



Uit

THE ARCTIC
UNIVERSITY
OF NORWAY

Department of Clinical Medicine
The Faculty of Health Sciences

Implementing a Health Information System at the Greater Accra Regional Hospital in Ghana

End User Perspective

Dillys Larbi

Master's Thesis in Telemedicine and E-health (TLM-3902)

May 2018



Food for Thought

'Information technology is not a magic formula that will resolve all the problems of the world, but a powerful force that can and must be harnessed for the global mission of peace and development' – Kofi Annan

Acknowledgement

First and foremost, I would like to thank the Lord Almighty for His grace, favour, love and protection over my life all these years. I could not have done any of this without Him and I am forever grateful.

I would also like to express my sincere gratitude to my supervisor, Professor Gunnar Ellingsen for his support and guidance throughout the research. Thank you very much.

I am grateful to the Judy Au, the program coordinator for the Telemedicine and E-Health masters program and to all the lecturers and guest lecturers who contributed to impacting me with so much knowledge.

I would like to say a big thank you to UiT - The Arctic University of Norway, for offering me the opportunity to further my education. Up until I started studying here, I did not know I loved to study and would like to go into academia. Thank you very much for everything.

To the administration and staff of the Greater Accra Regional Hospital, I say thank you for the support and participation in this research especially, Aba and Kafui at the laboratory department. You are truly awesome people and I pray the Lord grant you His blessings in all your endeavours.

Last but not the least, I would like to thank my family and friends for their love, support and encouragement during my studies, it got me through some tough times. My mum; Love and my siblings; Evelyn and Nancy, love you very much. To my nieces and nephews; Queeny, Celina, Jaden, Marius and Kayla, you are the best because you always make me laugh. I must say thank you to Mads Lynggaard Madsen for his support and confidence in me, you never had any doubts when it came to me. Additionally, I am grateful to Charles Anfu, Honesty Mensah Ganu, Milton Antwi, Kelvin Owusu, Ahmed, Ernest Zan Nkrumah, Grace Amoo-Ashie, Catherine (colleague) and everyone in my life for being a part of this. Thank you all very much. I am forever indebted to you.

Dillys Larbi

dilblaze@yahoo.co.uk

UiT – The Arctic University of Norway

Tromsø

May, 2018

Abstract

Health can be improved by information and communication technologies (ICT) in developing countries. Electronic health systems coordinate patient care processes in different departments within the same facility to enhance efficient delivery of care. However, health sectors in developing countries are unable to implement modern health care technologies due to challenges which negatively impact their adoption of ICT. The refurbishment of the Greater Accra Regional Hospital (GARH) in Ghana has resulted in the first phase of an ultra-modern building and the procurement of a comprehensive health information system (HIS) known as Health Pro. The shakedown phase of the implementation of the Health Pro is crucial to its overall success. Thus, the acceptance of the Health Pro by the end users in this phase will play a vital role in its adoption into routine practices at the health facility.

Challenges to the use of the Health Pro could negatively impact its acceptance and adoption which will then affect its successful implementation. The study aims to assess the challenges to the implementation of the Health Pro in several departments as perceived by the health professionals. Interpretive research, specifically a case study was the research method used in this study. Health professionals at GARH were interviewed to provide the data for the study in addition to observations, photography and informal discussions.

The top-down approach was used by the management of the health facility to implement the Health Pro. The involvement of the health professionals, the targeted users of the health information system was minimal at best. The health professionals at the frontline of the delivery of health care felt alienated in the design and development of the Health Pro. User perceptions prior to the use of a technology influence experiences and later, these experiences gained from using the technology influence the perception of it. Challenges to the implementation of the Health Pro include; unplanned and inadequate training of the health professionals, lack of communication regarding the Health Pro, delay in work processes and an incomplete implementation process. Addressing the challenges to the implementation process could enhance successful implementation of Health Pro. Nonetheless, the effect of Health Pro on work processes at the health facility cannot be fully assessed until it is fully implemented. Proper maintenance of the Health Pro after it is fully implemented will ensure its sustained implementation.

Keywords: Shakedown phase, Health Pro, Information Infrastructure, Health information system, User perception

Table of Contents

Acknowledgement	iii
Abstract	iv
Table of Contents	v
List of figures	vii
List of tables	vii
List of Appendices	vii
Abbreviations	viii
Chapter One	1
Introduction	1
1.1 General Introduction	1
1.2 Information systems in Ghanaian hospitals	2
1.3 Challenges to the healthcare system	2
1.4 ICT for health purposes	3
1.5 Problem statement	4
1.6 Purpose of the research study	4
1.7 Research questions	5
1.8 Chapter composition	5
Chapter Two	7
Theory	7
2.1 Electronic Health Records in developing countries	7
2.2 Electronic Health Records in Ghana	8
2.3 Healthcare work and implementing technology	9
2.4 Approach to new system implementation	10
2.5 Information systems implementation in Healthcare	11
2.6 Information infrastructure	14
Chapter Three	21
Methodology	21
3.1 Study site	21
3.2 Study Design	26
3.3 Data Collection	30
3.4 Data Analysis	36
3.5 Role of the researcher	37

3.6 Ethical Considerations.....	41
Chapter Four	42
Case study	42
4.1 GARH information infrastructure	42
4.2 Health Pro®	42
4.3 Overview of GARH healthcare	43
4.4 Departmental processes prior to Health Pro.....	46
4.5 Departmental processes after Health Pro	56
4.6 Health workers perception on the Health Pro	60
Chapter Five	68
Discussion	68
5.1 Early phase of Health Pro implementation	68
5.2 Approach to Health Pro Implementation	70
5.3 Importance of users of the Health Pro; Perceptions and Usability	72
5.4 User involvement; Participation.....	74
5.5 Training on Health Pro	76
5.6 Communication regarding Health Pro	78
5.7 Information infrastructure at GARH	80
5.8 Health workers' expectations of Health Pro	83
5.9 Maintenance of Health Pro.....	85
5.10 Limitations to the study.....	86
Chapter Six	88
Conclusion	88
6.1 Study contribution	90
6.2 Recommendations	90
References.....	91
Appendices.....	100

List of figures

Figure 1: Ideal effect of health information technology (Wagner-Menghin and Pokieser, 2016)	8
Figure 2: Levels of health service provision by the government healthcare facilities	24
Figure 3: Refurbished Greater Accra Regional Hospital (Ridge Hospital) in Ghana	25
Figure 4: Patients awaiting their turn for either the records department (wooden structure with glass windows to the right of seated patients) or the nurses' station (wooden stalls straight ahead with respect to the position of patients) at the out-patient department (OPD)	44
Figure 5: The typical patient process during a hospital visit to GARH.....	45
Figure 6: NHIS authentication device used for verifying patients visiting the health facility (Available at: https://twitter.com/nhis_ghana/status/682162762617884672)	48
Figure 7: Nurses' station where patients are attended to.....	49
Figure 8: The area at the nurses' station for the measurement of a patient's vitals.....	50
Figure 9: Patients awaiting their turn in front of the consulting rooms	50
Figure 10: A laboratory request form used by the government hospitals in Ghana	52
Figure 11: Notebooks for the recording of tests performed from two departments; haematology (left) and clinical chemistry (right)	53
Figure 12: Old hospital building at GARH - current location of the OPD.....	56
Figure 13: Health Pro interface for the laboratory showing the daily laboratory requests and daily trend analysis for October 2017.....	59

List of tables

Table 1: Overview of data collection	32
Table 2: Summary of the pros and cons of the researcher role (Walsham, 1995)	38

List of Appendices

Appendix I: Application letter to Ghana Health Service for approval to conduct research ..	100
Appendix II: Introductory letter from the Ghana Health Service	101
Appendix III: Approved Ghana Health Service introductory letter by the Greater Accra Regional Hospital.....	102
Appendix IV: A copy of the Informed Consent form signed by the participants	103

Abbreviations

AIDS	-	Acquired Immune Deficiency Syndrome
AMPATH	-	Academic Model for Prevention And Treatment of HIV/AIDS
AMRS	-	AMPATH Medical Record System
BLIS	-	Basic Laboratory Information System
BP	-	Blood Pressure
CEO	-	Chief Executive Officer
CHPS	-	Community-Based Health Planning and Services
DHIMS	-	District Health Information Management Systems
DOTS	-	Directly Observed Therapy, Short course
EMR	-	Electronic Medical Records
GARH	-	Greater Accra Regional Hospital
GHS	-	Ghana Health Service
HIS	-	Health Information System
HIT	-	Health Information Technology
HIV	-	Human Immunodeficiency Virus
ICT	-	Information and Communication Technology
II	-	Information Infrastructure
IS	-	Information Systems
IT	-	Information Technology
KBTH	-	Korle-Bu Teaching Hospital
LAN	-	Local Area Network
MOH	-	Ministry of Health
NHIA	-	National Health Insurance Authority
NHIS	-	National Health Insurance Scheme
OPD	-	Outpatient Department
PCIS	-	Patient Care Information Systems
RCT	-	Randomized Controlled Trial
TB	-	Tuberculosis
VIP	-	Very Important Person
WHO	-	World Health Organization

Chapter One

Introduction

1.1 General Introduction

Due to the restricted access to available modern information and communication technology (ICT), developing countries find themselves on the wrong side of the digital divide created by the global inequalities in ICT (Heeks, 2002). Health sectors in these countries are unable to implement modern health care technologies for the delivery of better health services to the populace due to a myriad of challenges. These challenges negatively impact the adoption of ICT in the health sector even when implementation is considered successful. The technological challenges include poor ICT infrastructure and lack of health ICT experts. Lack of funds due to poverty, and human factors constitute some of the non-technological challenges faced by developing countries implementing and adopting health-related ICT (Achampong, 2012a; Adjorlolo and Ellingsen, 2013; Marful and Winter, 2014). Weak information infrastructures, and poor data collection and management systems have resulted in the physical and human environment in many hospitals in developing countries being unprepared to receive computers and hence, health-related ICT (K. Herbst *et al.*, 1999; Achampong, 2012a). Farzandipur *et al.*, (2016) reaffirm this view when they identify human factors as having the most influence on successful implementation of hospital information systems. In certain scenarios, negative feelings associated with ICT lead to resistance and non-use of systems among particular groups of stakeholders in the healthcare organization (Heeks, 2002; Farzandipur *et al.*, 2016).

In general, health information systems at all levels of care in developing countries lack organization, and medical record keeping is in a deplorable state in most of these countries; individual records are written on paper in booklets known as folders by clinical staff and either kept on the hospital premises in the absence of ample security or kept by the patient. Furthermore, detailed information is lacking on disease incidence, health practices and available resources such as drugs for the treatment of certain diseases. (Clifford *et al.*, 2008; Fraser and Blaya, 2010; Ngwakongnwi *et al.*, 2014). Despite the difficulties and setbacks with health information systems in developing countries, the promotion of health-related ICT project initiatives remains unabated. This has resulted in ICT tools being developed, recommended and used in the health sector. However, there are hints of unsustainability as few health-related ICT projects go beyond the pilot phase, and those projects that transcend

this phase end up being fragmented and uncoordinated. Perchance, these are the ‘perks’ of implementing electronic systems in an environment that is unprepared, unreceptive and ill-equipped to meet this demand (Clifford *et al.*, 2008; Adjorlolo and Ellingsen, 2013; Asare *et al.*, 2017).

1.2 Information systems in Ghanaian hospitals

In Ghana, since the district government hospitals have no form of electronic health system available, they continue to employ the use of the paper-based system in the delivery of health care to their clients. Although, the national and regional hospitals in the country may have some form of electronic health system, these systems are rarely comprehensive, and their use is often limited to certain departments in the healthcare setting. For instance, most of these facilities have a basic laboratory information system (BLIS) which allows the results from the various departments in the laboratory to be collated and issued out as one report¹. The present practice in the country’s healthcare system often results in lack of coordinated and collaborative healthcare; patients have to register anew every time they visit a healthcare facility, sometimes they must register more than once in the same healthcare centre. This is unacceptable as a patient’s general and medical history is a principal part of his or her care process to ensure a more comprehensive and effective care. Thus, the unavailability of a system which makes this information readily accessible hinders the healthcare system in the country to a significant extent. For instance, if patient A goes to one government hospital with a health problem, he is registered and treated (all paper-based records). If the same patient travels or moves to another community, sometimes within the same region, he has to go through the whole registration process again at another government hospital when he reports there with the same or a related health problem. Subsequently, duplicate or multiple health records are created in the healthcare system and sometimes in the same healthcare facility for a single patient.

1.3 Challenges to the healthcare system

The paper-based health information system in most of the healthcare facilities in the country is one of the many challenges facing the healthcare system in Ghana. Problems such as missing patient health information because of the misuse of medical files (using one medical

¹ As opposed to the previous practice whereby each report from the different sectors in the laboratory is written down or printed out separately and given to the patient. This is the current practice in the district government hospitals.

file for two or more patients), the discoloration and fading of the ink with time of written information, and the lack of storage associated with the paper system create inconveniences for both the health professionals and the patient. Brain drain of the dearth of well-trained healthcare professionals is another challenge the healthcare system is faced with. The trend of the brain drain can be viewed in terms of migration of these health professionals from developing countries to the industrialised countries, and from the rural communities to the urban settlements within a country. For that reason, the density of the health workforce in Ghana and other developing countries is below the World Health Organization's (WHO) minimum threshold of 23 health professionals to 10000 population (Marful and Winter, 2014; WHO, 2014; Oluoch *et al.*, 2015).

Healthcare professionals in the country, particularly medical doctors, lack access to medical information for the proper diagnosis and treatment of patients. This can be attributed to the accumulation of patient health record information which is due to the emergence of more complex clinical problems. In addition to that, there is limited or no access to internet facilities, and the library facilities in the country range from mediocre to non-existent which makes it difficult to acquire current available medical knowledge for optimal patient care (Wagner-Menghin and Pokieser, 2016). Other challenges the healthcare system is faced with include; the use of outdated equipment, lack of consistent and reliable channels of communication between the various stakeholders, and poor roads to the healthcare facilities (Marful and Winter, 2014). The healthcare organization literally deals with human life therefore, the challenges it faces can lead to severe, irreversible and dire consequences.

1.4 ICT for health purposes

A strategy to deal with the healthcare system challenges is the application of information and communication technology (ICT) to its practices and procedures, in the form of an electronic health system. In both the developed and developing countries, health can be improved by information and communication technologies (ICT). Electronic health or medical systems coordinate patient care processes in different healthcare facilities so that patient information is available to health professionals. This enhances a more effective and efficient healthcare system (World Health Organization, 2012). Likewise, electronic health systems can be used within the same healthcare facility to coordinate the patient care process among the various departments and improve services by decreasing turnaround time, enhancing reporting of patient results and improving the overall data quality. Additionally, there is improvement in

data accuracy, increase in productivity, increase in overall effectiveness, and accessibility of data to relevant health professionals. Thus, ensuring collaboration among the different departments in the healthcare facility for the delivery of efficient health care (Paszko and Pugsley, 2000).

1.5 Problem statement

There are government hospitals in Ghana trying to implement some form of electronic patient record or health information system to be used for more than clinical business processes and aggregation of data. The Greater Accra Regional Hospital (GARH), is one of such hospitals. The health facility is currently undergoing refurbishment which has resulted in the completion of the first phase of an ultra-modern building for the delivery of healthcare. A comprehensive health information system (HIS) known as Health Pro has been procured by the management of the hospital to assist with their delivery of health care services. It is believed that the success of information systems in their shakedown phase; the period immediately after the implementation of an information system (Bossen *et al.*, 2013), is a contributing factor to its overall and long-term success. This suggests that the attitude and acceptance of the information system by the end users in this phase will play a vital role in its adoption into daily routine health practices and subsequently, its total implementation success. Therefore, the lack of proper planning for the implementation of health information systems results in challenges for the end users of these systems, and that eventually leads to their resistance and rejection of the information system.

1.6 Purpose of the research study

This study seeks to assess the information systems that are being used currently by some of the departments at the Greater Accra Regional hospital, in light of the refurbishment and the introduction of a health information system. The perceptions of the health workers at the facility about the issues encountered in the shakedown phase of the implementation of the HIS will also be assessed. The study can help inform healthcare organizations about the issues that are likely to be encountered during the first few months of implementation of a health information system. Additionally, the study can contribute to the literature on implementation of health information systems in developing countries.

1.7 Research questions

This study aims to answer the following questions;

What are the challenges encountered in the early phase of implementing a health information system on the departmental level in a government hospital in Ghana?

How do the health professionals in the government hospital perceive the implementation of the health information system?

1.8 Chapter composition

Empirically, the study will focus on the work processes in five departments at GARH with the introduction of the health information system, but it will not be limited to these; the out-patient department (OPD), the laboratory, the pharmacy, the corporate and prestige unit, and the medical stores. Theoretically, the study is based on the concepts of information infrastructure, approach to implementing information systems, and actor network theory.

From here on out, the thesis is organized as follows;

- Chapter two; Theory

This chapter analyses some concepts in telemedicine and E-health with a focus on electronic health records, the implementation of health information systems (HIS), information infrastructure (II), and insights and challenges that determine successful implementation.

- Chapter Three; Methodology

Here, the study setting including a country profile, study site description is presented. The chapter also describes in detail the study design, data collection strategy, and the data analysis process employed.

- Chapter Four; Case description

The case description gives a brief overview of the healthcare system in Ghana. It however, highlights the process of health care at the Greater Accra Regional Hospital with a focus on the departments that are currently using the new health information system; Health Pro and those that should have been included in the first phase of its implementation. In addition, the perceptions of the health workers in these departments on the Health Pro is presented.

- Chapter Five; Discussion

In this chapter, themes, categories and sub-categories identified from the data collected at the study site will be discussed in light of available literature on the topic. Additionally, the limitations to the study will be pointed out.

- Chapter Six; Conclusion

The conclusion will summarize the study, highlighting points that are important to note while making recommendations for further studies.

Chapter Two

Theory

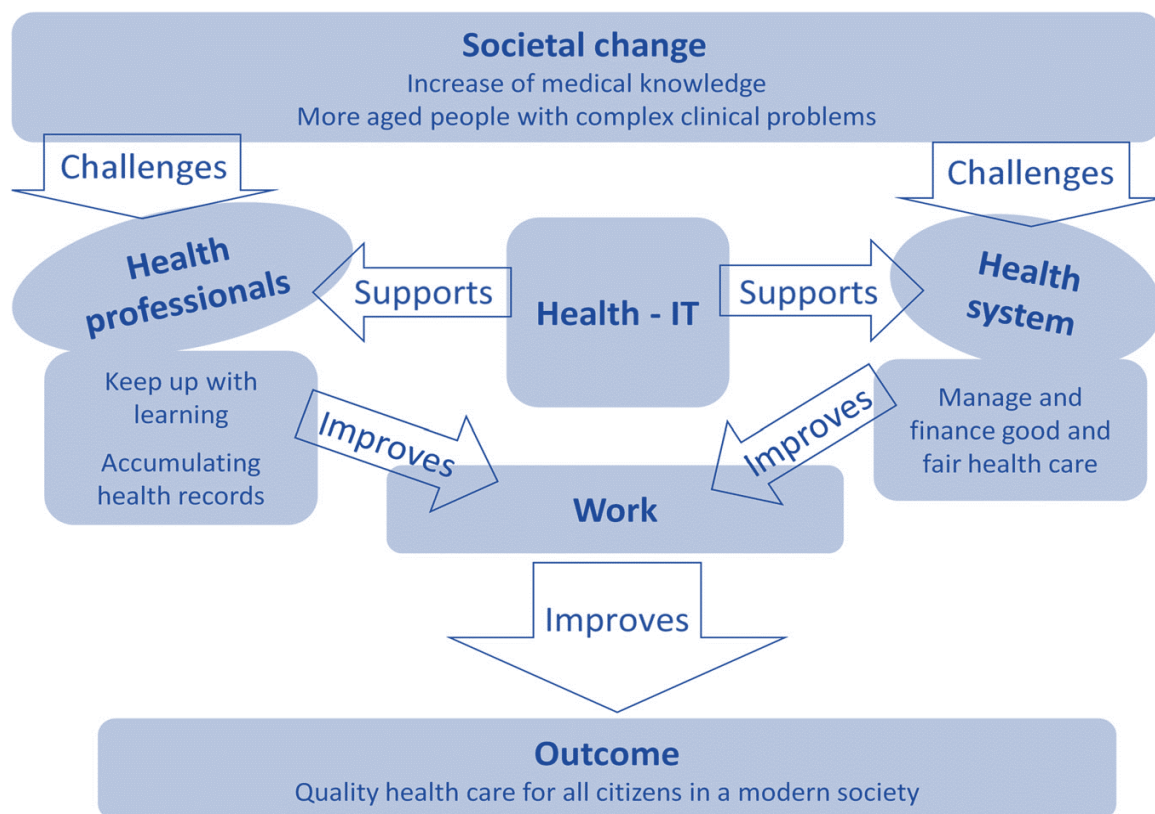
2.1 Electronic Health Records in developing countries

One-fifth to one-quarter of information systems (IS) projects implementation in industrialized countries is estimated to be a total failure. That of developing countries is suspected to be much higher; there is lack of literature and lack of evaluation of IS projects to provide adequate information to this effect. In rare cases where literature and evaluation exist, the focus has been on case studies. This goes to show that the implementation of IS projects, be it in health or other sectors of the economy is no mean feat, especially in developing countries where there is a lack of technical and human infrastructure (Heeks, 2002). The use of ICT in the healthcare organization in developing countries is particularly relevant because, it can help reduce the excessive cost of running hospitals which tend to be a problem for the governments. Moreover, this reduction in cost comes with an improvement in healthcare delivery and efficient patient care for the populace (Mbananga *et al.*, 2002).

West African countries lack the exposure to readily available and current healthcare information systems which in effect hinders their ability to provide proper and efficient healthcare. In the absence of electronic patient records, physicians in Nigerian hospitals are unable to trace the medical history of their patients. The medical history is contained in files which are stored in the medical records section of the hospitals but somehow, these files end up missing most of the time (Achampong, 2012b; Marful and Winter, 2014). Due to conflict of interests between the Nigerian Ministry of Health (MOH) and donor agencies, the implementation of health information systems (HIS) in this country has encountered some setbacks. The development of HIS in Tanzania and Mozambique on the other hand, has experienced problems such as lack of technical capacity and the failure to involve those who were going to use the information systems. The WHO recognizes the importance of the end users in the development and implementation of information systems, that is the reason for recommending the workforce as one of many eHealth components which should be focused on by countries in the development of an eHealth Strategy (Hamilton, 2013; Seitio-Kgokgwe *et al.*, 2015). Perhaps, the development of the workforce in developing countries will go a long way to contribute to the successful development and implementation of information systems.

In an illustration of the ideal effect of health information technology (HIT) as shown in figure 1, Wagner-Menghin and Pokieser (2016), posit that HIT is but a support mechanism to the health system and the different healthcare professionals in doing their work. This support mechanism helps to improve the overall work processes in the healthcare institution. Subsequently, it also results in an improved provision of quality health care for the population in a society where there is increase in medical knowledge and complex clinical problems. In order for health information systems to perform this function of providing support, the healthcare environment must be willing and receptive to the adoption of the technology.

