questions regarding NG-CPR from anybody. And again during the first month of the implementation we had a technology person who was available even 24 hours in the intensive care unit to answer all technical aspects of the NG-CPR. So having a leader; having somebody in charge made things easier. (CONSULTANT PHYSICIAN-1: 146)

I always find them you know and really they are very helpful when you want any information or any help they're always there. I'm really saying the truth about the users. And there are key-users or key people who are very helpful and I wish we had a lot of them. (CIMS ANALYST-3: 402)

9.5.3 CIMS champions

The CIMS team portrayed a high level of dedication and support for the project. For example, I was surprised to hear from the CIMS analysts that they did not get any training from NG-CPR. I saw the application and modules myself and I when I interviewed some of the CIMS team members I was under the impression that they had received training from NG-CPR. I was amazed that they did not get the training

because the skills and level of work that was put into the application and modules would give the impression that they had.

Yes, everybody is surprised. Also, the CEO actually we got a letter of appreciation-a letter of recognition from him because he was surprised that we trained ourselves, we made the manuals; I know it was a little bit stressful for the analysts, but you know sometimes when we cultivate any trees that we'll find the results later will be the right branch. (AB: 115)

Yes, everybody is surprised. Also, the CEO actually we got a letter of appreciation-a letter of recognition from him because he was surprised that we trained ourselves, we made the manuals; I know it was a little bit stressful for the analysts. (CIMS TEAM-LEADER: 115)

The CIMS team also agreed to work remotely with the vendor under strenuous circumstances and with limited staff, yet they saw the change through. A reasonable conclusion from this is that the CIMS team put in a good effort and showed a high level of dedication and motivation, as evident in the interviews with them and with others that they had worked with;

So, most of the problems they were overcome by the hard work and commitment of the CIMS National Guard Health Affairs team...it's by our strong effort to work remotely and to work under any condition, so see the whole project a success. (IT DIRECTOR-CIMS: 390)

No, I have more grey hairs than when I started, sleepless nights, but thank God, I think it's a project worth being involved in on all levels of it; yeah. (IT DIRECTOR-CIMS: 630)

9.5.4 Reward recognition

Recognition and appreciation are widely accepted as top motivational factors. They are key sources of the fun and excitement, will to win, desire to belong, and passion vital to continually improving performance. NGHA leaders used many ways to build an atmosphere of success, accomplishment, and pride through recognition and appreciation;

Any type of benefit for the ones who work on the new applications or the ones who will be nominated as the best user of the new application on a monthly or a weekly basis. These types of things I believe would help a lot to decrease the user resistance. (NETWORK MANAGER-1: 156)

It's very important. You know you have to motivate people. People say oh you're going to pay people more money and that sometimes helps a little bit but really what fires people up is that they get recognised you know they like to just be seen as being able to have contributed something. Maslow's hierarchy; self-actualisation, you've got to get a little piece of that in the equation for people and this really helps a lot and people may become very very involved when they're appreciate and go the extra yard and maybe go an extra hundred yards for you. (CARDIAC TECH-SUPERVISOR: 145)

It's a very important aspect of teambuilding, to ensure that people are rewarded as part of the system and even in the change management processes to incorporate rewards within the framework of the change management. You know recognise the people who are helping out a lot and recognising users even who are coming up with great new ways to use the system and ideas and things like that. So to some extent there was that in the system, to the extent that you realise that this is a massive deployment and rewards do not necessarily have to come from the very top of the authority on change, it could be just from your colleague, but it's... sort of um approach philosophy of how you are approaching the project. If people are approaching it from a positive view then you're going to find people being positive with each other and reinforcing each other, sort of trying to create that culture in the environment in deployment. (CARDIAC TECH-SUPERVISOR: 139)

After seeking out the best suitable people to champion the project, the NGHHA senior leadership supported them by recognising their efforts and rewarding them, so that they could in turn nurture the implementation;

As a key super-user, he will be well recognised from the project team. He will join the team, the implementation team. He will receive the recognition by the organisation by a good letter or maybe a present; all kinds of things. (IT DIRECTOR-2: 377)

With NG-CPR I think; one of the comments I was going to make is that there were many, many people that were very enthusiastic and very hard working and they worked very long hours, some of which were paid, for some individuals they were not, but nonetheless they worked a lot of extra time to make it successful, so I think in that regard it's going to be very critical when you mention the people OK it's those people working all those extra hours that made things work. (CARDIAC TECH-SUPERVISOR: 342)

9.5.5 Leading by example

Champions also had a responsibility to lead by example. The champions with senior roles had to be supportive, motivate, create a sense of urgency for the cause, portray a positive attitude and facilitate the change. In other words, they had to lead the change by being transformational leaders;

Be supportive;

Actually we were blessed with the CPOE go-live. The ICU Chairman; he is one of the champions actually and he did believe in the system which made things easier for the ICU... He is very supportive; very very supportive. And that was really important and it plays a very important role to ease our jobs and people's acceptance. (CIMS ANALYST-4: 284-308)

Facilitate the change;

Yes in nursing certainly we had some major champions for it and I think really that's what helped with the motivators that we had in nursing. And you know we're all very much committed to it as a Nursing executive team and then we pulled people out, we allowed them the time to become committed. So we pulled them out of direct care, we gave them the titles and recognition for doing additional work related to it and we tried to make it something that was seen as an exciting project for them so that they could actually be motivated with the staff that they came in contact with as well. (ASSOCIATE EXEC-DIR NURSING: 83)

Create a sense of urgency;

But I think the bottom line is that the generation of the sense of urgency. Early in the project there is a great sense of urgency and I think that later in the projects the same sense of urgency and enthusiasm is very difficult to maintain and it's critically important to have a kind of cheer leader if you want to call it that or a kind of person who is let's just say um...a champion that really is enthusiastic about it, that gets people fired up because you have to motivate people to do things. A lot of these things are very tedious and boring to work on. (CARDIAC TECH-SUPERVISOR: 24-30)

Motivate;

Having the leadership role was very very important because it helped to motivate the buy in of everybody and it's not just the commitment of signing a piece of paper; you have to be out there and talking about it; enthusiastic about it and you know working with people and listening to why they thing there's problems with it etc. (ASSOCIATE EXEC-DIR NURSING: 173)

Be positive;

You know you can take that and say everybody has to be retrained and they delayed it and you know what? I would take a totally opposite point of view. Thankfully we have another chance to take another session to learn more so that we are more ready for the implementation. We have more time to help people really understand the system. We have more time to market it properly but again it has to be done with the right attitude. If anyone goes in with a negative attitude on this and says 'oh this is wrong and that is wrong and everything else' this is not the attitude that solves problems. This is an attitude that creates problems. It creates a problem because what occurs is that people are actually infected by that attitude. So a critical piece of change management is to maintain momentum and enthusiasm.

9.6 Leadership

The discussion in this section follows the discussion in the previous section on leaders championing change. The topics here again overlap, so this section should be considered a continuation of the previous one. Here leadership issues will be discussed on more detail.

What the evidence shows is that change should be lead not managed, and a combination of transformational, supportive, and path-goal leadership styles were evident in this implementation as the following accounts portray.

9.6.1 Supportive leadership style

When work is tedious or stressful, leaders took on a supportive leadership style, by considering the needs of the followers, showing concern for their welfare and creating a friendly working environment. This includes increasing the follower's self-esteem and making the job more interesting as was evident from the interviews;

Really they were very supportive in all the stages... everything we need to make the system a success, they tried to give... management was really a big help; without their support-it's really-we would not be a success. (CIMS ANALYST-3: 334-327)

Because the project was supported from higher management so as I said everyone was helping us. (CIMS ANALYST-3: 54)

Well that's one of the most important things; the leadership and the management support. And we were very fortunate to have a very strong management support; a manager that was supporting us all the time and backing us, because this is not an easy plan or an easy project to go with, right? So yes we did need support and we did have it. (CIMS ANALYST-4: 152)

Well actually we had very good support from the upper management and they did understand our status as we have lack of human resources. We had really good support from them. (NETWORK MANAGER-1: 258)

9.6.2 Transformational leadership style

As mentioned in Chapter 2, transformational leaders are positive and have the ability to motivate others through personal charisma and influence, by inspiring others and

motivating them to make the change and with attention to individuals. There was evidence of this type of leadership style through the interviewees' accounts;

The person in charge might address this issue to the people who are working with him; if he is negative then nothing will be implemented. I used to tell this to the staff who worked with me during the go-live. I was so positive and they looked up to me and they did the same thing that I did. (SUPERVISOR DENTAL; 331)

But then again you speak of the issue of change management and it's a matter of attitude and leadership and attitude is critical. (CARDIAC TECH-SUPERVISOR: 133)

Having the leadership role was very very important because it helped to motivate the buy in of everybody and it's not just the commitment of signing a piece of paper; you have to be out there and talking about it; enthusiastic about it and you know working with people and listening to why they think there's problems with it etc. or why they think it's challenging and seeing what you can do to try to address those. (ASSOCIATE EXEC-DIR NURSING: 173)

9.6.3 Path-goal leadership style

Leaders were also described as having a role in helping people define goals and then reach them in the most efficient way; in other words they took on a path-goal leadership style. As discussed in Chapter 2, mainly path-goal leaders helped clarify paths for the users to achieve those goals. They helped them define goals, helped them remove any obstacles along the way, and provided support and encouragement for achievement of goals.

I think you know they couldn't have been involved directly. I think it was primarily a moral support happening and also to ensure that there is sufficient quantity of staff; to do the implementation and the support thereafter. (DIRECTOR PHARMACY; 73)

They were very supportive really for all the needs that we require for the system and we haven't faced any problems in this regard. (KEY-USER INPATIENT PHARMACY: 225)

The organisation actually supported the fact that it was a huge change for the staff and that they had to be released so that they could function and work on the computer system and helping nurses or anyone and to make that change. So it worked because we were supported and we had the structure within the hospital. (DIR CLINICAL NURSING-2: 143)

Support... leadership has a major role whenever we face any issues and um it is beyond our control and resolution we have to present to the leadership for them

to assist in the resolution of this issue; either and internal or external issue... They were very supportive. (IT DIRECTOR-CIMS: 270-276)

9.6.4 Leadership from the beginning

It is too late to convince people of change when you are in the middle of implementing it. People need to be convinced (and led) at much earlier stages and this is when strong transformational leaders are needed to voice the vision;

The planning phase is the most important part where you need the leadership, and because the role of the leader is to minimise the users' resistance; which is expected in any project that deals with change. When you are implementing it's too late to convince people, it's too late to gain the buy-in of users. (CIMS ANALYST-1: 102)

Along with top management support we should address the change management from the initial phase of the system planning and I believe adequate training and these are factors to affect usefulness of the system, ease of use of the system. If we have user involvement and top management support from the beginning we-the user will enjoy the system and they will find that the system is useful for them. (IT DIRECTOR-PACS: 383)

9.6.5 More could have been done

Some interviewees felt that more participative leadership from senior management and more preparations for leading the change would have been beneficial;

Some of it couldn't have been helped; some of it, but more involvement and more active effort on the part of the governance; on the part of the leadership; on the part of the board. I think the board of directors which is the Health Affairs Council wasn't as proactive and aggressive and-and um and um knowledgeable and emotional about the system to push it when things got slowed down. There wasn't a very strong push on the part of the leadership. I think we could have done more as of putting pressure on the vendor and allocating more resources to the um to the system. (EXEC-DIR MEDICAL-SERVICES: 73)

