

UNIVERSITY OF GHANA

**ICT- LED HOSPITAL INFORMATION SYSTEM IN THE MANAGEMENT OF
HEALTH SERVICES WITH PARTICULAR REFERENCE TO UNIVERSITY OF
GHANA HOSPITAL, LEGON.**

BY

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DECLARATION

I do hereby declare that this work is the result of my own research and it has neither in part nor in whole been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged. Nonetheless, I bear sole responsibility for all errors and omissions inherent in the study.

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CERTIFICATION

I hereby certify that this thesis was supervised in accordance with the procedures laid down by the University of Ghana.

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.....

DATE

DEDICATION

I dedicate this work to my parents, Mr. and Mrs. Gabriel Kofi, siblings, the Catholic Archdiocese of Accra and my supervisor Dr. Gordon Abekah-Nkrumah.

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Without any doubt, this thesis was completed with the effort of synergy and determination. I am grateful to the ALMIGHTY GOD for his strength, knowledge and guidance that enabled me to complete this thesis successfully. To my supervisor Dr. Gordon Abekah-Nkrumah, I appreciate your patience, compassion, attention, encouragement and critical evaluation of this thesis. I am also grateful to Dr. John Effah, who worked with my supervisor to guide me through this process. My sincere thanks again go to Dr. Justice Bawole, head of the Department of Public Administration and Health Services Management, Dr. Albert Ahenkan, Dr. Roger Atinga and all the staff of the department of Public Administration and Health Services Management for their support. I also extend my appreciation to my family, the Ben Tetteh family, the Catholic Archbishop of Accra, Most Rev. Gabriel Charles Palmer- Buckle and the University of Ghana Hospital for their encouragement. Last but not least, my gratitude goes to Mr. Jacob Ashemond who served as the rapporteur during the collection of data for this thesis. I remain forever grateful.

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LIST OF ABBREVIATIONS

CIS	Clinical Information System
FIS	Financial Information System
HIS	Hospital Information System
HM	Healthcare Management
ICT	Information Communication Technology
LAN	Local Area Network
LIS	Laboratory Information System
MOH	Ministry of Health
NIS	Nursing Information System
OECD	Organization for Economic Cooperation and Development
PACS	Picture Archiving Communication System
PIS	Pharmacy Information System
RIS	Radiology Information System
SHT	Stakeholder's Theory
TCA	Thematic Content Analysis
UG	University of Ghana
WHO	World Health Organization

ABSTRACT

The study investigated ICT- led hospital information system in the management of health services with particular reference to University of Ghana Hospital, Legon. The study utilized the qualitative method. Through the purposive sampling technique, 12 participants were selected for the study. The participants included 1 medical director, 1 administrator and 10 departments and unit heads of the Hospital. The qualitative instrument used for primary data collection was an interview guide. The findings of the study revealed that the Hospital has over a decade implemented two Hospital Information System (HIS) namely: System Consult (SC) (old software) and Equipment Business Frame (EBF) (New Software). It was found that the SC was implemented alongside the manual system using the parallel implementation approach, whilst the EBF was implemented using the direct conversion and hybrid implementation approaches. It was discovered that the process of implementation of the SC was difficult, expensive and the existence of the manual process did not motivate employees or staff to use the software as compared to the EBF which was found to be easier. The effect of the EBF on service delivery was found to be positive and reliable as compared to the SC which was negative and non-reliable. The basic elements underpinning the utilization of the HIS were access and use. Significant factors that propelled the effective implementation and use of the EBF were effective collaboration between staff and service providers, and the cost saving nature of the EBF, adequate training and education, easier use of the software, and the role of the medical director. Moreover, with regards to use, it was found that the SC had significant number of constraints including fewer staff that could use it, expensive nature of the SC, not getting value for money, poor records keeping, inability to do follow up, slower pace of work, unable to raise proper bill, delay in reporting, delay in laboratory result and frequent folder misplacement. In conclusion, the study suggests that the implementation of the HIS in the University of Ghana Hospital focused critically on stakeholders integration of the Hospital whilst exploiting recent development within cloud technologies. On the basis of the constraints, the following recommendations were made. The Hospital should liaise effectively with the University of Ghana Computing Systems so that technical challenges such as network issues and computers are working adequately. Further, the Hospital must also continually ensure that HIS are upgraded, most especially the modules. This will help meet the changing demands of patients and the university community

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In today's world of technological advancement, the implementation and use of Information and Communication Technology (ICT) has permeated almost all aspects of life due to its significant effect on productivity and organisational management (Ranta, 2010; Oshikoya & Hussein, 2007). In recent times, the need to improve quality healthcare service delivery has challenged healthcare institutions and professionals to implement and use ICT to enhance their operational activities (Tossy, 2014; Oliveira, et al., 2011; WHO, 2007). This has led to the advancement of Hospital Information System (HIS) in almost every hospital both in developed and developing countries (Tossy, 2014).

Health Information Systems and Hospital Information System (HIS) are two different concepts. According to Aghajari (2013), any system that captures or collects, stores, manages or transmits information related to the individuals' health or the activities of organisations that work within the health sector is termed health information systems. Moreover, studies on hospital information system, define the concept as an integrated electronic system that collects, stores, retrieves and displays the patients' overall data and information such as the patients' information, laboratory test results, diagnoses, billing and other procedures used in several departments in hospitals (Ismail et al., 2010; Hamid, 2010; Ariffin, 2008). Based on the size and mission of the hospital, components of a hospital information system may include clinical information system, financial information system, laboratory information system, nursing information system, pharmacy

information system, and radiology information system (Ismail & Abdullah, 2010). This suggests that HIS is limited to a specific hospital aimed at enhancing the delivery of quality healthcare service.

Currently, the demand for HIS is high in order to help handle the ever-growing population health needs and also assist health practitioners with timely services and quality in healthcare delivery (Joe-Rodrigues, 2010). According to Joe-Rodrigues (2010), the implementation and use of HIS is very critical to health services management, as it aids the improvement of communication between health professionals and ensures confidentiality of patients' data and records. Adding to this, HIS improves quality of healthcare service delivery and facilitates the standardization of medical procedures (Cline & Luiz, 2013; Feijooa, Fernandez, Olvera & Calveta, 2010). This may lead to better access to healthcare facilities and improve the quality of healthcare delivery, which subsequently will translate into productive labor and the country's development as a whole (Khan, Shahid, Hedstrom & Anderson, 2012; Oyeyemi & Wynn, 2014).

Although, HIS presents several prospective benefits to patients and hospitals, its implementation is quite demanding (Hamid, 2010). There are several factors that serve as constraints to the implementation and use of a hospital information system (Sadoughi, Kimiafar, Alhmadi, & Shakeri, 2013). These factors include among others; high initial costs (Boonstra & Brockhuis, 2010; Smelcer, et al., 2009); time needed (Tossy, 2014); technology and technical problems such as complex system and integration problems (Farzandipur, Jeddi, & Azimi, 2016; Kimiafar et al. 2015); basic problems such as lack or inadequate computer skills, complex tasks, complex functions (Ajami & Bertiani; 2012; Khalifa, 2013) and ethical issues such as certification, security, privacy, and confidentiality (Ahmadian, et al., 2014; Ahani, Nilashi & Ahmad, 2016).

Given the above background, the intended interest of this study is to investigate ICT-led hospital information system in the management of health services with particular reference to the University of Ghana hospital.

1.2 Problem Statement

Players in the healthcare market in both developed and developing countries have invested substantial amount of resources in information systems to gain competitive edge, reduce operational cost and improve quality healthcare service delivery to its clients. Given this, the success and failure of information systems implementation will largely depend on how well hospitals handle this stage (Ahani, Nilashi & Ahmad, 2016). Although the challenges faced in implementation of information systems are enormous, hospitals today see information systems as necessary for their survival (Ahani, Nilashi & Ahmad, 2016).

Literature review shows that significant number of studies have been carried out within the area of Health Information Systems in the developed world. However, most of the studies concentrated on the acceptance of health information systems (Sagiroglu, 2006; Yusof, 2007; Ahani, Nilashi & Ahmad, 2016). It is clear that these studies focused on understanding health information systems within the broader context. The researchers' aim was to develop models to help improve health information systems for Hospitals in both developed and developing countries. The challenges are the failure to acknowledge cultural indicators as well as specific needs and function of specific hospitals. These show that these previous studies were conducted on a broader perspective. Therefore, it is important that this study focuses on hospital information system rather than health information systems as studied by previous researchers. A

hospital information system is unique to a specific hospital and has the propensity of revealing the vital information regarding specific hospitals, their needs and functions.

In addition, some studies in developed countries also concentrated on user role in the success of information systems (Yusof, 2007; Mahmoudi, 2010); health information systems (Sagiroglu, 2006; Sam-Zadeh, 2011); health information technology (Morton, 2008; Ping et al., 2008; Koivunen, 2009; Sam-Zadeh, 2011) and clinical information systems (Pare et al., 2008; Anderson, 2010). Further, in Africa most of the studies also concentrated on health information systems and technology adoption (Ojo and Popoola, 2015; Farzandipur et al., 2016). This clearly shows that the aim of these researchers was to provide critical understanding to specific aspects of health information systems.

Further, previous studies concentrated on single viewpoint either on clinical, or single user groups such as doctors, nurses, laboratory technicians (Chau & Hu 2002; Croteau & Vieru 2002; England & Stewart 2007; Schaper & Pervan 2007) or organisational factors only (Hamer and Schwarts 2000; Ping et al., 2008). Even though, their concentration was specific, their focus was to develop models to support health information systems. Although, concentrating on specific aspects of health information systems is good, it does not reveal specific issues regarding specific hospitals, their needs, technology adaptation and operational effectiveness. In addition, the previous studies ignored the human and system interaction within the hospital milieu and how this influences implementation and use of hospital information system. These shortcomings also underscore the need to study specific hospitals and the implementation and use of a hospital information system.

In light of these, the researcher decided to concentrate on a specific Hospital (i.e. the University of Ghana Hospital). The University of Ghana Hospital is one of the reputable hospitals in Accra, the capital city of Ghana. Despite its role in providing quality healthcare service to the University Community, critical observation has revealed that implementation and use of HIS at the Hospital has not been empirically studied, although some studies have covered health information systems (Ahani, Nilashi & Ahmad, 2016). According to Ahani et al., (2016) health information systems have been given critical attention by researchers within the health sector in Ghana. However, researchers have not given such attention to hospital information system, even though some hospitals have adopted such systems in Ghana. This makes the study unique as it narrows its scope to the implementation and use of HIS with reference to a specific hospital (University of Ghana Hospital).

The study aimed to answer the following three questions: How is the hospital information system implemented and used at the University of Ghana Hospital? What are the factors enabling or constraining the implementation and use of the hospital information system at the University of Ghana Hospital? and What is the impact of the implementation and use of the HIS on service delivery by the hospital?

In view of this, it is clear that most of the studies did not concentrate on hospital information system implementation and use. It is important to indicate that significant number of studies conducted were carried out in the developed worlds with limited studies in Africa, especially Ghana. This study would unearth specific hospital information system used by the University of Ghana Hospital, reasons underpinning the choice of such information system and its implementation processes and use. It would reveal unique implementation strategy by University of Ghana Hospital which previous studies failed to unearth because of their broad concentration

on health information systems. It is therefore, justified on the premise that studying health information systems reveal specific challenges prior to the introduction of hospital information system. Based on the literature gaps in literature, the study seeks to investigate ICT-led hospital information system in the management of health services with particular reference to University of Ghana Hospital.

1.3 Research Objectives

The purpose of this study is to investigate ICT-led hospital information system in the management of health services with particular reference to University of Ghana Hospital. The specific objectives are as follows;

1. To investigate how hospital information system was implemented and used at the University of Ghana Hospital.
2. To examine the factors enabling or constraining the implementation and use of hospital information system at the University of Ghana Hospital.
3. To examine the impact of the implementation and use of hospital information system on service delivery by the University of Ghana Hospital.

1.4 Research Questions

Based on the objectives, the study seeks to find answers to the following research questions:

1. How is the hospital information system implemented and used at the University of Ghana Hospital?
2. What are the factors enabling or constraining the implementation and use of hospital information system at the University of Ghana Hospital?
3. What is the impact of the implementation and use of hospital information system on service delivery by the University of Ghana Hospital?