Figure 1: Ideal effect of health information technology (Wagner-Menghin and Pokieser, 2016)



2.2 Electronic Health Records in Ghana

Ghana has had a national eHealth strategy which was to be a roadmap to national health systems development, since the year 2010. Through the adoption of innovative technologies for integrating data and systems, sharing information, extending and automating health service access and delivery, health system advancements were to be realized. The eHealth strategy aims to among others, focus on capacity building and a move towards a paperless

record and reporting system in the country (Ghana eHealth Strategy, 2010; Vroom *et al.*, 2017). Furthermore, there is a health sector ICT policy, and an ICT infrastructure is in existence in the country. However, in order for the ICT infrastructure to support health delivery systems, they have to be fully integrated and networked. The country has a number of health informatics projects which are still in their pilot stages, the projects are usually disjointed and lack coordination. In an attempt to establish management information systems in the health sector, most hospitals in the country are partially electronic with the major hospitals having some form of computer networking. Basically, the front desks in these hospitals, the records section and some departments, a typical example being the pharmacy department are computerized. Yet, the use of paper folders is still being practiced in virtually all the government hospitals in Ghana (Achampong, 2012b).

The health management information systems in the country are mainly used for clinical business processes and to support the collection and aggregation of data, like the computer processing of claims introduced by the National Health Insurance Scheme (NHIS). When it comes to the implementation of health information systems, like most developing countries, poor human resource, low levels of investment in ICT, and challenges of organisational nature such as resistance from employees towards a new system are some of the problems encountered. Most often, the main focus of the management of health institutions when implementing information systems are the hardware and software components of the system and not the humans required to use it. Also, infrastructural challenges such as internet connectivity and unstable power have played a role in the unsuccessful development and implementation of health information systems in the country (Achampong, 2012a; Achampong 2012b; Seitio-Kgokgwe *et al.*, 2015).

2.3 Healthcare work and implementing technology

Healthcare work is undoubtedly complex in nature, it involves the use of formal and informal work processes and tools, ad hoc interventions and unpredictable patient health conditions. This implies that, in any health organization, there is the need to understand current health systems in order to implement new technologies that will be acceptable to all health workers and ensure change with reduced system inertia (Berg, 1999; Coiera, 2011). The use of a radical “big bang approach” or methodology is therefore not advisable, simply because this type of approach tends to alienate those who are directly involved with the use of the new technology. This approach may also ignore minute details that will ensure easy and

sustainable use of the system being introduced. Thus, failure to understand the working processes at the frontline of the healthcare system which usually involves invisible yet essential and crucial contributions of some members of the organization may result in the implementation of a technology that cannot be integrated into the current working processes and subsequently, resistance by the intended users (Aanested and Jensen, 2011; Coiera, 2011). A review of health information technology in primary health care pointed out one limitation to technology in developing countries as the low adherence rate among health care professionals. Perhaps, the limitations imposed on clinicians' autonomy regarding clinical decisions by the protocols for computerization in primary health care, in the presence of an electronic health patient record, could explain the resistance to the use of health information technology by the health care professionals especially, the physicians (Tomasi *et al.*, 2004).

2.4 Approach to new system implementation

The tendency for a top-down approach to the introduction and implementation of a new IT system even in healthcare is very high. With this approach, policy makers, administrators or management in the healthcare sector, instigate systems or policies that they believe to be beneficial to the patient care process before they examine the extent, reasons for either success or failure and implications for achieving the intended objectives (Stewart *et al.*, 2015; Sabatier, 1986). The existence of command and control hierarchical systems in all governmental sectors including healthcare in most African countries, strongly advocate a top-down approach to decision making. Most often, strategic decisions made high up the hierarchical structure (usually at the ministerial level) are conveyed top-down to the 'subordinates' to carry out without question, irrespective of their implications (Blaise and Kegels, 2004).

It does not help that the management literature typically advocates a top-down approach. For instance, Hammer (1990) argues that instead of automating existing work processes, there should be an introduction and implementation of an entirely new system. Managers need to reengineer their work processes to help them stop the practice of outdated processes that threaten their businesses (Hammer, 1990). Contrary to this view, attempts by the health institution to use the top-down approach to e-health solutions in developing countries have resulted in failures. This, clearly suggests that the power of implementation resides with the lower level actors in an organization; such was the case with implementing telecentres in South Africa (Ruxwana *et al.*, 2010; Eboreime *et al.*, 2017). Likewise, an attempt by the

World Health Organization (WHO) to advocate an internationally defined set of policy steps and prescription in the DOTS (directly observed therapy, short course) package for tuberculosis in South Africa resulted in thwarted efforts at the local level. The reason being, the WHO approach did not consider the amount of local expertise in the management of tuberculosis which was different from their proposal (Schneider *et al.*, 2006).

Davenport and Stoddard (1994) also argue that, the ability to see and analyse entire processes in an organization is better achieved by those high in an organizational hierarchy. Thus, it is easier for them to introduce and implement innovative systems and technologies. This type of approach is problematic because usually, the top management in most organizations including healthcare, implement new systems to meet their administrative requirements without taking into consideration the economic and clinical consequences, causing serious and sometimes catastrophic implications (Aanested and Jensen, 2011). Moreover, those high up in an organizational hierarchy may not be privy to ad hoc decisions made during the daily work processes. In Ghana, just like in most African countries, those who head the Ministry of Health and the Chief Executive Officers (CEO) in majority of the public hospitals are medical doctors or specialists. The fact that society views medical doctors as supreme coupled with their inherent desire for power in the healthcare system could be what fuels their top-down approach to decision-making, despite their medical background and their oath to put the patient first (Aseweh Abor *et al.*, 2008; Olajide *et al.*, 2015). In other words, decisions made by those in authority in the health organization may not always be favourable to both health workers and patients. Perhaps, the already existing top-down orientation to policy implementation, constrained by hierarchical authority and resource uncertainty compel decision makers to serve the bureaucratic function of the health system in developing countries (Kwamie *et al.*, 2015).

2.5 Information systems implementation in Healthcare

Healthcare information systems (HIS) implementation is complex, nonlinear, and unpredictable. Possibly, because the healthcare organization itself is a complex sociotechnical network. This characteristic of the healthcare organization presents a difficulty in classifying HIS implementation as a success; the different stakeholders in the organization may interpret successful implementation differently. Besides, success is a multi-dimensional concept which is dynamic and fluctuating because it evolves over time. Success of system implementation can be considered in terms of effectiveness, efficiency, organizational attitudes, commitment

to its continuous use, and satisfaction of end users; both staff and clients (Berg, 2001; Sligo *et al.*, 2017). Berg (2001) suggests that success is subjective (from the view point of institutions or user groups), and therefore should be assessed considering to whom the question of implementation success is directed. Hence, it might seem redundant to postulate factors that lead to successful implementation of information systems (IS) in healthcare (Berg, 2001).

However, there are common characteristics that health information systems which are considered successful share. These characteristics or insights as suggested by Berg, (2001) can be used as “stepping stones” to assist other health organizations in implementing information systems of their own. In developing countries, the risk of health information systems being considered a failure if they are based on insights from the health information systems literature is very high. Health information systems designs from the western or industrialized countries have dominated the health sector in developing countries. This can be attributed to economies of innovation, business, politics of aid, and cultural attitudes which indicate that majority of the ICT and IS researchers and companies can be found in the industrialized countries. Furthermore, the industrialized countries have invested heavily in new information systems which they introduce to developing countries in the form of aid (Heeks, 2002). With respect to cultural attitudes, it is the general consensus in developing countries that items imported are of superior quality (Heeks, 2002), therefore by default, health information systems from industrialized countries are generally considered better than locally generated ones.

2.5.1 Successful implementation

According to Sligo *et al.* (2017), to successfully implement a health information system, one has to start by planning, designing and piloting. This should be followed by the new system being used intermittently, modified, accepted or rejected. If it is accepted, then the use of the system continues until it becomes a part of the daily working processes of the institution, to the point where it is considered routine. Success becomes an arduous task the wider the span of the information systems implementation. Since one of the aims of information systems is to improve organisational function through change and support, the greater the degree of change an IS introduces, the more likely it is that there will be great improvements in the functioning of the organization. However, this may come at the risk of IS implementation failure because of the size of change required. To put it simply, the more comprehensive the

IS, the more likely its implementation will fail and vice versa (Heeks, 2002; Sligo *et al.*, 2017).

For successful implementation of health information systems, Sligo *et al.*, (2017) group possible factors from available literature on the topic under three main headings; structural /organizational, human, and technical. There is emphasis on the interconnection between the technical and social (organizational and human) aspects of health information systems implementation (Evans *et al.*, 2014; Sligo *et al.*, 2017). The structural factors are concerned with the things needed prior to and during HIS implementation such as provision of resources (money and staff), clearly articulated goals and priorities, and good relationships and communication between and among the management and staff, just to mention a few. With regards to human factors, such characteristics as staff having some previous technology experience, perceiving the use of the technology as compulsory, easy to use, understandable, and better than the previous work processes they had, were essential for successful HIS implementation. The staff need to be trained adequately and given sufficient time to familiarize themselves with the new technology so as to accept and operate it for maximum benefit. There is also the need for ‘project champions’, these are senior leaders who act as liaisons between the management, technology staff and other staff members to ensure a continuous flow of information to enhance the implementation process. Characteristics of a technical nature that promote successful HIS implementation include the ability to integrate the new technology into existing systems and work processes, the new HIS should be user friendly; that is, it should be easy to understand and operate, the system’s navigation and tasks should be easy to remember, and it should be easily customised with a quality design interface requiring little training for its use (Evans *et al.*, 2014; Sligo *et al.*, 2017).

There is scarce experience with creating health information systems, particularly, electronic medical record (EMR) systems for developing countries. The need to report aggregate statistics for government or funding agencies have been the aim for developing and implementing healthcare information systems in most developing countries (Tomasi *et al.*, 2004; Fraser *et al.*, 2005). Furthermore, developing countries implementing health information systems created in western countries is a guarantee for failure because of the existence of differences in context with respect to information, technology, processes, objectives, staffing and skills, management and structures, and other resources. In other words, there is a clash of context between western HIS designs and developing country

reality which creates what Heeks (2002), describes as a *design – reality gap* (Heeks, 2002). There are challenges and issues to implementation even when the design of the health information system is local (by designers in developing countries). A common issue of health IT implementation is the focus on the new technology's workability in the larger organizational and administrative context instead of on clinical practice (Wagner-Menghin and Pokieser, 2016). Thus, the health workers' interaction with the HIS may be limited to inputting information into the system without realising its full benefits and therefore, creating a sense of neglect and work dissatisfaction (Nilsson, Eriksén and Borg, 2014). A strong information infrastructure prior to the implementation of health information systems plays a crucial role in its success.

2.6 Information infrastructure

In spite of the numerous research attributed to the concept and design of information infrastructure (II), a *univocal connotation* remains elusive. Braa et. al., 2007 like Borgman, 2010 approach the use of the information infrastructure concept from a broad perspective; a collective term that encompasses technological and human components used to facilitate the functioning of a specific information system (Borgman, 2010; Braa et. al., 2001 cited in Iannacci, 2010; Iannacci, 2010). The use of the term as noted by Iannacci (2010) extends beyond this broad perspective to incorporate communicative behaviours, taken-for-granted practices, systems of standardized practices, and defining II in relation to situated practices. It is this latter perspective that the author adopts in his investigation of the relationship between the cognitive and technical aspects of information infrastructure (Iannacci, 2010). In this research study though, the broad II perspective will be adopted and the characteristics of information infrastructure as proposed by Hanseth and Monteiro (1998) will be discussed later in this section.

2.6.1 II and the installed base

Existing systems and practices form part of the information infrastructures in healthcare organizations. These systems and practices need to be taken into account when introducing and implementing a new information technology (IT) system; it is impossible to change existing infrastructures instantly (Hanseth and Monteiro, 1998). So, new systems are built from the installed base or existing infrastructure (ibid), which means that the introduction and implementation of new systems will always be to some extent based on existing work. Therefore, the old health care work processes will have to influence any new electronic

health care system to be introduced. This process of building new systems from existing infrastructure is known as cultivating the installed base. For instance, when the Academic Model for Prevention And Treatment of HIV/AIDS (AMPATH) medical record system (AMRS) was being implemented in Kenya, the developers adopted a graphical user interface that followed the pattern of the paper forms which represent the installed base for its clinical data repository (Aanested and Jensen, 2011; Hanseth and Monteiro, 1998; Siika *et al.*, 2005). Furthermore, the new health information system implemented at the Greater Accra Regional hospital adopted the pattern of existing work processes at the various departments to design the user interface for the different groups of healthcare professionals. These work practices ranged from paper-based systems to basic electronic systems specific to a department.

According to the sociotechnical approach to patient care information systems (PCIS) and health care (Berg, 1999), a new technology should interact with the current working processes in the healthcare organization. This interaction is achieved when the new infrastructure establishes gateways to the installed base, which in turn influences the improvement of the new infrastructure. Hanseth (2002) postulates that the installed base should be viewed as a living organism that can be shaped, yet, it is not controlled by either designers or users (Hanseth, 2002; Aanestad and Jensen, 2011). This unique trait of an installed base enhances its mutual interaction with a new technology in order to facilitate a more effective and efficient patient care process within a healthcare setting. The AMRS, a comprehensive electronic medical record system illustrates the mutual interaction between an installed base and a new system because it balances the use of paper-based records (the existing working system) and electronic records (the new technology) to produce a uniformed patient data that can be retrieved for both clinical care and research purposes (Siika *et al.*, 2005). In the same vein, the health information system at GARH balances the use of the paper-based records produced at the out-patient department (OPD)² and electronic records from the departments that are operating in the completed phase of the ultra-modern building to produce patient data that can be used for diagnoses and treatment of the client.

It is imperative to take an information infrastructure (II) perspective in the implementation of a new healthcare system, because II can be considered the underlying foundation for systems

² The out-patient department is one of the departments to be relocated to the completed phase 2 ultra-modern building.

and similar developments related to information and communications technology. Typically, II is large, complex, diversified, interconnected and difficult to change (Hanseth and Monteiro, 1998; Aanestad and Hanseth, 2000), and it exhibits the following characteristics;

2.6.2 Enabling function

The design of information infrastructure should be such that it is able to support an array of activities in an organization. Furthermore, it should create opportunities for new activities in the organization instead of only automating the already existing practices (Hanseth and Monteiro, 1998). In the healthcare organization, there are numerous activities which translate into a common process - the delivery of health care or the patient care process. The ability of an II to support these various activities and consequently the patient care process is desirable. The health information system at GARH has the ability to support the various work processes at the different departments which constitute the patient care process. The system is also projected to have additional functions outside of the existing work processes; patients can have an account at the health facility which they can access for their financial needs at any time and in any department. This saves the patients the trouble of excessive movements and at the same time, ensures that all services provided to the patients are paid for.

2.6.3 Shared function

An information infrastructure is a single shared resource for members of a community. It is irreducible and allows several applications to be integrated through information exchange. In other words, the infrastructure is not an individual tool developed for specific purposes to be used by a specific group of individuals. Additionally, the II allows data captured by means of one application (a shared resource or a foundation) to be made available to other applications through information exchange. In this sense, the first application becomes an infrastructure for a larger set of activities within a community (Hanseth and Monteiro, 1998; Hanseth, 2002). Considering the Greater Accra Regional Hospital as a community, the implemented health information system is a shared resource for all the health workers; both the medical and non-medical staff. It is also a resource for the clients as well, who are a part of the GARH community. When the health information system is fully implemented at GARH, the interfaces of the other departments will be dependent on the patient information registered at the records department of the hospital making it a shared resource.

2.6.4 Open and Heterogenous

The open characteristic of information infrastructure translates to its heterogeneity, in that, an infrastructure is considered to be open if it does not have a limited number of elements to be included in its design, deployment and use; number of users, participants and contributors to its design, other technological components and application areas. Hence, the infrastructure lacks a strict border although that does not imply everything is included in every II. The heterogenous function of an II encompasses the various elements the information infrastructure is open to, which could be grouped into technological and non-technological components such as humans, equipment, applications and information (Hanseth and Monteiro, 1998; Hanseth, 2002). The health information system at GARH is expected to be used by all the health workers at the facility, that is, over six hundred people currently working at the facility. From all indications, the various groups of healthcare professionals were involved to some extent in the development of the health information systems, and most of the different equipment used at the different departments have been integrated with the system. Moreover, the development of the health information system is still ongoing since the system has not been fully implemented.

2.6.5 Evolving

An information infrastructure is said to evolve if it has the potential for growth, in this case, to be extended or improved upon (Hanseth, 2002). This evolution has to be a continuous and positive process in that, the improvement of the infrastructure should result in a better system or application than previously existed. The more users adopting the technology, the more use areas the technology covers, and the more applications are integrated with the technology should make the technology faster and better to use (ibid). The health information system implemented at GARH has the potential for all the above-mentioned factors to help it evolve. However, this cannot be realised until the implementation is successful and the technology has been accepted into the hospital community.

2.6.6 Actor Network Theory: II as a socio-technical network

The characteristic of information infrastructure as heterogenous makes it a socio-technical network. Both these terms refer to technological and non-technological components in a setting such as humans, systems, institutions and the like (Hanseth and Monteiro, 1998). Generally, the technological and non-technological components exist mutually and are often considered a whole; they interact and interrelate to achieve a given purpose. Thus, they form

a collectif of humans and non-humans which is also known as an actor network. In that regard, the introduction or removal of an actor (also referred to as an actant) will have a reverberating effect within the network. This may require current work practices and infrastructure to be altered, and new positions created to accommodate the change effected. Sometimes, that may involve some form of restructuring of the existing healthcare system because it is very difficult to completely change it (Berg, 1999; Aanestad and Hanseth, 2000).

The above-stated effect is true for a new technology (an actor) introduced in the healthcare organization. In almost all instances, there is a form of mutual transformation process when an information system is introduced into an organization whereby, the new system introduced will affect activities such as the distribution and content of work tasks and information flow, making them visible. Subsequently, this effect leads to a change in the relationship dynamic among the workers (the different categories of health professionals and non-professionals in the case of healthcare) within the organization. The organization will in turn change the way the system was intended to operate because most often, it will have to be fine-tuned to suit the working processes and specifications of the organization into which it has been introduced (Berg, 2001). With respect to the HIS at the Greater Accra Regional Hospital, the health facility was refurbished before the information system could be introduced in the facility. Upon implementation, the HIS has affected activities at the hospital like the requisition of medical items from the medical stores via the health information system as opposed to writing it on paper. Likewise, the information system has been affected by the health professionals who use it through the modifications being made to enhance its effective daily usage.

2.6.7 User involvement in II

The information infrastructure characteristics speak to the importance of users; Hanseth and Monteiro (1998) explain the shared function of II as a shared resource to be used by *members* of a community. Furthermore, the open, heterogeneous and evolving function of II note that humans, as non-technological components play a part in the evolution of information systems through contributing to its design and the adoption of its use (Hanseth and Monteiro, 1998; Hanseth, 2002). These characteristics of II, therefore, suggest the involvement of users in the various aspects of an information infrastructure. It is imperative that the targeted users of an application are allowed to participate in the design of the technology right from the start to ensure that it will be user-friendly and used for the purpose for which it was intended. Those

designing the technology should then be invited to observe the work processes and workflow in an organization; entering the user's context to enable them have a better understanding of the working practices into which the new technology is to be introduced. This process will also encourage the designers of the new technology to take into account the complexities in the work processes when designing it (Christensen *et al.*, 2014; Berg and Goorman, 1999).

In the healthcare organization, it is exigent that designers understand how the different health professionals work, to effectively design health information technology (IT) systems that can be accepted by most health professionals if not all (Cora Garcia *et al.*, 2010). In the development of a district based health information system in South Africa, a participatory prototyping strategy was employed which resulted in the system becoming an official national standard in the country (Braa and Hedberg, 2002). It stands to reason, that the system's interface was user-friendly and therefore accepted in the healthcare organization. On the other hand, when users are allowed to play a major role in the designing of information systems, there is the tendency for the project to lose direction and momentum. In the healthcare setting, different healthcare professionals mean differences in job descriptions and priorities, and therefore differences in opinion. Even within a professional group, there exist differences in opinion due to differences in personalities, experiences (work and personal), and work ethics. All these differences could eventually lead to either a multi-directional process or no direction in the development process. This could create difficulties and setbacks to the introduction and implementation process. In such instances, the intervention of top management with a clear vision and framework to articulate the individual user groups' preferences is required (Berg, 2001).

In designing the GARH information system, the developers visited each department and observed the way the health professionals conducted their work routine to enable them design a system that would be acceptable to these users. The opinions of the health professionals (at least those in managerial positions) were sought to help with the development of a user-friendly interface. To some extent, the development process suggests user involvement although, involvement of those users who are at the grass roots should have been a primary focus as they are the ones who determine the adoption of a new technology (discussed in detail in chapter five).

2.6.8 Communication and training in II

Communication and training are an essential part of a socio-technical network and hence, an actor-network. Communication between the technological and non-technological components of an information infrastructure is required to ensure its function. In addition to that, there is the need for effective communication between the users of the II, and proper training of the relevant personnel using the system to enhance its efficient use. In a healthcare setting, the communication and training should emphasize the collaborative nature and core features of a technology if it is to be used by different health professionals with the common aim of providing efficient patient care. Orlikowski (1992) noted that, the structural elements in an organization may sometimes have to be reviewed to encourage the use of a new technology as a collaborative tool.

With respect to training, Tomasi *et al.* (2004) observed that most of the authors included in their review of health information technology in primary health care in developing countries, agreed on the need for at least minimal training programmes for health professionals when implementing a new technology. Users of a new technology are likely to resist it should they find difficulty in using it for their work processes. Lack of communication and adequate training will definitely lead to users experiencing difficulties and eventually, to the technology being abandoned even if it improves work processes. The training and communication process involved in the implementation of the health information system at GARH will be discussed in detail in chapter five of this research paper.

Chapter Three

Methodology

3.1 Study site

Researchers involved in interpretive studies aim to understand the actions, activities, processes and procedures within their natural environment. That is, most of the research pursued by these researchers is related to the setting in which they work or are familiar with. Irrespective of this, research must be done within the larger context within which they take place (Robson, 2011; Blomberg and Karasti, 2013). All aspects of a research setting be it the physical structure, its relationship to other settings, interactions that take place in relation to the setting, and the like must be accounted for. Traditionally, the study sites for research are conceptualized as bounded single-sited settings which are studied in isolation, thereby limiting the researcher's understanding of proceedings and subsequently, misleading the understanding of the readers with regards to the research interest. As a study site comprises people, entities, activities, technologies and relations which are mobile and in constant interaction within a virtual environment or a real one, viewing the study site as multi-sited takes into account all these and more to promote a more comprehensive and holistic understanding of a research interest (Marcus, 1995; Blomberg and Karasti, 2013).

The availability and accessibility of opportunities and resources to the researcher, be it conceptual, relational, professional or financial enable the researcher to construct his or her study site as opposed to him or her discovering it (Amit, 2000). Thus, the decisions, choices and interactions of the researcher construct and contextualize the study site within which he is to operate. For instance, in negotiating for access to undertake a research, what the researcher is given access to and the conditions in which he finds himself may require a questioning of previously held assumptions and perhaps a revision of the research question and interest (Blomberg and Karasti, 2013). Robson (2011) suggests that real world research is the *art of the possible*, whereby a researcher's familiarity with the literature and the field play a significant role in the research. Despite one's familiarity or relation to a field, access has to be granted for a research to be conducted, as formal agreements on access to settings are somewhat of a requirement in real world research. Thus, it is crucial to negotiate access to a study site; convince those in top-management as well as those you will be dealing with directly to let you in and in some cases confide in you. The formalities are not only to grant

the researcher access to the study site, but also to serve as a reference should something go wrong during the research process (Robson, 2011).