We were not leading, we were not prepared to lead the project as implementing change. Some of them they were aware that it's a change process, and they had to manage the change, but in implementing the change there was less preparedness. (MANAGER LABORATORY: 226)

9.7 Vision

9.7.1 *Conceive the vision*

A reasonable conclusion to draw from the accounts is that to successfully lead change, leaders must conceive and communicate the vision for that change. People need to know where they are headed. The organisational commitment and the objectives behind implementing the new system must be transparent to everyone in the organisation so that they have a clear goal to work towards;

There was a clear message that the institution is committed to this. That was very important in getting the message across. (SENIOR PHYSICIAN: 408)

The overall goal is to improve patient care as well as to decrease healthcare costs. Or in other words to control healthcare costs... the most important thing is to improve healthcare first, yeah because the healthcare organisation is patient-focused. So the most important thing is to improve healthcare at the same time to control healthcare costs. (IT DIRECTOR-CIMS: 30-36)

9.7.2 *Communicate the vision*

When some users were asked why this system was being implemented, they were not sure about it, so it is not enough to just have a vision; that vision must be communicated well to everyone;

Project management has to be spelled out right from the beginning... a lot of people when they implement systems; they forget why they are doing that, so they forget what was the problem statement and that is something that I tried to change. (IT EXEC DIRECTOR:168)

9.7.3 *What was the vision?*

There were many expectations as to where the new system would take them, like improving services, standardising processes, and improving patient safety;

First of all we wanted to really unify and standardise the clinical operation process among four hospitals... secondly, we would like really to reduce the time the patient has to wait for an appointment or for medication and through the proper use of the system and we wanted to have an electronic medical record for all the patients... we wanted to have electronic information being used by all clinicians and by all healthcare givers, and the patient becomes the focal point of this information exchange among all the clinicians. (IT EXEC DIRECTOR:24)

On improving services and processes, the response was;

It' a step forward for improving the services overall and also to have what we call a paperless media to make the process of ordering medications as easy and as safe as possible. (KEY-USER INPATIENT PHARMACY: 26)

They expect from this HIS that it will increase the patient confidentiality, it will reduce some of the costs of the paper, of the labour and it will add more value clinically in the lab systems, in the pharmacy systems and even in the physicians in the diagnosis and other issues related to them. So I think the overall goal of this project was the trend; the trend of healthcare systems is towards HIS, so this is my opinion but I think one of the other things is that they also want the organisation to be a paperless organisation. (CIMS ANALYST-3: 108)

One of the main reasons is so that we can have one system for all regions. (LAB ANALYST: 98)

On Improving patient safety, the response was;

It was positive as I said. The goal is to improve patient safety. There is some data and some research to support the use of electronic ordering systems in the medical literature. That is our goal and that is what we should achieve. (CONSULTANT PHYSICIAN-1: 219)

This is very important, as well as to improve patient care... one of the main goals. The electronic patient record this is the main major goal. (IT DIRECTOR-CIMS: 72-564)

9.7.4 Aligned with the organisational vision

The reasons for implementing the new system, or the EHR and its vision should be aligned with the broader organisational message; which is to improve patient safety. That way it will not be perceived as an IT initiative because they will see it as part of the overall vision of improving patient safety;

If you have good information and you have proper processes in the system this will enhance the patient safety... this should be the vision, because now if we see the mission statement it states that... our vision is to enhance and provide the patient with the proper facilities, with good patient care. So the vision should be aligned with the higher vision of the management... how the system is going to improve the patient care through good capturing of the information and after that you get the benefit of the system. So this should be the vision. (CIMS TEAM-LEADER: 235)

9.7.5 The vision was not clear

The vision was not always clear to everyone, or it was mistaken for a different vision. Some thought that the purpose of the EHR was just to automate processes without any mention of patient safety;

So to be honest... our message was just to automate the system, no papers, just to give the technological advance that was the worldwide trend. So, maybe that was the message, maybe the vision was not clear and it was not aligned with the vision of the organisation. (CIMS TEAM-LEADER: 235)

So the objectives and the education about the project was not optimal. I think clearly when you show people that the reason for doing this is so and so then they will be more receptive about the idea. (CONSULTANT PHYSICIAN-2: 312)

9.8 Communication

The application analysts were always there. They always heard the complaints; the comments. They were always able to correct them or at least modify them and listen to all of the concerns, and being honest and direct with their communication. (CIMS ANALYST-4: 254)

9.8.1 Communication skills

Project leaders ought to have good communication skills as mentioned in the previous chapter, because a major factor in leading change is knowing how to maintain a good relationship with the users and super-users by maintaining good rapport;

If we have good communication with them and if we delivered the message to them in a right way; we tell them 'we know this is a hard job, but if you did it right believe me you will be in a feasible condition later because this information will help you after one year. So this is one of the important communication skills is to understand their situation and after that how to deal with it... this is a very very important factor. Communication with the user, educate with the user, understand their needs... communication skills are very important for the team analysts, for the project manager, and for anyone who is dealing with the project. So this is one of the important factors; is the communication with the end-users. (CIMS TEAM-LEADER: 241)

Having clinical expertise when dealing with the staff; this can push start the communication with them, but again even if he is not clinical he should improve his communication skills before starting to deal with the user and he should expect what is the user's reaction going to be; this is part of change management.

If I want to manage the change I need to understand the user expectations and to involve the user and so on. That was about the communication between the user and the CIMS analysts. (CIMS TEAM-LEADER: 241)

9.8.2 Open different channels of communication

By educating people and opening communication channels, they will be more receptive to change and it will help guide a smoother implementation;

The best way to manage change is to educate people and open channels of communication. Don't make any sudden moves; poke your way through. Inform them about anything that you are doing and the reason that you are doing it. (IT DIRECTOR-CIMS: 24)

Task forces or committees are a good forum for communication and discussing problems as they arise;

Things like that have been discussed in this committee, but that's a good communication channel for all departments to look at problem solving...I think for the implementation as I said the daily meetings that were held pre-go-live and during the go-live enabled communication to be open and issues to be resolved before they became issues. (DIR CLINICAL NURSING-2: 209-221)

Creating a user support centre is also another way of opening communication channels with the end-users and making it easier for them to report and convey their technical problems;

ISD at that time was involved in the implementation of the clinical information system in two ways. One way was in providing support to end-users, which is enhancing the ISD Help Desk, ensuring that the end-user can find the information he needs through a command centre, which we generated to receive the end-user calls regarding the system go-live. (IT DIRECTOR-1: 25)

9.8.3 Communication was good

The majority of interviewees were happy with the communication on all levels; communication between the different ISID teams, communication with the end users and communication with the key-users;

There was good communication between the IT people and the lab people; yes there was at least for the lab people because everybody was involved, we

informed everybody. Most of them came to the auditorium when the NG-CPR people came and they asked and they answered them and everything so there was good communication. (LAB ANALYST: 329)

Intercommunication between the departments and ourselves was good. Even from the ISD in having provided the hardware and network, it was really good. Except for the NG-CPR part which was somehow um; in the emails it was somehow good, but not physically, by the emails only it was not bad, otherwise it was not good. Also communication with the departments involved with the implementation of course we have ups and downs, but mostly it was a good one. (CIMS ANALYST-3: 78)

Actually we had after starting to implement the NG-CPR we used to have regular meetings with the technology people to try to fix everything. Most of the problems we had before are resolved now; most of them... I mean communication was perfect. (CONSULTANT PHYSICIAN-1: 116-213)

9.8.4 Communication was bad

Still, there were reported communication problems. For example, in attempting to resolve important matters over email, in failing to make communication easy, or failing to provide appropriate communication channels;

I had a very bad experience with this. Communication was difficult... communication is very important. (IT DIRECTOR-2: 263-275)

Communication really it wasn't on the level that it should be... they were using the e-mail as a communication media and sometimes you know the e-mail is not downright communication methods because you don't know exactly what he needs. (TECHNICAL MANAGER-1: 336)

I find communication very difficult... there are no clear communication lines of how to deal with issues. Not in knowing what to do in terms of if I have a problem I know who to go to, but... if we ever have issues than it is very difficult to find out what the process is to actually deal with the issues. And there are people from the IT on the task force as well and they very often pick it up but they kind of regard it as a different area issue. So the communication lines are very difficult. (DIR CLINICAL NURSING-1: 135)

9.8.5 Learn from your mistakes

When mistakes are recognised they can be corrected. If people shut out others when things go wrong then it is not possible to become a learning organisation and learn from those mistakes, so even problems should be communicated;

I think there needs to be a lot of communication. I find that people sometimes are a little bit unwilling to say there's been a mistake made or a problem. All of us are employed because there are problems in the world. The people are brought in to actually help fix those problems. We are in a hospital doing what; fixing patient problems. So what if we have problems? At least of somebody's recognised they've made a mistake; I'd say thanks because I've learned something. If it was the wrong thing I want to know what the right thing is. I know if I made a lot of mistakes that's because I do a lot of things. The point is to encourage people when implementing a system to accept that there is going to be mistakes. It's important to recognise those mistakes and it's important to correct ourselves from those mistakes but never to personalise them. (CARDIAC TECH-SUPERVISOR: 133)

I think it's important for there to be communication and... I believe it should be honest and obviously not too complex and just let people know what's going on and you'll find people much more accepting and just saying 'ghee we're really having a tough time fixing this one issue; we want to make sure it's ok when we actually get the system running.' (CARDIAC TECH-SUPERVISOR: 133)

9.9 Resistance

There is resistance and there is still some resistance to change their modus operandi, but with education um all things are improving. (EXEC-DIR MEDICAL-SERVICES: 157)

9.9.1 Accepting change

It is generally difficult to make people accept change, especially with new technology, and people were no different at the NGHHA. Accepting change was reported as one of the most difficult challenges;

The most difficult one-difficult stage- it was to make the user accept the change. This is the most difficult one. (CIMS ANALYST-3: 105)

First of all, it's hard to make people change and it's hard also sometimes to have people accept the changes. (CONSULTANT PHYSICIAN-1: 80)

With any new technology you will find sometimes you will have user resistance for this new technology and sometimes you will have also some minor issues or minor bugs within the system itself...so I could say one of the main obstacles we had faced during the migration was the user resistance. (NETWORK MANAGER-1: 132)

User resistance was one of the main challenges... we were facing really challenges from the end-user I mean if the end-user was very acceptable of the

project I believe we won't face any major challenges as what we did in the implementation. (NETWORK MANAGER-1: 423)

User resistance and the need to address the issue of change management is highly important. (CIMS ANALYST-1: 67)

I think human nature there is some people that are just resistant to change and especially if they don't fully understand the rationale behind it. You know there is some people who are just 'this is the way I've done it; this is the way I'll continue to do it'. (DIRECTOR PHARMACY; 235)

There's always resistance to change I think in most things. There was a lot of nursing was very supportive of it, I think in the whole it was easier for us; it was less of a change for us I think than it was perhaps for some of the other departments. But certainly there was a lot of resistance to change. (ASSOCIATE EXEC-DIR NURSING: 71)

We found difficulty from them in accepting this change, because they were used to some business process and they were used to whenever they need anything they get it from us, now it's not the case. (IT DIRECTOR-1: 49)

For sure resistance from end-users will be faced; there is not question about it. End-users always resist change, but with management's support usually projects will go through. (IT DIRECTOR-1: 325)

People were not convinced in using technology at all. So maybe that was a major obstacle. (CIMS ANALYST-4: 116)

The major issue is dealing with the resistance. (DIR CLINICAL NURSING-1: 20)

It is a challenge certainly to change attitudes and from paper based records to electronic and that still continues on; that will always be a challenge. (DIR CLINICAL NURSING-2: 125)

9.9.2 Why resist change?

People resisted the change for many reasons, like not wanting to learn new things; wanting to maintain the status quo and holding on to old habits; finding the old system easier to use; resenting additional work, or finding it threatening as discussed in the following sections.