1.5 Significance of the Study

The aim of this study is to investigate ICT-led hospital information system and its effect on management of the University of Ghana Hospital in the delivery of quality service. The findings of this study would be important to the management, board of the University of Ghana hospital as well as other health institutions in general. The findings of this study can help in the appraisal of the hospital information system and more importantly assess the difficulties that militate the effective and efficient use of the system in Ghana.

Moreover, the findings of the study would be beneficial to the Ministry of Health and the Ghana Health Service and other agencies that have oversight responsibility of healthcare administration. This would help in formulating policies and guidelines with respect to hospital information system implementation and use. To ICT Managers/Project managers, this study would be of great value when making decisions about hospital information system implementation. Finally, the study would be beneficial to future information system researchers as it would serve as background information for future studies on the subject matter. This is important because the implementation of HIS is still in its infant stage in Ghana as well as other developing countries.

1.6 Organisation of the Study

This study has been organised into six different chapters. An outline of each chapter has been presented as follows:

Chapter One: This chapter presents the introduction of the study. In this chapter, background information which introduces the study is presented. This is followed by the problem statement for which the study seeks to address. In line with the problem statement, the next stage under this chapter is the research objectives and questions which are to be answered by the study. This is

followed by the significance of the study which outlines the intended contributions of this study to various stakeholders. Finally, the organisation of the study.

Chapter Two: This chapter presents an in-depth review of prior literature in relation to the research. It includes a review of the literature on hospital information system and the different phenomena that have been investigated. Also, the chapter compares the similarities and differences; the evaluation and assessment in terms of implementation and use of hospital information system. This was followed by the conceptual framework. Prior to this, the relevant theory appropriate to the study was discussed. This chapter also presents the historical development of hospital information system in the world. It also covers hospital information system evolution in Ghana.

Chapter Three: This chapter represents the methodological processes needed to answer the research questions. To this end, the chapter provides an overview of the research approach which includes the philosophical assumptions and methodology used to carry out the study. It also describes the data collection processes and methods as well as the data analysis information. Furthermore, it presents some measures adopted to enhance the quality of the study findings.

Chapter Four: This chapter presents the findings. This includes the description and analysis of the data gathered from the field.

Chapter Five: This chapter presents the discussion of the research findings in relation to the research questions. This was supported with prior empirical literature. The chapter also presents the theoretical and practical implications of the findings.

Chapter Six: This chapter finalizes the study as it summarises, concludes, outlines some contributions of the study and recommendations based on the research findings.

The contributions of the study are subdivided into two sections, contributions to literature or theory and contributions to policy.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing and relevant literature in relation to the research questions. The rationale for this chapter is to uncover and understand what other scholars or researchers have done with regards to HIS implementation and use. The chapter also, provides the theoretical framework and conceptual framework for the study. It also presents the historical development of HIS in the world and Ghana.

2.1 Understanding of Hospital Information System (HIS)

The advancement of information and communication technology has had major impacts on the various sectors of the economy of Ghana (Xue et al, 2008; Kuo et al, 2015). The healthcare sector is one of the industries that have witnessed massive application of information and communication technology (Aghazadeh et al, 2012; Staggers et al., 2001). One of the key concepts in healthcare that has received attention from practitioners, researchers and scholars is hospital information system. According to Tachinardi et al. (1994) and Olusanya et al (2015), hospital information system has evolved into useful and indispensable tools in healthcare management. Grandia (2017), Classen (1994) and Littlejohns et al., (2003) note that hospital information system has assumed a vital role in the delivery of healthcare since the 1970s propelling hospital managers to invest huge sums of money into it.

In the views of Ahani et al., (2016), effective hospital management information system is a pre-requisite for the delivery of cost effective and quality healthcare to clients as it has become an integral component in clinical and non-clinical healthcare services. The importance of hospital

information system in healthcare delivery is premised on the need to deliver timely and quality services to the growing number of people visiting health facilities (Premkumar & Kalpana, 2013).

According to Ahani et al., (2016), the term “hospital information system” has been defined differently by several scholars with the aim of providing a clear understanding of it. Simply put a hospital information system is a network designed to support the flow of information between departments (Sneider, 1987). Vegoda (1987) defined hospital information system as an integrated system which facilitates healthcare by increasing the user’s knowledge and reducing uncertainty allowing rational decisions to be made from the information provided. Degoulet and Fiesch (1997) also defined HIS as a computerized-based system designed to ease medical and administrative information and to facilitate healthcare delivery.

Olusanya et al., (2015) termed hospital information system as an automated application of information management system to manage the administrative, clinical and financial aspects of a hospital to assist the monitoring and controlling of activities in the hospital and enable timely accessibility of patient and departmental information. Adebisi et al., (2015) termed hospital information system as a set of automated system used to manage patients’ information and for the administration of the hospital as a whole. To the authors, hospital information management is made up of data collection, data processing, data storage and report generation to reduce time wastage in healthcare delivery and ultimately improve efficient running of the hospital.

From the above definitions, it can be deduced that a hospital information system is a specialized system specific for its use in a particular hospital taking into consideration the process of dissemination of information to enhance healthcare service delivery.

Hence, the main goal of hospital information system is to integrate health information to meet the needs of patients, research, improve quality of care, reduce costs, and automate tasks such as reporting test results, and entering physician's order (Hekmat et al., 2016). Given the importance of hospital information system, its implementation and use have potential benefits to the healthcare sector (Thakare & Khire, 2014).

According to Schaper and Pervan (2007) HIS is essentially a computer system that has the capacity of managing hospital information by allowing healthcare providers to do their job effectively and efficiently. HIS has been in existence for long, although it was utilized for managing only hospital bills and inventory (Schaper & Pervan, 2007). However, all these have changed in recent time as hospital information system now include clinical, financial and administrative applications. A clear understanding of HIS in modern times is very paramount since HIS include many applications for addressing the needs of various departments in a hospital.

According to Thakare and Khire (2014) HIS in recent time helps to manage data or information related to departments such as laboratory, dental, maternity, claims processing, pediatrics etc. The hospitals that are using HIS have quick access to reliable information illustrating details the demographics of patients. Vital information such as financial system of the hospital, distribution of medication and even diet of patients. The monitoring of drug usage in the facility and improvement of its effectiveness is easier with the availability of these information. Hence, as many as 200 disparate systems have been combined into the hospitals' HIS (Adebisi et al., 2015).

Advancement in technology has increased HIS innovations within the hospital environment. However, Fei (2016) argued that HIS becomes useless when it confuses the employees of the

hospital. The software must be user friendly and should include training by the vendors in order to make easier its use by hospital staff. For a HIS to be effective, it should be patient centric, medical staff centric, affordable and scalable. This will lead to numerous benefits such as delivery of quality patient care, enhancing information integrity, reducing transcription errors, optimizing report turnaround times and better financial management among others. Flexibility of the system is required in order to accommodate hospital growth since technology dynamic (Fei, 2016).

2.2 Theoretical Framework

The study adopted the stakeholder theory. The application of the theory to the study is explained and presented as follows. The section also, explains how the theory is used in the development of the conceptual framework of the study.

2.2.1 Stakeholder Theory (SHT)

The stakeholder theory focused on the relationship between an organization and its stakeholders. The relationship exerts significant effect on how the organization functions and conducts its activities (Mehraeen et al., 2014). According to Aaltonen, Jaakko and Tuomas (2012) stakeholder include customers, suppliers, employees, government and many others. It could be a person or group emerging from within or outside the business. The stakeholder theory evolved from the work of Edward R. Freeman (Mehraeen et al., 2014). The fundamental idea of the stakeholder theory is that organisations survive longer and perform better when they create and manage effective relationship with their stakeholders as compared to organisations that fail to do so. Hence, the need to develop certain competences of the stakeholder Freeman (2010). These include:

- Making a commitment to monitor stakeholders' interests.

- Developing strategies to effectively deal with stakeholders and their concerns.
- Dividing and categorizing interests into manageable segments.
- Ensuring that the organisation functions to address the interest of stakeholders.

(Source: Mehraeen et al., 2014)

The theory shows that if a unit of analysis is adopted then the relationship between an organisation and its groups (stakeholders) will be cordial (Bidhan et al., 2010). The theory deals with giving critical attention to diverse stakeholders within an industry or organisation and developing systems to meeting their needs (Walsh, 2005). According to Jones (1995), the stakeholder theory explains that business can be projected as a set of associations among groups that have a stake in the operations and activities of the business. It explains how customers, suppliers, business owners, financiers (stockholders, bondholders, banks, etc.), communities and managers interact to jointly create and conduct business.

The study by Wolfe and Sheth (2007) found that an organisation that gives critical attention to its stakeholders builds effective relationship. This according to the authors results in value creation for all units across the organization. Further, effective management of stakeholder relationship has been found to foster business survival and performance (Phillips, 2003). Moreover, management that gives critical attention to creation, maintenance and alignment of stakeholder relationship better equips practitioners to create value and avoid moral failures (Post, Preston, & Sachs, 2002).

The theory has been criticized by other scholars despite its enormous benefits. Table 2.1 shows the limitations or criticisms and the benefits.

Table 2.1 Summary of Benefits and Criticisms to Stakeholder Theory

Contributions or Benefits	Limitations and Criticisms
• <i>The theory has contributed to meeting the needs of stakeholders (Friedman, 2006; Phillips, 2012.)</i> • <i>The theory through its application has improved the performance of many organisations (Bidhan et al., 2010).</i> • <i>The application of the theory has increased the profit of most businesses (Marcoux, 2000; Bidhan et al., 2010).</i> • <i>Effective evaluation of performance of organisation (Bidhan et al., 2010).</i> • <i>All stakeholders are considered in the decision making process (Van Buren, 2001; Bidhan et al., 2010).</i> • <i>The interest of all stakeholders are given critical attention to (Walsh, 2005; 2012).</i>	• <i>Stakeholder theory is an excuse for managerial opportunism (Jensen, 2011).</i> • <i>Stakeholder theory is primarily concerned with distribution of financial outputs (Marcoux, 2010).</i> • <i>All stakeholders must be treated equally (Gioia, 1999; Sternberg, 2009).</i> • <i>Stakeholder theory requires changes to current law (Hendry, 2009).</i> • <i>Stakeholder theory is socialism and refers to the entire economy (Barnett, 2011).</i> • <i>Stakeholder theory is a comprehensive moral doctrine (Orts & Strudler, 2012).</i>

➤ **Application of Stakeholder Theory in Healthcare**

The stakeholder view or theory has been widely applied in a wide area of disciplines, sectors, organisations, institutions, agencies and countries across the globe.

These include law, healthcare, public administration, environmental policy, and ethics (Freeman, Harrison, Wicks, Parmar, & de Colle, 2010). Considering that healthcare is a significant component of every nation's development, the stakeholder theory has been suggested to have a significant contribution to the healthcare sector. Despite this, some critics have indicated that the stakeholder theory pose a lot of challenges to the healthcare sector. These challenges include delay in decision making, poor stakeholder engagement, and inadequate educational level of some stakeholders (Sorenson et al., 2008). However, Freeman (2010) indicated that, although some critics have identified some challenges with regards to the stakeholder theory, this does not belittle the enormous advantages of the stakeholder theory to healthcare.

In Africa, the study by Harrison, Bosse, and Phillips (2010) discovered that the theory allowed relevant stakeholders to be more involved in decision making within the healthcare system. The study by Sorenson et al., (2008), revealed that most of the new health technologies approved by nations, hospitals and institutions have close to 90% of stakeholder representation in the decision making process. The reason underpinning this behavior of stakeholder involvement in healthcare issues was to allow the users and beneficiaries of the healthcare services to be part of the process. This would ensure the acceptance of the process, the tool and the services being rendered by the hospital (Organisation for Economic Co-operation and Development, 2005). According to Jensen (2010), considering stakeholders to be part of healthcare decisions is a necessity that plays significant role in healthcare performance and prosperity in business. However, according to Mitchell et al. (1997), stakeholders must be ranked according to legitimacy, the urgency of the request or the ability to exert any form of power, since they contribute to healthcare service and decision making of the organisation through their influence.