The study site for this research is multi-sited as it comprises different departments in the same healthcare institution, groups of healthcare workers, technologies and many more. Marcus (1995) proposes a strategy for multi-sited research known as tracking. This strategy involves following people, metaphors, stories, objects and conflicts across sites during a research study, all the while making planned contact with the actants in situations where there is mobility, diffuse processes, and fragmented social networks (Marcus, 1995; Amit, 2000). Constructing and contextualizing the study site is influenced by the results of negotiated access to the setting, the participants involved, as well as the interactions and decisions made during the data collection process (Blomberg and Karasti, 2013). The Greater Accra Regional Hospital (GARH), also known as the Ridge Hospital in Ghana is the main study site for this research. Within this healthcare facility, there are different departments which are interconnected to provide quality and efficient health care to their clients. A description of the main study site cannot be done without taking into consideration the larger context of the research, the country within which the study site is located.

3.1.1 Ghana

This is a tropical country within sub-Saharan Africa, specifically, West Africa. Just like most African countries, it is a developing country with about twenty-eight million inhabitants. The country has a young population (more than half of its population is below the age of 25 years) and an average life expectancy of 65 years. The capital of Ghana is Accra which is located in the Greater Accra, one of the ten regions in the country. Most of the population is concentrated within the southern sector of the country with the highest concentration found in and around the capital (Central Intelligence Agency, 2018). There is a double burden of disease in the country; on one hand, communicable diseases, under-nutrition and poor reproductive health are health issues common to the population. On the other hand, there has been an increase in non-communicable diseases, diseases such as cardiovascular diseases and diabetes previously associated with the rich in the society. A relationship has been established between poverty, inequalities, health, and the morbidity and mortality of the population in the country (Ghana eHealth Strategy, 2010).

3.1.1.1 Overview of health service provision in Ghana

The Ministry of Health (MOH) is the main governmental agency in charge of all health-related issues. It aims to provide access to quality health care for everyone living in Ghana. Hence, the MOH promotes health and vitality which will ensure a healthy and productive population for socio-economic development, and subsequently, national development. The roles of the MOH among others are to; provide overall policy direction for all stakeholders in the delivery of health, mobilize and allocate resources to all providers in the health delivery services, and monitor and evaluate health services in Ghana (Ministry of Health| Republic of Ghana, 2015).

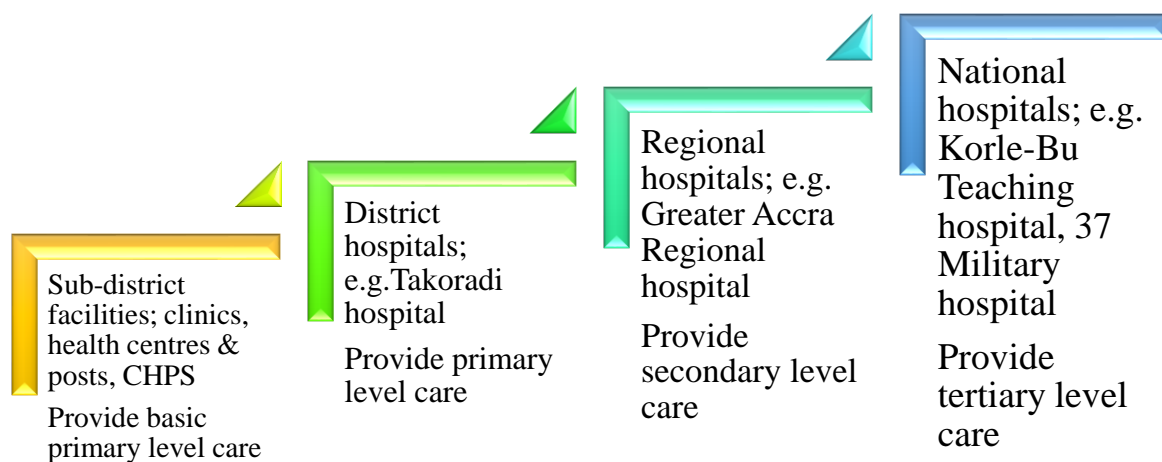
However, the Ghana Health Service (GHS) as an agency of the ministry is responsible for the administration of the health services provided by the government and the implementation of the government policies on healthcare. In spite of these roles, it is an independent public service body which is designated to oversee the establishment of a more equitable, efficient, accessible and responsive healthcare system in all health delivery services in the country. The exception to this are the Teaching hospitals, private hospitals and mission hospitals which are overseen directly by MOH. GHS manages comprehensive and accessible health service in the regional, district and sub-district levels with emphasis on primary health care. This, the GHS does by managing and administering the overall health resources within the service, performing functions relevant to the promotion, protection and restoration of health in Ghana. (Ministry of Health | Republic of Ghana, 2016).

The provision of health care in the country is by a range of organizations, agencies and individuals. These health service providers include government health facilities, private healthcare facilities owned by individuals and/or businesses, traditional healers and healing centres, nongovernmental health facilities, civil society and community groups. Furthermore, various ministries, agencies and departments are in collaboration and partnership with these health care providers to enhance effective and efficient provision of care (Ghana eHealth Strategy, 2010). The study site for this research is a government health facility, thus, focus will be placed on the health service provision by the government institutions.

As illustrated by figure 2 below, there are distinct levels of health service offered by the government healthcare facilities. These range from the sub-district level to the national level. At the sub-district level are the health centres, health posts, clinics and the Community-Based Health Planning and Services (CHPS) responsible for the provision of basic health care

services. This is followed by the district hospitals at the district level which provide primary health care services to patients. Thereafter, there are the regional hospitals which are responsible for the provision of secondary level health care services and supporting the district hospitals through referral services. For the provision of tertiary level health service through referrals mainly, the national healthcare facilities including two teaching hospitals, three psychiatric hospitals, the police hospitals and the military hospital are responsible for that (Ghana eHealth Strategy, 2010).

Figure 2: Levels of health service provision by the government healthcare facilities



3.1.2 Greater Accra Regional Hospital

The Greater Accra Regional Hospital, also known as Ridge hospital (Figure 3) is the setting for the study. It was started by the British during their colonial rule around 1928 as one of the many hospitals intended to provide health care for their people. It became a district hospital after Ghana gained its independence in 1957 and then a regional hospital four decades later (Elective Ghana, n.d). The hospital is located somewhat in the centre of the capital city of Ghana, Accra. In addition to being surrounded by the most populated communities in the capital, the hospital is also in close proximity to several businesses, financial institutions, and government establishments such as the ministries including the ministry of Health. The Ridge hospital was recently refurbished and equipped with modern facilities and diagnostic tools to enhance the quality of health care provided to the citizens of Ghana (Ibrahim, 2016).

Figure 3: Refurbished Greater Accra Regional Hospital (Ridge Hospital) in Ghana



Prior to its refurbishment, GARH was a 192-bed facility which served on average 800 outpatients and 250 inpatients daily. The buildings and equipment at the hospital were outdated and outmoded. The various service points which included outpatient, inpatient, specialist, administrative and support services were located in a number of individual buildings scattered on the hospital premises. This did not contribute to an effective and efficient patient care process. Upon completion of the ultra-modern healthcare facility, GARH will be a 620-bed facility with a comprehensive range of services from outpatient services to a 24-hour surgery unit. Furthermore, the hospital will provide complete specialist care services and it will be fully networked to operate a health management and information system (HIS) within its facilities. Subsequently, the health facility will be able to provide tertiary level of care for the over four million inhabitants within its catchment area. The refurbishment is in two phases; the phase one is complete and the HIS has been implemented in the departments that have been relocated to the new building. Phase two is yet to be completed. Currently, about a total of 654 workers are employed at the hospital; both health professionals and auxiliary workers.

With the implementation of the health information system at GARH less than six months before the start of the data collection, the issues encountered by the health professionals in their daily work can be identified in this early phase. To a significant extent, the successful implementation and adoption of HIS is enhanced by the health care workers who use it.

Moreover, to ensure the overall success of the HIS implemented at GARH, challenges to the system must be identified through constant iterative evaluation and adjustments to its design process. The opinions of those who are in constant contact with the system could go a long way to help with this iterative design development process. The Greater Accra Regional Hospital is the appropriate setting for this study because it has just implemented a health information system in its ultra-modern facility.

3.2 Study Design

It is the *blueprint* of research; a plan that steers and informs the researcher in all aspects of the research process such as collecting, analysing, and interpreting data (Nachmias & Nachmias, 1992 cited in Yin, 1994; Yin 1994). Taking into consideration the topic of the research, the use a qualitative and interpretive approach to the methodology is appropriate because this research aims to explore the challenges in the early phase of implementing a health information system from perceptions and accounts of the health professionals at the Greater Accra Regional Hospital.

3.2.1 Research methods: Qualitative versus quantitative

Qualitative study is a broad methodological approach to research under which interpretive research falls (Klein and Myers, 1999). In scientific research, quantitative research methods which deal with the size, extent and duration of a phenomenon is rated higher than the qualitative approach. In addition to that, a randomized controlled trial (RCT), often used in quantitative research is considered the gold standard in research strategies. This is because when researchers make use of the established methodological standards which is often used in a quantitative study, it is assumed that their results are reliable. With the qualitative research approach, social phenomena are explained through theory building which could be considered a scientific process (Stoop and Berg, 2003).

These social phenomena explore participants' perspectives; the focus is on the participants' meaning and understanding, with emphasis on their social context and natural settings. This is as opposed to the use of experimental settings in the quantitative research approach. Furthermore, there is a form of flexibility attached to the data collection and analysis processes in qualitative studies that allows for the exploration of emergent issues (Kemperaj and Chavan, 2013). However, unlike the quantitative research method, there is more involved

for readers to be convinced of the text from qualitative research. (Golden-Biddle and Locke, 1993).

3.2.2 Interpretive research

Interpretive research seeks to explore and examine the different meanings individuals attach to a similar experience, phenomena, and process based on their social context. This is sometimes done through the use of ideas, concepts and other symbolic forms. To put it succinctly, interpreting events and happenings, and making sense of emerging situations are influenced by an individual's social environment (Golden-Biddle and Locke, 1993; Popay and Williams, 1998; Klein and Myers, 1999). Correspondingly, Stoop and Berg (2003) suggest that qualitative research methods help a researcher to understand an individual's point of view or opinion on a matter of interest in a given social and institutional context. Interestingly, these personal interpretations, point of view or opinions have to be studied and interpreted by the researcher in such a way that readers who interact with the study as presented in an article are convinced of its validity (Golden-Biddle and Locke, 1993).

“Convincing emerges not only as a result of what the text conveys but also of how the text conveys that message” – Golden-Biddle and Locke (1993). To develop texts, researchers must enter a field setting and convert the stream of field experiences into their written form. Individual backgrounds and experiences influence the meanings disclosed in reading a text actively. Due to dissimilarities of the experiences of the different readers, there is asymmetry created in the process of actively reading a text, between the readers and the text. These readers engage and interpret the text by relating their reading to their personal and intellectual context. Usually, the meaning created by the author is disclosed in the reading process, however, readers do not necessarily grasp the same meanings in the text as intended by the author. Hence, readers of a text need to be convinced of the following;

- the credibility of the researcher's finding
- the credibility of the interpretations offered, given that there are numerous possible interpretations.

Golden-Biddle and Locke (1993) suggest authenticity, plausibility and criticality as the three dimensions of convincing needed to convince readers of a text.

Authenticity: It means “being genuine to the field experience as a result of having been there” (Golden-Biddle and Locke, 1993). This is achieved by meeting these two conditions;

- assuring readers that the researcher was present at the study site therefore, gained first-hand experience with the world of the participants
- assuring readers that the researcher was genuine to the experience in that, he gained familiarity (grasped and understood the participants' world) with the setting to convey a written account of the participants experience (ibid).

Plausibility: It is the ability of a text to connect the descriptive and conceptual worlds depicted when one is reading a written account. Plausibility considers the relationship between the readers and the subject matter being conveyed; the personal and professional experiences of the readers with regards to the topic at hand. In trying to achieve plausibility, a researcher must aim to write the text in such a way that, a reader can make sense of it given his personal, disciplinary background and experiences. This can be done by allowing the text to convey a sense of familiarity with the readers yet creating a sense of distinction and innovation unique to the written account (Golden-Biddle and Locke, 1993).

Criticality: This is a text's ability to disrupt readers' common sense by actively probing them to step back, reconsider and reflect on their 'taken-for-granted' beliefs, intellectual assumptions, ideas which form the basis for their work. The effect of this active probe is that readers are able to imagine different potentialities for intellectual discourse as the written account provides a cultural critique of assumptions underlying established theories and thought patterns on a particular subject matter (Golden-Biddle and Locke, 1993).

This research in part, aims to assess the experiences, knowledge and actions of the various health professionals with regards to the effect of the newly implemented HIS on their work processes and perhaps, the influence of social factors on these. For instance, why one health professional will consider the HIS as user-friendly and improving the patient care process while another will perceive the HIS as having no effect whatsoever. Is this perception likely to change should their ranks and contribution to the design and implementation process be reversed? In addition to this, it would be interesting to explore the factors that influence their decisions and choices in the course of working with the HIS. This implies that the interpretive field study specifically an in-depth case study, a type of interpretive research is appropriate for this study. Simply because a form of enquiry will be employed in this research process in a relatively short period of time (Klein and Myers, 1999).

3.2.3 Case studies

Explaining case studies, Yin (1994) writes; *the case study allows an investigation to retain the holistic and meaningful characteristics of real-life events such as individual life cycles, organizational and managerial processes, neighborhood change, international relations, and the maturation of industries*. Complex social phenomena exist in real life, using an empirical inquiry to investigate and comprehend these phenomena within their real-life context is what the case study seeks to do, especially, when the boundaries between a phenomenon and context are blurred (Yin, 1994). The case study as a distinctive form of empirical inquiry has characteristics which distinguish it. Some characteristics of case studies based on Benbasat *et al.*, 1987; Yin, 1994; and Bossen *et al.*, 2013 are as follows;

- A phenomenon is examined in its context and natural setting
- Data are collected by multiple means
- Ability to deal with a full variety of evidence
- Researcher has little or no control therefore, no experimental controls or manipulation are involved
- Case research is useful in the study of "why" and "how" questions because these deal with operational links to be traced over time
- The focus is on contemporary events in which relevant behaviours cannot be manipulated
- The interest is in understanding what happens, why and where

According to Benbasat *et al.* (1987), problems in which research and theory are at their formative stages, and practice based problems where experiences of the actors and the context of action are important require the use of case studies. In information systems research, a case study is the method of choice due to the following reasons;

- information systems can be studied in their natural setting - learn about the state of the art and generate theories from practice
- in answering the "how" and "why" questions associated with information systems, the researcher is able to understand the nature and complexity of the processes taking place
- the rapid pace of change in the information systems field gives rise to many new topics for which valuable insights can be gained through the use of case study research (Benbasat *et al.*, 1987).

This research aims in part to elucidate the challenges encountered in the early phase of implementing a health information system. This might be considered a pertinent issue that is strongly associated with the health information system's success or failure. In spite of the differences in opinions, perceptions and interests of the different stakeholders in the implementation of a new system, there is a common denominator; the success of the implemented health information system for the improvement of health care provision to patients. The use of a case study will highlight these challenges which can be addressed before the next phase of the implementation of the health information system, which will take place upon completion of the second phase of the refurbishment of GARH (Talmon *et al.*, 1999, cited in Stoop and Berg, 2003; Stoop and Berg, 2003).

Based on the questions this research aims to answer, interpretive research appears to be the appropriate method for finding valid and useful answers. Interpretive research will bring to bear the opinions and interpretations of health professionals in the healthcare institution on the issue at hand; implementation of information systems, which can be utilized for improved patient care in the country and perhaps, in developing countries. In addition to this, the successful implementation and acceptance of information systems in the African region could be enhanced based on this research's findings (Sackett, 1997, cited in Popay and Williams, 1998).

3.3 Data Collection

This being an interpretive study, the use of thick description (Walsham, 1995) would be required to lend authenticity to the study process and the study as a whole. The constructs and interpretations of the participants would not only be taken into consideration, the data collection process would aim to capture the context of the meanings of the participants constructs; circumstances, intentions, motivations, emotions, thoughts and perceptions of each construct. Additionally, the context in terms of environment and setting at the time the participants are giving their constructs would be taken into consideration (Ponterotto, 2006). However, in order to obtain participants' constructs or opinions, theory may serve as an initial guide to the interview process, keeping in mind that pursuing the suggestion of the theory alone would prevent the identification of potentially new issues and avenues (Walsham, 1995).

Deem's (1996) accounts of contingent, nonlinear, accidental and serendipitous occurrences in the progress of research attest to the flexibility a researcher should maintain during a research (Deem, 1996 cited in Robson, 2011). Despite these existing information, the data collection process would be done without prejudice. Hence, a certain degree of openness to the data collection process and analysis would be considered to allow for the expansion and revision of initial theories associated with the case under consideration (Walsham, 1995; Dingwall, 1997). I collected the data over a one-month period in several departments at the Greater Accra Regional hospital. The criteria for choosing the departments and hence, the health professionals to be interviewed were either one or both of the following;

- use of the new health information system
- critical part of the patient care process.

Prior to the process of data collection, I contacted a biomedical scientist via WhatsApp³ to find out the status of the hospital with respect to electronic systems. This, I did because the hospital (phase 1) had just been refurbished and handed over to the management of the facility. During our correspondence, the biomedical scientist told me that they had not yet moved to the new building and therefore, they had not started using the health information system they had been told would be implemented. After a couple of months, I received a positive feedback from her on the subject, although she expressed that they were already encountering difficulties with the new system then. Immediately I arrived in Ghana, I drafted my application letter and together with accompanying documents, I sent it to the Greater Accra Regional Health Directorate of the Ghana Health Service (GHS). Even though I had made an acquaintance at GARH, I needed an introductory letter for the management of the hospital to consider my request to conduct my research. Before the decision arrived from the Greater Accra Regional Health Directorate of GHS, I visited the study site to acquaint and familiarize myself with the health facility and some of the health professionals.

Once my letter was approved by the Regional Health Directorate, I sent it to the administration of GARH for approval as well. Upon receiving approval, I was introduced to the research manager of the hospital whose job it was to find the kind of participants I needed for my research. During the course of my data collection, I would report to the research

³ A multimedia platform which allows users to send instant messages, make voice and video calls as well as send pictures, audio and video messages.

manager upon arrival at the hospital and he would take me to the health professionals he had managed to ‘recruit’ for my interviews. As it turned out, the research manager recruited the health professionals when we arrived at each department of interest. On certain occasions, I was handed over to the head of a department whose job it was to then find willing health professionals within the department for me to interview. It is worth mentioning that the category of health professionals I had intended to interview, and the focus of my research changed as I conducted the interviews and learned new information I had not been privy to before my arrival at the study site. Beforehand, I had intended to interview biomedical scientists, a couple of senior administrative personnel⁴, medical doctors and nurses who worked at the out-patient department. In the end, I interviewed a variety of health professionals in different departments and one individual who works at the administration. In total, I interviewed fifteen (15) workers at the Greater Accra Regional hospital. An overview of the data collection can be seen in table 1 below;

Table 1: Overview of data collection

Department	Personnel	Number	Data type	Duration (per person)
Administration	Personal Assistant to the Medical Director	1	Interview	11 minutes
Records	Manager	1	Interview Observation	51 minutes
Out-Patient (Nurses’ station)	Nurse in -charge Senior nurse	2	Interview Observation	8-14 minutes
Laboratory	Deputy Head Biomedical Laboratory scientists Front desk staff	6	Interview Observation	16-42 minutes
Pharmacy	Technician	1	Interview Observation	18 minutes
IT	Technician from developer	1	Interview	14 minutes
Medical Stores	Supply Officer	1	Interview	11 minutes
Labour Ward	Medical Doctor	1	Interview Observation	7 minutes
Corporate and Prestige	Nurse	1	Interview (not tape recorded) Observation	15 minutes

⁴ Someone who worked at the administration, preferably in a management position like the medical superintendent or the administrator or both.

3.3.1 Data collection strategy

Answering a research question requires the availability of data (information) for the process to be progressive. The data collection process involves obtaining participants' accounts of their experiences, actions and knowledge through strategies such as; interviews, observations, focus group interviews, life histories, think aloud method, critical incidents technique and existing documents (Stoop and Berg, 2003; Kemparaj and Chavan, 2013). These data collection strategies afford the privilege of documenting accounts in the natural setting of the participants with the added benefit of context and perspective. As this study is a qualitative one, I employed the use of a couple of the data collection strategies mentioned above, particularly, interviews and observations. Additionally, I made use of photography and informal discussions in the data collection process.

3.3.1.1 Interviews

As a research tool, the qualitative interview is a powerful and excellent means of gathering data. In one another's immediate physical presence, the reciprocal influence of the interviewer and the interviewee's actions on each other makes an interview a social interaction (Goffman, 1959 cited in Myers and Newman, 2007; Myers and Newman, 2007). In their description of qualitative interviews, Rubin and Rubin (2005) liken the research tool to night goggles which allows the researcher to see what is not ordinarily on view and to examine what is looked at but is seldom seen (Rubin and Rubin, 2005 cited in Myers and Newman, 2007). Qualitative interviews can be classified as follows;

Structured interviews: the interview questions are complete and 'fixed' allowing no room for improvisation.

Unstructured or semi-structured interviews: the interview questions are flexible allowing room for improvisation during the interview process.

Group interviews: there is more than one interviewee at a time (Myers and Newman, 2007).

I conducted semi-structured interviews with fourteen (14) of the fifteen (15) health workers I interviewed at GARH. All the interviews were tape recorded with the exception of one. As shown in table 1 above, one nurse refused to have the interview session recorded; her reason being she was not comfortable being recorded. I conducted face-to-face interviews with the health professionals at their departments or offices. Some of the interviews were conducted

on the bench⁵ when the participants had a moment to spare from their busy schedule. To be honest, this was problematic on certain occasions as there were constant interruptions by colleagues, interns, mobile phones and on one occasion a group of health professionals from other health facilities conducting a peer review at the study site. Due to the fact that I had to 'follow' the research manager to the departments, I could hardly book appointments with the willing participants for an interview. However, there were one or two occasions when I was able to do that. In some instances, the scheduled appointment took place as planned although there were times when the appointment had to be rescheduled or cancelled completely due to extenuating circumstances. Health professionals or people who work at a health care facility are very busy individuals. This means that during my visits to GARH trying to find health professionals to interview, I spent countless hours just waiting for one of the health professionals to be available for an interview. There were days when I spent virtually the whole day waiting to conduct interviews, only to return home with either one or no interview at all.

The questions for the semi-structured interviews were formulated based on prevailing theories on health information systems implementation and my preconceived ideas about the subject matter. I relied on my lecture notes on the topic of interest as well. I chose to use semi-structured interviews in order to allow for the perceptions and opinions of the interviewees to be elucidated and emphasized. On most occasions, the interviews were done concurrently with observations and hand-written notes. However, as I had quite a number of hours to wait before most interviews, I did some observations independent of the interviews. Nonetheless, the observations played a role in the restructuring of my interview questions and clarifying some of the responses given by the health professionals during the interviews.

3.3.1.2 Observations

A researcher observing the events, behaviour and interactions within a study setting; the inter-relationships and dynamic between and among the different actants in their natural setting is one of the research tools used in qualitative research. It can be a revealing and powerful data source when the researcher observes what people do and how they do it (Baillie, 2013; Kemparaj and Chavan, 2013). Observations can be done solely as a data

⁵ The term is used to describe the workstation of the health professionals, particularly in the laboratory department

collection strategy or in conjunction with the other research tools. There are two types of observation;

Participant observation: the researcher is a part of and experiences the phenomena herself

Direct observation: the researcher takes more of a 'back seat role' and watches as events unfold (Kemparaj and Chavan, 2013).