9.9.3 Maintaining the status quo

The first reason for resisting change is the natural impulse to hang on to the past and feel safe and secure in the present. Some may feel that what you know is better than the unknown and should make every effort to prevent the unknown from happening;

A lot of clinicians who are more familiar with the um with the usual medical record; for example the usual-the order entry with the status quo; they are comfortable doing things they way they have been doing them and this learning process; having to learn a new system to many-many clinicians was a chore; was quite difficult. (EXEC-DIR MEDICAL-SERVICES: 55)

I've noticed that some people are just not interested in learning new things full stop; 'I can improve endlessly on what I know, but don't ask me to learn new things'. So that's again an issue with preparedness to learn. (MANAGER LABORATORY: 220)

You know the resistance was because they don't want change. (CIMS ANALYST-3: 188)

There were many and some were system-based obstacles and others were people-based. As I mentioned earlier it is natural that people are counteracting any changes that may need a great effort in implementation. Also it is something new and whenever you are doing something new people may be defending their previous systems. (KEY-USER INPATIENT PHARMACY: 38)

They don't want to learn a new system just for a short period of time, especially that any system is time consuming initially because the training would be not good. So that's why it was hard to implement and a lot of people didn't like it initially. (CONSULTANT PHYSICIAN-2: 86)

Making people change their workflow, making people depend more on computers. Some people are reluctant to use systems that are new to them, and using the system and using the computer in their daily activities was a bit challenging to them. (CIMS ANALYST-4: 62)

Don't forget that in our society; in our setting you have a lot of doubters who were not interested. I mean forget about developing, they were not interested in getting the thing off the ground. (SENIOR PHYSICIAN: 180)

The other phase that you hate the system in is the beginning when you go-live and I think that's normal. Anything new you will hate it, so that's normal. (KEY-USER PHYSIOTHERAPY: 290)

9.9.4 Change is threatening

It is natural to feel threatened by a new system that will change processes and probably reduce them. People can feel apprehensive about the new changes and the security of their roles;

People are used to what they were doing and they like what they want. People who like reports on a daily manner ((holds up a piece of paper)) they would like

to maintain the same report, even though with the new system you don't need to print anything because everything is on the system. So if there was some change management and the culture-change that needs to take place with implementing the system. (IT EXEC DIRECTOR:36)

When they see IT people they think they're people that come with an idea that will reduce the number of people, technology will come and reduce all the processes, reduce manpower, I'll lose my job. So this is why I should resist. He thinks that he can stop; or he thinks that he's valuable and we can come to him and without him we cannot move further. He thinks that he can do something for us or to stop anybody from his section or his department. But he finds out that 'OK I am now, I have no choice I have to accept the system and work with the team'. (IT DIRECTOR-2: 371)

9.9.5 More work without added value

The new system was regarded as something that management wanted, that only added work to their already heavy workloads and did not really add value or help;

I think the fact that they have to do the double documentation; that's the only thing that makes them resistant to the system. I think if we get to a stage where the paperwork is completely taken out of the way the documentation part in NG-CPR will be more accurate and it will be more complete... you know the entry into NG-CPR is not that complete; not 100% everywhere all the time, so the compliance is not good, but if we get rid of all the paper and there is no documentation they have to do it in NG-CPR, the compliance will be much better. (CLINICAL RESOURCE NURSE: 269)

Maybe at the moment because they see it as something they are forced to do. They are forced to do the paperwork because the paperwork is the hard copy, so the paperwork gets done, but NG-CPR not because they see it as something extra that they have to do. They don't see it as a benefit. They don't see it as helping them at this stage. (CLINICAL RESOURCE NURSE: 404)

They said that it gave us more paperwork to do and they were right, because we have to do our specific processes and at the same time we have to right down our statistics... if we were able to do some type of statistics on NG-CPR from the beginning so we could have eliminated some paperwork that's being done by therapists, this would motivate them to do it more, because right now-the problem I am having right now with my staff is that most of the staff are not doing their specific process. They say 'it's a waste of time and I'm getting nothing out of it'. (KEY-USER PHYSIOTHERAPY: 362)

They don't appreciate-they don't like the system if it does not help them so they claim that it does not help a lot and it creates a problem for them. (KEY-USER INPATIENT PHARMACY: 204)

9.9.6 We like the old system!

A common reason for resistance is in addition to wanting to maintain the status quo, people constantly make comparisons with the previous system or how things were in the 'good old days' of the old system. This type of mentality can keep the effort from moving forward;

Because they get used to a speciality in the keyboard and then they change to a different way of working...before, in the old system they used to memorise things ... now it's like shooting in the dark. They don't know what it is this system, what it's doing for them. Even if you tell them; if they don't have the experience by themselves, they will not feel the positive things about it. (CIMS ANALYST-3: 191-509)

Anything new is always hated, because if you have been working on a system for many years, especially the older staff; and it's working; why change? (KEY-USER PHYSIOTHERAPY: 356)

Whenever people have any obstacles in the system they will refer it back that the whole system as bad, and the whole system is not working as it should in making life easier... we need to find out whatever problem is on the system in order to solve it because this will cause increased resistance to the system. First of all, it is a new thing and second it will cause a lot of trouble so people will be resistant to deal with the system. Even if you want to get a good impression about the system, they will always give you a bad impression. (KEY-USER INPATIENT PHARMACY: 38-62)

The first thing is the resistance of all the people working with these systems to change. This is the first thing; the resistance is very high. The other thing is they want the system to exactly imitate the old system. Which cannot be done as I told them new systems have different concepts. So we cannot imitate what happened in the past or imitate the existing systems. (CIMS ANALYST-3: 42)

Our old system was legacy. A text based application. And usually the text-based application is straightforward; a terminal and only one window. They know the steps of the sequence by heart... with a new application; it's completely different; it's completely changed. The new application is windows based. It's graphical and a lot of windows have to be opened... some departments and really they're not used to working in this environment... this caused a resistance in the users. They found it's really hard for them to deal with it. (TECHNICAL MANAGER-1: 211)

Till now getting or collecting the main data that you need from the end-users is very difficult because they already got their system and it's working so you are asking them to give you the raw data so you can work on it. Usually they want it easier and easier and they don't want to do it and you have to ask them and run after them. (LAB ANALYST: 110)

9.9.7 Dealing with resistance

There are many ways to deal with resistance. It is almost an inevitable by-product of change and the best one can do is to find solutions to deal with it. The interviewees suggested many different tools like supporting them and making them understand, showing them how the technology can help them, moving them where they can learn, forcing them to use it.

Making things easier for them listening to their concerns; trying to get them involved in checking the system and treating their inputs and their complaints seriously. Giving them more training; I mean even if they had a schedule for training if somebody else has requested more training then more training is given to them. Support was given to them in a continuous form where somebody answers their phone calls 24 hours a day yeah and continuous supervision. (CIMS ANALYST-4: 98)

9.9.8 Understanding their needs

Understanding what people need, sympathising with them, and explaining what is required of them and what the new system will do for them defuses a lot of the anxieties that lead to resistance;

But if I went directly to the users and I just told them OK we are now implementing a system and we want this this and this he will say 'c'mon this is not my job... understanding their change and understanding the impact of the change and explaining to the user, and cooperating with the user, reward him, all this will help managing the change and will help to implement the system successfully. (CIMS TEAM-LEADER: 259)

When we explained to them why we need the physician to enter all the orders just because of this and this; you know how to explain to them the benefit of the system and after that they can understand the plan. But if they didn't feel the benefit or they didn't feel that the change can get them benefit for their work they will not do it. (CIMS TEAM-LEADER: 271)

They were not really; I can't really say that they were resistant. It's just that they needed more time to understand or they needed more training to use the computer itself. (CIMS ANALYST-4: 68)

Well at the beginning of the go-live as I told you, resistance was very high. A few months after that everybody understood the system and they really appreciated what they had. (IT DIRECTOR-CIMS: 528)

9.9.9 Show them how technology works for them

One way to encourage people is to actually show them some of the benefits of the new system; features they would not have dreamed of in the old system that they now have access to and that make their jobs easier;

They tried to mix some areas with PCs and Sunrays and they added additional services in the Sunrays, which are not in the PCs. For instance Internet access was not available in the PC and they had this in the Sunrays. They also supplied the Sunray users with 'Smart Cards' so the user was saying 'wow this is new technology'. With the smart card the user can get the same desktop anywhere in the hospital. So it was a kind of trade-off...the resistance was decreased but was not totally eliminated. (NETWORK MANAGER-1: 150)

When I started to do the CPOE most of the assistant consultants were rolling their eyes going 'oh God we've got to enter all this stuff into the computer? This is going to make me crazy'. So I thought I have to come up with something really creative for these guys... I said 'guess what? When we get this system guess what you can do?' And I paused and I said 'if it's not a crazy night and you're not running all over the place and you're just in your on-call room you can stay there. You can get on a laptop in the on-call room... the doctor is going to be able to write the order as soon as it's requested by the nurse. No sooner has she hung up the phone than he has already written up that order in the computer; done deal. In addition he is also working on all the other orders that he needed to work on for various patients and he's checking orders on his laptop when he's in his on-call room. So patients get better care... the paradigm totally changed just with one example... they won't stop bugging me 'when are we gonna have it?' (CARDIAC TECH-SUPERVISOR: 97)

9.9.10 Get on board or be left behind

The strategy of the NGHA was not to force anyone. First, they tried to convince people, but for some they had to exercise extra authority and enforce the organisational commitment to the project regardless of how people felt about it;

(Laugh). I think you could say there's no choice. (DIR CLINICAL NURSING-2: 270)

I think the overall institutional commitment to the implementation at the start. I mean the message was sent very clearly that this was; this is the way it's going to be. And then once people were forced into doing it, the system was easy enough to use that people just went along; as they picked up they became more comfortable with it, it sort of took care of itself. (SENIOR PHYSICIAN: 318)

Well they had to get on board because we have now started the system and there are a lot of people that still don't know the system. Yeah so and now they realise

that they cannot get the information that they need because they don't know how to use the system so in that way they are forced now actually go get their act together. (DIR CLINICAL NURSING-1: 123)

Sometimes harsh decision must be made to enforce the system. For example, it was ordered to stop making printouts for physicians of anything from the system like lab results, so they had to go online to see these results for themselves;

I think the decision was made at the time at a higher level that if they are going to start providing the physicians with copies; with printouts they will never use the system. And think that that was a very good decision because they forced all our physicians into using the system and I think if I'm not mistaken 80% of everybody now is using the system if not more. (SENIOR PHYSICIAN: 180)