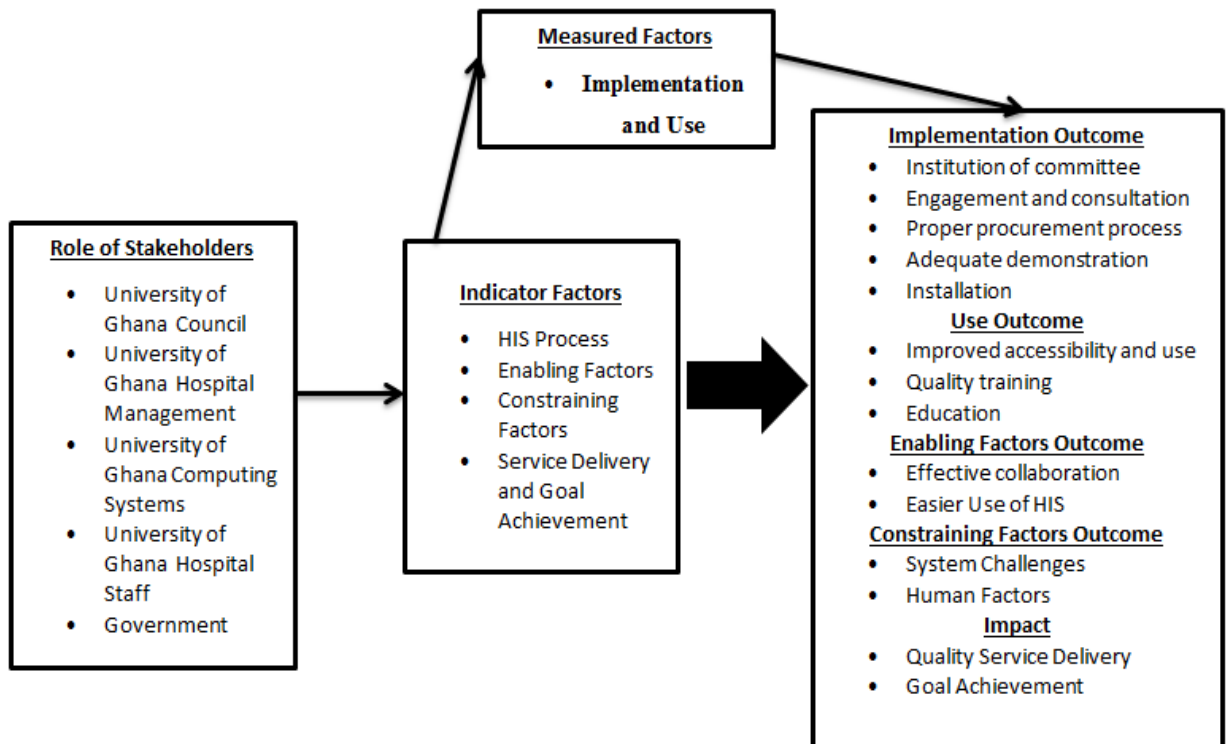
➤ **Application of the Theory to the Study**

Healthcare organizations are made up of several stakeholders that contribute significantly to the unified mission of quality healthcare services. This therefore enables patients to return to a condition of wellness. The University of Ghana Hospital is not different from such. The Hospital has significant number of stakeholders including employees, the University, clients, students, government etc that play vital roles within the University of Ghana Hospital. In order to provide quality healthcare to the university community, these stakeholders cannot be ignored in the decision making process. Therefore, effective relationship is required among all stakeholders in order to achieve the overall objective of the University Hospital.

On the basis of the stakeholder theory, the conceptual framework was developed. The framework was developed to cover the implementation and use of HIS at both the management level and the operational level. In order to properly achieve the stated objectives of the study, specific measures were adopted based on studies of Sorenson et al., (2008), Harrison et al. (2010), Jensen, 2010). The studies revealed HIS processes (institution of committee, consultation and engagement, procurement processes etc), enabling factors, constraining factors, service quality and goal achievement as the indicator factors. These represent the implementation and use measures for the current study. It is expected that the outcome measures fall under two categories namely: implementation outcome and use outcome. It is also expected that when the indicator factors are properly reviewed, they would predict the implementation processes and use of HIS at the University of Ghana Hospital. It would also reveal the impact of the system on the goals of the Hospital as well as quality healthcare service delivered at the hospital. In addition, it is expected that the indicator factors would reveal the enabling and constraining factors in relation to the implementation and use of HIS at the University of Ghana hospital.

It is also clear, that for proper and adequate implementation and use of HIS to be achieved, the role of key stakeholders cannot be ignored. These stakeholders include University of Ghana Council, University of Ghana hospital management, University of Ghana hospital staff, University of Ghana computing systems, and the government. The effective role of these stakeholders would ensure effective implementation and use of HIS, hence quality of healthcare service delivered and the achievement of goals. Figure 2.1 shows the pictorial representation of the conceptual framework adopted by the researcher.

Figure 2.1 Conceptual Framework



(Source: Researcher's own construction based on modified indicators of Aaltonen et al., 2012: 10)

It is vital to indicate, that the conceptual framework shows the relationship between the measured and the indicator factors.

The first arrow of the conceptual framework deals with the role of stakeholders leading to the achievement of the indicator factors. It shows the stakeholders role in HIS implementation and use, enabling factors, constraining factors, service delivery and goal achievement. The main bold arrow shows the direct link between the indicator factors and the expected outcomes. The arrow from the indicator factors to the measured factors shows the direct link between the indicator factors and the implementation and use of HIS. Further, the arrow from the measured factors thus, implementation and use to expected outcomes, shows the link between the implementation and use of HIS and results or outcomes.

2.3 Evolution of Hospital Information System – World

Haux (2006) reveals that data management in hospitals has shifted from mainly paper-based processing and storage to an improved computer-based processing and storage and hence the development of hospital information system in hospitals. They are based on the following phases: a move from paper-based data collection, processing and storage to computer-based data collection, processing and storage. In addition, a move from departmental information system to institutional information system; integration of patients and health consumers information with health and administrators; application of hospital information system data for patient care delivery, administrative purposes, health care planning and clinical research. A move from technical hospital information system challenges to strategic information management; a move from purely alpha-numeric data in hospital information system to images; increase in new technologies such as ubiquitous computing and sensor-based technologies.

Grandia (2017) and Collen (1994) acknowledged that the evolution of hospital information system dates back to the early 1960s where expensive and complicated mainframe and storage devices were shared by hospitals to manage their accounting functions.

Northern Virginia Community College (2014) points out that early introduction of hospital information system was used to serve the purpose of billing as cost-based reimbursement was the order of the day. This became necessary as the hospital was expanding and administrative and financial functions were gaining importance in the delivery of healthcare. During this period hospital attendance increased due to the passage of the Medicare and Medicaid legislations and hospitals have to prepare bills for reimbursement (Staggers et al., 2011).

Barnett (1999) and Ahani, Nilashi and Ahmad (2016) indicate that the integration of hospital information system was first done through the application of technology in Chemistry laboratory test reporting system and the Bacteriology test reporting system in the hospitals in 1968. These views was supported by Staggers et al. (2011) when he indicated that hospital information system was first applied in the healthcare sector to manage acute care in the late 1960s through computer-based patient record to support management decision making. In the views of Tachinardi et al., (2009) hospital information system was initially designed to support administrative functions before integrating it into medical function to manage clinical data. Most of the institutions that developed and utilized hospital information system in their operations in the 1960s were mostly teaching hospitals (Collen & Miller, 2015).

In the 1970s, the application of hospital information system increased. The improvement in information technology resulted in the development of smarter and smaller computers than the main frame computers used in the 1960s though hospital information system were still being shared among healthcare providers (Grandia, 2017; Northern Virginia Community College, 2014). The financial functions played by hospital information system were improved to include administrative functions as well as automation of clinical departments. This resulted in the reduction in health care delivery cost (Northern Virginia Community College, 2014).

Staggers et al., (2011) pointed out that due to the reduction in computer technology and advancement in computing systems in the 1970s, many physicians started using hospital information system to address the healthcare needs of their clients.

The 1980s witnessed the marketing of hospital information system by vendors based on the success of the hospital information system in the 1960s and 1970s (Collen & Miller, 2015). Hospital information system gained international attention in the 1980s when many countries especially in Europe initiated to shift from paper-based healthcare delivery to the automation of the healthcare delivery processes in the hospitals (Aghazadeh et al., 2012). In the United States hospitals, many clinical functions were integrated with improved information systems, with advanced database systems, with local area networks and the application of a large mini- and microcomputers (Collen & Miller, 2015; Grandia, 2017).

Tremendous growth in hospital information system was experienced in the 1990s. The application of hospital information system to resolve challenges in the various departments in hospitals increased in the 1990s (Grandia, 2017). The number of computers used in hospitals increased with many departments charged with the responsibility of processing their own data (Northern Virginia Community College, 2014). Aghazadeh et al., (2012) noted that massive changes and improvement in medical technology and hospital information system occurred in the in 1990s.

In the 1990s, data storage technologies improved dramatically. The level of technological expertise among hospital staff also increased with improved changes in healthcare service delivery. The billing system for insurance reimbursement technology saw an improvement over the technology applied in the 1980s (Grandia, 2017). In the views of Grandia (2017), in the

1990s, hospitals had access to robust computing systems and networks with the creation of the integrated delivery network for data capturing and reporting. Collen and Miller (2015) indicated that the application of hospital information system among academic institutions reduced, while patronage by commercial vendors increased in the mid-1990s. The main design requirement requested by users was the interoperability of the hospital information system.

Grandia (2017) indicated that the use of hospital information system for financial management gained more prominence in the 21st century. Also, the application of the hospital information system for healthcare billing for reimbursement also intensified. The clinical application of hospital information system also increased for effective decision making. Northern Virginia Community College (2014) pointed out that in the 2000s, hospital demand for data in decision making increased exponentially. The demand for high volume of data and analytical information were increased, prompting hospitals to employ mainframe computers in the management of hospital wide applications. In the views of Collen and Miller (2015), exchange of information among hospitals became paramount as healthcare experts intensified their efforts to improve global health status. Open system architectures and interconnection standards were used to exchange information among hospitals and hospital information system multi-vendor. Aghazadeh et al., (2012) indicated that the rising demand of patients and industrial expectation has increased the use of hospital information system in the delivery of healthcare services in the 21st century.

2.4 The Emergence of Hospital Information System - Ghana

According to Shortliffe and Blois (2005), hospital information system evolved in Ghana through the Ministry of Health (MOH) legal and policy framework. The challenges within the health system in Ghana led to the drafting of a policy framework. The purpose was to ensure effective

use of ICT for healthcare management and development. Further, the working document for MOH (2009), the use of ICT in healthcare was to ensure that data and information are synchronized from diverse departments of the Hospital. Therefore, diverse hospitals started using ICT in Ghana in order to ensure quality healthcare delivery. Greenes and Brinkley (2004), argued that ICT in modern times have been broadly used to help doctors, nurses and other specialists to give superior care to health in both administrative and medical fields. Hospitals therefore used ICT in practically every aspect of health structure – public health, hospital management, healthcare range, medical records, pharmacological history, clinical sessions, etc.

According to MOH (2009), standard of the health offices in the country have significant number of challenges in relation to IT applications. These include problem of sight and sound gadget, imaging and printing framework, correspondence and web framework. Further, the predominant of ICT in the 1990s have not been fully consolidated. Unmistakably, from a couple of healing facilities with a local area network (LAN), the vast majority of the health awareness suppliers have repressed their LANs to the front office and drug constituent of their offices (MOH, 2009). The LANs are often used to backing the mechanisation of drug administrations. Sight and sound frameworks are included for playing back medicinal and nonmedical documentaries.

According to Ministry of Health (2009), different programming are utilized as a part of the administration of doctor's facility activities. The degree to which these methods are grasped by data frameworks varies from clinic to healing center and from action to movement. In light of this, hospital information system gained grounds through electronic applications in the hospitals after the 2000s. Through these health information systems, the implementation of ICT, the adoption of E-Learning became paramount among nurses, doctors and majority of health professional in Ghana. The advancement in technology identified unique characteristics of every

hospital making it vital for the use of hospital information system in Ghana in recent times of which the University of Ghana Hospital is no exception.