My observations at GARH were of the direct observation kind. I observed the health professionals in their natural habit, performing their duties and interacting with their environment (colleagues, interns, superiors, patients, technology, culture, etc.). The observation was done in a convenient manner due to time constraint. That is, I made my observations during the interviews and when I did not have any ongoing interview sessions. There were days when the research manager was absent from work, hence I took the opportunity to observe the work processes in some of the departments we had already visited. My observations were also of the happenings within the departments as I moved through them to meet either the head of department to suggest a participant to me or the person I was to interview.

I observed several interesting events, interactions and behaviour which could or could not be relevant to the research. Nonetheless, these observations contribute to the genuine experience of being present at the study field and will enhance a thick description of the research where needed.

3.3.1.3 Photography

Scenes from the study site and some data were captured on camera to serve as a visual representation of data collected for the research. The graphical representation of the study site and work processes will reinforce the authenticity of the study.

3.3.1.4 Informal discussions

Informal discussions are not a qualitative research tool. However, they can be a very important and useful tool to the researcher. Through informal discussions, the researcher can assess the reactions, expressions (both verbal and non-verbal), opinions and perceptions of individuals in the study setting. Likewise, informal discussions allow the researcher to make acquaintances and build rapport with the interviewees as well as other health workers at the study site. In instances when the participant is not comfortable with either interviews or

observations, informal discussions enables him to express himself 'freely'. In the absence of tape recorders and notes, the researcher is able to gather information about his subject matter and gain an in-depth understanding of his participants through informal discussions.

I had informal discussions with several of the health workers at GARH. Due to my profession as a biomedical laboratory scientist, I was able to engage in health-related discussions as and when it was required. I had informal discussions with the research manager about the health information system that had been implemented and gathered data I would otherwise not have been privy to. The relevant information obtained from these discussions were written down at a convenient time so as not to forget. There was complete anonymity employed when writing down the information; no names, ranks or departments were noted. On few occasions when the information required some form of identity to be attached (mainly rank and department), the individual was asked for his informed consent.

3.4 Data Analysis

Qualitative analysis as described by Bradley, Curry and Devers (2007) is "*an ongoing, iterative process that begins in the early stages of data collection and continues throughout the study.*" With qualitative data analysis, the researcher is trying to make sense of the data collected through interviews, observations or other qualitative research tools. To elaborate, the constructs of participants in light of their experiences, the sequence of events, and conditions which influenced these constructs during the data collection process must be incorporated into the interpretations of the data. The use of thick description could be employed to enable the researcher grasp and understand these interpretations of the constructs so as to convey an authentic written account to the readers (Denzin, 1989 cited in Ponterotto, 2006; Bradley *et al.*, 2007; Walsham, 1995).

First, I personally transcribed each of the fourteen interviews from the health workers at GARH verbatim. The transcription process took approximately a month to complete. It involved listening to the recorded interviews several times and repeatedly in order to get the statements and phrases right. As mentioned earlier, most of the interviews were conducted in the work areas of these health professionals and therefore, there were background noises from the equipment and patient transactions among others. However, because I am the one who conducted the interviews, it was easier for me to recollect most of the conversation and grasp

the context as I transcribed. Moreover, my being present at each of the interviews made it possible for me to remember the individual interviews as vividly as possible.

One approach to qualitative data analysis is the deductive approach. This approach applies preliminary codes to known concepts from existing literature on the subject matter (Bradley *et al.*, 2007). The semi-structured interviews were based on themes and concepts from the literature on health information systems and electronic patient records. Themes are recurrent unifying statements, words or phrases that are apparent from the whole data but characterize specific experiences of individual participants (Bradley *et al.*, 2007). As this is my first time conducting a qualitative study and thus, an in-depth interview, these existing themes and concepts allowed me to uphold the subject matter and avoid major deviations. Subsequently, I analysed the data using the deductive approach.

After the transcription process, I assigned codes to paragraphs, statements, phrases or words relevant to the subject matter in each transcript. Sometimes I assigned codes to the interview questions to allow for contextual reference to the participants' constructs. The codes were described allowing me to easily identify them in each of the transcripts. Through the constant comparison of data, similar phrases, statements, sentences, words were then grouped together and placed under the themes. For the phrases and sentences that did not fall under an existing theme, a theme was created, or they were placed under sub-categories where necessary. The themes and sub-categories were linked to prevailing theories and literature available such as information infrastructure and implementing health information systems.

3.5 Role of the researcher

According to Randall, Harper and Rouncefield (2007), acquiring a role in the field is inevitable for a researcher once he enters into the natural setting of participants. Certainly, the members of the study setting must assign the researcher a role which they can interpret and understand in order to engage in this complex human process. Therefore, the role acquired by the researcher influences the interactions and inter-relations between himself and the study site (Randall *et al.*, 2007). Walsham (1995) stresses on the importance of the researcher figuring out his role when conducting interpretive studies. He identifies two roles the researcher can assume; outside observer – the researcher is distant from the personnel, and participant observer – the researcher is a member of the study setting either as a permanent

employee or temporary worker (Walsham, 1995). The pros and cons of these roles are summarized in table 2 below;

Table 2: Summary of the pros and cons of the researcher role (Walsham, 1995)

	Researcher role	
	<i>Outside observer</i>	<i>Participant observer</i>
Pros	No direct stake in outcomes hence, personnel express themselves frankly	Inside view – involved in processes
		Access to confidential or sensitive issues and data
Cons	No inside view; practically on ‘side-lines’	Direct personal stake in outcomes hence, personnel are guarded
	Debarred from access to confidential or sensitive data and issues	Research motive alienates researcher within group
		Difficulty in reporting part played; prone to over-modesty or self-aggrandisement

Choosing a researcher role should be done in an explicit and reflective manner. Furthermore, the researcher must gain credibility through his actions in the organisation or institution of interest. For instance, if he is working temporarily in an institution, he has to work all the shifts possible and put up with the conditions which members have to work in. Whatever the role assumed by the researcher, he must have a nonintrusive demeanour without being too self-effacing, pay attention to dress codes, and observe the properties of the setting (Walsham, 1995; Randall *et al.*, 2007).

As a trained biomedical laboratory scientist who has worked in the Ghana Health Service for a few years, my role at GARH was quite difficult to define. It stands to reason that as a health professional I would be considered as an insider in a healthcare facility setting. However, on most occasions, I was an outside observer while on certain occasions and in certain departments such as the laboratory, I was an insider (I refrain from using participant observer as I did not participate in any medical work at the study site). Working as a professional biomedical laboratory scientist is one thing whereas working on a research related to the field is another. Perhaps, as the research was my main purpose for being in the hospital setting,

that reinforced my role as an outside observer. On the other hand, prior knowledge of the healthcare and patient processes heightened my position as an insider. Being an insider does not necessarily have to be as a participant observer, it could merely be that the researcher is accepted as an honorary worker and therefore, given access to data and issues considered confidential or sensitive. I am inclined to agree with Mesman (2007) who suggests that the insider and outsider roles are fluid and ambiguous and therefore, the researcher moves from one role to the other in different settings (Mesman, 2007). In the data collection process, I moved from one department to the other, which constitutes different settings within the study site. This contributed to the changes in my researcher role as described above.

3.5.1 Negotiating access

Access in research spans a variety of issues including entry to the study site, being accepted, and moving around the study setting (Randall *et al.*, 2007). A researcher being present at the study site to augment the authenticity of the research as recommended by Golden-Biddle and Locke (1993) requires access to the setting.

3.5.1.1 Entry to the study site

Having worked in the healthcare service in Ghana implies that I am privy to the politics of the government healthcare facilities and have substantial knowledge on how the formal hierarchy actually works in these institutions. This, I used to my advantage per the recommendation of Robson (2011). The Regional Directorate of the Ghana Health Service was my first point of call on arrival in the country. The Greater Accra Regional Hospital did not have the authority to approve or reject my request for access to the healthcare facility without an official introduction from the former. Afterwards, I required the approval from the medical director of GARH to gain access to the various departments and the whole hospital which I obtained after the necessary procedures.

3.5.1.2 Moving around the study site

During the data collection process, moving around the hospital and the departments was quite essential to the whole process; in terms of gaining an in-depth understanding of the natural setting of the health professionals, interpreting their constructs in light of their surroundings, experiences, interactions and the like. The approval from administration granted me the right to move about the hospital premises without confrontations. However, the presence of the research manager in the departments assured the health workers (in most cases, the heads of

department) I had been granted permission to conduct my research and hence, given access to information, observation and movement in their respective departments. All the same, there were times when my identity and my purpose for being in a department needed clarifying, especially when the worker encountered did not know the identity of the research manager (who he was and whether he worked there).

3.5.1.3 Gaining acceptance

As already mentioned, I visited GARH prior to starting the data collection to familiarize myself with the setting. Moreover, I had established contact with one of the health professionals at the health facility through a mutual acquaintance and I needed to introduce myself in person. Upon arrival at GARH, I met my contact at the laboratory department who introduced me to fellow biomedical scientists. I took part in discussions and observed work processes in an unguarded atmosphere. For instance, one biomedical scientist invited me to go along on a sample collection round⁶ at the male orthopaedic ward which allowed me to gain some information on the wards at the new building, although not particularly relevant to my research. I was accepted at the other departments as well through the cooperation and voluntary participation of the health workers as both a fellow health professional and a researcher.

3.5.2 How my research convinces

My reflections on how my research convinces readers are based on the three dimensions of convincing proposed by Golden-Biddle and Locke (1993);

3.5.2.1 Authenticity

With regards to authenticity, I was present at the study site for the data collection process. Although healthcare facilities are a familiar setting for me with my background as a biomedical laboratory scientist, I gained as much familiarity with Ridge hospital as possible by exploring the grounds and making acquaintances with some of the health professionals. Moreover, I have not worked at this health facility before so, there was the need to grasp and understand that ‘world’.

⁶ To take samples from patients admitted to the various wards

3.5.2.2 Plausibility

I will try to achieve plausibility in this research by writing about a topic that is quite familiar in this field of study; health information systems implementation. However, this written account will focus on the perceptions of health professionals in different departments at the Greater Accra Regional hospital and the challenges they are facing in the early stages of the implementation process of a health information system.

3.5.2.3 Criticality

In my discussion, I plan to question and assess prevailing theories on the topic of my research allowing readers to reconsider their held beliefs and intellectual assumptions from similar studies.

3.6 Ethical Considerations

The study was to assess the perceptions of the health professionals on the newly implemented Health Pro, a health management and information system at the Greater Accra Regional Hospital (GARH). Therefore, it consisted mainly of interviewing health professionals and observing the work processes at the various departments of the healthcare facility studied. As it did not involve any medical intervention, there was no need to involve an ethical review board.

First and foremost, permission to conduct the study was granted by the Regional Health Directorate of the Ghana Health Service (GHS) which oversees government hospitals in the Greater Accra region. Secondly, institutional approval to conduct the study was granted by the Medical Director of the Greater Accra Regional Hospital after submission of the introductory letter from the Regional Health Directorate (see Appendix II).

Participation in the study by the health workers was voluntary after the potential interviewees had been taken through an informed consent form (see Appendix IV) which they had to sign before the interviews started. Moreover, the participants had the option to opt out of the research or refuse participation at any time without penalties of any kind.

Chapter Four

Case study

4.1 GARH information infrastructure

The information infrastructure at the Greater Accra Regional Hospital (GARH) prior to the implementation of the health information system was identical to that of any regional hospital in the country. This information infrastructure includes a functional local area network (LAN) used for registration of patients, records keeping, automation of pharmaceutical services and in some cases, within the laboratory for the compilation of results from the different units within the department. There are computers available at most of the departments for other purposes other than the automation of work processes as these are not networked and lack any software for that purpose. An intercom for communication via telephones is available at the various departments in the health facilities, at least at the front desk of each of the departments. Multimedia systems are available at the out-patient department and the waiting areas at all service delivery centres to playback documentaries and movies for the patients while they wait to be attended to (Ghana eHealth Strategy, 2010).

In addition to the above-mentioned information infrastructure, there is an ICT infrastructure in the government hospitals since they are accredited healthcare providers by the National Health Insurance Authority (NHIA). Automation of health insurance services at the healthcare facilities involve common protocols for authentication and online claims management systems for patients. Therefore, the infrastructure is used mainly for business processes and does not support any shared services and procedures. In order to generate aggregate data from all government health facilities, the District Health Information Management Systems (DHIMS) has been implemented in these institutions to pool together annual reporting of data based on some preferred indicators (Ghana eHealth Strategy, 2010). GARH is equipped with these systems as part of its information infrastructure. However, in recent times, a health information system known as Health Pro has been introduced and implemented to enhance the provision of health services in this hospital.

4.2 Health Pro[®]

This is a web-based health management and information system designed for the efficient coordination of every activity (medical and non-medical) and generated report of a healthcare facility to ensure its smooth operation. The software design for the Health Pro is flexible,

object-oriented and structured allowing for good maintenance and support for the system. Furthermore, the system design incorporates recognized standards and practices of the healthcare organization together with intuitive user interfaces and comprehensive reporting protocols (Spagad Technologies Limited, n.d). The Health Pro is developed by Spagad Technologies Limited, a Ghana-based software development company which has developed electronic systems for several hospitals in the country including 37 Military hospital and The Trust hospital, a quasi-governmental health facility (ibid). The Health Pro was designed and developed based on the specifications of the Greater Accra Regional hospital.

According to one of the IT personnel for the software company, the design and development involved an iterative process which included observations of work processes, conversations with the health personnel at the various departments and contributions of the users, resulting in a health management system customized for GARH and its workflow. Additionally, the use of the manufactures' standardization for existing hardware at the healthcare facility enabled the Health Pro to be integrated with other hardware such as imaging equipment and laboratory equipment. The Health Pro was partially implemented around mid-year of 2017 after the hospital had been partly upgraded to an ultra-modern facility with a larger bed capacity and comprehensive specialized services. The flow of information and services required a health management system to be in place to ensure communication between all the units at the hospital on a common platform.

At full capacity, the Health Pro is expected to assist with the provision of expeditious yet effective and efficient medical services to patients. The health information system will eventually be linked to the hospital website (it has been shut down due to technical difficulties) to provide the following services to existing and potential patients via the internet;

- Booking of admissions
- 24-hour online medical consultation
- Emergency services
- Referral services from other healthcare facilities

4.3 Overview of GARH healthcare

Greater Accra Regional hospital, as a secondary healthcare institution has similar healthcare work processes as all the other regional hospitals, perhaps with a few modified processes to suit the setting and circumstances in the region. Typically, when a patient (non-emergency

cases) goes to a Ghanaian hospital, he goes to the out-patient department (OPD) as shown in figure 4 below, where he is registered and given a folder at the records department. If the patient has been to the hospital prior to this visit, his folder is retrieved and given to him after payment (applies to patients without insurance) or verification of his NHIS status. After this process, the patient then submits his folder to the nurses' station at the OPD (this he does by placing the folder into a box beside the cubicle designated for the nurses). The patient then sits and waits to be called by name, by one of the nurses on duty. At the nurses' station, his vitals such as blood pressure, temperature and the like are measured and recorded in his folder. In addition to this, the purpose for his visit to the healthcare centre is established and that determines which of the consulting rooms at the OPD he will be assigned to. The folder of the patient is sent to that consulting room and the patient sits in the waiting area and waits his turn.

Figure 4: Patients awaiting their turn for either the records department (*wooden structure with glass windows to the right of seated patients*) or the nurses' station (*wooden stalls straight ahead with respect to the position of patients*) at the out-patient department (OPD)



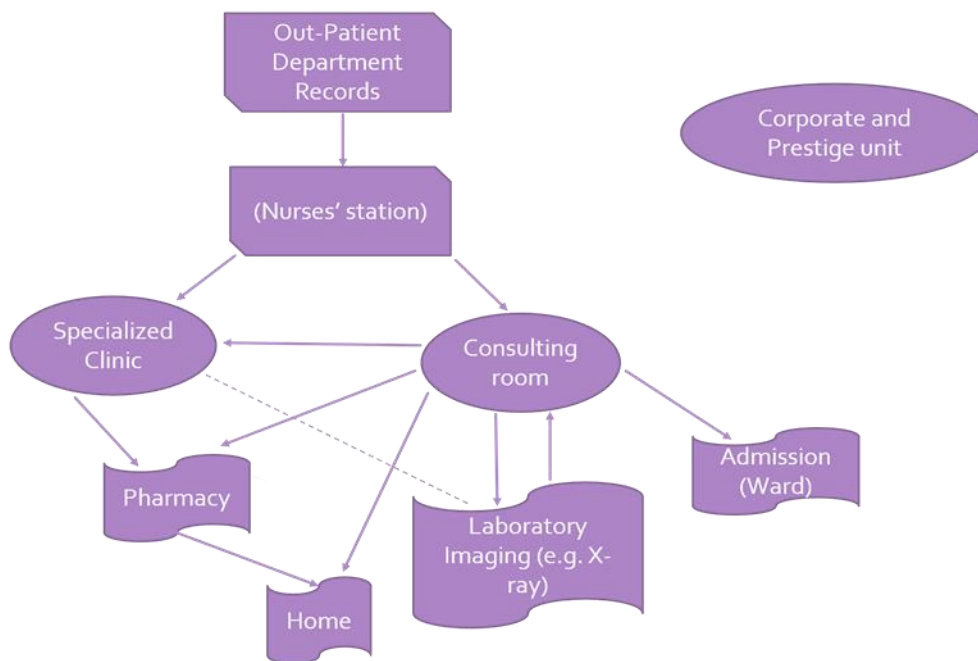
Upon seeing the medical doctor, the patient is asked to do one or more of these;

- Go to the laboratory for testing either on the same day or some other day depending on the kind of test to be performed or the funds available to the patient
- Go to the pharmacy for medication

- Go to the radiography department for x-rays, scans etc.
- See a specialist in one of the specialist clinics on the same day or some other day
- Go on admission in one of the wards depending on the ailment
- Go home (It is important to note that in Ghana, this is not a desired outcome for the patient. The consensus is that at least medication must be prescribed to a patient once he has reported to the hospital).

The above-mentioned processes can be requested individually or together, for instance after being asked to see a specialist, the patient will then be asked to go to the laboratory and the radiography department for tests. At the time of the study, most of these processes were paper-based and the patient carried his folder from one point of care to the other within the hospital. The patient care processes within the different departments in the healthcare facility are interconnected and form a continuous process which facilitate the delivery of care to patients. Figure 5 is an illustration of the general out-patient department process for a patient at GARH;

Figure 5: The typical patient process during a hospital visit to GARH



4.4 Departmental processes prior to Health Pro

The activities of the individual departments at the health facility although interconnected, are different and distinct. The following are the processes in some departments of the Greater Accra Regional Hospital (GARH) before the Health Pro was implemented. The work processes in these departments are best described by the interviewees who work there;

4.4.1 Out-Patient Department (OPD)

The OPD comprises mainly of the records department, the nurses' station and the consulting rooms. Every patient (except for emergency cases) reporting to the Greater Accra Regional hospital is attended to by at least, the health professionals in these three units that make up the out-patient department.

4.4.1.1 Records Department

A description of the work processes at the records department is given by the records manager. It is the first point of call for cases that are not considered an emergency such as review patients and patients who are able to walk to the health facility.

Records manager: *Okay, we have two kinds of patients. We have those who are paying, we call them the non-insured. When we say insurance, it's not the private insurance, the national health insurance. The one that is provided by the Ghanaian government, they are the insured; those are people who have registered with the national health insurance authority. They come with their cards and those who are not insured come and then direct to pay; cash and carry. So, basically what happens is that if you come as a non-insured client, when you approach us we ask whether you're insured or not and then we know where to assign you to. If you're not insured we'll ask about your demographic data, meaning your name, your sex, date of birth, occupation, your home town, your residential address where you're coming from. And we ask this because we need to trace you if there's an issue. Also, for clinical decision taking. If somebody is coming with an infectious disease, we'll need to trace to know where the person is coming from; maybe diarrhoea or cholera, we should know where... so that we can design an intervention for the area. And also, if there is an absconder, we can use that same strategy to trace or to know where the person is coming from and get our money back. So, we also do that to do tracing, tracing maybe contact tracing that is what it is called. If there's an infectious disease, maybe TB client, you'll want to know and those that the person is staying with or those that the person has been in contact with. So, basically this*

is why we take the residential address and other information. When you come as a non-insured client those questions are asked and then we take down the information, enter you into the system and then automatically the OPD number will be generated for you. And then you're asked to go and pay, and that payment will involve; the revenue guy⁷ will give you a bill, that bill will be submitted to you with an amount, let's say a defined amount for OPD attendance and the cost will include folder and then consultation. So, the revenue guy will prepare the bill for you which you can pay⁸, take the receipt, come and then give it to the revenue guy and then the folder will be handed over to you to see the nurse, the nurse will then process you for the doctor. And then, there and then you're either going for admission or you're going home. A similar process also applies for those who are coming with insurance. When you come with insurance, you are verified with the use of the authentication machine (Figure 6) and then there is a verification code generated and that one will confirm that you have been verified and then when we submit our claims it will not be rejected. In the past, we didn't use to have the authentication machine. Now we have it, because of the absence of the device in the past, people could come; you're my sister, because we all look alike I will bring your card and then... It was very rare but because people were using it, sometimes they create loss to the state. So now, the process is that you should have been verified before you are allowed to go and access other services. If the authentication machine cannot validate your NHIS card, you either pay or you go to the NHIS office, they rectify it then you come, because once I allow you to pass through the system with the card we'll not get our money. After the verification, just like the cash and carry, you go to the nurse with your folder and they take your vitals and then assign you to the consulting room. You don't need to go to the accounts though because you're not paying anything. That's basically what happens

⁷ The revenue guy is a person at the OPD responsible for preparing the bill (writing down the amounts designated for items to be used for delivery of healthcare and the healthcare service itself) for the patients without insurance. They are usually referred to as the accounts section and they can be found in other departments such as the laboratory, pharmacy and radiography.

⁸ Payment of a bill is done at the bank. The bank is a cubicle located at some departments representing one of the banks in the country which has a contract with the hospital to receive cash and issue out receipts. This is to ensure accountability and avoid the embezzlement of funds.