9.9.11 Was there resistance?

Although there was much evidence of resistance being a key problem, that resistance did not necessarily come from one group of people. There are sometimes misconceptions about physicians in how much they value CPOE; that physicians do not want to do order-entry, or that physicians want to rely on other members of staff to do this type of work. The evidence shows that many physicians were actually in favour of the new system and excited about it;

No there wasn't; no. there was not much resistance at all. (CONSULTANT PHYSICIAN-2: 273)

Actually everybody was happy with the system because it's really user friendly. And they were first of all I mean very reluctant to use it because of this issue of being time consuming, but the system is very user friendly even from the first time they used it they got used to it and they were very happy using it. (CONSULTANT PHYSICIAN-1: 267)

Many nurses were happy to use the system too;

As with learning any new product or skill or whatever there was you know reluctance to use the system or whatever, but now a lot of areas are actually using the system far more than what is expected by the organisation. (DIR CLINICAL NURSING-2: 95)

I think most of Nursing were pretty much committed to it and were happy to work towards it although there was as usual resistance to anything different in that being motivated to keep people motivated to see that it was something positive that's working towards patient safety, those dealing with some of the systems

issues that they found frustrating and those kinds of things. (ASSOCIATE EXEC-DIR NURSING: 77)

9.9.12 Positive about change

There were the project champions; they were motivated and they were trying to get everyone else on board. Their attitude spread and some users did get excited about the new system, and people had a generally positive attitude about the change;

No I think our organisation is probably a very dynamic one and that's one of probably its strengths is probably that it does embrace change quite easily. It does need to be motivated though from the right people but I think that is one very positive thing about it. (ASSOCIATE EXEC-DIR NURSING: 131)

I think there will be some resistance, yes. It will be overcome and things will go just fine. (CONSULTANT PHYSICIAN-2: 106)

Well you can say they had changed from neutral. I mean when you first start these things people are a bit sceptical and they are not sure and they are not you know 100% comfortable, but as long um; as we went through with the system people better understood the system and its capabilities and they were able to see the bigger picture of the system so they are positive to use it now. (CIMS ANALYST-4: 344)

People in general are very receptive to new things and they're willing to change if they think the change is going to make a difference. (CONSULTANT PHYSICIAN-1: 288)

No I think our organisation is probably a very dynamic one and that's one of probably its strengths is probably that it does embrace change quite easily. It does need to be motivated though from the right people but I think that is one very positive thing about it. (ASSOCIATE EXEC-DIR NURSING: 131)

Well until they are aware of how good the changes are, of course at the beginning there is a neutral response. There is no good or bad response regarding the changes, but once the people are living with the change and experiencing this change they begin to realise that this was on the positive side and it wasn't on the negative side. (KEY-USER INPATIENT PHARMACY: 141)

9.10 Managing Change

If you motivate people to the extent that they believe that they have done right by their day-to-day life and their work and their patients they are ready to do miracles. (EXEC-DIR MEDICAL-SERVICES: 247)

9.10.1 Changing the way we do things

Implementing a new clinical information system was reported as an opportunity for change and an opportunity to improve processes, standardise procedures across the different sites, or to change some redundant or unnecessary processes. Some embraced this chance for something new; something better;

I think my most valuable lesson was that what we need to do is take a step back from what we are currently doing and look at implementing something like this as an opportunity to do something fresh and to forget about what we have done traditionally as part of our roles and look at what is actually required. (ASSOCIATE EXEC-DIR NURSING: 269)

At least from the executive board and the people I am meeting on a daily basis. Yes I think they have this idea. In fact, we always shared the idea that the system would be our change vehicle. OK we all know that there needs to be a change... and we all know that using the system as a change vehicle would be the right way to do the change. (IT EXEC DIRECTOR:83)

From the beginning what they have to do is they have tried to apply the system in such a way that it matches our practice. And I think it should be the other way around. The system-if the system is implemented... it may change our practice. (DIR CLINICAL NURSING-1: 225)

Yes, definitely-definitely on the part of I would say most people; that's how they perceived it; it's going to be a paradigm shift in managing the institution. (EXEC-DIR MEDICAL-SERVICES: 139)

There is a lot of talk about change management, so they understand that implementing the system it's a major change to the whole organisation and the focus is to make the change a positive change and to make it a win-win situation so there was a lot of discussion about change management and um how to approach it and how to react to the resistance. (IT DIRECTOR-CIMS: 504)

9.10.2 A change management model

When specifically asked if the change was managed by implementing a specific strategic change management model, the chief information officer explained that although they did not label the process as a change management process and did not resolve to an exact model for managing change, they use many of practices commonly described in different models for change, perhaps bringing together a combination of different tools;

We had a good training program. We had a good advertisement for the project where we had newsletters distributed, presentation, meetings with individuals. So this was the way by educating, but not by using a proper change management plan or committee. No, we did not have that. Everything came as a by-product of the implementation. (IT EXEC DIRECTOR: 95)

9.10.3 An opportunity for change

Although the goal of this project was not to change the business processes, it is something that naturally happened during the course of the implementation, either because some processes were wrong and had to be corrected before automating them, or because people saw it as an opportunity for change. Nonetheless, it was generally agreed amongst respondents that only expert people can lead these projects and process reengineering should be incorporated in the initial plan for these systems because it is too late to try to manage change after production. It is something that must be planned, practiced and preached from the start;

They may be a really smart person, but you cannot change; if you're working in an area you sort of get in the habit, so that process reengineering in these areas in many respects is reliant on having I would call individuals who have expert experience in many other facilities so that they can make a comparative assessment of different approaches to process reengineering and the related change management as we discussed earlier in planning so that you can maximise the benefit of the EMR. Simply building an EMR to reflect the current workflow is truly a lost opportunity. You must evaluate current workflow with a clear plan to reengineer where you can derive benefit... once you go into production, I mean really and particularly of you chose to do things a certain way, I mean you just can't go change processes now. (CARDIAC TECH-SUPERVISOR: 300-303)

We should standardise the work in order to fit the workflow which has been changed due to the system. So we faced a lot of these problems and actually this is one of the important things in the project management in the planning side. If you want to have a good system you have to find the policies and procedures of the organisation and know how to align this either to change the system to somehow to adopt the policies and procedures, but sometimes you cannot change the system. Because this is the right way of the system or because the system has limits. We need to adopt to these limits and we need to explain to the users; the workflow should be standardised in order to standardise the workflow in the system. (CIMS TEAM-LEADER: 271)

And of course the physicians; the business process for all the physicians functionality has changed. What they usually did on the paper now is transcribed with the system and still they have some things to do on papers, so there are big changes in their workflow and their business process. (CIMS ANALYST-3: 156)

It was positively received because it was an enhancement to the business process. It was an enhancement to the patient care process. (IT DIRECTOR-1: 205)

You talk about change management, well if you're making a manual process into an electronic process without considering how you're going to improve the process it is a rather big waste isn't it? And you want to maximise the benefits and there's many, many ways to do this, but I think there's a lot of opportunity to um maximise that and I think in each implementation you're going to get better and better at doing that and again that's a learning process that is difficult to replicate once you've implemented a system. It's something that happens when you're doing your original system's configuration. So, yes you use this experience, which I have to say is still a great success, is still a great success. I mean you know it's running and the thing is can it be done better in Jeddah? Well let's hope we have learned something and it can be done better. (CARDIAC TECH-SUPERVISOR: 312)

9.10.4 Carefully introduce the change

After assessing the need for change, and then agreeing on implementing something new, it has to be introduced gradually into the healthcare environment even if it is an IT system, because they are dealing with areas where patients are being treated, sometimes in critical areas and mistakes cannot happen;

Any time you have a change in an area where you have the need for rapid accurate decision-making that would impact care, you want to very carefully introduce change to those areas and you want to understand that you can't always put this on paper, but you want to understand what is the impact on workflow in that area in terms of distress induced with the individuals involved. The cat-lab is a good example. Often you get very very sick people there and everything happens by reflex. Everything you use in that area, the people know it blindfolded, but you go in there and you start changing a lot of stuff then you are gonna start messing people up unless you're very careful about the change. So if you're looking at change management in an area like that you have many considerations. You have to consider what is gonna happen when the patients come rolling through the door and things fall apart. You're not dealing with a situation where everything is working just hunky dory, you want to be aware of what is the situation, what happens on the ground when things really start to go wrong. People have to be well enough trained and the change has to be introduced gradually enough and carefully enough that it doesn't disrupt the patient care; it doesn't disrupt the care in highly critical areas. (CARDIAC TECH-SUPERVISOR: 115)

We should have two things, a clear plan, a transition plan and we need to have the social aspects... um we didn't have that clear plan for change management... but for the user as a CIMS team um we didn't give that message how to manage

the change. We were only dealing with the user. Our message or our role was to collect the data, explain the function in the system, train the user and that's it. We didn't look at it from a different perspective as this process is 'changing' the workflow so we need to understand the people's needs, we need to understand their emotional needs sometimes their social needs, sometimes they are working over time so this part should be considered under the change management. (CIMS TEAM-LEADER: 253)

9.10.5 If it isn't broken...should you fix it?

As discussed in the previous section on resistance, people by nature strongly fight to maintain the status quo, and the way to change that attitude is by educating them, showing them what new developments are out in the world, and allowing them to become lifelong learners. When that happens, they will let go of the attitude of not wanting to improve what to them is working fine;

That creates resistance to change because people are not aware of what's going on...but if people are aware of change and people are educated and people are granted the time and resources for postgraduate studies, for continuous development, they will be aware of the new things; they will be ready for change. It's only when you don't know anything and probably that's one of the most common reasons for resisting change; is that you are not fully aware of the new approach and you are not fully aware that your current approach is not good, because this is the only thing that you have been doing and it did work for you, building on the old 'saying; if it ain't broke, don't fix it'. (CIMS ANALYST-3: 95)

9.10.6 It's a matter of attitude

The most poignant message that came across on issues of change management, is that how the change is managed relies heavily on the attitudes of people involved in implementing it;

But then again you speak of the issue of change management and it's a matter of attitude and leadership and attitude is critical. You know you can take that and say everybody has to be retrained and they delayed it and you know what I would take a totally opposite point of view. Thankfully we have another chance to take another session to learn more so that we are more ready for the implementation. We have more time to help people really understand the system. We have more time to market it properly but again it has to be done with the right attitude. If anyone goes in with a negative attitude on this and says 'oh this is wrong and that is wrong and everything else' this is not the attitude that solves problems. This is an attitude that creates problems. It creates a problem because what occurs is that people are actually infected by that attitude. So a critical piece of change

management is to maintain momentum and enthusiasm. (CARDIAC TECH-SUPERVISOR: 133)

9.10.7 Technical success doesn't translate into human success

Sometimes when people begin these projects, they go in with a mentality that this is an IT project; it's a technical thing; buying servers, distributing computers; and because they have a budget for it, and the manpower to do it. They implement it as an IT project when in reality it is not and there are so many dimensions and so many human factors that are involved. It is easy to lose site of this and focus only on the technical success that might not necessarily translate into the human success;

This is actually the root of failure. The technical success may not translate into clinical success. Hospitals are designed around people; designed around taking care of human beings. You know it's not a factory, although certain aspects of factory management can be applied to improve the efficiency of processes, but ultimately the care of a human being has to be taken into account.. you're taking care of patients and also from the IT side you are taking care of a lot of professionals with a lot of pressures. These people have to process large quantities of information. (CARDIAC TECH-SUPERVISOR: 324)

Well they say a well-implemented poor solution is better than a poorly implemented good solution. (CARDIAC TECH-SUPERVISOR: 336)

And this gets back in to somebody saying for example how good is the clinical information system? Well the clinical information system it may not be the best system in the world, but it was reasonably implemented; what a converse. Most of the systems you have in the world today are highly configurable... so a well-implemented inferior poorer solution is better than a poorly implemented good solution.... so the ability to have a completed successful systems deployment depends a lot on motivating people in terms of how important it is and getting people to work on this in an enthusiastic way. (CARDIAC TECH-SUPERVISOR: 342)

9.11 Summary and Synthesis

Implementing large-scale IT systems in healthcare is not only about dealing with the technology, but is also about dealing with people. More arguments are being made that the behavioural and socio-cultural challenges of implementing MI projects are as daunting as the technical and logistical ones, if not more significant (Hendy, Reeves et al. 2005). It was evident from Chapter 6 that dealing with technical issues was not that problematic for the NGHHA. I was left to explore the organisational issues, and I

therefore investigated in detail the behavioural aspects of this implementation. There is no denying that healthcare systems significantly change the organisations in which they are introduced, and profoundly alter routine workflows within them. Consequently, they have the potential to change the very cultures of those organisations.