2.5 Features and Functions of Hospital Information System

Aggelidis, and Chatzoglou (2008) note that a successful hospital information system has seven main features:

- Ensuring system quality: the whole system must function effectively and efficiently.
- Ensuring information quality: information generated by the system must meet international and national standard.
- Ensuring service quality: the healthcare delivered must be of high quality and must improve the health status of the patients.
- Ensuring information usage: the application of information must meet the needs and demand of the hospital.
- Ensuring user satisfaction: the HIS must meet the requirement of the user.
- Ensuring individual impact: the individual staff work must be effectively impacted by the hospital information system.
- Ensuring organizational impact: the entire work flow in the hospital must be positively impacted by the hospital information system.

Hospital information system has become a key component in the healthcare delivery system within the health sector. The relevance of HIS is measured by the functions it performs in the delivery of healthcare services. Quintegrasolutions (2006) asserts that the functions of HIS is divided into five main components namely: patient administration, clinical management,

resource management, financial management and management information system. Further, the study by Quintegrasolutions (2006), provided some important functions of hospital information system. These include diagnostic function, information management, insurance reimbursement, transfer information, inventory management, and clinical function.

Premkumar and Kalpana (2013) also summarizes the functions of HIS into: Storage and monitoring of patient's condition to collect, process and store data for managerial and statistical analysis in health research. Management and Data Flow to support automation of transfer of patients' data among departments and hospitals, graphically diagnose images generated from the database of the hospital and communication among department. Financial management to facilitate efficient financial administration

2.6 Dimensions of Hospital Information System

Every hospital information system does not work in isolation. The dimensions of HIS called modules work together in order to ensure overall operation of the system (Fuad, 2012). According to Ismail and Abdullah (2012), the components of each hospital information system provided is based on the functions performed by the various departments in the hospital. Each department has their own module of HIS that works in connection with others in order to ensure the achievement of the overall objective of the hospital. These components include Clinical Information System (CIS)/ Nursing Information System (NIS), Laboratory Information System (LIS), Financial Information System (FIS), Picture Archiving Communication System (PACS), Pharmacy Information System (PIS), and Radiology Information System (RIS) (Ismail & Abdullah, 2012).

Clinical Information System: In the views of Blum (1986) and Hannah (1994) clinical information system is made up of computer-based applications that contains data base with clinical data for delivering healthcare services to patients. The clinical information system forms a major component of the hospital information systems in many hospitals in the 21st century. Accenture (2016) indicates that clinical information system is widely used in both developing and developed nations. Almost all hospitals with more than 20 beds employ clinical information system in the hospitals for the management of patients' healthcare in UK and US (Accenture, 2016). Kuperman (2000) mentions that clinical information system is used in hospital to achieve the clinical goals such as improving integration, delivery of improved quality healthcare services, increasing and promoting healthcare delivery efficiency, improving patients' satisfaction and supporting healthcare service line.

Laboratory Information System: Sepulveda and Young (2013) point out that laboratory information system is applied in the delivery of healthcare to improve the quality of laboratory data management in the hospital. The application of laboratory information system has increased over the last two (2) decades (Boran, 2012). Monu (2010) and Taylor and Skolnick (2009) posits that laboratory information system is the main computer base application system used to gather, process and disseminate data and information in the laboratories to the various units in the hospital.

Financial Information System: Diamond and Khemani (2005) indicate that financial information system is the process of computerizing expenditure management budget planning, formulation, budget execution, and budget evaluation. It is used to efficiently manage the financial resources in the hospital. It is the main system in the hospital that records all expense, revenue, accounts receivable, accounts payable and financial transactions. In the views of World

Bank (2011) financial information system is a set of computer-based application solutions that enable hospitals to plan, implement, monitor, evaluate financial resources by reporting revenues and expenditures and their sources.

Picture Archiving Communication System: This component of hospital information system has elements such as RIS interface system, Digital Imaging and Communications in Medicine standards, an archive server and system, and database and file server (Latham, 2008). It is made up of infrastructure linking workstations, work modalities, image archive, and medical record information system to an integrated system to electronically distribute and store medical images efficiently and have easy access to medical record data (Robertson and Saveraid, 2008). Hecht (2010) indicates that due to the advancement in technology and increase in network connectivity, Picture Archiving Communication System has developed over the last decade.

Pharmacy Information System: It is the component in hospital information system that collect, process, retrieve and update information of drugs in stock and drugs dispensed to patients safely and effectively (Asadi et al., 2011). Pharmacy information system is an integral part of pharmaceutical supply system for planning and information management. It is a vital tool for effective decision making in the pharmacy department in the hospital (Levison and Fraser, 2008; Asadi et al., 2011).

Radiology Information System: It is a component of hospital information system that supports efficient flow of work in the hospital (Nance et al., 2012). It is the system that promotes and supports data capturing and reporting in the radiology department to improve healthcare delivery.

It must be understood that for any hospital information system to be vibrant and workable, it must have all these dimensions fused together in a single hospital in order to ensure efficiency of work. According to Nance et al. (2012), failure in one of the dimensional modules of HIS affects effective operation of the entire system. This means when the clinical module of the HIS is not working, it affects laboratory information system which also affects the finance information system as well as the general administration of the hospital.

2.7 Implementation of Hospital Information System

Effective implementation of Hospital Information System is to enhance efficiency and effectiveness of work at the Hospitals. According to Watson (2007), the implementation of HIS is very significant to the overall development of the hospital since the failure can affect the use of the system. In light of this, Davies (2002) and Watson (2007) argued that effective implementation of HIS must be based on three main approaches namely: the direct conversion implementation approach, parallel implementation approach and hybrid implementation approach.

2.7.1 Direct Conversion Implementation Approach

This type of implementation of HIS is also called the ‘big bang’ implementation. This is where there exists an old system and a new system is developed to take over the old. According to Watson (2007), when a new system directly replaces an old system then direct conversion approach has occurred. This is where people are trained to use the system after the changeover has been completed. One advantage according to Davies (2002) is that this approach prevents data or information overlap from the old system to the new system.

2.7.2 Parallel Implementation Approach

According to Davies (2002), this approach is highly used in large organizations or hospitals where there is difficulty in replacing an old system with a new system at once. Here, both the old system and the new system work in parallel. In order to reduce the risk of running two systems, both systems must be run at same period and under similar arrangement (Davies, 2002). If the hospital encounters a problem with the old system, the new system becomes more functional and this applies when the opposite occurs. Although, in everyday parlance, this approach is referred to as hybrid approach, the term with regards to HIS is used wrongly. Therefore, its appropriate term is parallel approach.

2.7.3 Hybrid Implementation Approach

With regards to this approach, the implementation procedure occurs in phases. The phases allow for some section of the hospital to utilize the system, which allows others to be rolled over systematically. After the completion of each phase, the system is getting closer to be fully adopted by the hospital (Watson, 2007). It is an evolutionary approach as the implementation is distributed over time using the direct conversion approach (Davies, 2002).

2.8 Trends in the Use of Hospital Information System

The increasing rate of hospital information system and its use in this 21st century can be attributed to its impact on medical services. As stated earlier, hospital information system is a customized and interrelated set of information systems that enhances quality of healthcare service delivery. This implies, that different hospitals may have different hospital information system based on the size and mission of the hospital.

Over the years, researchers have studied the extent to which HIS is been implemented and used in various hospitals across the world. Whiles some of these studies have studied HIS in its totality, others have studied only some of the components of HIS

The work of Bakshi and Shakeel (2012) set out to study hospital information system in its totality at tertiary teaching hospitals. Using an exploratory design, it was found that about 53% of the hospital staff use HIS frequently. Also, in a descriptive-cross sectional study on the impact of HIS, the work of Takhti, Rhaman, Abedini and Abedini (2012) found a positive view about hospital information system implementation and its use.

A study on the use of information system in healthcare facilities in Brazil by Correia et al., (2013) employed a survey design. In the study, a high use of HIS was revealed in the areas of financial planning and management decision-making. Furthermore, to access the use of electronic hospital information system, Jayawaradena et al. (2017) employed a descriptive cross-sectional study. From the results, it was indicated, that all health workers use electronic HIS to write patients' prescription and more than 70% use it to access patients' records. To study the usefulness of telemedicine in South Africa, Cilliers and Flowerday (2013) employed quantitative survey approach to seek for the views of rural health workers and urban health workers. From the study, it was revealed that rural health workers viewed telemedicine to be more useful as compared to urban health workers. These studies provided the ground needed to understand the use of HIS across diverse geographical areas.

Contrary to these findings, other studies have also found low/poor usage of hospital information system in various healthcare settings. In a survey study by Batra and Pall (2015) to investigate the adoption and access of HIS, the results of the study revealed poor implementation and use of HIS in Jalandhar, a city in Sri Lanka. Similarly, in a review of literature on HIS in Nigeria,

Benson (2011), noted poor use of hospital information system in Nigeria. In an exploratory study on hospital information system carried out in Brazil, Cortes and Cortes (2011) only focused on patient electronic record system. From their study it was found, that about 67% of hospital staff such as doctors, nurses and administrative staff make use of patient electronic system for their daily activities.

2.9 Enabling Factors to the Implementation and Use of Hospital Information System

The introduction of computerized system in healthcare has seen much positive results. There are several factors that contribute to the successful implementation and use of hospital information system. These factors can be largely grouped under technical factors, human factors, organisational factors, social/environmental factors and political factors (Ebadi, 2010; Anderson, 2012).

2.9.1 Technical Factors

Technical factors in HIS are highly linked to technological or the computer aspect of the business. According to Anderson (2012), technical factors for implementation and use of HIS are very critical since they ensure the efficient operation of the system. Technical factors include the type of software or system or HIS, system communication, easier use by humans, electronic interchange and system facilities for easier operation (Ebadi, 2010; Anderson, 2012). Anderson (2012) argued that one of the most significant factors besides human factor about successful implementation and use of HIS is the technical factors. Similarly, Ebadi (2010) indicated, that amongst all factors, the impact of the technical factor on the system development capability and HIS reliability in safekeeping of information have gained higher score than other factors. In Andersen's study, the inability of suppliers to deliver acceptable products has been described as a major obstacle to the application of HIS.

2.9.2 Human Factors

Human beings are the core component regarding the implementation and use of Hospital Information System. A systematic review by Hurvk (2010) indicated that human factors such as attitude, age, gender and educational background positively inform the use of hospital information system. Similar to the work of Hurvk (2010), a descriptive study by Sheykhotayefeh et al., (2017) revealed that attitude influence the implementation and use of hospital information system in Iran. Furthermore, the work of Sheykhotayefeh et al., (2017) found out that meeting user's needs and ease of use contribute to hospital information system implementation and use. These show that human factors cannot be ignored or underestimated with regards to effective implementation of HIS. Further, Hsiano and Chen (2016) indicate that the main human factors such as lack of knowledge and skills to use computers and lack of users understanding of the use of the HIS are what affect the successful implementation of HIS. This does not exclude the tendency for users to use the system. In addition to saving time and cost users will be familiar with the system if it is easier to learn the system. This will lead to the successful adoption and implementation of the system by end users (Hsiano & Chen, 2016).

2.9.3 Organisational Factors

Every organisation has a structure and culture. This structural arrangement as well as the culture either propel the use of HIS effectively or not. In an in-depth interview in San Francisco, Tieu et al., (2015) identified convenience of system and improved organisational communication as factors leading to the implementation and use of hospital information system. Again, in a survey to study the critical factors to the implementation and use of hospital information system, Hsiano and Chen (2016) identified organisational support, organisational structure, organisational arrangement and culture as well as perceived usefulness of the HIS in the organisation and social

influence as the main critical factors influencing implementation and health practitioners use of HIS. Similarly, Maher, Malmir, and Alimohamadzadeh (2016), found that organisational regulations or policies, impact on effective implementation and use of hospital information system.

Further, unsystematic review of study carried out by Ajami and Bertiani (2012) revealed, that training is a key indicator to the implementation and use of hospital information system. Attesting to the results of Ajami and Bertiani (2012), a quantitative study by Namakula and Kituyi (2014) found training as part of the factors leading to the implementation and use of hospital information system. Furthermore, the work of Namakula and Kituyi (2014) found management support, user involvement, resource supply in addition to education and training as the most influential factors to hospital information system implementation and use in Uganda. Based on this, the work of Sinha and Kurian (2014) indicated the need to conduct regular and refresher training for healthcare workers.