Figure 6: NHIS authentication device used for verifying patients visiting the health facility (Available at: https://twitter.com/nhis_ghana/status/682162762617884672)



4.4.1.2 Nurse's station

The work process at the nurses' station at the OPD is explained from the accounts of two nurses who work at the hospital;

Main OPD nurse in-charge: *The main OPD is the eye of the hospital, the entrance of the hospital.*

OPD nurse: *The OPD is the first area where the patient visits, so from records when they go for their folders then they come to the nurses' station (Figure 7).*

Figure 7: Nurses' station where patients are attended to

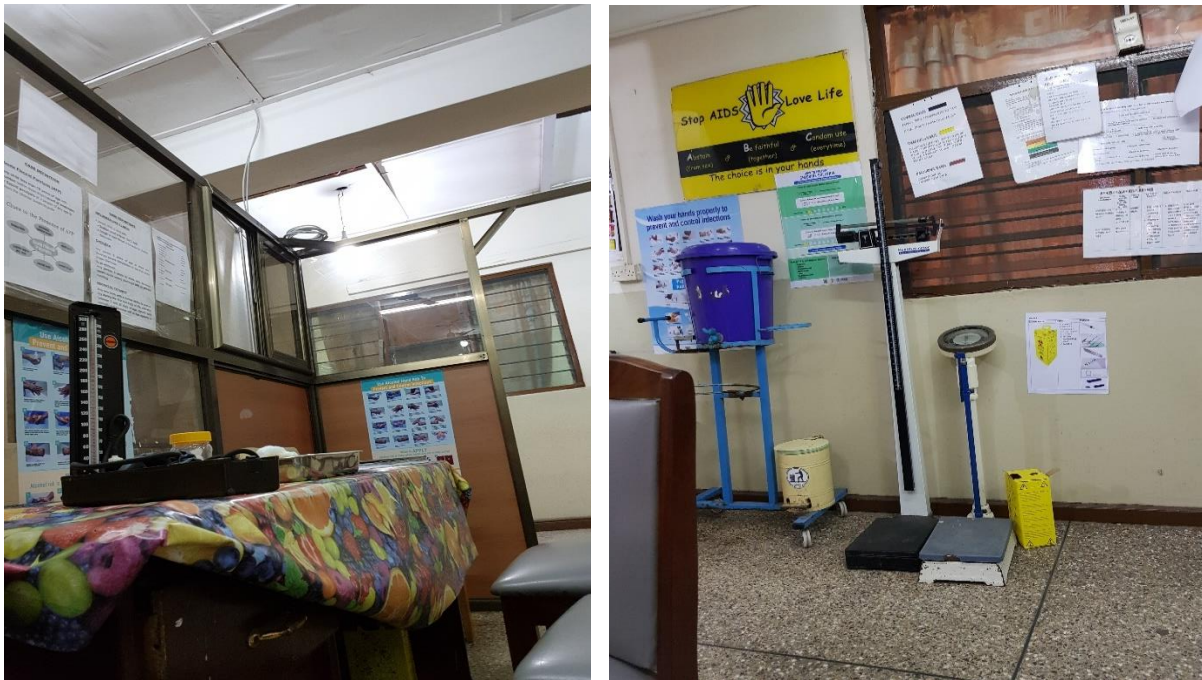


Main OPD nurse in-charge: *We receive cases for everything; those who walk in, those who are coming for specialised clinics and those who are just sick, and they want to come. If you're seriously ill, we send you to the emergency. If you are okay, we see you on OPD basis.*

OPD nurse: *Sometimes we attend to some emergencies that is, when there is a peculiar problem that is needed to be solved at the OPD. Such as, when a patient is having emergency where the blood sugar is very high, we have to do some infusion for the sugar level to come down. At the nurses' station, their vital signs are checked that is BP⁹, temperature, weight (Figure 8). We also register them in our books. So, from there we check their blood sugar level. We have a glucometer which we use to check so the reading is written into the folder before we send them to the consulting room where they are seen by the doctors.*

⁹ BP – blood pressure

Figure 8: The area at the nurses' station for the measurement of a patient's vitals



Main OPD nurse in-charge: *We've allocated consulting rooms (Figure 9) for; we have surgery, we have medicine, we have orthopaedic, we have neuro and we have a new system now known as family medicine. Anybody that walks into Ridge hospital has to be seen.*

Figure 9: Patients awaiting their turn in front of the consulting rooms



4.4.2 Corporate and Prestige Unit

The corporate and prestige clinic is designated to the staff of companies that have signed a contract with the regional hospital for provision of health care and individuals willing to pay extra for healthcare services. The healthcare services provided at this department is similar to that of private healthcare in most parts of the country; companies and businesses are affiliated with some private healthcare facilities where they refer their staff for all their healthcare needs. The healthcare facilities are then reimbursed for services provided at the end of each month. The private healthcare facilities charge exorbitant fees for services provided to their patients because it is believed that they provide quality health care services as compared to their public or government counterparts. Basically, this unit is a private clinic within a government health facility. When asked if the corporate and prestige unit is for the affluent in society, the research manager at GARH replied;

“Not necessarily, it is for those willing to pay extra to have a VIP (very important person) treatment during their hospital visit”.

Although the corporate and prestige unit is structured like the out-patient department with a nurses’ station and consulting rooms for their “prestigious” clients, there is a reception area with a front desk where patients and potential patients can make enquiries and are registered when they visit the clinic. Perhaps, the VIP treatment these patients receive is the notable difference in service provision offered at the unit such as;

- ✓ the environment for waiting and measurement of one’s vitals is more comfortable and less crowded
- ✓ Nurses and doctors spend more time with each patient
- ✓ Laboratory samples are taken at the clinic, so the patients do not have to walk to the laboratory
- ✓ The patients are taken to the auxiliary care units such as pharmacy or radiography by a nurse should they need these services, hence, they are attended to faster than the average patient.

In short, the patients who are attended to at the corporate and prestige unit are exempted from the hours of waiting which seems to be the plight of a “regular” out-patient.

4.4.3 Laboratory

The processes in the laboratory at the regional and national hospitals have undergone a couple of changes over the years. First, there was the paper-based system which most refer to as the manual system. With this system, the requests for laboratory tests are written on a laboratory request form (Figure 10) and given to the patient to send to the laboratory after consultation with a physician.

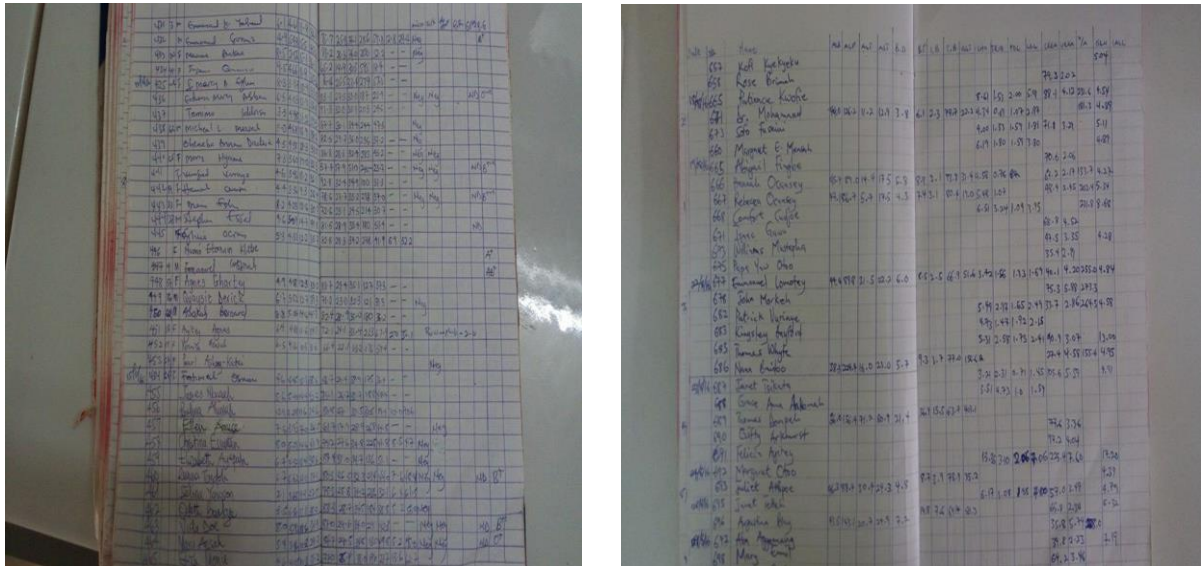
Figure 10: A laboratory request form used by the government hospitals in Ghana

REG NO.	HOSPITAL	PATH NO.
REQUEST FOR LABORATORY SERVICES		
Bacteriology <input type="checkbox"/>	Haematology <input type="checkbox"/>	
Chemical Pathology <input type="checkbox"/>	Histopathology <input type="checkbox"/>	Parasitology <input type="checkbox"/>
Indicate by a tick department required		
SURNAME	Other Names	Age Sex
	Ward or Dept.	
Clinical Summary and Diagnosis		
Material and Tests		
Date of Request	Signature of Doctor	
REPORT (for Laboratory use only)		

In an ideal situation, depending on the laboratory tests being requested for, the patient should be given instructions on the procedures and routines prior to the test by the physician to avoid excessive movements about the hospital premises by the sick patient. However, the patients are sent to the laboratory to be given these instructions and if the test will not be done on the same day, the patient is expected to report back to the laboratory on the day of the test. Most often, the patients do not return for the laboratory tests. When the patient reports to the laboratory, he is registered, given a laboratory number and the appropriate samples are taken either by the phlebotomist or a biomedical laboratory personnel. There are occasions when the sample taking process is done by the patient himself either at home or at the healthcare facility. After the tests have been performed, the results are validated, recorded in the appropriate books (as shown in Figure 11) and subsequently, the laboratory report is written

on the appropriate report form¹⁰ and given to the patient to send to the attending physician or health professional.

Figure 11: Notebooks for the recording of tests performed from two departments; haematology (*left*) and clinical chemistry (*right*)



This is the usual laboratory process or practice in most government healthcare facilities with possibly few differences at each facility. It is still practiced at most of the district hospitals, although the national hospital, Korle-Bu Teaching Hospital (KBTH) and almost all the regional hospitals have a form of laboratory information system to at least help with the compilation of results from the different departments to form a single laboratory report. This electronic laboratory system however does not extend beyond the laboratory to the other aspects of healthcare such as the physician’s office. Therefore, these healthcare facilities still make use of paper-based request forms and reports which are transported to the relevant health professionals via the patient (Korle-Bu Teaching Hospital, 2016). This current system is the one described during the interview by the laboratory workers at the Ridge hospital;

Female BMS: *So, the BLIS is basic laboratory information system and it is also laboratory based. That one is quite laboratory based so it was done for just the lab and it helped us to be able to get our lab results organized and then... for patients to have all their results on one piece of paper or well printed out instead of the period where we were writing some of them,*

¹⁰ There are several departments in the laboratory department and each one has a report form so if the patient is doing a test from all the departments, there will be several different reports written and this can be quite bulky.

some of them were printouts from the analysers and the rest of the tests that are accompanying them that are manual gets to be written with pen and making it all untidy and error prone. So, the BLIS came in to help tidy up all that. With the BLIS, we would have to get the results written in a book and then transcribe it manually onto the system. We were not able to connect any of our analysers to the BLIS such that we could get our results shared. I think probably it was just one analyser that could do that, the haematology analyser. All the others could not do that, so we were still having to transcribe manually in all the rest.

A more detailed description of the general process is given by one of the laboratory personnel at the front desk, which is the first point of call when a patient walks into the laboratory department.

Lab Front desk staff: *First, when the patient comes in, the patient will first greet you then you greet back and then they give you their request form. Depending on the kind of request they're coming to do, you just take the form and check through and then you give them a price to go and do the payment. If there is any request that needs be done using insurance, you use the insurance to claim the test for them and then you send them to go and do the other payment. But unless a patient is coming in from the ward whereby you can't just give a price, but you rather give them their bottle to go and take the blood sample and come back. Being the case that you don't let the patient pay before they go to take the sample because you might not know what might happen before the sample is being taken. It can be either they won't be able to locate the veins to take the sample or not. So, when the person is on admission, we first give them the bottle to take to the ward. They'll take the blood sample and then they come back to us with the request form. When they come back with the request form, we just check and then those we can claim, we claim. Those that they have to pay, we send them to go and pay. They'll go to the revenue sector where they'll write an invoice for them. After that, they'll take it to the bank and then do the payment at the cashier point and then they come back to give us the receipt number and the request form. The receipt number or the number from the claim sheet if it is an NHIS patient is entered together with the patient information and we give this number to them so that we can use it to print their results. When the patient is to submit the sample, they'll just take it to the sample collection area where they receive the sample from them. And then if they're to take a blood sample, they go to the phlebotomy area, they have a seat, we call them and then we take their samples for them. When they're done, we tell them to go and then come back for their results. The result*

will basically depend on the kind of test they are doing. We have some of the tests which we will tell them to come back the following day or the same day or in 3 days' time or 7 days' time. That is the duration of the test we can do for them.

4.4.4 Pharmacy

The work processes at the pharmacy department prior to the introduction of Health Pro as described by a pharmacy technician;

You just drop your prescription on our tray, we will pick it and do the assessment (write down the price of each drug) for you so that you go and pay at the bank. When you bring the receipt back to us, we enter it into our system and then someone will pick the prescription. The one who did the entry is not supposed to do the picking. So, someone will pick the drugs and give it to another person to cross-check. After cross-checking before another person will dispense the medication.

This was the process for the patients who walked in after they had been seen by the medical doctor and gone through all other health services required for their ailment. The pharmacy used an electronic system for the processing of drugs. Prior to this, they used the manual system where most of the process was paper-based and involved a lot of writing and recording of transactions in books only. The process for emergency cases and those on admission differed from the one described above;

Pharmacy Technician: *For the emergency cases, a nurse will bring a requisition and the pharmacy will generate an invoice for them and then supply them their medication.*

With those on admission, at first, we use to do "Dear pharmacy" but right now we put a stop to that. The doctor will write a brief note to us that "Dear pharmacy, kindly supply this medication to this patient" So, for that case we too we will consider but we will just make sure we don't supply more than 24 hours; we will just supply just the medication for 24 hours to be used within 24 hours. Then we will do the necessary documentation on that and that's all. So, before the patient is being discharged, the doctors have to make sure that the patient has settled the bill.

4.4.5 Medical stores

Describing their work processes, one of the supply officers says;

Basically, we receive items to be used in the hospital, store them under good or proper conditions and then issue them out. And upon receipt of the items, we also advise account¹¹ on payment to suppliers who have performed their part of the contract. A request is made via a requisition book. After the request has been made, you have to chase an administrator or anyone who is in authority to sign. After an approval has been granted by them, you then bring your requisition book here so that we also issue the quantity that we have before you can take your items.

4.5 Departmental processes after Health Pro

The implemented health information system is being used in some of the departments that have been described above. However, the out-patient department with all its units such as the records department, the nurses' station and the consulting rooms which is located in the old hospital building (Figure 12), were not using the Health Pro. The nurses' station and the consulting rooms did not have computers available for data entry as at the time of the research. The records department though, had computers they used for the registration of patients especially those who were registered with NHIS.

Figure 12: Old hospital building at GARH - current location of the OPD



¹¹ The accounts being referred to here is the main accounting department of the regional hospital responsible for its financial affairs

Health Pro was being used in almost all the departments with the exception of the wards such as the labour ward located in the new building. Although, the wards in the new hospital building have computers at the front desks where the nurses do their paper work, the health information system is yet to be introduced and implemented. Almost all the departments using the Health Pro have experienced changes to their work processes after its implementation. The nature of this change based on the perceptions of the health professionals in these departments however, can be classified as a positive or negative effect of the Health Pro on work processes.

4.5.1 Corporate and Prestige Unit

With the introduction of the Health Pro at this unit, a visit number is generated by the HIS after registration of the patient at the reception. A new visit number is generated every time a patient visits and this number can be used in the other departments using the Health Pro to access the patient information. The vitals of the patient are taken and recorded on the software, in the patient folder and in a book designated for this purpose. Due to busy schedules and lack of time, the measurements or assessment are written down and later keyed in into the software. The interface for the OPD nurses has a section which allows for notes to be written on a patient. Not all the doctors at this unit had access to the Health Pro as at the time of the research because they were yet to receive their password. One of the nurses interviewed at this unit seemed to be of the view that the Health Pro has improved their work processes and the patient care process since its implementation.

According to the corporate and prestige unit nurse, the health information system is easy to use and even those who are not computer literate should be able to use it. Perhaps, the consultation of the health workers at this unit on the development of the Health Pro contributed to the user-friendly interface designed. On the other hand, she expressed difficulty logging onto the system. However, there have been benefits to the use of the Health Pro, one of them being the availability of patient information of the computers. She recalled an instance when a doctor accidentally took a patient folder with him therefore, the folder was not available for the continuation of the patient care process. However, the patient received the necessary health care because his information was readily available on the Health Pro.

4.5.2 Laboratory

With regards to the general process in the laboratory department, the Health Pro is similar to the previous system, BLIS, that was being used prior to its implementation. The generation of codes by the Health Pro (Figure 13) and the interaction of the system with the other departments especially, the consulting rooms for direct transfer of laboratory requests and reports between the physicians and the department are the main differences between the two systems. The laboratory staff at the front desk describes the work process after the implementation as follows;

Lab Front desk staff: *When the patients give the receipt and the request form to us, we go to the Health Pro and that's the system we are using for now. So, we use the Health Pro for the registration. We have different codes in registering that is generated by the system; when they are using receipts, we have a code we use and when they are using insurance we have a code we use for them. After we register the patient, we generate a code from the Health Pro. That is the code we're going to put on the request form and then behind the receipt for the patient.*

After the registration, the patient goes through the sample collection process described previously. There are several departments within the laboratory department such as but not limited to; Haematology¹², Microbiology¹³, Chemical Pathology¹⁴, Pathology¹⁵ and the Blood Bank¹⁶. There are sub-units within the above-mentioned departments, each with its specific function in the patient care process. The implemented Health Pro was not being used in all the departments in the laboratory as at the time of the data collection. For instance, the Health Pro was not being used in departments such as the Blood Bank even though the interviewed biomedical scientists working in the department had been introduced to how the Health Pro would contribute to and modify the work processes at the Blood Bank.

¹²Haematology department; responsible for laboratory tests associated with diseases related to blood.

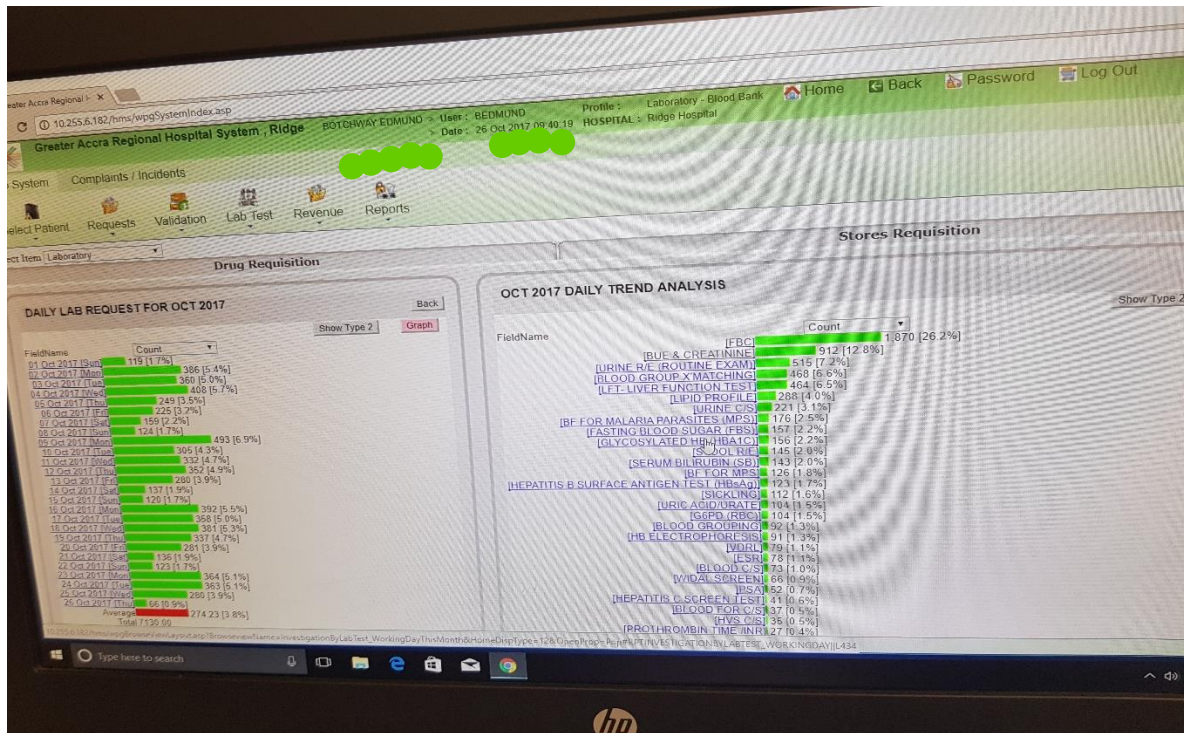
¹³ Microbiology department; investigates disease causing micro-organisms.

¹⁴ Chemical Pathology; analyses body fluids with chemical or biochemical tests to find the cause of a disease. It is also known as Clinical Chemistry or Biochemistry in some health facilities.

¹⁵ Pathology; it involves the examination of cells, tissue samples, organs etc. for the cause of a disease.

¹⁶ Blood Bank; technically, this is a discipline under Haematology. It deals with the processing and proper storage of donated blood for safe blood transfusion.

Figure 13: Health Pro interface for the laboratory showing the daily laboratory requests and daily trend analysis for October 2017.



4.5.3 Pharmacy

The implementation of the Health Pro at the pharmacy department replaced an existing electronic system specific to the work processes of that department. Most drugs and medication are covered by the NHIS, therefore patients with insurance are registered on the NHIS system in order to claim the payment. The changes to the work processes at the department after the introduction of the Health Pro is minimal. With the Health Pro, payment is a prerequisite for issuing patients with the prescribed medication, in addition to the system being linked to the other departments in the hospital. Thus, when fully implemented, prescriptions can be sent to the pharmacy directly from the consulting rooms and wards via the Health Pro.

4.5.4 Medical stores

Supply Officer: *The Health Pro is a software that enables users, the user department¹⁷ of this institution to order items via the internet without bringing a requisition book. That means we're moving from the manual aspect into the internet world. The Health Pro is like a three in one affair, unlike the requisition book where the user department after writing takes the*

¹⁷ The user department as used here refers to the other health workers in other departments

book... carries the book to an administrator to sign. This one, simultaneously when a request is being made, the administrator becomes privy to it and we also have access to it. So, immediately the administrator approves we can also issue the quantities that we have available in stock to the user department. They'll also accept the quantities that we are giving them before we issue the items.

Departments such as the OPD nurses' station and the wards in the old hospital building which do not have computers at their disposal have to make requisitions at the medical stores in person on the computers in that department. Likewise, the wards in the new building since they are not using the Health Pro must make requisitions on the Health Pro-linked computers at the medical stores. Usually, the items to be requested for are written on pieces of paper and entered onto the system after logging in. While waiting at the department to interview one of the supply officers, an older nurse came into the office to make a requisition. She had to be assisted by one of the staff in that department as she kept asking whether to click once or double click. At the end of the requisition she complained about the process. According to her, *"this process is now frustrating"*. A younger nurse came in after a while to do the same, make a requisition for her department. She didn't seem to have a problem with the process as she required no assistance. However, she inquired why they had to key in the requests by themselves. One of the staff explained,

"There was a problem with one of the requests which was keyed in by personnel in the medical stores department, so now the departments have to key in the requests themselves".

In order to avoid making wrong requests or other mistakes related to the requests from the various departments, the staff at the medical stores have devised a solution to the problematic work protocol; staff members from the various departments have to make their own requests on the Health Pro. If they need assistance during the requisition process, that will be provided by the medical stores staff.

4.6 Health workers perception on the Health Pro

The implementation and use of Health Pro at GARH is in its initial stages, the shakedown phase. The HIS is not fully implemented, therefore all the departments are not using the system. Furthermore, within the departments that have started using the system, some sub-units have not yet been migrated to using the Health Pro. In an organization such as

healthcare where the processes associated with patient care are interconnected, this poses challenges and setbacks for the stakeholders involved. Consider the above illustrated patient flow within the hospital (Figure 5), the patient moves from the records department to the nurses' station to the consulting room. From there, the patient moves to other departments and may end up returning to the consulting room before going to the pharmacy and then home. The patient information recorded at the OPD is essential and may be required in the other departments visited for an effective and efficient care process and most importantly for continuity of care.