Conversely, as discussed in Chapter 8, the managerial issues were present mainly in planning in dynamic organisations, maintaining momentum, finding suitable project managers and training the workforce, and were more 'how people plan' issues. Many of those challenges span over to matters discussed in this chapter as many of these topics overlap. Project management and change management must go hand-in-hand and cannot be separated. They were discussed in two different chapters, but that does not reflect how the events actually unravelled. In reality all the issues mentioned happened simultaneously and were only separated here to present the discussion in a more manageable manner. Take for example the issue of maintaining momentum. Although it was discussed as a project management issue, it is also a very important issue in managing change. Many change efforts fail because of an imbalance in reward-recognition, in celebrating short-term wins, or in failing to solidify wins by building on their momentum.

Although the NGHHA did not name a particular change management strategy for implementing their large-scale HIS project, the evidence shows that there was actually a very lengthy process that was based on a predetermined strategy. This strategy engulfed both short-term and long-term plans that helped implement their new system. The exact source of their ideologies is unknown. I only recorded what people said in response to my questions, but I do not know for example where they get their management decisions. I do not know what the influence was for their implementation strategy; as it could have been inherited from the vendor, books, personal experience, training or other. Knowing this is beyond what the methodology would allow. Here I can only summarise their experiences; many of which conform to other typically documented change management practices.

To ease user acceptance, the NGHHA engaged in spreading awareness through numerous campaigns. People needed to know that the change was coming. Users will

be more prepared for change and more accepting of it if they are aware, and if they receive previous education about what is to come. As many authors on change management agree (Dunphy and Stace 1993; Kotter 1996; Schein 1996; Audit Commission 2001; Burnes 2004; Cork 2005); the more knowledgeable people are about the change, the higher their acceptance will be.

One of the most discussed topics in the interviews was user involvement. It was generally recognised by the interviewees that user involvement is important, as agreed by many publications on managing massive change (Kotter 1996; Schein 1996; Burnes 2004; Day and Norris 2007). Not only is user involvement valuable because of their input, but also because by involving the users, they can feel ownership of the system and better value it, leading to better acceptance and more success.

Another issue recognised by the NGHHA was the level of expertise and skills of users and analysts as well as the issue of having an independent, local, fully trained team (as discussed in the previous chapter). The NGHHA also had to rely on clinical people to work as IT analysts, but were difficult to recruit and that proved challenging. They also had to deal with the varying levels of computer literacy amongst staff, which affected their acceptance and willingness to accept the change. As discussed in section 2.6.6, many have advocated the need for solutions to the shortages in medical informatics skills (Haux 2008; Carlisle 2009).

Change must also be led by local champions who feel the need to succeed and who can spread those feelings and motivate others to act upon them (Kotter 1996; Day and Norris 2007; Hayes 2007). The NGHHA have realised that it is important to encourage this progressive attitude by rewarding progress and acknowledging achievements and their achievers.

Change is also necessary to overcome over-managed and under-led cultures. Because management deals mostly with the status quo and leadership deals mostly with change, the NGHHA had to create transformational leaders (Avery 2004; Northouse 2004) to deal with the change that the new systems brought about. Still, 'managing' the project (as discussed in the previous chapter), is equally as important as 'leading'

the change effort. Both leadership and management are required to keep change efforts and IT projects on track. But for most organisations, the much bigger challenge is leading change. It has been recognised in the literature (Sittig 2001; Avery 2004; Bryman 2004; Northouse 2004) and by the NGHHA that effective leaders are needed, especially with the changing nature of management that has moved away from close control of the workforce towards environments of coaching, support and empowerment (Mullins 2007). Leadership is necessary to motivate can motivate the actions needed to alter behaviour in any significant way. Once the change has been achieved, effective leadership is even more critical to get the change to persist, by anchoring it in the very culture of the organisation.

Leaders also have to conceive and communicate the vision for that change and that vision must be aligned with the overarching organisational vision (Kotter 1996; Burnes 2004; Paton and McCalman 2006). As stressed by the interviewees, the purpose cannot be to only implement a successful HIS. The organisational commitment and the objectives behind implementing the new system must be transparent to everyone so that they have something to work towards. Successful leaders must also possess communication skills. They need to communicate on many different levels and must open different channels of communication.

It is difficult to discuss change management without mentioning user resistance. This seems to be one of the inevitable side affects of change, as discussed in the literature on change management (Kotter 1996; Burnes 2004) and as previously mentioned in section 2.8.3. People resist change for many reasons. They usually want to maintain the status quo, feel threatened by the change, end up with more work without any benefit, or they may simply hold on to their old habits because they like previous systems that they are familiar with. The NGHHA experience highlights some of the many ways to deal with resistance. As explained by the interviewees, it is sometimes useful to understand users' needs and accommodate them, show them how the technology can work for them, or if all else fails; they can be forced to use the system.

Some take the introduction of a new system as an opportunity for change; chances to correct bad practices and redesign workflows. Some embrace this chance as one of

the virtues of change. Granted, the evidence presented here shows that positive transformational leaders (Schein 1992; Shortell 2002; Avery 2004; Northouse 2004; Jasper and Jumaa 2005) must introduce change gradually and carefully. One thing to remember is that technical success does not always translate into human success. So if the project fails it is not fair to blame the technology, and conversely if the technology is successful that does not mean that the behavioural aspect had similar success. In complex organisations it is not enough to manage change. Successful change must be lead through strong leadership and with time, the difficulties become easier to cope with and the challenges begin to dissolve.

The NGHAs were aware of the changes that were about to happen when they decided to introduce their new HIS. They saw the introduction of the system as a change and they recognised the change as a process and not a one-time event. This process took them on a long journey and many lessons were learnt. What has emerged from this experience was a change management model ideally suited for implementing IT systems in healthcare environments.

Taking into account some of the managerial issues from the previous chapter, this model can be summarised in the following (not necessarily sequential) interconnected elements, as illustrated in Figure 9-1. It is difficult to provide a visual representation of this model, because there is no particular order to the elements; some of them occur simultaneously, others occur sequentially while there are elements that have a cyclic nature and are maintained all throughout the implementation as a continuing process. What I offer here is a schematic visual representation of the change management events that should not be taken literally. I present it only as a visual aid in the form of a list with arrows to indicate a link; not sequence. Similarly, I could have represented the elements as a cycle, a process or a matrix and there is not necessarily any significance in the order they are presented in.

The notion that it is difficult to summarise the elements only showcases what a complicated process change management is; as many have suggested (Dunphy and Stace 1993; Kotter 1996; Schein 1996; Cabrera, Cabrera et al. 2001; Burnes 2004; Burnes 2004; Hayes 2007) and as discussed in Chapter 2. Conceptualising change management within IT project management adds a further layer of complexity

(Bloodgood and Salisbury 2001; Kurupparachchi, Mandal et al. 2002; Aziz 2007). Couple that with the workings of healthcare organisations and the complexities exacerbate (Lorenzi and Riley 2000; Audit Commission 2001; Rose, Fleischmann et al. 2003; Lorenzi and Riley 2004; NCCSDO 2004; Cork 2005; Clegg and Shepherd 2007). There is a definite need for conceptualising these change management practices within healthcare organisations offered through a structured model for change management.

Although many authors agree upon the complexity involved with change management strategies, there have been no serious attempts in the literature to conceive a change management model for implementing large-scale HIS; as discussed previously in detail in section 2.9 under 'Suggested Models for Organisational Change'. To reiterate, the only explicit change management model offered in the field is Lorenzi and colleagues' (1997) 'four-stage model of organisational change' that is not based on empirical findings of a large-scale implementation. Although their model is still relevant, the work was done over a decade ago and could be considered outdated by some, especially considering the advances that have taken place over the past ten years in both the medical and MI fields. Moreover, as previously discussed in section 2.9, Kurt Lewin's 'theory of planned change' (Schein 1996) may not take into account the perplexities of dynamic organisations (Dunphy and Stace 1993; Burnes 2004).

What is significant about the model offered through the findings of this study is that it is empirically robust and is inductively drawn from not only exhaustive research, but also one on a large-scale HIS implementation. Each of the nine elements has been conceived and described in detail in previous sections of this chapter, although heading names of the sections are not identical to the labels of each of the elements. For example, the element 'Spread awareness and educate users' is derived from the evidence described previously in this chapter under section 9.2 'Awareness and Education'. Bearing in mind that 'Awareness and Education' can be traced back to the code 'Awareness-Education' in 'Table 4-1 Codes Report' (Chapter 4). The same goes for each of the elements, which makes this a purely evidence based model; derived directly and inductively from the interviews; and each of the codes/descriptions/elements is empirically sound.