2.9.4 Social and Environmental Factors

The social environment upon which the hospital operates has significant influence on its implementation and use of hospital information system. According to Sinha and Kurian (2014), the social milieu where the organisation's operations occur can be influenced by both external and internal variables. These variables can include noise, location, infrastructure, internet cables arrangement and many others. The study by Postema et al., (2012) revealed that environmental factors are the most prominent factor influencing the implementation of telemedicine. In Nigeria, Ojo and Popoola (2015) revealed that social factor is one of the critical factors contributing to the successful implementation and use of Electronic Health Information Management System (EHIMS).

2.9.5 Financial Factors

Financial factors have been assigned strategic importance in economic development. According to Ojo and Popoola (2015) every organisation needs funds to run its operations effectively and efficiently. Lack of funds can jeopardize effective implementation and use of any HIS. Financial factors go beyond lack of funds, but include exchange rate fluctuations, higher interest rate, high inflation rate etc (Namakula & Kituyi, 2014). The study by Ojo and Popoola (2015) revealed that financial factor is one of the critical factors contributing either to successful or non-successful implementation or use of EHIMS in Nigeria.

2.9.6 Political Factors

Political regulations and inference from government play significant role with regards to the successful implementation of HIS. Maher et al., (2016) sought out to identify the contributing factors to the successful implementation and use of telemedicine in Iran. From the study, it was recorded that successful implementation and use of telemedicine includes political and government regulations. Adding to this, Ojo and Popoola (2015) indicate political factor as a contributing factor to the successful implementation and use of EHIMS in Nigeria. Political regimes alter hospital management boards and management teams which changes the direction of the hospital regularly. This according to Ojo and Popoola (2015), which occurs most especially in Africa exerts significant effect on the implementation and use of hospital information system.

In Summary, from the review factors, it is clear that technical, human, organizational, financial, social and environmental as well as political factors exert significant effect on HIS implementation and use. Similarly, a systematic review of literature by Sadoughi et al., (2013) to identifying the success and failure factors of hospital information system found that the factors to the implementation and use of hospital information system have moved from technical factors to human factors such as computer literacy, and perceived usefulness. This confirms a survey study carried out by Farahnaz, et al. (2015), which ranked human factors as the most important factor, followed by organisational and technological factors. Also, a quantitative study carried out in Malaysia by Ahmadi et al., (2014) noted that quality human resource, good support system, user-friendly and adequate training of the end-user were identified as determinants or success factors of hospital information system implementation and use.

User participation has been widely recognized as a successful factor to the implementation of hospital information system. This assertion confirms a descriptive-cross sectional study by Rahimi, Safdari, and Jebraeily (2013) which revealed a higher rate of user participation/involvement in the implementation phase of a hospital information system as a result of teamwork and top management support. These point to the fact that organisational factors do promote the implementation and use of hospital information system as discovered by other studies. Adding to this, a quantitative study carried out by Khalifa and Alswailem (2015) discovered the availability of computers as an influential factor to the implementation and use of hospital information system.

2.10 Hospital Information System and Management of Health Services

Information and communication technologies (ICT) are being widely used to ensure the day-to-day activities of hospitals. The fast growth in ICT in years past provides remedies to the challenges facing health services management as the benefits of using information system in the health care settings are many. The challenges confronting manual operations in the hospital also necessitated the increase in the usage of hospital information system. Qazisaeed et al., (2006) identified important reasons for the implementation of hospital information. These include inefficiencies in the manual processes in management of data and work flow in the hospitals. In addition, some of the reasons include growth in health insurance and the urgency for hospitals to receive reimbursement, rapid development in medical research, rapid growth and development in reimbursement mechanisms, increased patient expectation on quality healthcare delivery and increase in medical education campaign. According to Malliarou and Zyga (2009), the introduction of information system in healthcare service delivery does not only minimize errors

and accelerate speed of care and accuracy but also has the potential of lowering health cost by coordinating services and improving quality of care.

The following sub-section presents prior empirical studies on the benefits of hospital information system on health services management.

2.10.1 Reduce Cost

The integration of hospital information system has helped to lower health cost by taking away unwanted duplication of effort and at the same time improving quality healthcare service delivery by automating processes so that employees can work more efficiently. Integrated system components are able to communicate with all other components and these speeds up the flow of information (Jan Walker et al, 2005; Aghazadeh et al., 2012). An effective means of reducing healthcare cost is through the implementation and application of hospital information system. The hospital implicit and explicit cost of handling manual data and work flow is reduced to the minimum with hospital information system. Time and costs spent on data presentation and communication of information is reduced to the minimum levels (Aghazadeh et al., 2012; Munro, 2010).

Using an archival data on hospital information technology usage, a three-year longitudinal study was carried out by Bardhan and Thourin (2013) in the U.S. Findings of the study found out that the use of financial management system is associated to lower hospital operating costs. Similar to this finding, a study using an eight years panel data (1987-1994) was carried by Borzekowski (2009) and revealed that the use of financial and clinical information technologies result in cost reduction. Furthermore, a descriptive study by Oliveira et al., (2011) in the US revealed that the implementation of hospital information system leads to cost reduction. Again, a mixed-method study carried out in South Africa by Cline and Luiz (2013) revealed that the implementation of

hospital information system results in cost reduction, which then manifest to positive outcomes with respect to patient experience, hospital staff workflow enhancements, and overall morale in the workplace. Fichman et al., (2011) also posit that hospital information system is a major mechanism used by managers of hospitals to minimize the cost incurred in the delivery of healthcare services and also improve the health outcomes of their patients.

2.10.2 Improved Communication and Privacy of Information

Implementation and use of integrated hospital information system stands the potential to improve the incentives for providers to share information and secure the privacy of patient information. Hospital information system is believed to maximize the sharing of information (Jonathan & Joel, 2007). Snyder et al., (2011) made it known, that the use of hospital information system has the potential of coordinating care and sharing of information among health practitioners and patients. An empirical study by Maroofi (2016) acknowledged the positive and significant relationship between hospital information system and quality of information content; information and access to information. Again, an empirical study by DesRoches et al., (2008) and Densie and Stablein (2016) noted that electronic health record system does not only improve care coordination but also improve communication with patients.

2.10.3 Reduce Errors and Redundancy

The implementation and use of hospital information system helps to reduce errors and redundancy in medical records. Hospital information system is credited with quality healthcare delivery (Maroofi, 2016). The application of hospital information system also promotes green working environment in the hospital by reducing wastes associated with manual operations (Muno, 2010; Maroofi, 2016).

A cross-section study by Takhti et al., (2012) revealed that the benefits of hospital information system include but not limited to timeliness, reliability, data completeness and accuracy of information. Also, a systematic review of literature carried out by Waneka and Spetz (2010) argued that hospital information system is of much importance to health service delivery as it helps improve the quality of documentation; reduces medication and administration errors. Furthermore, a study by Mahoney et al., (2007) on the influence of an integrated clinical information technology on medical errors revealed, that integrated clinical information technology reduced medical errors and reduced prescribing errors.

2.10.4 Improve Patient Outcomes

Studies on the benefits of hospital information system have revealed, that the implementation and use of hospital information system has a potential benefit of improving patient's outcome. The implementation of the hospital information system allows for better follow up on patients even in their homes. This therefore brings in better management of healthcare of patients on timely and accurate manner (Aghazadeh et al., 2012). According to Monu (2010) the application of hospital information system reduces the patients waiting hours, thereby, improving the health outcomes of patients not excluding improvement of consumer service and patient satisfaction level.

A retrospective observational study by Speedie et al., (2014) noted that the use of electronic health record system improves patient outcome by reducing the time of patients stay. Still on the benefits of electronic health record system, Kutney and Kelly (2011) carried out a cross-sectional and hospital survey data. Results of their study revealed that working in hospitals with basic EHRs promotes quality healthcare delivery as compared to working in hospitals without EHRs.

Also, in a three-year longitudinal study of a large panel data, Bardhan and Thouin (2013) recorded a positive association between usage of clinical information system and patient scheduling applications and conformance with best practices for treatment of heart attacks, heart failures, and pneumonia. Furthermore, a quantitative study by McCullough et al., (2016) revealed that hospital information system improves the outcome of patients with chronic medical complications.

2.10.5 Improve Efficiency and Productivity

The introduction of hospital information system is said to improve patient's outcome. This suggests that hospital information system also improves efficiency and productivity of medical staff (McCullough et al., 2016). Hospital information system is a major tool employed by doctors to handle serious complicated health issues. Emergency cases are easily decided on among doctors on the medical methods to deliver healthcare. Doctors need not to be physically present to attend meetings concerning emergencies. In situations where the experts are not around, they can be consulted to help in the handling of emergency case. With the application of hospital information system, doctors can easily generate information about patients' health history. The hospital information system generates report of patients' diagnosis with just simple click of a button. In addition, the implementation of the hospital information system allows for better follow up on patients even in their homes. This therefore brings in better management of healthcare of patients on timely and accurate manner (Aghazadeh et al., 2012).

Canning and Loeb (1988) and Galletta and Lederer (1989) also point out that hospital information system increases efficiency and effectiveness in data collection and processes for clinical database, information of staff and departmental efficiency.

The work of Rand, Blumkin, and Szilagyi (2014) agrees to this when they discovered, that medical staff using electronic health record system can offer counselling more than medical staff without electronic health record system. Again, in a secondary analysis of cross-sectional data, Hessels et al., (2015) discovered that the implementation of electronic health record system improves better quality care and promotes patients' satisfaction. Maroofi (2016) also revealed that hospital information system relates positively with improved accountability.

Employing a cross-sectional study, the work of Azizzadeh et al., (2014) found some levels of satisfaction with the implementation of hospital information system as it improves speed, precision and accuracy of nursing processes. This confirms a study conducted out in Bangladesh by Khan, Shahid, Hedstrom and Andersson (2012), where the use of electronic health record system leads to work efficiency. Similarly, in a national survey of U.S hospitals, Thakkar and Davies (2007) discovered that electronic health record system promotes work efficiency and time management. Adebisi (2015) posits that we can correct the challenges confronting the manual process of healthcare delivery by reducing the time involved in processing data on patients, consumables and non-consumables, financial and administrative as well as improving the data storage and retrieval.

Furthermore, a descriptive study by Oliveira et al., (2011) in the US revealed that the implementation of hospital information system leads to the improvement of quality of health practitioners as well as patient care services. Also, a systematic review of literature carried out by Waneka and Spetz (2010) argued that hospital information system is of much importance to health service delivery as it helps improve quality documentation; reduces medication administration errors; and promotes a high sense of satisfaction and positive attitude among health practitioners.

2.11 Constraints to the Implementation and Use of Hospital Information System

Despite the aforementioned benefits of implementing and using hospital information system in healthcare institutions, there are a number of constraints or challenges that hinder the progress of hospital information system implementation and its use. Staggers et al., (2001) indicate that the hospital information system challenges in the 21st century include lack of systems integration, poor data standardisation, weak hospital information system implementation plan, and poor internet connectivity. Olusanya et al., (2015) acknowledge that the main obstacles to efficient running of hospital information system in most developing countries include: high initial cost associated with hospital information system software components as well as high cost of updating the software. The hardware costs involve in implementation of hospital information system is also high especially to hospitals in poor and deprived communities in developing countries. It is a major burden for many hospitals in developing countries to smoothly migrate from manual process to automation process. The inability of many staff and patients to quickly and easily cope with the automation process is due to low computer literacy in many developing countries.

Barnett (2009) identifies and grouped the challenges that affect the interface of hospital information system into three main classes of problems: underestimations of problem, lack of understanding, and lack of commitment of administrative and professional staff. Barnett (1999) indicates that most hospital information system developed overlook many difficulties in the manual process before developing the software for hospital information system.

In the views of Monu (2010) implementation of hospital information system in developing countries faces more challenges than in the developed countries. Monu (2010) points out that these challenges are as a result of:

Poor and intermittent power supply: The electricity supply in Africa leaves much to be desired. Many parts of the continent have no power supply and those with power supply do not have access to constant electricity supply.

Inadequate equipment: The required number and type of machines and equipment to use in the application of hospital information system are lacking. The frequent power cuts experience in developing countries also frequently damage equipment.