In the absence of Health Pro at the units of the OPD, the patient information cannot be accessed digitally in the departments using the Health Pro, which means that the information which should have been readily available to them on the HIS is to be entered by the staff of each department using the Health Pro, increasing their workload. Currently, the increase in the workload at these departments is due to the recording of information on the Health Pro and in notebooks as well; the staff in these departments are still using the paper-based system in addition to the electronic system available to them. As one health worker puts it;

Yes, yes. We also write it in our books. We have books for each test that we do. Even when you register into the system we still... we have a reception log book that we still write... register the patient and write it in our book - Lab Front desk staff

When I asked if they will eventually stop the use of the books for recording, she explains further;

Well, computers can easily get spoilt. For records sake, it's good even if you have the computer you still have a hard copy because soft copies, it can work but we all know at times it can get corrupted and... So, it's not easy for us. So, all the time we need our books - Lab Front desk staff

The pharmacy technician I interviewed seems to agree with this assertion because when asked if they will stop writing the receipts in a book as I observed was being done at the department, he replied simply;

Still I think they will still be writing it - Pharmacy Technician

4.6.1 Usability and user- participation

The health workers using the Health Pro seem to find its interface simple and user-friendly. According to those I interviewed, the HIS is easy to use and should be easy to use even if one is not computer literate. Those who were not using the HIS seemed confident they would be able to use it easily without problems because they had been introduced to the system prior to its implementation. On the issue of user- participation, when I posed the question, “Were you (the interviewee) or the department contacted on the development and design of the Health Pro?”, the following are the responses which show a diverse view;

Pharmacy Technician: *I'm not the head so... maybe if there was any contact, it will be the head but we operating on the machine were not contacted.*

Supply Officer: *Yes, we were aware of it (the development of the Health Pro).*

Principal BMS 1: *Mmm ... I'll say yes. I'll say yes, when they started I'll say yes (seemed quite uncertain).*

Female BMS: *It was even an introductory training for unit heads to be introduced to the software so that they get our input supposedly so that if there are any issues, some changes that we wanted to be done before it is fully implemented.*

Clearly, from the accounts of the health professionals, the level of user participation ranged from no participation to being aware of the introduction of the Health Pro to heads of department being introduced to it after the initial designs had been developed.

4.6.2 Training for Health Pro

All the groups of health workers at GARH had been introduced to the Health Pro prior to its implementation and use. From the accounts of the interviewees, the introduction to the Health Pro gave a general description of the HIS and how it was to be used for the provision of healthcare to the patients. However, it was also specific to its use within each department and how it was to be used. Even the doctors and nurses who are not actively using the HIS (with the exception of those at the Corporate and Prestige unit who sometimes work at the main OPD) had been introduced to the system and knew what was required of them should they

start using it. The introduction included a hands-on training on how to use the HIS, at least for the medical doctors;

Medical Doctor: *Well... we were given yeah... some training with some examples, patient folders with what to key in, what to do. Yes, we were given some examples.*

The training seems to have differed in each department and with each group of healthcare professionals. For instance, some of the laboratory personnel and the pharmacy technician I interviewed state that the training for the HIS was done after the implementation of the Health Pro in the department. The duration of the training differed as well;

Pharmacy Technician: *We were trained after they've introduced it. Just about a week, for the week we can say maybe 2 hours.*

Female BMS: *I just think that there was not enough training for staff before the system came into being. We had just one training and it was even an introductory training for unit heads to be introduced to the software, and we never got any other chance to be retrained until we moved in. So, it was when we moved in and already we had clients to serve and we still were now being introduced to ... so it was a PowerPoint presentation when we did the first introduction, it wasn't a hands-on... It wasn't like we had time to come to the new lab and look at how it actually run and probably do a simulation to actually see it. We just sat down for a PowerPoint presentation and that was it. We didn't hear anything and then the movement also delayed for reasons that we did not know. It took months, more than six months later before we eventually moved. I'm not too sure but they didn't quite kick start very well, they didn't have time to do proper training. So, they just did it bits and pieces, so they grabbed those at the reception because they are the first people to receive the client and then they quickly tried to get them to know it (the Health Pro) and then somebody will train somebody, you know. It was just a bit haphazardly done, honest to God. It took one of my own colleagues to quickly train me myself, the trainings were not well structured and not well executed, if you ask me.*

4.6.3 Communication regarding Health Pro

Communication in this study, is mainly about the flow of information regarding the Health Pro and the construction of the new building between the health professionals and the

administration. The introduction and use of the Health Pro came with its challenges for the health professionals working with it. Although the design of the HIS was based on existing working processes in each department and the health facility as whole, there are challenges encountered during the use of the system. These challenges are mainly technical as the Health Pro is not fully implemented for the other challenges such as organizational and human factors to be entirely obvious. These technical challenges have to be reported to either the administration or the ICT department at GARH. Challenges such as additions or omissions to the work process have to be addressed directly by the Software designer, which means it is out of the “jurisdiction” of the ICT personnel of the hospital.

With regards to the Health Pro, departments such as the pharmacy department describe a challenge with the HIS; it cannot be used without a receipt from the bank. In situations where the software of the bank is experiencing difficulties, they cannot issue a receipt to the patient which is required for the processing of medication via the Health Pro. This software difficulty can take hours to be resolved, in which case the patient has to either wait several hours or leave without their medication. The pharmacy has devised a temporary solution which involves generating a manual receipt for the patient and issuing the prescription without using the Health Pro. Subsequently, another problem arises whereby the stock levels of medicines in the pharmacy differ from that on the electronic system. The problem has been reported to those in management and the software developer, but it is yet to be resolved. The pharmacy technician I interviewed puts it this way;

Oh... we've told it (the problem) to them several times but no good response

The health professionals express different levels of satisfaction with how the challenges they are facing with the Health Pro is being addressed.

The second phase of the ultra-modern healthcare facility is yet to be completed. As mentioned previously, the full effect of the Health Pro as a health information system which integrates and coordinates effective and efficient health care cannot be realised as the OPD, the first point of call is not equipped with the system. The health professionals at the OPD cannot give a specific time the second phase is to be completed when asked about it. Perhaps, this is because the administration has no concrete answer as well. It seems the politicians are the ones with the exact answer to the question, ‘when will the second phase of the new

building be completed'. Nonetheless, the health professionals seem ill-informed of decisions regarding the intentions of the administration. There were speculations of the Health Pro being implemented in the old hospital building so that the OPD can start using the system. When that would be done was not a question the health professionals I interviewed could provide an answer to.

4.6.4 Effect on patient care

The views of the healthcare professionals actually using the Health Pro and that of those who are yet to use it differ on the effect of the HIS on the provision of health care to the clients. This reflects the differences between the reality of using a health information system and the proposed benefits of the HIS with respect to enhancing the provision of services.

Pharmacy Technician: *Oh... for that one, no (referring to the improvement on the patient care process). The patients have always been fighting with us.*

Female BMS: *Improve the patient health care process? I think it could do much more... it could do better if it was fully utilized so that patients don't have to go up and down chasing results but because it's still quite manual at the moment, it's almost difficult to even notice that we've even had a change of system to the ordinary client who is using our service. Honestly, because it's the same thing, you come in, you present your request form, we bill you, you go and pay and then you come, we take the sample and then you come back and come and pick your result, normal day. So, I'm a bit hesitant to say that it's improved the patient health care process because it is still quite paper intense, and they still have to do all that walking around.*

OPD nurse: *Yes, I am confident. It'll also help if I mean... you know patients normally keep long here when they come. The waiting time for patients (made a sound of disapproval) is not something that.... so, I think with the Health Pro, it will help to limit the waiting time of the patient to increase our income because so far as the system will run very fast, more patients will like to visit the hospital.*

4.6.5 Effect on work process

For those using the Health Pro, the HIS has either improved their work processes or made their work processes more difficult. The views of some health professionals on the way the HIS has improved their work processes are as follows;

Lab Front desk staff: *It has improved in a way. It has improved in a way because now when it transmits straight (referring to the transfer of test results from the laboratory equipment to the Health Pro), you just have to print the results for the patient.*

This is as opposed to having to follow up at each department to collect the results for a single patient with the paper-based system. Technically, there is no difference with the previous electronic laboratory-based system since the implementation process of the Health Pro is not complete. Upon completion, there will be some distinction to the process as physicians and other authorised healthcare professionals will be able to access the results of patients. In addition, the results of patients will always be available for reference if needed.

Supply Officer: *Unlike when we were using the manual, we keep a lot of books, papers. Now, it has freed up space and also... Aside freeing up space, it saves time. Let me put it that way... it saves time, especially by chasing administrators to sign requisitions and others.*

Inter-departmental communication and interaction seems to have improved and this has reduced unnecessary delays in work procedures which in turn cause delays in provision of service. Health professionals do not have to spend time walking all over the healthcare facility just for signatures of those at the administration or heads of department. With just a 'click', authorisation can be given, and requests approved via Health Pro.

Pharmacy Technician: *If you're fast then you can... if you're not then the way the system is, as I've already said it's very slow.*

Some healthcare workers in a couple of departments expressed dissatisfaction with how slow the Health Pro is. This problem affects the work processes with respect to how long it takes to attend to patients. Hence, patients spend a considerable amount of time at these departments which the health professionals believe should not be the case with the implementation of a new health information system.

4.6.6 Health workers' expectations of Health Pro

The healthcare professionals I interviewed at the departments that have not started using the Health Pro have expectations and anticipate that the system will bring improvements to their work processes. They had this to say on the matter;

Medical Doctor: *I believe with time the Health Pro, with time... once everybody has familiarized themselves with the system it should improve, it should make things a little bit easier and smoother than it is as at the now.*

Main OPD nurse in-charge: *Yes, it will improve it totally because with the health review, you enter... it's not paperless. When you check the patient's vitals, you feed the computers straight away then you send. So, that one when you finish, the patient's vitals, every information is there at the consulting room, the doctor only continues and sometimes, to assess the history.*

Chapter Five

Discussion

5.1 Early phase of Health Pro implementation

Health Pro implementation at the Greater Accra Regional hospital was at the shakedown phase during this research. As mentioned in the previous chapter, it had been introduced in some of the departments in the refurbished section of the health facility about four (4) months prior to the commencement of the data collection. The shakedown phase of an implementation, the period a new technology is introduced into work processes until when it is adopted into routine practice is a very critical phase in IT system implementation. This phase which typically lasts up to a year after a technology is introduced, determines whether the intended users and the IT system will continue to interact in a given setting. Shortly after the introduction of a new system in an organization, there is usually loss in productivity and disruption in the work processes which could result in the discontinued use of the introduced technology (Sykes *et al.*, 2011). This suggests that, to some extent the fate of the Health Pro at GARH depends on how it fares in this crucial phase.

During this shakedown phase in the implementation process, users are familiarizing themselves with the new system and readjusting their well-known work routines and processes to incorporate the use of the IT system. Thus, the issues encountered such as low productivity and work disruption could be attributed to this readjustment. This is true for the health workers at GARH who admit to trying to familiarize themselves with the Health Pro and to figure out how it factors into their daily work routine;

You know, any new system will definitely come along with challenges. So, we started just implementing the Health Pro in recent times because this is a new hospital... the first phase was just completed and working barely less than six months ago. So, we may have such small small challenges but we're still in the process of fixing all the challenges out – Deputy Head of Laboratory

Yes, yes. We also write it in our books. We have books for each test that we do. Even when you register into the system (Health Pro), we still... we have a reception log book that we still write... register the patient and write it in our book - Lab Front desk staff

As the tendency to abandon the use of the Health Pro is very high in the shakedown phase, there is the need for effective communication and continuous proper training which highlight the system's advantages, together with periodic evaluations of the system (Sykes *et al.*, 2011; Lynge *et al.*, 2012). In doing so, Gilmore *et al.* (2014) write that it will “provide in-depth, contextually relevant, and timely information on factors that can potentially enhance or impede implementation success”. To enhance implementation success, the IT developers of the Health Pro require information on the potential modifications needed to allow users realize the benefits of the IT system and therefore, employ its use in their daily routine processes. This is to say that, timely feedback and recommendations given through ongoing progress monitoring are de rigueur for the improvement of the Health Pro to help the end users work better with the technology (Sykes *et al.*, 2011; Gilmore *et al.*, 2014; Saldana, 2014).

Generally, implementation of systems and programmes come in three main stages; pre-implementation, implementation and post-implementation. The pre-implementation phase comprises of the following steps; before planning, planning and feasibility. Implementation phase involves piloting and roll-out. Roll-out is usually the scaling-up from a successful pilot to a fully run system. The post-implementation phase then deals mainly with sustaining the system after it has been adopted into routine work practices (Stoop and Berg, 2003; Lynge *et al.*, 2012). The Health Pro at GARH is already implemented so we focus on the implementation phase of introducing health IT systems. With the Health Pro, the health information system was rolled-out when it was introduced and hence, the pilot phase was omitted from the implementation process. The Health Pro was introduced into the daily work practices of the health professionals at the health facility and they were expected to incorporate it into their daily routine right away;

It wasn't like we had time to come to the new lab and look at how it (Health Pro) actually run and probably do a simulation to actually see it ... they should have had hands-on training on the Health Pro before patients come in as part of the transition process... made sure that we are comfortable with the interface because it is quite different from the old one we knew. So, we should have had time to have practiced on it, a lot more before we moved in and patients were supposed to come to us - Female BMS

The essence of the pilot phase of implementation is to allow for evidence-based modifications to be made to the IT system prior to a scale-up so that there will be very few challenges, if any, encountered when the scale up does actually happen. Supervision and coaching in the pilot phase are necessary to ensure that problems associated with the use of the system are identified early in the implementation process (Lynge *et al.*, 2012). With the case of the Health Pro, it was being implemented in a resource constrained setting, as GARH is a government hospital in a low-income country. This implies that the funds and time required to conduct the pilot phase of the Health Pro implementation were probably not available to the health facility. Nonetheless, IT projects in healthcare in the country and most developing countries are notorious for not surpassing the pilot phase of the implementation process (Heeks, 2002; Adjorlolo and Ellingsen, 2013). Perhaps, the pilot phase of implementation in these developing countries has become a ‘roadblock’ to the whole implementation process. If that is the case, then avoiding this phase and introducing the use of an IT system directly into the work processes in an organization could contribute to its successful implementation, acceptance and adoption.

Management or those in authority will have no choice but to sustain the IT system in the healthcare organization because it has been incorporated into routine work, and those on the frontline may have to form anti-programs (use the technology in a way that it was not intended) in order to work with the IT system effectively because it has been made a part of their work processes (Latour, 1990). On the other hand, an investment in a properly conducted pilot phase of implementation could enhance the successful adoption of the IT system by all stakeholders. In addition to realizing the full potential of the IT system in the pilot phase of implementation, the identification of the problem areas in the system that need modification will enable the end users to use the technology as it was intended. Moreover, the targeted users would have contributed to the ‘final’ system design, therefore, they will be more willing to accept and adopt it into their daily routine; it is at the pilot phase that those at the grassroots can contribute meaningfully to the development and design of an IT system.

5.2 Approach to Health Pro Implementation

The implementation of Health Pro at the Greater Accra Regional hospital was done using the top-down approach. The decision to acquire and implement the health information system was done by the management of the healthcare facility. In the implementation process, the extent of the involvement of the health professionals at the forefront of the provision of

health care was being aware of the system to be implemented. Perhaps, when the developers were in the various departments to observe their work processes. Some of the health professionals in leadership positions also participated in an introductory programme where they were asked to suggest ways the already designed Health Pro could be further improved for maximum output at their departments. Training sessions were held for the various health professional groups to introduce them to the system. All these were done prior to the roll-out of the Health Pro and could represent the point at which health professionals were involved in the implementation process.

In Ghana like most developing countries, cultural values such as kin loyalty, authority, holism, secrecy, and risk aversion are a part of the country's tradition and therefore, organisational structures are more hierarchical and more centralised (Heeks, 2002). Indeed, the top-down approach to systems and programmes implementation has become the norm in most organizational settings in the Ghanaian community. Management make decisions regarding the daily work routines of those on the 'ground' and these workers are expected to accept such decisions with no questions asked. Schneider *et al.*, (2014) writes that when that happens, the frontline workers "are able to exercise discretionary power in either accommodating or resisting policy initiatives and in shaping them in ways that fit with their everyday realities". That is, the workers develop ways to work with or around such decisions, and sometimes they totally ignore the decisions especially, if it interferes with their daily routine.

To safeguard the job an individual already has because there is scarcity of jobs in the country, employees in organizations including healthcare are compelled to blindly accept decisions made by those in authority. The top-down approach to IT implementation alienates the targeted users of a technology and this it could lead to extra cost associated with the new system; an introduced technology may be abandoned by users although it may seem as though it is being used. Granted, those high up in the organizational hierarchy may be able to see and analyse entire processes (Davenport and Stoddard, 1994), however, in the healthcare setting, ad hoc decisions are made on a case-to-case basis which implies that there is no 'fixed' entire process. Therefore, the contributions of those at the grassroots who are tasked with making these decisions when providing health services to patients are extremely crucial to technology development. It is safe to say that at the Greater Accra Regional hospital, the health professionals who are directly involved in the patient care process will be making

decisions with the Health Pro in their daily routines. In addition to that, they will be the ones faced with the unforeseen consequences of the IT system. This is the reason why the health professionals should have been contacted to participate in the decision to acquire the Health Pro. Moreover, the demands of top management for a health information system and the reality of service delivery with the HIS usually conflict, requiring the efforts of the health professionals at the forefront to reconcile this demand-reality discrepancy (Schneider *et al.*, 2014). These issues with the top-down approach to implementation seem a legitimate basis for a bottom-up dominated approach to implementation of health IT systems or at least, a balanced combination of the top-down and the bottom-up approaches.

5.3 Importance of users of the Health Pro; Perceptions and Usability

The role of users in health IT implementation and adoption has been emphasised in literature; Farzandipur *et al.*, (2016) cites human factors as the most influential for information systems being implemented in healthcare settings to be successful. In addition to that, Gilmore *et al.*, (2014) notes how the acceptance and future utilisation of IT systems is predicted by user satisfaction. In the same manner, Schneider *et al.*, (2014) like Eboreime *et al.*, (2017) suggest that those at the low levels or frontline (the ‘actual’ users of health IT) of the health organization hold the power to the adoption and efficient utilization of IT systems. Furthermore, Doebbeling and Pekny (2008) insist that end-user feedback should be the basis for continuous improvement to a health information technology. These users of health IT accept and adopt a new technology based on their experiences with the technology; user perceptions prior to the use of a technology influence their experiences and later, those experiences gained from using the technology influence their perception of it.

According to Sykes *et al.*, (2011), the use of health IT systems by health professionals can be explained by two (2) technology-related perceptions. One is the perceived usefulness of the IT system; the users’ belief that the technology can help improve how they perform their daily work routines. The other is the perceived ease of use of the health IT system whereby the users expect the use of the IT system to be as effortless as possible. Of these two and among the technological factors that influence health IT implementation, perceived usefulness appears to be the most influential in the use of IT systems (Sykes *et al.*, 2011). The users of the Health Pro at GARH are all the health professionals who work there, but mainly those at the frontline of the health delivery service who interact with the patients and provide them with the health services they require. These frontline health professionals will

use the Health Pro in their tasks of providing health care, hence their perceptions of the use of the Health Pro is important to enable them to perform their duties competently and meritoriously. Almost all the health professionals interviewed perceived the Health Pro as a useful tool that would enable them work more efficiently. It appears those who had previous experience with the use of an electronic system in their routine work processes perceived the Health Pro as very useful because it is expected to be more advanced with numerous functions:

*But way forward, anybody who is brought in here when the system (Health Pro) is fully deployed, we expect that whatever a person's complain is should be written in there and then the continuation of service can be done without hinderance. This is the expectation of the new software - **Records manager***

With respect to the perceived ease of use of the Health Pro, all the health professionals interviewed were computer literate. Some interviewees had learnt to use and be conversant with computers at one point during their tertiary education, most refer to when they were writing their bachelor thesis. Others learnt it on their own through personal tutelage or computer lessons taken at an institution other than GARH, while a couple of the interviewees reported that they had received some form of basic computer lessons at the healthcare facility. The interviewed health professionals were quite young, and this could be a reflection of the computer literacy level of the middle-aged and young health professionals working at GARH. Those health workers who are relatively older could be less comfortable with computers and therefore could have a different perception of the ease of use of the Health Pro which could lead to resistance of use of the IT system.

The position of the GARH administration regarding the ease of use of the Health Pro by the health workers at the facility is expressed as follows;

*Ooohhh... So far as we all use mobile phones and other things, the Health Pro is just similar to our mobile phones because if we look at how it is being done, whatever you want... even when the nurses and doctors start using theirs, the BP has ranges. Immediately you check, you just click... so that's how it is - **Personal Assistant to the Medical Director***

Although there are similarities in the use of technological tools such as mobile or smart phones, laptops, tablets and desktop computers, each device has characteristics that differ from the others. Furthermore, applications and software have unique features that require the know-how to effectively and efficiently use them for what they are designed to do and even more. The assumption that the health professionals' ability to use mobile devices implies that they are capable of using a health IT system could result in the hospital administration ignoring the IT needs of its workers and consequently, issues such as resistance of the technology, improper use of the system, and ignoring the technology in performing daily routine tasks. A case in point is the reluctance of the older staff at some departments at GARH to use the Health Pro described below;

At the laboratory department, one biomedical laboratory scientist explains the reluctance of those who were older to use the Health Pro because they had not received any official training and they refuse to be trained by their younger colleagues. This poses a challenge to the delivery of efficient health care, as most often these older biomedical scientists are those who validate a laboratory result prior to it being issued out. The design of the laboratory interface of the Health Pro is such that the result validation by an authorised biomedical laboratory scientist is mandatory. If results are not signed or validated by an authorised biomedical scientist, the patients' results cannot be printed and released on time and therefore the doctor cannot properly diagnose and treat patients who patronize GARH. In short, this could create a 'butterfly effect' which will lead to inefficient provision of health care and deaths that can be prevented.

5.4 User involvement; Participation

The user involvement concept advocates input from all user groups, together with that of top management in decisions related to the implementation of information systems. In the healthcare organization, this refers to all the health professional groups who partake in the patient care process. Ideally, in a large healthcare setting like a regional government hospital, representative participation which permits the involvement of a representative from the various health professional groups as well as from the different departments in all aspects of the design and roll-out of the Health Pro is acceptable. This ensures that the development of the health information system takes into account the needs of these health workers in addition to that of the department in instances where they differ. In departments where there are different health professionals working to provide the same health services, it is imperative to

consider each role and hence, a representative for each group is necessary. Departments like the laboratory which have various units that perform distinct functions require a representative from each unit to ensure the HIS design for individual units is acceptable and can help with the performance of daily routine tasks. These representatives can also double as champions for the health information system as they are responsible for reporting back to their professional groups, departments and units on the development and the potential benefits of the technology. Furthermore, they can support the implementation of the new system and promote its acceptance to their fellow health professionals (Ruxwana *et al.*, 2010; Sligo *et al.*, 2017).

With regards to the Health Pro, consultative participation which involves the system development team consulting the would-be end users of the new system on their preferences for the information system's design and development was practiced. With this participation approach, the developers of the health information system are in full control of its overall design and only require the end user's contribution to guide the design process (Ruxwana *et al.*, 2010). Likewise, the developers for Health Pro observed the working practices of the health workers in the various departments of the Greater Accra Regional hospital to facilitate the design of a system that is suitable for the health facility. In addition to this, the heads of departments were given an introductory training to the Health Pro which included a consultation on the design interface for their various departments. Although this consultation came after the Health Pro had been designed and developed, and the consultation was not on the needs of the departments but rather, on issues and changes that the heads of departments wanted for their already developed interface.