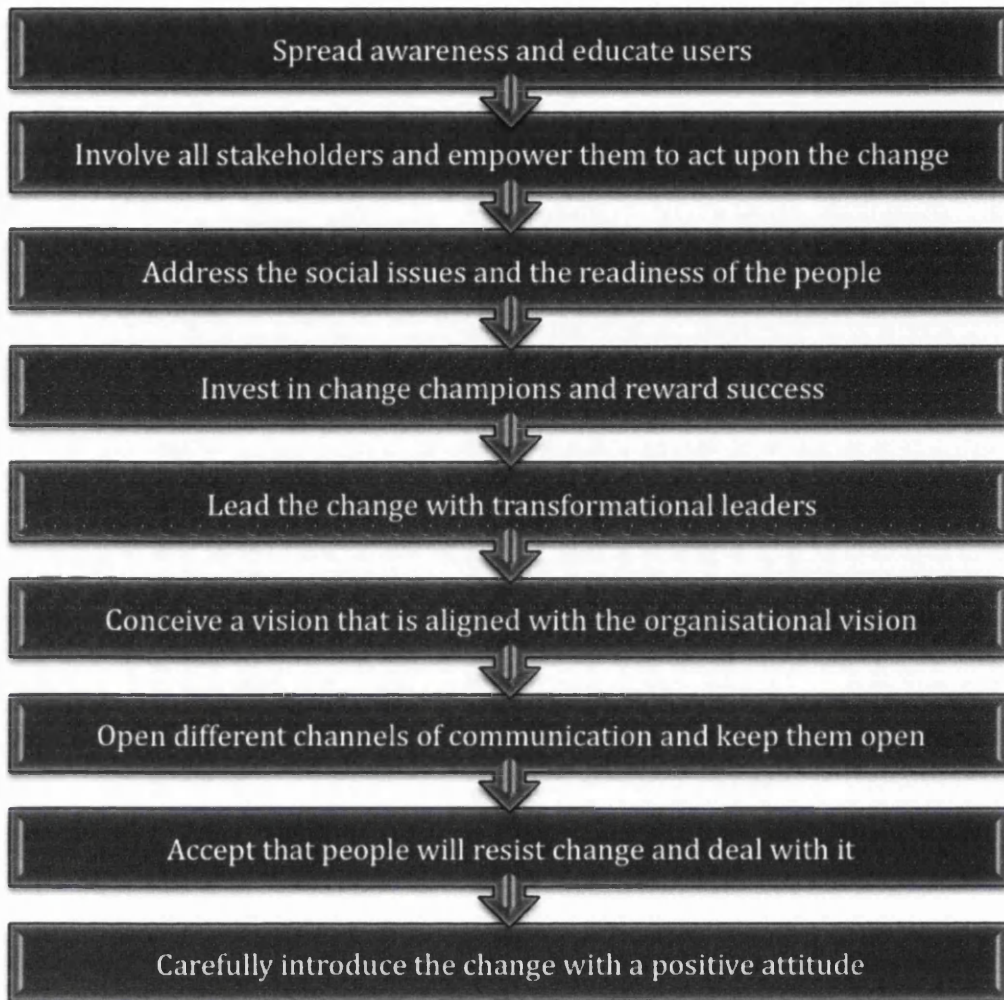


Figure 9-1 NGHA Change Management Model

It could be argued that there are similarities between this model and John P. Kotter's Eight-Stage Process (Kotter 1996) discussed in Chapter 2, although there was no mention of it by any of the interviewees. Conversely the NGHA did not follow a specific change management model, however they did have their own strategy that has emerged in the steps described above. Perhaps it is that the implementers absorbed some of these management ideas elsewhere and incorporated them in their projects.

Although there are similarities between the two models, they are in fact different. First, Kotter's (Kotter 1996) model is generic and applicable to organisations in general, not healthcare organisations or MI projects in particular. That does not mean

that this model is not applicable within healthcare organisations, it is only to say that it was not envisioned specifically for them. Admittedly, John P. Kotter has been a leader in the field of change management for over thirty years and has undeniably made significant contributions. He is regarded by some as the world's foremost authority on leadership and change. His attention to the human aspects of change are generalisable and widely applicable and he offers his model as a solution to resolve those human factors;

Whenever human communities are forced to adjust to shifting conditions pain is ever present. But a significant amount of the waste and anguish we've witnessed in the past decade is avoidable (Kotter 1996, p.4).

A closer look also reveals that although Kotter's model has addressed only eight out of the nine elements mentioned here. Although his work precedes this work by decades, it does not acknowledge social or local readiness issues while the NGHA model does. This is evident where they were forced to acknowledge and overcome internal (lack of local expertise) and external (political) issues when dealing with their change. This is depicted by the element: *Address the social issues and the readiness of the people*. This element encompasses any social, cultural, socio-cultural factors both internal and external that may have an impact on change.

It is important to highlight one point. The NGHA 'model' in the points mentioned above addresses a unique issue, which is assessing the local readiness of the people in terms of their skills and any social barriers whether they are internal social norms of the organisation or its culture. This was evident in terms of addressing the skills of their cadre. The lack in local expertise is in both project management skills and lack of enough expertise to be independent of a foreign supplier for the product. This is not to imply that one should reinvent the wheel and custom design a system locally from scratch when fully functional, well-tested and established ones could be purchased externally. But there needs to be a way to become independent from overreliance on foreign technology or at least overreliance on support from foreign companies by establishing a well-equipped local team.

The NGHA issues addressed in this study were as mentioned above, however for another organisation their social and readiness issues could be, for example cultural. If the local organisational culture or the culture of the country is an issue that may cause problems for the implementers of change, then those issues should be addressed and dealt with as part of the change management process. A good example of this is Scott and colleague's (Scott, Rundall et al. 2005; Scott, Rundall et al. 2007) investigation on Kaiser Permanente's experience of implementing an EMR in Hawaii. From their study they concluded that the organisation's cooperative culture minimised overt resistance to change but also inhibited constructive feedback during implementation. They recognised 'cultural issues' as one of the factors that hindered the implementation; bearing in mind that the initial system was eventually withdrawn. Had the implementers considered the cultural issues (respondents characterised Hawaiians as averse to conflict) as part of the change process (as suggested by the NGHA Model), they may have been able to at least strategise a solution for this problem or take it into account before implementing the change.

Leaders do not necessarily need to limit themselves to one specific model for change management to derive their implementation strategies (as discussed in sections 2.9.6 and 2.9.7) and it might be useful to scope different models and find one or a combination of strategies that are suitable. As discussed in section 2.8.8, in Bryman's (2004) review on qualitative research on leadership he did not present a 'model for change', but was able to find some recurring themes from a collection of publications. From his review he found that leadership styles themselves sometimes change in response to particular circumstances. He also draws attention to some necessary skills for leading change, like securing an organisational commitment to the change, addressing internal and external constituencies, conveying a sense of need for change, instilling a vision for the implementation and the purpose for change. The NGHA experience is in line with some of these recurring themes, suggesting perhaps that the measure taken by them followed common change management strategies that are generally adopted by other organisations. Nonetheless, Bryman's (2004) review has a lot of applicability, but it was not specifically a review of literature on healthcare organisations nor on IT projects.

CHAPTER 10 A MODEL FOR CHANGE: LESSONS REFLECTIONS AND FUTURE IMPLICATIONS

10.1 *Lessons Gained*

The purpose of this chapter is not to summarise the entire thesis because each chapter has been summarised on its own. I will instead take this space as a chance to reflect upon the entire process and to describe this work's contribution to the field.

I was worried when I began this study that the enthusiasm and intrigue I had for the subject might subside over the years, but I found myself pleasantly surprised even at the very final stages of writing up my thesis that the area I am researching raises much interesting debate and has not failed to challenge me and others. I thought that by the end of my study I would have all the answers, but I find myself now with more questions than when I first started, and what I have found in the literature evokes mixed feelings of reassurance and frustration. At times I am discouraged by not finding enough similar studies to refer to, but that in turn reassures me of the value of doing this research.

I was undeniably grateful for the chance to so closely examine such a dynamic and massive project as it unravelled, although this study was not an evaluation of a system, neither was it a success/failure story. The purpose was clearly to examine the challenges of implementing a large-scale HIS, while addressing the technological managerial and behavioural issues.

There cannot be a correct answer or solution that will fit all the permutations that may exist, nonetheless I can conclude that when implementing large-scale HIS systems the managerial and behavioural issues outweigh the technological ones. Failing to understand this could be the reason why many healthcare IT projects have in the past failed. This research proves the critical need to address these issues.

10.1.1 What is known about this topic

Healthcare organisations have their own attributes that make them quite different from other types of organisations (Lorenzi and Riley 2004). Healthcare organisations have become extremely complex organisations (Plsek and Greenhalgh 2001; Plsek and Greenhalgh 2001). They must deal with life and death issues, with complex structures, varied stakeholders, exploding technologies, strong traditional roles and ethical codes and complex confidentiality issues (Lorenzi and Riley 2004). There is general agreement in the literature that managing IT projects is difficult; more so in these complex environments (Protti 2002) as discussed in section 2.2.4. There have also been many IT implementation failures in these organisations (Berg 2001; Stavri and Ash 2003; Heeks 2006; Scott 2007; Altuwaijri 2008; Sittig, Ash et al. 2008; Thomas and Fernández 2008). We also know that the organisational and managerial; or 'human' aspects of implementing these projects are important, yet reasons behind these failures are largely misunderstood. These reasons are rarely investigated pragmatically in the field (Kuruppuarachchi, Mandal et al. 2002), proving a need for further research in this area (as suggested in sections, 2.3.3 and 2.3.4). The research carried out in this study has contributed to the understanding of these human factors.

The implementation challenges of specific modules or functionalities like CPOE (Ash, Stavri et al. 2003; Stavri and Ash 2003; Ash, Gorman et al. 2004; Ash, Sittig et al. 2004; Martin 2004; Ash, Sittig et al. 2005; Altuwaijri 2008), or PACS projects (Pare and Trudel 2007) have been reported in small-scale studies (for example within a hospital ward, a clinic, or one hospital), however we have not seen a similar influx of studies on these challenges when it comes to investigations on a larger scale; for example across an entire country.

Many themes on implementation challenges have emerged from publications in the literature (discussed in more detail in sections 2.5, 2.6, 2.7, 2.8). Some are old and some are new, yet no study has previously reported a single exhaustive list that encapsulates the technological, managerial and behavioural issues on a large-scale implementation. These issues have all been reported in one list in this study as noted in Chapter 4 (Table 4-2 Codes Themes). The relevant codes in this list are discussed thoroughly in the four Discussion Chapters, and the lessons gained from them are

summarised at the end of each of those chapters. Although this was not a 'comparative' study, it would have been interesting to compare and contrast each of the reported codes/themes to a similar list from another equally comprehensive study on the same scale. However, there was no 'one' comprehensive; comparable list to be found. Most studies only report the more general themes and some of these examples are given in Chapter 2 (section 2.4). Nonetheless, the themes discussed earlier in Chapter 2 (sections 2.5, 2.6, 2.7, 2.8) are correlated with the reported findings in the summaries of each of the Discussion Chapters.

10.1.2 Why this study is needed

This was not an easy area to research because there has not been much published on the technological, managerial and behavioural difficulties combined in one rigorous study with responses elicited from a fairly large cross-section of respondents. An exhaustive literary search was undertaken, but yielded limited results (see section 2.3.1 and Appendix 1).

As mentioned in Chapter 2, section 2.3.4, the many different disciplines that are involved with implementing IT in healthcare (such as sociology, business management, engineering, change management, project management, policy studies, and others) when discussing IT implementations either discuss issues in isolation from the other disciplines, or only address some of the issues associated with the other disciplines (like project management and IT only and not on healthcare specifically) without having a comprehensive overview of all of them combined. Describing a process where all of these disciplines come together is a rarity in the literature. This study has brought together and rigorously addressed the technological, managerial and behavioural aspects of a large-scale implementation in a way that has not been published before.

The argument made by Kurupparachchi, Mandal et al. (2002) that IT literature does not exhibit serious attempts in studying the implementation aspects of IT projects only confirms the crucial need for more research in this area; insight that this study has provided. They also maintain that there are hardly any attempts to relate conventional project implementation methods to change management strategies or how various IT project management implementations contribute to change

management in organisations, describing this as a neglected area, as previously mentioned in Chapter 2, section 2.3.4.