Poor internet connectivity: A major challenge to the implementation of hospital information system in developing countries is poor internet penetration. In many instances, internet connectivity is restricted to the offices in the hospital while the patients do not have access to internet in the homes to book appointments for medical services. Hospital to hospital transfer of data is affected by poor internet connectivity.

Weak computer proficiency: Many people in Africa possess poor knowledge in computing. This affects the smooth application of hospital information system.

Poor maintenance culture: The procurement systems in developing countries are weak, allowing public officials to procure sub-standard equipment for the implementation of hospital information system. This equipment is not properly maintained and they frequently break down.

In a study to determine the factors affecting the successful implementation of a hospital information system, Farzandipur, et al., (2016) carried out a descriptive method, clinical and para-clinical users. The study revealed that human factors, organizational/managerial factors and technological factors impede the success of HIS.

Furthermore, the study of Ahani, Nilashi and Ahmad (2016) grouped the challenges of the implementation and use of hospital information system into technical factors, human factors, organisational factors and environmental factors. Similar to this, Khalifa (2013) also categorized

barriers to the adoption of an electronic management record system into six parts. Namely, 1) Human Barriers, which relate to the beliefs, behaviors and attitudes, 2) Professional Barriers, which relate to the nature of healthcare jobs, 3) Technical Barriers, which relate to issues of computers and IT, 4) Organizational Barriers which also relate to issues of hospital management, 5) Financial Barriers, which relates to money and funding and 6) Legal and Regulatory Barriers, which relate to laws, regulations and legislations.

In Iran, Mehraeen, Ahmadi, Mehdipour, and Noori (2014) employed an evaluative index to assess organisational and server components of hospital information system in some selected hospitals. Utilizing a mixed method approach, the study revealed that the studied hospitals lack pharmacy information system, decision support system, communication services and telemedicine services. In Ghana, a qualitative study by Opoku, Stephani, and Quentin (2017) highlighted inadequate information, delays and additional workload as challenges to the use of teleconsultation.

In Malaysia, Bakar et al., (2011) employed a qualitative study to access the challenges of adopting hospital information system. The results of their work have it, that challenges to the implementation of hospital information system include human factors, technology and infrastructure factors, software limitation and lack of management support. Again, Ahmadian et al., (2013) prioritize the barriers to hospital information system implementation into lack of powerful information networks, error in data entry, technical problems, lack of organisational training, lack of users' knowledge about system and negative attitudes.

Moreover, in a qualitative study to address key challenges to the implementation and use of a clinical information system, Or, Dohan, and Tan (2014) grouped the barriers into (a) infrastructure-based barriers, which is caused when there is a conflict between system functional

needs of users and government regulations; lack of technical and financial supports; inadequacy of hardware-software infrastructure; and inconsistency between workflow, work policy and procedures. (b) process-based barriers which is caused when there is a mismatch between the technology, existing work practice and work flow, and communication; clinical content inadequacy and availability; poor system usefulness and user interface design; low system speed, accessibility, and stability; deficient computer literacy; and more experience healthcare profession and (c) outcome based barriers, which is caused when there is lack of measurement in addition to monitoring of system effectiveness.

In a survey study on the challenges to the adoption of hospital information system, the work of Khalifa (2014) revealed over 50 challenges to the implementation and use of hospital information system. These include human challenges; relating to awareness, training and usability of systems as well as the technical challenges, which relates to hardware and software of HIS. A survey study regarding the efficiency of electronic health record system by Ryota et al., (2014) noted that healthcare facilities with electronic health record system usually encounter the challenges of inadequate funding for the implementation and maintenance of the system. This he said affects the overall performance of workflow. Again, in a national survey of U.S hospitals, Thakkar and Davies (2007) discovered that challenges to the implementation of electronic health record system include cost of hardware and hospital size. A quantitative study carried out in Greece by Zikos et al., (2010) identified barriers to the implementation and use of hospital information system to standardization and encodings, lack of resources, lack of qualified staff, lack of participation and inadequate training.

2.12 Conclusion

In conclusion, this chapter of the study revealed relevant literature and a theory within the framework of the study. The literature review and gaps identified became the basis for the development of the research objectives and questions. In addition, the revealed theory which is the stakeholder theory provided support to the research questions. The theory underscores the need to obtain information on HIS from significant actors who have in-depth knowledge with regards to HIS at the University of Ghana Hospital. In addition, the theory underscored the development of the conceptual framework for the study. Further, it clearly provided implementation approaches to HIS as well as trends regarding the use of HIS.

The chapter also revealed relevant factors enabling the implementation and use of HIS which include technical, human, organizational, financial, social-environmental and political. It also revealed constraining indicators regarding HIS implementation and use which include human and technical constraints among others.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodological processes needed to answer the research questions. The chapter has been organised into sections. The first section of this chapter presents the research paradigm. Finally, the second section of the chapter presents the research methods and techniques employed in conducting the study.

3.1 Research Paradigm

Research paradigm plays a vital role in the study of any discipline within the social or natural sciences. Various definitions have been given by various scholars regarding research paradigm. According to Collis and Hussey (2008), research paradigm is a philosophical yardstick for conducting a research.

3.2 Choice of Research Paradigm

The aim of this study is to understand how the implementation and use of hospital information system enables or constrains management of health services at the University of Ghana Hospital. Based on the definition for the research paradigm, the appropriate paradigm used for the study was the interpretive research paradigm.

The rationale for selecting this paradigm is, that the researcher cannot consider himself as being independent throughout the process of this study. This is because interpretive research encourages the researcher to be the main data collection instrument as this enhances the consistency of data and support engagement of respondents.

Further, this allowed the researcher to explore hiding reasons behind the use of hospital information system at the University of Ghana Hospital. The researcher adopted this approach because it allowed him to reconcile the subjective interpretation of hospital information system implementation and use by respondents at the University of Ghana Hospital. From a positivist research paradigm point of view this would not have been possible because it would affect the objectivity of the research conducted.

3.3 Research Methodology

In order to investigate how hospital information system is implemented and used at the University of Ghana Hospital, there is the need to apprehend the experiences and roles of key decision makers and policy implementers of the University of Ghana Hospital. The qualitative research method is used due to its suitability. Its suitability is with regards to getting to know the experiences of key decision and policy makers and current insight into how hospital information system is implemented and used at the University of Ghana Hospital.

Further, since diverse departments and units of the University of Ghana Hospital are involved in the implementation and use of the Hospital information system, the qualitative method offers the best method. This is because, the qualitative method offers the best platform in situations where events can be interpreted, described and explained by different actors in different departments and units of the University of Ghana Hospital. Despite the fact, that the study utilized interpretative approach which is in line with qualitative study, the method provides opportunity for respondents with in-depth views and experiences on issues to bring them out and hence aids in conducting detailed search about a given phenomenon.

3.4 Research Design

The case study research design was employed for the study. According to Gulsecen and Kubat (2006), a case study can be considered as a robust research method particularly when a holistic in-depth investigation is required. Case studies, in their true essence, explore and investigate contemporary real-life phenomena through detailed contextual analysis of events or conditions and their relationships. The case study therefore tends to focus on a particular issue, feature or unit of analysis. The purpose is not for generalization but fully apprehend a given phenomenon such as implementation and use of HIS at the University of Ghana Hospital.

The case study design is suitable because, it ensures that a phenomenon under study is not explored through a single lens, but rather a variety of angles which requires for multiple facts of which a phenomenon such as hospital information system can be revealed and understood. The case study design is also adopted because, it offers the researcher the opportunity to learn about issues that are very complex and perhaps needs a broad assessment of the issues which can be obtained through extensive explanation and analysis.

3.5 Case Boundary

Employees of the University of Ghana Hospital were identified as the participants of the case study. They included the hospital information system analyst, hospital administrators/managers, doctors, and nurses. The period of observation spanned from December, 2017 to January, 2018.

3.6 Research Population

The target population was top level officers and managers (heads of departments and units) within the Hospital. The reason for the choice was to obtain diverse views from these top level respondents who have in-depth opinions with regards to the Hospital information system at the Hospital.

Another reason was to obtain information from those at the top level of the Hospital structure who were directly involved in the decision making to obtain HIS to help the operations of the Hospital. In addition, the target was utilized based on time frame, familiarity and proximity of the researcher to the Hospital. The target population was important because, it helped the researcher to obtain relevant information regarding Hospital Information system at the Hospital.

3.7 Sampling Technique and Sample Size

Sample and sampling technique are significant elements within the frame of any research plan which details the manner in which the sample for the study were selected through relevant and appropriate research procedures as well as processes considered as techniques. In congruence to this, the study adopted the purposive sampling technique. The reason for the choice of purposive sampling technique was, that it allowed the researcher to select participants who have the experience and potential to inform the grand research questions to be addressed regarding Hospital information system at the University of Ghana Hospital. Twelve participants were selected using the purposive sampling technique. The participants were the Medical or General Director, Administrator, Head of Finance, Head of Dental, Head of Pharmacy, Head of Public Health, Head of Laboratory, Head of Pediatrics, Head of Physiotherapy, Head of Medical Records, Head of Surgery and Head of Stores. The sample representation falls within the acceptable number for qualitative study as indicated by Creswell (2003; 2009). According Creswell (2003; 2009), the representation for a qualitative study should at least be 9 participants and at most 30 participants, in circumstances where top level decision makers are involved in the study.

3.8 Data Collection Method

The study adopted significant number of methods in order to achieve the overall objective of obtaining relevant and appropriate data for the study.

The section included sources of data collection, data collection instrument, procedure for data collection, trustworthiness of data, ethical consideration and data analysis information.

3.8.1 Sources of Data Collection

In this study, both primary and secondary data were employed to give a more complex explanation about the phenomenon. Primary data was collected through interviews. Secondary sources of data collection for this study were obtained from different sources such as journal articles, books, and official online websites. The use of both primary and secondary data helped create the knowledge necessary to answer the research questions and, in the end, solve the problem formulation.

3.8.2 Data Collection Instrument

The study utilized an interview guide designed by the researcher. Before the interview guide was designed, extensive literature was reviewed. The literature review underpinned effective design of the guide. In addition, the design was done in congruence with the stated research purpose, objectives and questions as indicated in chapter one of the study. The interview guide covered six sections namely bio-data of interviewee, the Hospital and department of the interviewee, implementation and use of hospital information system, enabling factors regarding the implementation and use of HIS, constraining factors regarding the implementation and use of HIS, as well as outcome or success regarding the implementation and use of HIS.

3.8.3 Data Collection Procedure

Prior to the full use of the interview guide, the study pre-tested the guide. After the pre-test, the method of triangulation and part-checker method was utilized to ensure the credibility, utility and dependability of the guide. The guide was reviewed through the help of my research supervisor with regards to the main study.

With regards to the main interview, face-to-face interviews were conducted with staff from the University of Ghana Hospital. The reason for choosing this type of data collection underpins the need of gaining a certain understanding about how the implementation and use of a hospital information system has influenced management of health services. Furthermore, it helped gain information about related experiences at the hospital which the employees have been through, which could also help in understanding the research questions. The interview was a structured interview, meaning that a number of questions were prepared beforehand, while some questions were asked during the process of interviewing the respondents. Interviews were conducted at the offices of the interviewees at the Hospital based on appropriate time booked by the researcher with the participants. The interviews were conducted in a serene environment which did not face any external distractions.

3.8.4 Rigour/Trustworthy of Results

Determining the precision of qualitative findings is a challenge. However, there are several strategies and criteria that can be used to enhance the rigour of qualitative research findings. Scholars have suggested that the precision of qualitative findings can be achieved through four (4) strategies: credibility, transferability, dependability and confirmability (Schurink et al., 2011).

In order to ensure credibility, that is, accuracy of the research data and analysis, enough time was allocated for data collection. Furthermore, member check was encouraged to allow the participants to give feedback with regards to the research observations and interpretations. Accurate descriptions of the respondents' experiences were also ensured by the use of probing and transcription of recorded data.

To enhance transferability, a detailed research methods, contexts, and assumptions underlying the study was provided. Furthermore, a clear biographical description of the respondents and their social context were provided.

To enhance dependability, several strategies such as the use of multiple source of data collection tools, audit trail, member checking and long-term observation were adhered to.

To enhance confirmability of this strategy, a saved paper trail of all transcribed interviews was made in case it would be requested for (Schurink et al., 2011).