Comments like; *maybe if there was any contact, it will be the head but we operating on the machine were not contacted* and *Yes, we were aware of it*, give the impression the health professionals at the forefront of the health delivery service felt left out of the Health Pro design and development even though they are the targeted users of the system. For the Health Pro to be used for the provision of safe, effective and accessible health care services, representatives from both the would-be end users, developers, and top management of GARH should have been involved in discussions on the acquisition, design, introduction and implementation of the new system (Berg, 2001; Nilsson *et al.*, 2016). Typically, the health professionals will have concerns about the changes that the Health Pro will make to their

work practices and daily routines (Bossen *et al.*, 2013), which could have been addressed in such discussions to facilitate ease of use and hence, early acceptance of the Health Pro.

Notwithstanding that those at the frontline were alienated in the implementation of Health Pro, the system is being used at the healthcare facility and it remains to be seen the effect of this lack of user involvement. On the one hand, the hierarchical nature of institutions in Ghana signify the adoption of the Health Pro at GARH is not up for negotiations and it is more or less mandated. Acceptance of the Health Pro, on the other hand is within the control of the health workers; deciding whether or not to use the Health Pro for their daily working practices and also, for what it was intended for is subjective. It is worth noting that user involvement is encouraged because it influences user perception in a positive manner since the users feel confident and proud they had a part to play in the implementation of the information system.

5.5 Training on Health Pro

Achampong (2012b) notes that in the healthcare facilities in Ghana where computers are available, the health professionals' skills to use these computers for their intended purpose is either lacking or inadequate. Authors and researchers like Evans *et al.* (2014), Herbst *et al.* (1999), Sykes *et al.* (2011), Tomasi *et al.* (2004) and many others underscore the importance of effective and extensive training for the end users of health IT. There is the need for the meticulous planning of both the training of health professionals and the resource requirements for the implementation and adoption of new technology in the healthcare setting. Even more so at the shakedown phase of health information system implementation, as the tutoring of the health professionals in activities like logging into the system, typing, scanning, and transfer of data is done at this stage and requires ample resources (Evans *et al.*, 2014). Contrary to the assertion that training for health IT is essential, the training for Health Pro at GARH as described and narrated by at least a couple of the interviewed health professionals lacked planning. Some of the health professionals at the Greater Accra Regional hospital were totally dissatisfied with the training they received on the use of the Health Pro:

I'm not too sure but they didn't quite kick start very well, that's one of the major challenges and so they didn't have time to do proper training ... It's part of the reasons why we had challenges, because the trainings were not well structured and not well executed, if you ask

me ... So, the training should have been done in batches to make sure that every staff goes through good training (stressed) because when I'm training someone else, I might leave out some information - Female BMS

The lack of proper planning for the training of the staff at GARH on the Health Pro resulted in introduction and training on the use of the system much earlier than the implementation date (date the staff started using the Health Pro). Those who had attended that training sessions could not remember what they had been taught on how to use the technology when it was finally implemented. Due to the fact that there was no pilot phase for the implementation of the Health Pro, the re-training of the staff occurred during regular working hours and it targeted those who were considered essential personnel for the use of the system. The laboratory staff at the front desk who are responsible for registering the patients who go to the department for laboratory tests are an example of essential Health Pro personnel. Training the staff at the health facility who were not migrated onto the Health Pro, like those at the OPD section creates a bit of a dilemma. On one hand, staff members like nurses and consulting doctors take turns to work in all the wards and consulting rooms so, they may be required to use the Health Pro if it is finally implemented in the wards at the new building. This would make the training of the staff in the early stages a wise decision, that is, if they do not require retraining.

On the other hand, if the implementation of Health Pro in these wards and departments is expected to be done together with that of the second phase, these health professionals will have to be retrained which requires the use of extra resources. Thus, an unwise decision to have trained the staff early. There is no information on the completion of the second phase of the refurbishment project and therefore, an uncertainty surrounding the migration time of the OPD staff onto the Health Pro. From the accounts of the staff at the OPD, there were rumours that they would be provided with computers so that they would start using the Health Pro before the end of the year. As at the time of this study, the out-patient department with the exception of the records department did not have computers. These uncertainties and lack of information accentuates the need for proper planning for the training and resource allocation in implementing health IT systems especially, in resource poor settings.

Comparatively, the money allocated to IT in developing countries is less (Heeks, 2002), which suggests that resources for the training and education of staff in an organization on a

new technology is inadequate or non-existent. The substantial resources that Evans *et al.* (2014) states that is required for standardized, consistent education in the early stage of a new information system implementation process is unlikely to be available to institutions and organizations in developing countries. Nonetheless, effective and extensive training of health staff on the use of a health information system could be possible with limited resources or no resources at all. Irrespective of the resources available and the time of training of health personnel in an implementation process, the manner in which the training is done is very critical as it can influence the perception of users and consequently, the acceptance and adoption of the health information system. Effective training should involve education on the use of the system; what, when and how to click, where and how to find features relevant to the various health professional groups and so on, as well as detailed explanation of the performance benefits of the HIS that emphasizes why it should be used for the provision of health care services (Herbst *et al.*, 1999; Sykes *et al.*, 2011).

The views on the nature of the training given for the Health Pro at GARH to the staff seems to be subjective; there are different opinions on how well the training was conducted. One issue identified with regards to the training process that could threaten the acceptance of Health Pro at the health facility was the inability of the developers or consultants to train all the staff on the use of the system. It is imperative that all health personnel receive training from the developers or the IT personnel at the health facility. To avoid challenges to the training process, the developers of the Health Pro should have trained the IT personnel on how to train the various health professionals on using their respective interfaces. This would have facilitated the planning of 'in-house' training sessions which would most likely have involved every staff member. In that case, the inconveniences created by having to learn how to use the Health Pro from a colleague would have been averted.

5.6 Communication regarding Health Pro

Communication in an actor-network like the Greater Accra Regional hospital permits the flow and transfer of information to and from one or more of the individual actors for the effective provision of health care services to clients. Information flow and hence effective communication between the following in the healthcare setting is crucial;

- the health professionals and the Health Pro
- the individual devices integrated with the Health Pro such as computers, imaging equipment, laboratory equipment etc.

- Health Pro connected devices and other tools such as notebooks for recording patient information
- the distinct health professional groups
- top management and the front liners (those not in management positions)
- health workers and the patients
- Health Pro and the patients
- health professionals and the system developers

In agreement with the opinion expressed by Herbst *et al.* (1999), socio-technical networks such as healthcare facilities need to develop, establish and maintain effective channels of communication for the optimal functioning of each of the elements in the network. In the healthcare institution, a mutual understanding between the diverse actors in this setting ensures that human lives are not needlessly and prematurely lost or injured. Thus, taking into account the perspectives and priorities of each actor through communication in decision making at the hospital will go a long way to provide a safe and comfortable environment for both the health workers and the patients (Herbst *et al.*, 1999). At the Greater Accra Regional hospital, the channels of communication although existent can barely be described as effective. Not only did the health professionals at the forefront lack sufficient information on the Health Pro prior to its implementation, the challenges they are facing now after the implementation are not being addressed in a timely manner.

Challenges in the healthcare setting if not properly addressed can lead to catastrophic consequences. Through effective communication, the reasons for the delay in response to the issues that arise with the use of the Health Pro can be explained to the health workers so as not to discourage them from using the technology. When faced with a challenge on the use of the Health Pro, the end users find alternate solutions to enable them to continue with the provision of health care. If these challenges are not addressed by the relevant authorities in time, these health professionals may be inclined to adopt these alternate solutions into their new working process which may not involve the use of the Health Pro. Providing adequate information on the progress of events that take place in the hospital could easily be done through memos to the various departments in the healthcare facility. The busy nature of the setting might present a challenge to constant meetings updating the staff on matters such as the current state of affairs with the second phase of the refurbishment.

In order not to disrupt the provision of health care services, meetings for batches of the health professionals should be organized occasionally so that the staff can be made aware of happenings in the healthcare facility. Patient comfort and satisfaction is quite important in the healthcare industry, therefore effective communication with patients is necessary. The state of patients visiting the hospital is varied, ranging from critically ill to quite healthy. Lack of adequate information about the relocation of departments and new processes introduced after the introduction of the Health Pro results in patients unable to find the various point of service delivery and spending a considerable amount of time on the hospital premises unattended. This is unacceptable in the healthcare industry which is established with the patients' welfare as the ultimate aim; even more so, in a health facility with a health information system. Thus, the patients must be provided with adequate and comprehensive information through directional charts and signs to the various service delivery units ensuring a stress-free experience at the hospital.

5.7 Information infrastructure at GARH

The previous work practices and processes at the Greater Accra Regional hospital, like the use of DHIMS at the records department and BLIS at the laboratory department set the stage for the development of Health Pro. These existing practices and processes therefore could be considered as the installed base for the design and development of the new technology that has been implemented at the health facility now. As already mentioned, the developers of the Health Pro designed and developed the system based on observations of the work processes in all the departments at the health facility to capture the essence of the current working practices in the design. Although the health professionals have complained of challenges after the implementation of the Health Pro, they all seem to be in agreement that the interface for the system is user-friendly and can be easily used once trained. This is a positive characteristic of the Health Pro and it implies that once all other challenges identified with the system have been resolved, the health professionals are likely to accept and adopt the use of the technology in their routine practices for provision of health care services.

With the increasing demands for health services due to the double burden of diseases, people living longer with chronic diseases and inadequate health professionals, measures such as implementing Health Pro is welcomed to assist with the efficient delivery of health care. Furthermore, health information systems like the Health Pro can facilitate disease surveillance in its catchment area, in this case that refers to the regional capital of the country

- Greater Accra region. The fact that health information technology offers scalability implies that the Health Pro can be considered as an information infrastructure and also, an installed base which can be cultivated (Doebbeling and Pekny, 2008).

5.7.1 Health Pro as information infrastructure

The Health Pro at GARH has the characteristics of an information infrastructure as described in chapter two. The system is **shared** by the wide range of health professionals who work at the Greater Accra Regional hospital such as medical doctors, nurses, biomedical scientists, pharmacists and radiographers. Other workers at the health facility like accountants, administrators, secretaries, supply officers, national service personnel, health students¹⁸ and interns¹⁹ also have access to the Health Pro. When fully implemented, the patients and health professionals in other healthcare facilities will be able to access the technology for health care purposes. However, in the shakedown phase of the implementation, just a few of the groups of individuals listed share the Health Pro; those who work in the departments where the system has been implemented. Health Pro is irreducible because the different departments with their different interfaces and equipment that have to be integrated are all using the same technology (Hanseth and Monteiro, 1998).

As an information infrastructure, the Health Pro is **open** because of the unlimited number of elements that contributed to its design, development and implementation at GARH (Hanseth and Monteiro, 1998). These include the paper-based practices that were being used in the various departments, the electronic systems that were being used in the pharmacy and laboratory departments, and the consultation on the opinions of the heads of departments about their departments' developed interface. Presumably, the Health Pro captured the essential and relevant aspects of the work practices in each of the departments while ensuring that the flow and continuity of patient care is preserved. In other words, although it may lack strict borders, not every aspect of the current working practices and processes were included in the development of the Health Pro so as not to have a cumbersome system that is difficult to use. Additionally, in future when the system is sharing information with other healthcare facilities while it is being accessed by their health professionals, there will be an overlap of

¹⁸ These include medical students, nursing students, allied health students; biomedical science students, physiotherapy students and radiography students who go to the health facility for training as part of their curriculum.

¹⁹ Health students who have graduated and have to acquire a one-year experience in a health facility.

information infrastructures which will present difficulties in determining what is on either side of the border (Hanseth and Monteiro, 1998).

Information infrastructure and the Health Pro implemented at GARH both share a common characteristic; they are **heterogenous**. The use of the technology encompasses the technical and non-technical in the Greater Accra Regional hospital (Hanseth and Monteiro, 1998; Hanseth, 2002). Basically, this is made up of the humans and equipment that share the system for the delivery of health care services. Each department, group of users and equipment uses the Health Pro for a distinct purpose which has a role in patient care at the hospital. For example, a haematology analyser used to run patient blood samples sends out the results of the test to Health Pro on a computer, the test results are verified on the haematology interface of the Health Pro by an authorised biomedical scientist. The current practice is that the results are accessed by the laboratory personnel at the front desk and printed out to the patient who then takes it to the doctor for interpretation while considering the patient's signs and symptoms. When implementation of Health Pro is completed, the results after verification by the biomedical scientist will be accessible to the medical doctor in charge of the patient. He will then view the results on his interface of the Health Pro, diagnose and treat the patient accordingly. This example clearly shows the different actors that use the Health Pro in a given situation, endorsing its heterogeneity.

With respect to the **evolving** characteristic of Health Pro, as an information infrastructure it has the potential to be improved upon and extended into a better and more efficient system. With continuous assessments and evaluations of the technology, issues with the current version of the Health Pro can be identified and updates can be made for improvements in its function. The better the Health Pro becomes in the delivery of effective and efficient health services, the more attractive it will be to other government hospitals in the country who will be willing to adopt its use. That means more users, more areas covered by the Health Pro and more integrated applications because the system will be exposed to new and different ways of health service delivery from other healthcare facilities (Hanseth, 2002). This predicted evolution of the Health Pro indicates that it can be cultivated as an **installed base** on which the new system that results from its improvement and extension will be built. Just as the Health Pro was built on the installed base (existing practices and processes prior to the Health Pro) at the Greater Accra Regional hospital. In effect, old and existing practices influence

new practices and systems through established gateways while interacting with each other in a mutual manner to accomplish a given goal (Hanseth and Monteiro, 1998; Berg, 1999).

5.8 Health workers' expectations of Health Pro

Justifiably, the unprecedented expectations of the health professionals of the Health Pro, an information and communication technology tool for health purposes is warranted. The Health Pro's ability to improve work practices is basically why it was developed for the health facility. In addition to that, as a health information system it is expected to coordinate the delivery of health services to patients, and facilitate the availability and accessibility of patient information to the various health professionals in their respective roles for the provision of the best possible care (World Health Organization, 2012). Although health information systems are expected to be beneficial to the healthcare organization, challenges arise with its use which can dampen one's enthusiasm for the technology. Wagner-Menghin and Pokieser (2016) refer to physicians' experiences with an EHR system which caused changes in their work practice by negatively affecting the doctor-patient communication as well as requiring more time for documentation of patient information. Their experience was further worsened by the lack of the relevant features on the EHR to support their work processes (Wagner-Menghin and Pokieser, 2016).

Perhaps, the health professionals interviewed at GARH did not express it but the usual reaction that accompanies the introduction of an automated process in an organization is that of fear. The fear of losing one's job as work practices and processes have been presumably simplified by the IT application or system implemented. When a new technology is introduced in most organizations in the country, the default action of top management is to reduce their workforce; laying off workers to make way for the new technology. Possibly, due to the limited resources available for organizations to perform their activities. Resistance to the new technology is therefore the usual reaction of workers in such organizations (Achampong, 2012b). Although there are no indications of such a downsizing strategy planned at the Greater Accra Regional hospital, it is a natural response for workers to live in constant fear of losing their job once a new technology is introduced. However, the complex nature of healthcare work requires the presence of humans even when there is a new technology to ensure that no avoidable errors are made that could cost a patient his life. Reassurances on the matter from top management at the health facility could strongly contribute to the successful implementation of the Health Pro.

5.8.1 Effect of Health Pro on patient care

Some health professionals believe strongly that the implementation of the Health Pro has not made any changes to the patient care process yet and others believe it has made the process more complex. Nevertheless, there are some health workers who believe the Health Pro has brought improvements to the patient care process. Improvements in patient care processes in this study refers to less demands on the patients with regards to their movement about the hospital premises when they require health care. It also refers to faster yet more effective and efficient delivery of care by the health professionals at the various service delivery points. In that regard, the current implementation of Health Pro has not improved patient process at the Greater Accra Regional hospital. One reason for this conclusion is based on the accounts of the health professionals who explain that the patients have been reacting to delays with the Health Pro by arguing and ‘fighting’ with them. One of the main challenges at the pharmacy department is the delay with the new system which results in long waiting time for the patients who must fill out their prescriptions. Patients become anxious and impatient when they are not attended to early at the service delivery points and some may resort to arguing with and insulting the health workers. Resolving the issue of the delay with the system may reduce the waiting time and hence, improve the relationship between the patients and the health professionals.

Another reason for the conclusion that the patient care process has not been improved by the implementation of Health Pro is that, the patients move about the health premises as much as they did prior to the implementation process. One laboratory staff explains this better when she says; *I think it could do much more... it could do better if it was fully utilized so that patients don't have to go up and down chasing results but because it's still quite manual at the moment it's almost difficult to even notice that we've even had a change of system to the ordinary client who is using our service.*

She identifies the problem with the lack of improvement in the patient care process as the partial implementation of the Health Pro which excluded the OPD, the first point of call of patients to the health facility from the migration onto the use of the technology. The electronic health delivery service which the Health Pro seeks to offer at GARH is at a disadvantage in the shakedown phase because of this exclusion. Hopefully, once the Health Pro is fully implemented, the patients will walk about the health premises less, to and from the service delivery points.

5.8.2 Effect of Health Pro on work processes

Improvements were reported in the work processes by some of the health professionals at GARH with the implementation of Health Pro. Noticeably, those who reported improvements with the Health Pro had been migrated onto the technology from a completely manual process, like with the processes at the supply office prior to the implementation of Health Pro. The complete transformation from manual to electronic makes work processes seem a lot simpler which may be misconstrued as improvements in work processes. Nonetheless, improvements can be associated with the change of work processes from manual to electronic which shows a more efficient way of performing tasks and processes in addition to simplification of the work processes. Other departments that had a semi-electronic work process prior to the Health Pro implementation like the laboratory also reported an improvement in their practices. This improvement in work practices was purported when the work practices after the implementation of Health Pro were compared with the previous manual practices and not the recent semi-electronic processes on which the design of the Health Pro was based on.

The effect of Health Pro on the work practices at GARH cannot be fully assessed in light of the partial implementation of the new system. The individual departmental work processes as well as the overall patient care process and health delivery service can be completely visible after the full implementation of Health Pro. Perhaps, after the completion of the second phase of the refurbishment when all the departments have been equipped with the new technology and are operating at full capacity.

5.9 Maintenance of Health Pro

Successful adoption does not, however, guarantee sustained implementation at scale – Schneider et al., 2014

Sustaining the implementation of health information systems and their maintenance are mutually exclusive activities. To achieve sustained implementation after the various challenges to the technology have been resolved, the Health Pro must be maintained at its optimal at the healthcare facility. Achampong (2012b) identifies lack of maintenance culture as one of the challenges the private and government organizations in the country face with IT projects. He recommends the allocation of finances for preventive and corrective maintenance when purchasing an ICT equipment for an organization (Achampong, 2012b). It

therefore comes as no surprise when the question about how the Health Pro will be maintained in the long term could not be answered by either the representative of the developers or the staff at the administration of the Greater Accra Regional hospital. The maintenance of a health information system is necessary for its efficient performance as well as its 'durability'. The Health Pro at GARH, if not maintained properly will be rejected and abandoned by the end users with time. As an information infrastructure with the potential to be improved and extended, maintenance plans need to be made and resources allocated to the Health Pro's sustained maintenance.

5.10 Limitations to the study

This study like most research has limitations, though these limitations do not invalidate the findings of the study. The limitations are as follows;

5.10.1 Access

Access in terms of acceptability by the health professionals was limited. Most of the health professionals interviewed seemed to be choosing their words carefully during the interviews while others refused to participate in the interviews after a series of questions. The presence of the research manager may have given the impression that the top management of the health facility had a stake in the study research which made the staff reluctant to participate even after reassurances that there will be complete anonymity and the interviews were solely for research purposes.

Additionally, the Greater Accra Regional hospital is a very busy setting which made it difficult to make appointments with some of the health professionals. In instances when appointments were made, they ended up being cancelled or rescheduled because the health professionals had to either attend to a patient or a medical-related issue.

5.10.2 Interviews

Interviews as a method of data collection require participants to spend a considerable amount of time away from their work which could be viewed as problematic in the healthcare organization. In complex and busy settings like a hospital, interviews can be used in conjunction with other less time-consuming methods like questionnaires. The issue of uncertainty about anonymity or the involvement of the top management in the research could have been resolved with questionnaires being used as another method of data collection. In addition, issuing out questionnaires could have covered a wide range of health professionals

and the findings could have included health professionals of all age groups and other characteristics.

The time for the data collection was one month which prevented the change in data collection strategy once the difficulties mentioned above were realized. This realization came about half way through the data collection processes and during the analyses of the findings from the interviews.

5.10.3 Generalizability

Although GARH is a regional government hospital in Ghana, generalizing the findings of this study to government hospitals in the country and developing countries should be done with caution. The work processes and practices in governmental hospitals differ and are usually subject to the local context. However, these facilities share a number of similarities which could make generalization a possibility.

The opinions of the interviewed health professionals were subjective, and the interviewees were relatively young. Perhaps, the findings could be generalized to the younger members of the health professional groups.

Chapter Six

Conclusion

Successful implementation of EHRs generally requires satisfaction on the part of staff - Bossen et al. (2013)

The shakedown phase of Health Pro implementation at the Greater Accra Regional hospital is critical because the experiences of the health professionals (the targeted end users) in this implementation phase, sets the tone for its acceptance in the healthcare facility. Decisions to abandon the use of Health Pro if there are any, will most likely be made in this phase of the implementation process. However, with effective communication, proper and extensive training in addition to the challenges encountered in this phase being addressed on time, health professionals will not only accept the Health Pro, but they will adopt it into their daily routine work processes. The pilot phase of the implementation process was omitted when the Health Pro was implemented and introduced directly into the working processes of the health professionals at the departments which have been relocated into the completed first phase of the refurbished building at the Greater Accra Regional hospital.

This omission of the pilot phase could prove to be positive for the implementation of the Health Pro as the implementation of health information systems in the country and developing countries rarely surpass the pilot phase. Perhaps, avoiding this phase could strongly contribute to the success of health information systems implementation projects in developing countries. On the other hand, the pilot phase would have allowed for the contribution of end users to the design and development of the Health Pro through the identification of problems as they tried out the new system. Nevertheless, if the end users are given the opportunity to contribute to the design and development of a health information system from the decision-making phase, the pilot phase of implementation could be justifiably omitted.

The top management at the Greater Accra Regional hospital implemented the Health Pro without adequate communication about the system or extensive training for the health professionals. The decision to acquire the technology was made at the top level of the health facility and those at the forefront are expected to accept and adopt it into their work practices without question. Acceptance is demanded from the health professionals on the front line of

the health delivery service because in Ghana, those at the top of the hierarchy in organizations make the final decisions. The use of a combination of the top-down and the bottom-up approach to the Health Pro implementation which would have allowed for the contribution of the health workers at the forefront would have been ideal. The end users of the Health Pro would have felt a part of the design and development process for the system and this would facilitate its early adoption. Acceptance of the Health Pro does not necessarily imply its adoption because the health professionals can ignore the use of the new technology although top management would have expediated its introduction into their working practices. This highlights the importance of end users in the implementation process of a health information system.

Perceptions and experiences with the Health Pro will influence the decision of end users to accept and adopt the new system into their daily routine work practices. Perceptions of usefulness and ease of use are important to the Health Pro's adoption. These perceptions can be impelled by training and communication as well as experiences with challenges. The challenges with the Health Pro like delays in work processes experienced by the health workers in the various departments can result in their rejection of the new system. Effective and adequate communication was lacking in the implementation of Health Pro at the Greater Accra Regional hospital. Likewise, effective and extensive training needed for the use of the Health Pro was derisory. Training, just like the maintenance of the Health Pro should be planned properly and adequate resources should be allocated to their execution even in a resource poor setting like a government healthcare facility in a developing country. The proper maintenance of the Health Pro is necessary to its sustained implementation at GARH.