Other studies in the MI field have been described as overly specific; focusing only on a single case study of IT failure where it is difficult to generalise conclusions (Heeks 2006). However, from this study many of the lessons are drawn from a substantial sample and have wider implications, as they can be applied in healthcare organisations elsewhere. For example, the NGHHA Change Management Model can be adapted within virtually any healthcare IT implementation. Conversely, there is an abundance of literature on managing change (Dunphy and Stace 1993; Huber and Glick 1995; Kotter 1996; Schein 1996; Burnes 2004; Burnes 2004; Paton and McCalman 2006; Hayes 2007; Lee and Ahn 2008) and more specifically on managing change in healthcare environments (Audit Commission 2001; Rose, Fleischmann et al. 2003; NCCSDO 2004; Wing and Langelier 2004; Anderson 2007; Aziz 2007; Day and Norris 2007; Jenkins 2007), or in IT and MI literature (Massaro 1993; Robey and Azevedo 1994; Chu and Cesnik 2000; Lorenzi and Riley 2000; Bloodgood and Salisbury 2001; Kurupparachchi, Mandal et al. 2002; Shankman and Malcolm 2002; Simpson 2002; Lorenzi and Riley 2004; WenShin and Hirschheim 2004; Haux 2006; Heeks 2006; Anderson 2007; Aziz 2007; Day and Norris 2007; Scott 2007; Frame, Watson et al. 2008; Leonardi and Barley 2008; Sittig, Ash et al. 2008). There are even more specific offerings on change management models that have been established and used for many years as discussed at length in Chapter 2, section 2.9. Yet, there is no single change management model designed specifically for managing change in healthcare that is brought on by large-scale IT implementations; and one that is derived purely from empirical evidence. This is the most significant contribution of this study and the one that has most applicability and implications for the wider field.

Moreover, as mentioned in Chapter 2, section 2.3.5, Heeks (2006) contends that when there are MI studies with strong conceptual frameworks, they only offer limited practical guidance and he describes them as static, usually concerned with factors underlying success and failure. While in this study, detailed discussions on all facets of the implementation were presented without taking the more common route of giving a success/failure story. The four Discussion chapters clearly outline the

many processes involved in the implementation and the chapter summaries provide commentary and suggested solutions.

10.1.3 Specific to the NGHA

Specifically for the NGHA, in order to achieve a nationwide HIS implementation, they were faced with various technological, behavioural, organisational, and external difficulties. They also had to overcome these challenges, without any benchmarks, reference sites or similar case studies. What this study has revealed is set of general problems that could be considered in other HIS implementations, while at the same time a set of unique problems very specific to the NGHA; and by extension the entire region, were also evident.

Additionally, the study revealed that what may normally be a barrier in similar implementations elsewhere was not a difficulty for the NGHA. For example, a problem normally associated with other healthcare systems implementations is financial restraints and lack of resources. Although many healthcare organisations are limited by their budgets, for the NGHA financial restraints never jeopardised the project. They also consistently had had enough 'logistical' resources to support their implementation.

To conclude, the problems specific to the NGHA were not technical, not financial, and did not seem to stem from lapses in change management strategies. The problems transpired mainly from *external* (vendor-related) issues, and *internal* lack of local expertise (from either within the organisation or the country). If the latter was not an issue, then there would be no need to depend on external (foreign) vendors and the most significant challenges like the impact of the political climax would be overcome. What can be deduced is that there are some things that money simply cannot buy, and one of those is IT project success in healthcare organisations. There has been no previous evidence in the literature to prove this point, while this study does (based on interviewees' feedback, as discussed in Chapter 8).

Coincidentally, the findings also divulged a unique model for change management in healthcare systems implementations in Saudi Arabia that takes into account the local

cultural and internal organisational issues. This model could be applied within similar organisations elsewhere and not exclusively to the region.

Furthermore, from this study, there are more specific lessons to be gained, which are not necessarily generalisable to all healthcare organisations, but only those with similar circumstances. One specific lesson that may not pertain to all healthcare organisations, but provide useful pragmatic conclusions is the repercussions of the external constraints linked to the political situation post 9/11 which is an unusual situation that forced the NGHHA to devise unorthodox solutions to overcome this unanticipated barrier through transformational and creative leadership (discussed in detail in section 7.5).

10.1.4 What this study adds

In short, this study presents several contributions. First, it provides an empirical investigation of a large-scale IT system implementation within a healthcare setting that specifically and thoroughly examines the technological, managerial and behavioural issues via a representative qualitative data sample. As such it provides pragmatic evidence on this topic that is based on research, which the field has been lacking. This is purely an evidence-based study that is in no way anecdotal and provides a robust contribution.

This study also presents a model for leading change that was evident from this implementation. Although the model was not made explicit by any of the interviewees, I was able to draw it from the many interviewee accounts and from the culmination of processes described.

Another original contribution is the methodological approach represented by the Five-stage Analytical Framework. It is drawn from other well-documented qualitative analysis techniques, but here these varying procedures are joined with other stages of data collection and immersion processes in a unique manner within this framework. These are all presented together as one coherent and original process of analysis that can be used to analyse large qualitative datasets in a systematic and rigorous manner.

The Framework helps to confirm through empirical findings, what has been previously argued in the literature about the importance of addressing the behavioural and managerial issues. It also offers a detailed discussion on these problems presented in the words of the participants who themselves were actively involved in the implementation. It is a novel and richer way of presenting the evidence and describing the account; that gives the reader an intimate; closer look at the implementation problems. This kind of detailed representation is only possible when a large dataset is available, with rich and descriptive responses.

10.2 Limitations

10.2.1 Trying not to quantify

A thesis would not be complete without pointing to some of the limitations. Some were limitations literally, while others were only issues that made the research difficult, but did not restrict it. For instance, I felt limited because I had to train myself not to quantify the data even though it would have been easy for me to do so with my IT background and having coded all my data with NVivo 8. It took a tremendous effort on my part not to.

I also felt at times ‘uncomfortable’ because of my background. To conduct this study they way I had designed it; I had to step back and examine the people issues. This was difficult for me because for many years my job mostly dealt with technical issues. To do this study justice, I had to consider all facets of the project and not just the (all too familiar) technical ones.

10.2.2 Still considered a large-scale project?

When I first submitted my research proposal (one year before I commenced my PhD studies and two years prior to data collection) the NGHHA plan was to begin rollout of the remaining phases (Phase II and Phase III). As planned, I expected all three phases of the project to be implemented by the time I began collecting my data. I was disappointed that the system was not rolled out to the other two regions when I did. At that point I had to make a decision. I could have either changed the research question one year into my studies, or I could have opted to embrace this misfortune

as an opportunity to ask what the problems were that delayed the rollout to the other regions. I decided on the latter, and I was pleased with my choice. That way I was able to continue with my original research design on a topic that I was convinced needed further research.

This however raises questions, and the actual scope of this research could come under scrutiny. Some may question whether or not this was actually a large-scale study. To that, I can say that although the system was physically rolled out to only one region out of three, it was still implemented within an entire region and a significantly large medical city, not just one hospital. What is more important is that the implementation 'plan' and all subsequent preparations were carried out for the nationwide implementation for all three regions. The system was purchased and the vendor was contracted for the complete implementation with all three phases. The hardware, servers, disaster-recovery site, infrastructure and all the peripherals were also prepared and installed for all three regions. The awareness campaigns, selecting key-users, recruiting and training the CIMS analyst, all were done for all regions. The task forces and steering committees had representatives from all regions. In short, the purchased and planned system was a large-scale one. The people interviewed and the lessons gained were from a cross-section of people from the different regions; many of which had corporate responsibilities and oversaw the interests of all three regions. Actually the act of rolling-out certain functionalities in a specific area was only considered to be one aspect of the over-arching much bigger picture of implementing a large-scale system. If you purchase a product, purchase the hardware, ready the infrastructure, train the people and design the plans for a large-scale project, then you know that rolling out functionalities is only one aspect of it.. The NGHHA contracted NG-CPR Vendor to implement a nationwide system and were in the process of implementing it when this study took place. The selection of research participants with their varied backgrounds and responsibilities along with the evidence demonstrate that this was the case. Any shortcomings were seen as part of the challenges (the focus of the study) and were examined as lessons to learn from.

10.2.3 Word count

Although word count is not normally considered a limitation, I did feel many times limited by it. I believe this was especially an issue for me because of the (again) large body of data that I had collected. I had to compromise and make decisions on what to include and what to exclude. Because I wanted to incorporate as much of the interview excerpts as possible, and because I wanted to be transparent in my analytical process, I felt very limited by word count in other areas of the thesis.

10.2.4 Travel

Because the scope of the study covered all regions of the country, it was not always possible to travel to meet in person with the interviewees. Although this did not hinder the study and I was able to carry out the interviews remotely, it may not be considered as a limitation by some. Granted, I was still limited by the fact that I was one researcher and did not have the logistics at my disposal to meet with them all face to face.

10.2.5 Triangulation and transcript validity

It was not possible to use documentary material or participant observation to ‘triangulate’ the findings and I had to rely on the interviews only. Furthermore, it was not practical and was not in line with the analytical ideologies of this study to validate the interview transcripts by returning them to the interviewees or by peer-debriefing.

10.3 *Implications for Further Research*

There are several future studies that may follow this work. I personally would like to follow up the progress of Phase III of the project when the rollout to the other regions takes place. It would be interesting to investigate the affects of introducing this stage on the previously implemented phases of this project. It might be useful as well to research other healthcare organisations in Saudi Arabia or the Middle East and possibly carry out comparative studies.

Research into attitudes might also be useful. What surprised me in this study was that all the physicians who were interviewed had similarly positive attitudes about the

implementation of the system and its applicability and use, even though they varied in age groups and years of experience. This led me to believe that there may be some misconceptions about physician's attitudes towards CPOE and information systems. The results of this study were not conclusive on this matter; however it would be interesting to investigate how other healthcare workers viewed physicians' attitudes and how this might affect overall acceptance.

Furthermore, since the implementation occurred over a significantly long period of time and went through various stages in different parts of the organisation, it was difficult to interview patients for this study. However, further research could be carried out on patient's attitudes towards the system or how the system impacts the care they receive

I also feel the need for further research in education in the medical informatics field to bridge the gap between clinicians and IT analyst, and to harness the much-needed skills of qualified healthcare informaticians.

Another question that has long eluded me and warrants further research is how to plan for IT systems in dynamic organisations, especially those dealing with constantly changing fields. Although I have made some suggestions for this in the summaries of Chapters 8 and 9, specific research into this issue is still needed.

10.4 Reflections

I cannot believe I am actually writing the following passages (at last). This means that the journey is over and I can now reflect upon the entire process.

10.4.1 If I could do it all over again

I once thought I had to turn out a perfectly polished thesis, but what I came out with was a study with important findings with its own set of imperfections. My learning curve, my personal growth and involvement as a researcher, and all the decisions, disappointment, and mistakes along the way were what made it real and gave my study the character that makes it unique. I have no regrets because this was a learning experience and any mistakes are valuable lessons that taught me (the hard

way) what I know today about this topic and about research methods. I would not change a thing and any mistakes are (proudly) my own.