3.9 Ethical Considerations

The study obtained an ethical clearance from the school of humanity. A letter of introduction was obtained from the department of health services management, University of Ghana. The letter was addressed to the administrator of the University of Ghana Hospital. The aim was to introduce the researcher to the organisation for permission to be granted to carry out the research. Further, the following ethical considerations were adhered to when conducting the research.

Participation in this study was strictly voluntary. Furthermore, the purpose of the study was explained to all respondents and a written consent was obtained before data collection. The right to withdraw at any point in the study was made known to all respondents. Respondents were

given the opportunity or the right to skip any question which they considered as sentimental without any penalty.

This study endeavored to avoid any potential or physical risk or harm.

Respondents of the study were duly informed before their participation, that there would be no direct material or financial benefit for their participation, but rather, their participation might bring to them a sense of satisfaction for participating in an important study. In addition, this may likely help formulate health policies to improve upon the hospital information system at the hospital in order to promote quality of healthcare delivery.

All information from respondents were kept confidential, thus, personal identifiers such as names, identification numbers were not included during data collection. In addition, information obtained from the respondents were not altered.

All information obtained was electronically stored and password protected in a personal computer, and access was limited to only the researcher and the supervisor.

3.10 Analysis of Data

The thematic content analysis method as described by Braun and Clarke (2006) was used in analyzing the data. The purpose was to give the participants' experiences a logical, coherent and a concise account by the development of themes and sub themes in the data. Thematic content analysis was deemed appropriate as it summarises voluminous data into key themes for a rich description of its similarities and differences (Terre-Blanche, Durrheim, & Kelly, 2006).

Through the process of reading and re-reading of the research transcript, the researcher familiarises himself with the data. This according to Braun and Clarke (2006) is the first phase of data analysis. Here, the researcher immersed himself into the data to the extent of familiarising

himself with the data. Immersion here is the process of active repeated reading of the data in order to search for meanings, patterns and so on. Also, during this phase of the analysis, the researcher took notes of ideas for coding that might be beneficial in the subsequent phases.

Following this phase was the creation of initial codes. As cited in Braun and Clarke (2006), codes identify a feature of the data that appears interesting to the researcher and refer to “the most basic segment, or element, of the raw data that can be assessed in a meaningful way regarding the phenomenon” (p. 18). In doing this, the researcher manually coded many potential patterns as possible by using highlighters.

When all data have been initially coded and collated, the researcher re-focused the analysis on a broader level of themes, rather than codes. This was done by sorting out the different codes into potential themes, and collating all the important coded data extracts with the identified themes. In a nut shell, at this phase, the researcher started analyzing the codes, and considered how the codes may combine to form a primary theme.

After this phase, the researcher defined and named the different themes generated. This was done by defining and refining the themes that would be presented in the analysis. By “define and refine”, Braun and Clarke (2006), meant to identify the “essence of what each theme is about, and determine what aspect each theme represents” (p. 22). Following this phase was the development of a report and it included the final analysis and write-up of the findings. The essence of the write-up of a thematic content analysis is to tell the complicated story of the data in a way which seems pleasant and convenient to the reader. In view of this, the researcher provided a concise, coherent, logical and non-repetitive account of the data within the themes developed.

CHAPTER FOUR

PRESENTATION OF FINDINGS

4.0 Introduction

This chapter of the study provides the data analysis and interpretation based on information obtained from twelve (12) respondents who were the director, administrator, heads of departments and units of the University of Ghana Hospital. The analysis and interpretation were conducted in line with the stated research objectives and questions. The chapter is organised into three sections. The first captures the case organisation. The second captures descriptive analysis of respondents' information in the hospital. The third section presents the result in congruence with the posited study objectives.

4.1 Study Area (University of Ghana-Hospital)

The University of Ghana Hospital, popularly called Legon Hospital, then University College Hospital was built and commissioned in 1957. The Hospital is an official property of University of Ghana and is wholly owned by the University. The University of Ghana Hospital came into existence the same period that University of Ghana was established. Beginning as a clinic it had its location at the West Compound of the Achimota School with the assistance of a senior nurse the hospital was first managed by a Scottish doctor by name Dr.A.B. Boyd. According to the director of the Hospital, this information is readily available at the University of Ghana website within Health Services category.

As the hospital grew over time, four nurses in addition to a doctor from the Achimota Hospital were sent to start work at the University College Hospital in 1959.

The facility grew further in terms of Maternity Ward and Staff Quarters. With a bed capacity of 130 comprising of Maternity Ward, General Ward, Casualty and Emergency Ward, Operating Theater, Pediatric Unit, and Dental Unit. The University of Ghana Hospital is currently located 12.6 kilometers off the main Accra-Aburi road, specifically behind the Legon Police Station. It is a Quasi-government hospital (University of Ghana Health Services, 2015). However, in recent times respondents intimated that the Hospital has over seventeen (17) departments and units. The departments of the Hospital are unfolding and continuing. This was found in the expression of the head of finance department that:

“The departments are continuing and now I can tell you that we have over seventeen (17) departments and other units and sub-units”.

Further, the Hospital’s operations can be grouped into two dimensions namely: clinical departments and non-clinical departments. The departments and units include surgery, dental, pediatric, internal medicine, medical records, obstetrics and gynaecology, pharmacy, emergency, physiotherapy, laboratory, Public health, OPD, IPD, store, finance, transport, procurement, and kitchen. Each department and unit play a vital role in the Hospital.

Moreover, the original aim for the establishment of the Hospital was to cater for the health needs of the student population, staff and their dependents. However, in 1976/77 as the community started developing, the inhabitants of its fast growing environs began to seek healthcare from the Hospital. During the time of the Hospital’s establishment, the student population was two hundred and forty (240). In recognition of the change in the function of the University Hospital in 1976/77, the Ministry of Health (MOH) readily accepted to assist the hospital yearly with drugs, supplies, equipment and instruments.

This arrangement worked quite well until 1986/87 when the “cash-and- carry” system was introduced and the assistance to the hospital ceased. The Hospital readily offered its services to these people as there was no other hospital in the whole Legon vicinity. With time, the hospital has assumed the functions of a District Hospital and has a wide catchments area (University of Ghana Health Services, 2015).

In recent times, the University of Ghana Hospital has established a Primary Health Care outreach programme aimed at teaching and advising students, pregnant women, nursing mothers and the general public about personal hygiene, good diet, child care, including immunization against childhood communicable diseases, family planning and school health services. It can therefore, be viewed as part of the hierarchy for the delivery of health services in the Greater Accra Region whose population is currently estimated as over 5 million (University of Ghana Health Services, 2015). The main referral points for the hospital are the Korle-Bu Teaching Hospital and 37 Military Hospital. The hospital has introduced specialist consultancy services and this has made referral cases to Korle-Bu and 37 Military Hospital very minimal.

4.2 Characteristics of Respondents

The mean age of the respondents was forty-five (45) years, however, the age range was between 30-60 years. This shows that the entire interviewees fall within the adult population range or pyramid of Ghana.

Further, the result showed that 2(17.0%) of the respondents have been in the hospital between 1-6 years, 3(25.0%) between 7-14 years, 5(41.6%) between 15-20 years and 2(17.0%) have been working in the hospital for 21 years and over. Significant number of the interviewees intimated that their current position did not occur in a vacuum but have moved through the ranks thus

junior level to senior positions. This shows that respondents have enormous level of experience from lower level decision to top management positions that forms the major core of the decision making body of the Hospital. With regards to marital status of respondents, the entire respondents are married with most of them having at least three children. In addition, the knowledge level of the respondents was enormous considering their top level managerial skill and historical fact with regards to the University of Ghana Hospital.

The University of Ghana Hospital was found to be unique with regards to its implementation and use of Hospital Information System. It was indicated by 7(58.3%) of the interviewees, that the University of Ghana Hospital was the first among the other university hospitals to implement HIS software in their operations in Ghana. Although, other Hospitals adopted similar software with a combination of manual and electronic implementation called the parallel implementation approach, the University of Ghana Hospital was the only hospital that implemented the electronic process at once or at a go, called the hybrid and direct conversion implementation approaches. It was the only University Hospital in Ghana that falls under the Quasi-Government Hospitals in the country. These therefore make it unique in its decision, implementation and use of systems which fall within the vision and mission of the University of Ghana. Everything about the Hospital from OPD, IPD, and other supporting services are all computerized.

4.3 Implementation and Use of hospital information system at the University of Ghana Hospital

The first objective of the study was to investigate how hospital information system is implemented and used at the University of Ghana Hospital. The aim was to understand how the hospital information system is implemented and utilized in order to assist management and staff in providing effective healthcare services at the University of Ghana Hospital to its clients.

In order to achieve the slated objective diverse themes were developed based on responses from top managers of the Hospital. The findings in congruence with the theme development are presented as follows:

4.3.1 Implementation of the Hospital Information System

The study investigated the implementation of HIS in the University of Ghana Hospital. Based on the information obtained from respondents, some themes were developed and are presented as follows:

(a) Existence of Hospital Information System

In order to investigate how hospital information systems are implemented at the University of Ghana Hospital, the first identified theme was the existence of hospital information system at the Hospital. The Hospital Information System (HIS) was found to exist in the hospital since November 2015. This does not derail the previous information system that existed in the hospital which had greater amount of challenges. The old system was called System Consult Software or Consult Software (SC) and the new system is called Equipment Business Frame (EBF) software.

System Consult Software (SC)

It was found that the first electronic information system adopted by the Hospital was System Consult software (SC). However, it was found to have significant number of challenges resulting in its abandoning and reversion to the use of the manual system of data processing which was already in existence. The SC as an electronic system was implemented alongside the manual process called the parallel conversion approach. However, this failed resulting in reversion to the use of the manual system. Respondents indicated, that although the system was implemented alongside the manual process, this did not benefit the Hospital, its employees, management and patients resulting in its failure after six months.

The implementation process was found to be difficult and the software was found to be expensive although it was a gift to the Hospital. The huge number of challenges of the SC in line with the manual implementation process led to the abandoning of the software. This was found in the words of the Medical Director,

“The old software was implemented for only six months because of the difficulty in its implementation. It was difficult linking it across departments. Therefore, the manual system was adopted fully”

EBF Software

The Hospital adopted the EBF software in November 2015. The software was designed to support the flow of information between departments, units and all sections across the organisation. The existence of hospital information system at the University of Ghana Hospital assisted management to facilitate vital decision making, increasing the users knowledge, understanding and providing the platform for allowing rational management decisions to be taken. The decision taken by management in previous years contributed to the current information system adopted by the Hospital. The existence of the hospital information system at the hospital gives credence to the importance and the critical role of the system impacting on efficient healthcare delivery system at the Hospital. The existence also indicates the usefulness and recognition by management as an indispensable tool in healthcare management at the Hospital. When the medical or general director was asked of the existence of hospital information system, it was expressed as:

“Yes, we do have hospital information system”.

The HIS was required to help meet the increasing needs of the growing university community and the public at large. It was also to help harmonize the Hospital data across departments and units in order to achieve efficiency. By implication, the existence is premised on the need to deliver timely, effective and quality healthcare service through decisions of management to the growing number of people using the facility.

(b) Implementation Process of HIS

It must be noted, that implementation is a vital indicator within the success plan of any effective hospital information system.

System Consult Software

The result shows, that since the software was not secured through a proper procurement procedure its implementation was fraught with problems. Respondents intimated that the implementation process was done at once using the parallel conversion approach or system. The parallel approach allowed the electronic system to be implemented in line with the manual system. It was found that no critical procedures were followed in implementation of the software. However, it was carried out across departments and units. One major challenge during the implementation process was the software's inability to link departments and units at the Hospital.

EBF Software

The study found, that a number of factors were considered within the implementation process before the EBF hospital information system was adopted and implemented. The implementation process identified included institution of a committee, engagement or consultation with all departments and units, procurement processes, demonstration, installation, education and training.

- Institution of Committee

Institution of committee to ensure effective adoption and implementation of the process was very crucial to the overall development of the process. The committee was made up of both internal and external persons within and outside of the Hospital.