Despite the challenges associated with implementing the Health Pro at the Greater Accra Regional hospital in the shakedown phase, successful implementation is a possibility if the issues encountered by the health professionals at the various departments are addressed properly and promptly. The Health Pro is an information infrastructure and therefore, the challenges encountered should be considered as opportunities to improve and extend the technology. In addition to this, future decisions regarding the Health Pro should involve both top management and end users at the facility to ensure that the technology is accepted, adopted and used for what it was intended for; to improve the provision of health care to patients and facilitate the effective and efficient continuity of care at the healthcare facility.

6.1 Study contribution

The findings from this study can contribute to the existing knowledge on the implementation of health information systems in Ghana and developing countries, particularly in the critical early phase of the implementation process. The proliferation of information systems in the country implies that organizations can benefit from the knowledge of issues that could be encountered in the shakedown phase of information systems implementation. The health organization and perhaps, other organization that are similar can identify and account for potential implementation issues prior to designing and developing information systems to enhance the chances of successful implementation and adoption.

Furthermore, the refurbishment of the Greater Accra Regional hospital is ongoing which implies that the Health Pro will be implemented once again in the completed second phase. Knowledge obtained from this study can contribute to a smoother implementation of Health Pro in the departments expected to relocate to the ultra-modern building when the second phase is complete.

6.2 Recommendations

Health Pro at the Greater Accra Regional hospital is in its early stage of implementation which presents the opportunity for a longitudinal study. A single study involving both qualitative and quantitative research methods to assess the entire implementation process until it is fully adopted into the routine work practices of the healthcare facility would contribute immensely to the literature of implementing health information systems in the country and developing countries. On the other hand, a series of studies could be conducted in the distinct stages of the implementation process employing the use of varied methods of data collection for this purpose. Such studies should target different groups of health professionals in different age groups and perhaps, the patients who are also stakeholders and the recipients of services provided through the Health Pro.

References

- Aanestad, M. and Hanseth, O. (2000) 'Implementing Open Network Technologies in Complex Work Practices: A Case from Telemedicine', in *Organizational and Social Perspectives on Information Technology: IFIP TC8 WG8.2 International Working Conference on the Social and Organizational Perspective on Research and Practice in Information Technology June 9-11, 2000, Aalborg, Denmark*, pp. 355–369. doi: 10.1007/978-0-387-35505-4_21.
- Aanestad, M. and Jensen, T. B. (2011) 'Building nation-wide information infrastructures in healthcare through modular implementation strategies', *Journal of Strategic Information Systems*, 20(2), pp. 161–176. doi: 10.1016/j.jsis.2011.03.006.
- Achampong, E. K. (2012a) 'Electronic Health Record System: A Survey in Ghanaian Hospitals', *Journal of Health and Medical Informatics*, 1(2), p. e164. doi: 10.4172/scientificreports.164.
- Achampong, E. K. (2012b) 'The State of Information and Communication Technology and Health Informatics in Ghana', *Online Journal of Public Health Informatics*, 4(2), p. e6.
- Adjorlolo, S. and Ellingsen, G. (2013) 'Readiness Assessment for Implementation of Electronic Patient Record in Ghana: A Case of University of Ghana Hospital', *Journal of Health Informatics in Developing Countries*, 7(2), pp. 128–140.
- Amit, V. (2000) 'Introduction: Constructing the field', in Amit, V. (ed.) *Constructing the Field: Ethnographic Fieldwork in the Contemporary World*. London: Routledge.
- Asare, S., Otoo-Arthur, D. and Frimpong, K. O. (2017) 'Assessing the Readiness of the Digitization of Health Records: A Case of a Municipal Hospital in Ghana', *International Journal of Computer Science and Information Technology Research*, 5(4), pp. 76–90.
- Aseweh Abor, P., Abekah-Nkrumah, G. and Abor, J. (2008) 'An examination of hospital governance in Ghana', *Leadership in Health Services*. Emerald Group Publishing Limited, 21(1), pp. 47–60. doi: 10.1108/17511870810845905.
- Baillie, L. (2013) 'Enhancing observational data in qualitative research Observer-view', *Nurse Researcher*, 20(5), pp. 4–5.

Benbasat, I., Goldstein, D. K. and Mead, M. (1987) 'The Case Research Strategy in Studies of Information Systems Strategy in Studies of Information Systems', *Source: MIS Quarterly*, 11(3), pp. 369–386.

Berg, M. (1999) 'Patient care information systems and health care work: A sociotechnical approach', *International Journal of Medical Informatics*, pp. 87–101. doi: 10.1016/S1386-5056(99)00011-8.

Berg, M. (2001) 'Implementing information systems in health care organizations: Myths and challenges', in *International Journal of Medical Informatics*. doi: 10.1016/S1386-5056(01)00200-3.

Blaise, P. and Kegels, G. (2004) 'A realistic approach to the evaluation of the quality management movement in health care systems: a comparison between European and African contexts based on Mintzberg's organizational models', *The International Journal of Health Planning and Management*. John Wiley & Sons, Ltd., 19(4), pp. 337–364. doi: 10.1002/hpm.769.

Blomberg, J. and Karasti, H. (2013) 'Reflections on 25 years of ethnography in CSCW', *Computer Supported Cooperative Work: CSCW: An International Journal*, pp. 373–423. doi: 10.1007/s10606-012-9183-1.

Borgman, C. L. (2010) *Scholarship in the Digital Age: Information, Infrastructure, and the Internet*. Cambridge, Mass., United States: MIT Press.

Bossen, C., Jensen, L. G. and Udsen, F. W. (2013) 'Evaluation of a comprehensive EHR based on the DeLone and McLean model for IS success: Approach, results, and success factors', *International Journal of Medical Informatics*, 82(10), pp. 940–953. doi: 10.1016/j.ijmedinf.2013.05.010.

Braa, J. and Hedberg, C. (2002) 'The Struggle for District-Based Health Information Systems in South Africa', *The Information Society*, 18, pp. 113–127. doi: 10.1080/01972240290075048.

Bradley, E. H., Curry, L. A. and Devers, K. J. (2007) 'Qualitative data analysis for health services research: Developing taxonomy, themes, and theory', *Health Services Research*, 42(4), pp. 1758–1772. doi: 10.1111/j.1475-6773.2006.00684.x.

Central Intelligence Agency (2018) *The World Factbook : Africa - Ghana*. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html> (Accessed: 28 March 2018).

Clifford, G. D., Blaya, J. A., Hall-Clifford, R. and Fraser, H. S. F. (2008) 'Medical information systems: A foundation for healthcare technologies in developing countries', *BioMedical Engineering Online*, 7, pp. 1–8. doi: 10.1186/1475-925X-7-18.

Coiera, E. (2011) 'Why system inertia makes health reform so difficult.', *BMJ (Clinical research ed.)*, 342. doi: 10.1136/bmj.d3693.

Cora Garcia, A., David, G. C. and Chand, D. (2010) 'Understanding the work of medical transcriptionists in the production of medical records', *Health Informatics Journal*. SAGE PublicationsSage UK: London, England, 16(2), pp. 87–100. doi: 10.1177/1460458210361936.

Davenport, T. H. and Stoddard, D. B. (1994) 'Reengineering: Business Change of Mythic Proportion?', *MIS Quarterly*, 18(2), pp. 121–127. doi: 10.2307/249760.

Dingwall, R. (1997) 'Accounts, Interviews and Observations', *Context and Method in Qualitative Research*, pp. 51–65.

Doebbeling, B. N. and Pekny, J. (2008) 'The Role of Systems Factors in Implementing Health Information Technology', *J Gen Intern Med*, 23(4), pp. 500–1. doi: 10.1007/s11606-008-0559-3.

Eboreime, E. A., Abimbola, S., Obi, F. A., Ebirim, O., Olubajo, O., Eyles, J., Nxumalo, N. L. and Mambulu, F. N. (2017) 'Evaluating the sub-national fidelity of national Initiatives in decentralized health systems: Integrated Primary Health Care Governance in Nigeria', *BMC health services research*. BioMed Central, 17(1), p. 227. doi: 10.1186/s12913-017-2179-2.

Elective Ghana (no date) *Ridge Hospital: Brief History, online*. Available at: <http://electiveghana.org/home/ridge-hospital/> (Accessed: 28 March 2018).

Evans, W. K., Ashbury, F. D., Pun, J., Hogue, G. L. and Smith, A. (2014) 'Implementing a regional oncology information system: Approach and lessons learned', *Current Oncology*. doi: 10.3747/co.21.1923.

Farzandipur, M., Jeddi, F. R. and Azimi, E. (2016) 'Factors affecting successful implementation of hospital information systems', *Acta Informatica Medica*, 24(1), pp. 51–55. doi: 10.5455/aim.2016.24.51-55.

Fraser, H. S., Biondich, P., Moodley, D., Choi, S., Mamlin, B. W. and Szolovits, P. (2005) 'Implementing electronic medical record systems in developing countries', *Informatics in Primary Care*, 13(2), pp. 83–95.

Fraser, H. S. and Blaya, J. (2010) 'Implementing medical information systems in developing countries, what works and what doesn't.', *AMIA ... Annual Symposium proceedings. AMIA Symposium*, 2010, pp. 232–6.

Gilmore, B., Vallières, F., McAuliffe, E., Tumwesigye, N. M. and Muyambi, G. (2014) 'The last one heard: the importance of an early-stage participatory evaluation for programme implementation', *Implementation Science*. BioMed Central, 9, p. 137. doi: 10.1186/S13012-014-0137-5.

Golden-Biddle, K. and Locke, K. (1993) 'Appealing Work: An Investigation of How Ethnographic Texts Convince', *Organization Science*, 4(4), pp. 595–616. doi: 10.1287/orsc.4.4.595.

Hamilton, C. (2013) 'The WHO-ITU national eHealth strategy toolkit as an effective approach to national strategy development and implementation', *Studies in Health Technology and Informatics*, 192, pp. 913–916. doi: 10.3233/978-1-61499-289-9-913.

Hammer, M. (1990) 'Reengineering Work; Don't automate, Obliterate', *Havard Business Review*, July-August, pp. 104–112.

Hanseth, O. (2002) *From systems and tools to networks and infrastructures - from design to cultivation. Towards a theory of ICT solutions and its design methodology implications, online*. Available at: http://heim.ifi.uio.no/~oleha/Publications/ib_ISR_3rd_resubm2.html (Accessed: 8 April 2018).

Hanseth, O. and Monteiro, E. (1998) 'Defining information infrastructures', in *Understanding Information Infrastructure*. Manuscript, pp. 37–51.

Heeks, R. (2002) *Failure, Success and Improvisation of Information Systems Projects in*

Developing Countries, The Development Informatics working paper series, 11. Manchester.
doi: 10.1016/0736-5853(84)90003-0.

Herbst, A., Littlejohns, P., Rawlinson, J., Collinson, M. and Wyatt, J. (1999) 'Evaluating computerized health information systems: Hardware, software and human ware: Experiences from the Northern Province, South Africa', *Journal of public health medicine*, 21(3), pp. 305–310.

Herbst, K., Littlejohns, P., Rawlinson, J., Collinson, M. and Wyatt, J. C. (1999) 'Evaluating computerized health information systems: Hardware, software and human ware: Experiences from the Northern Province, South Africa', *Journal of Public Health Medicine*. doi: 10.1093/pubmed/21.3.305.

Iannacci, F. (2010) 'When is an information infrastructure? Investigating the emergence of public sector information infrastructures', *European Journal of Information Systems*, 19(1), pp. 35–48. doi: 10.1057/ejis.2010.3.

Ibrahim, A. (2016) *Mahama commissions newly refurbished Greater Accra Regional Hospital, Joy Online*. Available at: <https://www.myjoyonline.com/news/2016/november-30th/mahama-commissions-newly-refurbished-ridge-hospital.php> (Accessed: 12 March 2017).

Kemparaj, U. and Chavan, S. (2013) 'Qualitative research: A brief description', *Indian Journal of Medical Sciences*, 67(3), p. 89. doi: 10.4103/0019-5359.121127.

Klein, H. K. and Myers, M. D. (1999) 'A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems', *MIS Quarterly*, 23(1), p. 67. doi: 10.2307/249410.

Kwamie, A., Agyepong, I. A. and van Dijk, H. (2015) 'What Governs District Manager Decision Making? A Case Study of Complex Leadership in Dangme West District, Ghana', *Health Systems & Reform*. Taylor & Francis, 1(2), pp. 167–177. doi: 10.1080/23288604.2015.1032475.

Latour, B. (1990) 'Technology is Society Made Durable', *The Sociological Review*, 38(1_suppl), pp. 103–131. doi: 10.1111/j.1467-954X.1990.tb03350.x.

- Lynge, E., Törnberg, S., von Karsa, L., Segnan, N. and van Delden, J. J. M. (2012) 'Determinants of successful implementation of population-based cancer screening programmes.', *European journal of cancer (Oxford, England : 1990)*. Elsevier, 48(5), pp. 743–8. doi: 10.1016/j.ejca.2011.06.051.
- Marcus, G. E. (1995) 'Ethnography in/of the World System: The Emergence of Multi-Sited Ethnography', *Source: Annual Review of Anthropology*, 24, pp. 95–117.
- Marful, W. A. and Winter, A. (2014) 'When information technology meets healthcare in West Africa : a literature review', *Journal of health informatics in Africa*, 2(2), pp. 29–35. doi: 10.12856/JHIA-2014-v2-i2-104.
- Mesman, J. (2007) 'Disturbing Observations as a Basis for Collaborative Research', *Science as Culture*, 16(3), pp. 281–295. doi: 10.1080/09505430701568685.
- Myers, M. D. and Newman, M. (2007) 'The qualitative interview in IS research: Examining the craft', *Information and Organization*, 17(1), pp. 2–26. doi: 10.1016/j.infoandorg.2006.11.001.
- Ngwakongnwi, E., Atanga, M. B. S. and Quan, H. (2014) 'Challenges to implementing a National Health Information System in Cameroon: Perspectives of stakeholders', *Journal of Public Health in Africa*. doi: 10.4081/jphia.2014.322.
- Nilsson, L., Eriksén, S. and Borg, C. (2014) 'Social challenges when implementing information systems in everyday work in a nursing context', *CIN - Computers Informatics Nursing*. doi: 10.1097/CIN.0000000000000075.
- Nilsson, L., Eriksén, S. and Borg, C. (2016) 'The influence of social challenges when implementing information systems in a Swedish health-care organisation', *Journal of Nursing Management*. doi: 10.1111/jonm.12383.
- Olajide, A. T., Asuzu, M. C., Obembe, T. A. and Cooper, R. (2015) 'Doctor-Nurse Conflict in Nigerian Hospitals: Causes and Modes of Expression', *British Journal of Medicine & Medical Research Brazil*, 9(106), pp. 1–12. doi: 10.9734/BJMMR/2015/15839.
- Oluoch, T., Muturi, D., Kiriinya, R., Waruru, A., Lanyo, K., Nguni, R., Ojwang, J., Waters, K. P. and Richards, J. (2015) 'Do interoperable national information systems enhance

availability of data to assess the effect of scale-up of HIV services on health workforce deployment in resource-limited countries?', in *Studies in Health Technology and Informatics*, pp. 677–681. doi: 10.3233/978-1-61499-564-7-677.

Orlikowski, W. J. (1992) 'LEARNING FROM NOTES: Organizational Issues in Groupware Implementation', *MIT Sloan School Working Paper #3428-92, Center for Coordination Science Technical Report #134*.

Ponterotto, J. G. (2006) 'Brief Note on the Origins, Evolution, and Meaning of the Qualitative Research Concept Thick Description', *The Qualitative Report*, 11(3), pp. 538–549.

Popay, J. and Williams, G. (1998) 'Qualitative research and evidence-based healthcare.', *Journal of the Royal Society of Medicine*, 91 Suppl 3, pp. 32–7.

Randall, D., Harper, R. and Rouncefield, M. (2007) *Fieldwork for Design: Theory and Practice*. London: Springer-Verlag London Limited. doi: 10.1007/978-1-84628-768-8.

Robson, C. (2011) *Real world research : a resource for users of social research methods in applied settings*. 3rd edn. Oxford: Wiley.

Ruxwana, N. L., Herselman, M. E., Pottas, D. and Ouma, S. (2010) 'Advocating a quality assurance model for the implementation of e-health solutions in rural South Africa', *Health Information Management Journal*, 39(1), pp. 1833–3583.

Saldana, L. (2014) 'The stages of implementation completion for evidence-based practice: protocol for a mixed methods study', *Implementation science*. BioMed Central, 9(1), p. 43. doi: 10.1186/1748-5908-9-43.

Schneider, H., English, R., Tabana, H., Padayachee, T. and Orgill, M. (2014) 'Whole-system change: case study of factors facilitating early implementation of a primary health care reform in a South African province', *BMC health services research*. BioMed Central, 14, p. 609. doi: 10.1186/s12913-014-0609-y.

Schneider, H., Gilson, L., Ogden, J., Lush, L. and Walt, G. (2006) 'Health systems and the implementation of disease programmes: Case studies from South Africa', *Global Public Health*, 1(1), pp. 49–64. doi: 10.1080/17441690500361083.

Seitio-Kgokgwe, O., Gauld, R. D. C., Hill, P. C. and Barnett, P. (2015) 'Development of the National Health Information Systems in Botswana: Pitfalls, prospects and lessons', *Online journal of public health informatics*. University of Illinois at Chicago Library, 7(2), p. e210. doi: 10.5210/ojphi.v7i2.5630.

Siika, A. M., Rotich, J. K., Simiyu, C. J., Kigotho, E. M., Smith, F. E., Sidle, J. E., Wools-Kaloustian, K., Kimaiyo, S. N., Nyandiko, W. M., Hannan, T. J. and Tierney, W. M. (2005) 'An electronic medical record system for ambulatory care of HIV-infected patients in Kenya', *International Journal of Medical Informatics*, 74(5), pp. 345–355. doi: 10.1016/j.ijmedinf.2005.03.002.

Sligo, J., Gauld, R., Roberts, V. and Villa, L. (2017) 'A literature review for large-scale health information system project planning, implementation and evaluation', *International Journal of Medical Informatics*. doi: 10.1016/j.ijmedinf.2016.09.007.

Stoop, A. P. and Berg, M. (2003) 'Integrating Quantitative and Qualitative Methods in Patient Care Information System Evaluation: Guidance for the Organizational Decision Maker', in *Methods of Information in Medicine*, pp. 458–462. doi: 10.1267/METH03040458.

Sykes, T. A., Venkatesh, V. and Rai, A. (2011) 'Explaining physicians' use of EMR systems and performance in the shakedown phase', *Journal of the American Medical Informatics Association*, 18(2), pp. 125–30. doi: 10.1136/jamia.2010.009316.

Tomasi, E., Augusto Facchini, L. and de Fatima Santos Maia, M. (2004) 'Health information technology in primary health care in developing countries: a literature review', *Bulletin of the World Health Organization*, 82(11).

Vroom, F. B. da C., Godi, A., Dery, S. and Afagbedzi, S. (2017) 'Perceptions of EMR usage by health sciences students in Ghana', *Journal of health informatics in Africa*, 4(1), pp. 58–67. doi: 10.12856/JHIA-2017-v4-i1-166.

Wagner-Menghin, M. and Pokieser, P. (2016) 'Information technology and social sciences: how can health IT be used to support the health professional?', *Annals of the New York Academy of Sciences*. doi: 10.1111/nyas.13220.

Walsham, G. (1995) 'Interpretive case studies in IS research: Nature and method', *European Journal of Information Systems*, 4(2), pp. 74–81. doi: 10.1057/ejis.1995.9.

WHO (2014) *Achieving the health-related MDGs. It takes a workforce!*, online. World Health Organization. Available at: http://www.who.int/hrh/workforce_mdgs/en/ (Accessed: 7 April 2018).

Yin, R. K. (1994) *Case Study Research: Design and Methods*. 2nd edn. Sage: Thousand Oaks, Calif.

Appendices

Appendix I: Application letter to Ghana Health Service for approval to conduct research

Åsgardveien 9, H0205
9016, Tromsø
Norway

The Regional Director
Ghana Health Service
Greater Accra
17th October 2017



Dear Madam,

PERMISSION TO CONDUCT DATA COLLECTION FOR MASTER THESIS

I am a second year Telemedicine and E-health master student at UiT- The Arctic University of Norway. I would like to conduct some interviews and observations among the health personnel at the Greater Accra Regional Hospital, Ridge, regarding the laboratory systems at the facility for my master thesis. The title of the master thesis is: Electronic Laboratory Systems: A feasibility study in Ghana.

I am a biomedical scientist by profession and I have worked with the Ghana Health Service for four (4) years. I am interested in how the laboratories in Ghana can have comprehensive, cost-effective and functioning electronic laboratory systems to help improve patient care. The details of my master thesis can be found in the attached proposal.

I would be grateful for a favourable response.

Thank you.

Yours Sincerely,

Dillys Larbi

0203393939
dilblaze@yahoo.co.uk

Appendix II: Introductory letter from the Ghana Health Service

*In case of reply the
number and date of this
Letter should be quoted.*

*My Ref No GAR ADM. 17
Your Ref. No.*



Ghana Health Service
Greater Accra Regional Health.
Directorate
P O Box 184
Accra.

OCTOBER 18, 2017

Tel.0302 – 234225

**THE MEDICAL DIRECTOR
GREATER ACCRA REGIONAL HOSPITAL
GHANA HEALTH SERVICE
ACCRA**

**INTRODUCTORY LETTER - DILLYS LARBI
TELEMEDICINE AND E-HEALTH MASTER STUDENT**

This serves to introduce to you the above named student from The Arctic University of Norway, who has been granted permission to conduct interviews and observations among health personal at Ridge Hospital.

The attached letters are for your perusal.

Please give her the necessary support and assistance.

Thank you.

**MR PETER MENSAH
DEPUTY DIRECTOR, ADMINISTRATION
FOR: REGIONAL DIRECTOR OF HEALTH SERVICES
GREATER ACCRA**

Appendix III: Approved Ghana Health Service introductory letter by the Greater Accra Regional Hospital

In case of reply the number and date of this Letter should be quoted.

*My Ref No GAR ADM. 17
Your Ref. No.*



Ghana Health Service
Greater Accra Regional Health
Directorate
P O Box 184
Accra.

OCTOBER 18, 2017

Tel.0302 – 234225

**THE MEDICAL DIRECTOR
GREATER ACCRA REGIONAL HOSPITAL
GHANA HEALTH SERVICE
ACCRA**

**INTRODUCTORY LETTER - DILLYS LARBI
TELEMEDICINE AND E-HEALTH MASTER STUDENT**

This serves to introduce to you the above named student from The Arctic University of Norway, who has been granted permission to conduct interviews and observations among health personal at Ridge Hospital.

The attached letters are for your perusal.

Please give her the necessary support and assistance.

Thank you.

**MR PETER MENSAH
DEPUTY DIRECTOR, ADMINISTRATION
FOR: REGIONAL DIRECTOR OF HEALTH SERVICES
GREATER ACCRA**

*HLU,
For your attention
[Signature]
24/10/17*

Appendix IV: A copy of the Informed Consent form signed by the participants

Interview Consent Form

Research Participant's job title:

I volunteer to participate in a research project conducted by Miss Dillys Larbi from UiT- The Arctic University of Norway. I understand that the project is designed to gather information for a master thesis in Telemedicine and E-Health.

By signing this form, I agree that;

- I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
- The interview will be tape recorded and a transcript will be produced, the transcribed interview or extracts from it may be used for the master thesis in which case my words may be quoted directly;
- The researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals;
- I will not receive any benefit or payment for my participation;
- I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
- I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

Having read this consent form, I voluntarily agree to participate in this study.

Participant signature

.....