Granted, knowing what I know now, and if I had to do it all over again I can see that 36 in-depth interviews were too many to take on for one researcher within the time constraints and pressures of writing a doctoral thesis. If I had to do it over, I would conduct maybe only one third of the interviews. Twelve in-depth interviews would have been easier to transcribe, analyse and comprehend. One of the most difficult things for me was to hold in my head all the information from 36 interviews and 'know' them well enough to justly analyse them. Or, I could have interviewed the same number of people, but asked fewer, more focused questions on a specific topic; like only on the managerial problems or just the behavioural aspects.

As a member of the organisation I was advantaged by the position I was in because it sanctioned an insider's view of events and facilitated unprecedented access to the setting and people. Conversely, this vantage point also yielded a fairly large sample of 'unmanageable' size that I felt extreme pressure to rigorously analyse to calm my own concerns about truth and knowledge and to ensure robust findings.

10.4.2 It will never be perfect

Finally, what I have come to accept is that it will never be perfect. This study was a learning process and people learn the most from their mistakes. That is what experience is made of. Hardships build character. Every time I was 'stumped' I told myself that this hurdle is only adding 'character' to my work. A perfect thesis (if there can ever be one) without any flaws or evidence of any problems along the way might seem unrealistic; as if it had 'plastic surgery'. I see no point in fantasising about presenting a 'utopian' version of the events that culminated this thesis, when I know that the many flaws and mistakes are what made it real. I trust that I was able to portray the essence of my journey by being transparent and hope that my findings and conclusions have evoked as much intrigue as they have answered questions.

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SEARCH STRATEGY

1. Only journals available through the university (Athens) open access account were used.
2. From the results of the searches, relevant articles were identified and scanned. Any new terms found were fed into the search strategy, and new searches run.
3. The reference lists of the relevant papers found were searched for further studies.
4. All relevant articles found were entered into PubMed, and using the 'related articles' feature, a further search was carried out for any other published articles.
5. All searches were limited to the English language and some were limited between the years 1998 and 2009.
6. For PubMed, the full search strategy contained free text (including alternate spellings) and MESH terms, and MESH headings. For databases other than PubMed, similar search strategies were adapted.
7. For example, in EBSCOhost, a search in CINAH was done using "change management" AND ("information technology" OR "information management") AND implement* . It was also limited to English language, 1998-2009.
8. Separate searches with different combinations of keywords were used, because a template for all keywords (for example; change management AND information technology AND healthcare) together yielded inappropriate/insufficient/irrelevant results.
9. Databases, search engines, journals and keywords used are listed as follows:

Databases & Search Engines
NCBI/PubMed
Web of Knowledge
InterScience
Google Scholar
EBSCOhost
ScienceDirect
SAGE Journals
CINAH
ZETOC
Elsevier
SDO
Emerald
JSTOR

SEARCH STRATEGY

Key Journals
MIS Quarterly
Information Systems Research
Journal of the American Society for Information Science and Technology
Journal of Information & Technology
Journal of Management Information Systems
International Journal of Medical Informatics
Information Processing & Management
International Journal of Technology Management
Journal of Information Science
Information Systems Journal
International Journal of Information Management
Journal of Organizational Change Management
BMJ
Health Informatics Journal
Information & Management Journal
Journal of the American Medical Informatics Association
Information Management Systems

Keywords
Change management
Information systems
Healthcare information systems
Medical Informatics
IT project management
Information management
Organisational change
Healthcare
Project management
Information technology
Implement
Systems
Management
Information technology

SEARCH STRATEGY

Key Journals
MIS Quarterly
Information Systems Research
Journal of the American Society for Information Science and Technology
Journal of Information & Technology
Journal of Management Information Systems
International Journal of Medical Informatics
Information Processing & Management
International Journal of Technology Management
Journal of Information Science
Information Systems Journal
International Journal of Information Management
Journal of Organizational Change Management
BMJ
Health Informatics Journal
Information & Management Journal
Journal of the American Medical Informatics Association
Information Management Systems

Keywords
Change management
Information systems
Healthcare information systems
Medical Informatics
IT project management
Information management
Organisational change
Healthcare
Project management
Information technology
Implement
Systems
Management
Information technology

INTERVIEW GUIDE

Date:

Time:

Interviewee name:

Interviewee job title:

Years in the organisation:

Research aims

To arrive at the main challenges of implementing nationwide healthcare information system in a Saudi Arabian setting as experienced by management, the technical people, and the key end users and to analyse how this change was managed.

The implementation

1. What was your main role in the CIMS implementation?
2. Have you worked on a similar system in another organisation?
3. Could you tell me in brief about the process/steps of implementing CIMS?
4. Why was the CIMS brought into this organisation? What was the over-all goal?
5. From your experience, is it difficult to implement CIMS in a healthcare environment?
6. What are the main obstacles; if any that you faced during the implementation?
7. Where there any technical (IT) difficulties?
8. Where there any external difficulties?
9. Going back to the go-live day; what can you remember about it? What was it like?

Planning, resources and leadership

10. What can you say about the project planning?
11. What was the role of leadership in the implementation?
12. Were the aims of the project and the scope of involvement clear to users?
13. Were adequate time and resources provided to support user involvement? Were there constraints with time and deadlines, and if so, was it a challenge?
14. Was the scale of the project and the geographical distribution of the sites an issue?

INTERVIEW GUIDE

15. Was there transparency in the process? If users are to be part of the process of managing the change should it be completely transparent?
16. Was it a top-down approach to the implementation?
17. Did communication play a role in this implementation?
18. Where there any staffing issues (both IT and end-users)?
19. How was the new system promoted? Was there an awareness campaign?
20. What type of end-user training was given and how was it managed? Was it effective?

Change management

21. Did the implementers perceive and treat the implementation as a change initiative?
22. Has this implementation made things better? Did you perceive a significant improvement in the organisation's processes after implementing this project?
23. How much of a change to the business processes has the implementation brought?
24. What reactions were formed to this change? Were they negative or positive?
25. What do you think of the way this change was managed?

User involvement

26. Did the people involved in the implementation understand the change that was going to happen and were they excited about it?
27. Were users involved early on and asked for their input early in the process before decisions have been made?
28. Were the outcomes of the new system evaluated?
29. Was anything done to ensure the momentum was maintained after the initial go-live?
30. Were there any 'champions' who believed in the causes and proactively influenced the way the change was implemented in clinical practice?
31. Do you think that training to support change for the people involved with the implementation would have helped in effective change implementation?
32. What was most frustrating for you throughout this experience?

INTERVIEW GUIDE

Other

33. Did the JCI accreditation process have a significant impact on the implementation?
If so, was it positive or negative?
34. Where there any cultural difficulties specific to the organisation?
35. Do you think it's feasible that you will get a completely electronic/computerised patient record with this implementation?
36. What are the most valuable lessons that have you learned from your involvement?
37. What future recommendations can you give?
38. Is there anything else that you would like to add regarding the challenges of implementing CIMS in a healthcare organisation?

MANAGEMENT LETTER OF SUPPORT

Kingdom of Saudi Arabia
National Guard
Health Affairs
King Abdulaziz Medical City



المملكة العربية السعودية
رئاسة الحرس الوطني
الشفون الصحية
مدينة الملك عبد العزيز الطبية

OFFICE OF THE EXECUTIVE DIRECTOR
INFORMATION SYSTEMS & INFORMATICS DIVISION (ISID)

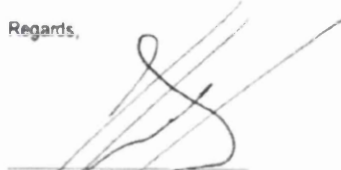
19 December 2006

TO WHOM IT MAY CONCERN

Subject: Research on Clinical Information Management Systems

Ms. Taghreed Jastniya is currently conducting a study towards her PhD on Clinical Information Systems and Change Management at the School of Health Science of the University of Wales Swansea, UK. She is a member of our staff and is sponsored by the National Guard Health Affairs for her studies. The focus of her study is on the implementation of the Clinical Information Management Systems (CIMS) at the National Guard Health Affairs and its integration with other systems. This research involves conducting interviews, gathering of relevant documents and observation of presentations involving the implementation of the systems. The Information Services and Informatics Division are in support of this study and hope that some valuable lessons will be learned from it. Your cooperation and participation in this research is appreciated.

Regards,


Dr. Majid Altuwajri
Executive Director,
Information Systems & Informatics
National Guard Health Affairs

PARTICIPANT INFORMATION SHEET

1. Study title

Implementing clinical information systems and managing the change across a national healthcare organisation in Saudi Arabia.

2. Invitation

You are invited to take part in a research study. Please take time to read the following information. You are free to inquire about anything that is not clear to you and you are welcome to ask for more information about the study. Please take time to consider and decide whether or not you wish to take part.

3. The purpose of the study

The study is a requirement for a PhD in Health Science at the School of Health Science, University of Wales Swansea, UK. The National Guard Health Affairs of Saudi Arabia sponsors it and the Information Services and Informatics Division is in support of this research and will hopefully gain some useful lessons from its findings. The overall aim of the research is to examine the challenges and tribulations of implementing clinical information management systems and managing this change across a nationwide organisation; namely the National Guard Health Affairs of Saudi Arabia.

4. Participant selection

You have been selected to participate in this study, because you are directly involved with the implementation of the clinical information management systems in the organisation. It is entirely up to you to decide whether or not you wish to take part. If you do, you will be given this information sheet to keep and be asked to sign and return a consent form. If you work in KAMC-Riyadh, kindly return the signed consent form to the ISID administrative assistant (mail code 2302/extension 43447). You are still free to withdraw from participation at any time without giving a reason.

PARTICIPANT INFORMATION SHEET

5. The interview

Once you agree to participate, the researcher will contact you to arrange a time that is convenient for you to be interviewed either by telephone or face-to-face. The interview will take approximately 30 minutes to one hour. It will be either open-ended or semi-structured (depending on your role in the implementation) and will allow for discussion. It will also be conducted in English. The interview will be digitally and/or tape-recorded and notes will be taken. The interview recordings will subsequently be transcribed and analysed.

6. Expenses and payments

The researcher is unable to reimburse the participants or their employers for the time they are giving up to take part in the study.

7. Confidentiality

Participants' confidentiality will be safeguarded during and after the study. All original data will be securely stored in a safe with the researcher and the researcher will use her password protected computer to store electronic data and findings. The electronic transcripts will be destroyed 5 years after the researcher has graduated.

8. The results of the study

The research findings will be presented in the researcher's doctoral thesis and may be published, while the anonymity of any participating individuals will be maintained. If you decide to take part in the study, you may choose to receive feedback that describes some of the key findings. Please let the researcher know if you wish to receive feedback.

9. Researcher's contact information

Name: Taghreed Justinia

Email: jastaniat@ngha.med.sa / TaghreedJI@yahoo.com

Thank you for your consideration in taking part in this study.

CONSENT FORM

The focus of the study

To explore the challenges of implementing healthcare information systems & managing the change across a national healthcare organisation in Saudi Arabia

Please tick appropriate boxes

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to examine the information and ask questions and have had these answered.

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without any reason.

3. I agree to the telephone or face-to-face interview being digitally and/or tape-recorded and notes taken on the understanding that the data will remain anonymous and the content kept confidential.

4. I agree to any attributable quotes being used in the researcher's thesis and future publications.

5. **I agree to take part in the above study.**

Name of participant	Signature	Date
.....
Name of researcher	Signature	Date
Taghreed Justinia