The aim was to obtain diverse views and technical knowledge regarding the adoption and implementation of effective hospital information system in order to achieve the objectives slated by management and the Hospital. Almost the entire respondents indicated that the committee was made up of experts from University of Ghana computing systems, external IT firms and the Hospital management representatives. The aim was to ensure the effectiveness regarding the implementation process. It was also found, that two representatives from each unit or department were part of the adoption and implementation process of the HIS. This also allowed diverse departments and units within the hospital to contribute their quota towards the overall development and adoption of the system. This was captured in an expressed view of some respondents;

“We engaged various vendors to let them know what we want. A committee was then set up for the bidding process. The bidding was done at the University of Ghana computing systems together with our members and other external IT firms to look at the implementation process” (R1, General Director, University of Ghana Hospital)

“During the adoption process a committee was set up. This was made up of two representatives from each unit or department of the Hospital. They gave each department the chance of being part of the documentation process. This allowed the decision and documentation to be done regarding HIS for the Hospital” (R6, Head of Department, Pediatrics)

By implication, it is clear, that the setting up of the committee regarding the adoption and implementation of hospital information system was crucial. It is evident that the bringing together of diverse people within and outside the Hospital allowed for fairness, transparency, and the entire Hospital executive at each department to be part of the process.

In addition, this was to bring together experts and professionals who have knowledge and clear understanding regarding recent development within the technological world and effective healthcare delivery system. It allowed for all units or departments of the Hospital to feel part regarding the process of documentation and adoption of the HIS.

- Engagement and Consultation

Engagement and consultation of all departments and units within the Hospital regarding the adoption and implementation of the hospital information system was very crucial for the effective implementation process. It was intimated by 10(83.3%) of the interviewees, that the engagement was done across all sections and within all levels of the organisational structure. This was to assist in obtaining credible and relevant information that would contribute to the implementation of the system at the Hospital. This was captured in an expressed view of the respondent:

“We had to go through a lot of processes considering every department, the staff and the vendors. We had to sit down and look at the processes that take place at the hospital environment from department to department, from unit to unit” (R1, General Director, University of Ghana Hospital)

“Each unit was represented by two representatives, including the technical unit from University of Ghana computing systems. We all agreed to select this particular one” (R2, Head of Finance, University of Ghana Hospital)

By implication, the engagement of all actors was to allow them to be part of the decision making process since the system would be utilized by the whole people within the Hospital.

It was also to develop and adopt a system that will support the operations of the hospital environment in order to deliver quality environment.

- Procurement Processes

The procurement processes were indicated by respondents to include brainstorming, thinking process, suggestions and adoption of the appropriate hospital information system to help management provide quality healthcare at the Hospital. These processes allowed all individuals within the organisation as well as experts to contribute to the pool of ideas in order to achieve the slated objectives regarding the adoption of the required information system. During the procurement process, departments and units consultations were done in order to ensure value for money regarding the hospital information system to be adopted. The aim was to save time, cost and ensure efficiency of the system. Although, departments and units were consulted during the procurement process, the technical evaluation was done by the University of Ghana Council and University of Ghana Computing systems. The result shows that three processes underpinned the procurement processes namely: technical evaluation, international competitive bidding and decision making. According to respondents the technical evaluation allowed for experts to provide technical knowledge regarding the software that would fit the Hospital based on the information given by the Hospital during the documentation process. However, 9(75.0%) of

respondents indicated, that the costing aspect of technical evaluation falls outside their domain since that was a major decision of the University Council. In addition, the international competitive bidding allowed diverse technological software developers to make application. The applications were evaluated through the help of University of Ghana Computing Systems and Intercom Programming and Manufacturing Company (IPMC). This process according to 9(75.0%) was to help obtain the required technology for the Hospital.

Despite the diverse number of application made by technology development software companies, three companies were selected from the numerous applications which underscored the decision making dimension of the procurement processes. This was found in the views of some selected respondents:

“Every department was scored, followed by questions, clarifications and discussions. A decision was then taken on which system to choose, taking into consideration the value for money as well” (R1, General Director, University of Ghana Hospital)

“That was purely procurement work. Once it was an international bidding, the technical evaluation was done before bidding was done for the values to be seen. After the technical evaluation was the selection of the three companies for their presentation and demonstration for us to make a choice” (R2, Head of Finance Department, University of Ghana Hospital)

By implication, the procurement processes allowed management to obtain required and relevant information needed to obtain the right HIS for the Hospital. The processes also allowed the

University which is a public institution to follow the Public Procurement Act, 2003 (Act 663) of Ghana.

- Demonstration

In order to test the effectiveness of the software, it was found that the software was tested through presentation and demonstration. Almost the entire respondents indicated that the demonstration was conducted in order to ensure effective implementation of the software in meeting the goal of providing quality healthcare.

This was to help establish the need to continue or not with the adoption and the implementation of the hospital information system at the hospital. The demonstration as revealed by a respondent was to obtain initial working of the software in order for management to take the necessary decision to adopt or not to adopt the use of the software. However, it was found that the decision to adopt or not to adopt a particular software was within the hands of the Hospital staff. Although, University of Ghana Computing Systems (UGCS) proposed a particular software to be adopted and implemented, it was found that the Hospital staff preferred a different one. Therefore, in order to give credence to the users of the software, the one approved by the University of Ghana Hospital staff was accepted and adopted by the Hospital.

According to significant number of respondents, this was to prevent sabotage of the system, unwillingness to use the software, agitation by medical doctors and strike actions by staff.

According to 10(83.3%) of the respondents, the demonstration process was regarded as the decision- making point for the software adoption. This provided the ground upon which knowledge of the software of the three companies were obtained. Application and use of the software and effectiveness of the software were analyzed by all staff. The demonstration was an

intense engagement process which allowed for questioning, discussion and clarification by software developers to be made. This was indicated by the Head of Finance Department as:

“The UGCS wanted a particular software but the hospital staff fell in love with this particular one. A decision was made in favour of the hospital staff since they would use the system. This was to avoid the failure of the system”

- Installation

The next identified factor as intimated by respondents was the initial installation of the software within the premises of the Hospital in order to ensure the first hand and practical use of the software. It was regarded as the last process of the implementation of the EBF software. The initial installation was to test the field use of the software at the Hospital in order to identify diverse challenges from users which will act as basis for management decision. This was the trial version or demo version of the main software. In order to ensure the effective use of the software, the trial version took a number of months before its evaluation. This was found in the expressed view of the general director of the Hospital:

“We had to go through an initial trial of the system. Firstly, all the various individuals were retrained to use what is applicable to them in their departments. We had a demo version that we used and everyone was supposed to make at least some minimum number of entries within a certain number of months” (R1, General Director University of Ghana Hospital)

The general implication regarding the implementation process was that, it was systematically executed, tested and adopted. This shows that the required procedure regarding HIS adoption and implementation were given the preeminence by management of the Hospital.

(c) Phases of Implementation of EBF Software

Another theme found based on the views expressed by respondents or participants was phases of implementation of the HIS. Although, almost the entire respondents intimated that the entire electronic process was implemented at once leading to the total scrapping of the manual system, not all departments or modules were implemented at the same time. This indicates the use of direct conversion and hybrid implementation approaches. The implementation process was found to occur in three stages or phases namely OPD and IPD, External Agencies or Satellite stations, and supporting services.

This can be categorised as clinical departments and non-clinical departments. According to respondents, the phases of implementation occurred in modules. Across departments and units, twenty-five (25) modules were developed for the Hospital.

- OPD and IPD Phase

The first rolling process or implementation of the software was the OPD and IPD. It was found that all OPD sections or units of the Hospital were implemented at a go including medical records, laboratory, pharmacy, dental etc. In order not to constrain the system the IPD section or units of the Hospital was also rolled in addition. This was to allow the clinical section of the hospital to function. The rolling process was found to be done based on modules including medical records module, Ward A, B, C etc modules, pharmacy module, laboratory module, surgical module, doctor's module, nurse's module etc. All the modules were rolled or implemented in order to ensure effective working of the clinical section of the Hospital. This was captured in words of the Head of Medical Records as:

"I think the OPD was implemented at a go. When we talk of OPD we are talking of medical records module, laboratory module, pharmacy module, doctor's module and the

nurse's module. So the IPD was supposed to follow the OPD but because of the intervention and what happened we had to roll them together”.

- External Agencies/Satellite Station Phase

The second phase was the satellite station phase. The satellite stations of the Hospital included City Campus clinic, University of Ghana campus clinic and University of Ghana Korle-Bu clinic. These agencies were also rolled in full during the second phase. The aim was to ensure that all parties or clinics that are part of the University Hospital are part of the full adoption and implementation of the system. This was found in the words of Head of Finance Department:

“We did not also roll city campus, Korle-Bu and main campus clinics. So at the hospital everything was working at the same time with the exception of these external clinics that are parts of the University of Ghana Hospital. They took effect at the second phase”.

- Supporting Services Phase

The next or third phase was the implementation of modules for supporting services. The supporting services areas were found to include mortuary, laundry, catering, transport, finance, administration etc. Each of the supporting unit has its own module. The module allowed the supporting services to be rolled out into the main system. It was found that the finance module which feeds through all the other 24 modules was the last to be implemented. The financial module acted as a super power that has direct link with all other modules within the HIS. This means the financial director has access to all other modules. This was captured in the words of Head of Laboratory as:

“After these, we added the catering, the transport, mortuary and the others. Finance was the last phase because all of them feed into the finance”.

4.3.2 Effect of the Implementation of System Consult Software (SC) on Service Delivery

With regards to system consult, the study found that there was difficulty regarding its full implementation across departments and units. Its impact regarding service delivery was poor resulting in delay in quality of service to patients as well as high cost on the part of management. The failure of the system was as a result of its enormous challenges.

4.3.3 Effect of the Implementation of EBF Software on Service Delivery

The implementation process was found to be easy, effective and ensured equitable distribution of modules across all departments and units. The effect of the software on service delivery has been positive and reliable in recent times.

4.4 Use of Hospital Information System

The use of Hospital Information System was examined and the result is presented as follows based on themes development.

- Use of SC Software

Although, the software was utilized in the hospital, few departments utilized its which was even very difficult to use. Respondents intimated, that the SC was difficult to use and this led to many people resorting to the manual process. This was indicated by the Head of Finance Department as:

“The old software was very difficult to use. It could not link all the departments where information can be shared. It was almost the same as the manual system, because reports were getting missing and identification of folders were sometimes challenging. This led to the complete resorting to the manual system”.

- Use of EBF Software

The use of the EBF from November 2015 till now was intimated by respondents to be a reliable software in comparison to the SC. On this level various themes were developed and presented as follows:

➤ Education and Training

Education and training of the staff regarding the use of the software was done across all departments and units.

It was found that providing the required training and education on the software is a prerequisite for staff and management to understand and use the software at the Hospital. According to majority of the respondents (8 of the respondents), the aim was to provide knowledge, insight and understanding regarding the use of the software. The education and training allowed management to adopt a new model from the standard model of software implementation which usually combines paper work with software usage. The education and training were done in two phases: training at group level and training at the individual level.

According to the entire respondents, training at group level allowed software development agency to interact with the groups and allowed each unit to provide its own suggestions which are peculiar to its department or unit. In addition, significant number of the respondents indicated that the individual training allowed for individual challenges to be handled. This was expressed by Head of Dental Department as:

“With regards to the training, everybody took part, but during the implementation we needed to go and work with them again because some of them came just to listen. So apparently this was done on group level and individual level”.

- Access and Use

The use of the EBF Software was found across all the departments and units of the Hospital. Further, 11(91.6%) of the respondents intimated that the modules were developed to provide access and use. The access and use had strict demarcation for users of the modules. It was found that a nurse cannot have access to the doctor's module. However, medical doctors have access to some modules within OPD and IPDs. Respondents indicated that the demarcation for access and use is based on a slogan called "No Access No Use". This means without access one cannot use a particular module. In addition, it was found that critical factors underpin access and use namely: the nature of work of the staff, assigned roles of the staff, experience of the staff within the unit or department, position of staff and relevant modules to be appropriate for the staff. However, it was found that only two people within the Hospital management were super users of the system. This means they have access to all the twenty-five (25) modules. The super users were found to be Head of Finance and Deputy Head of Finance. It was found that these two people within the finance department have access and use regarding all the twenty-five (25) modules. This was captured in the words of some respondents:

"Even in finance, it is not everyone who can see everything in the finance department unless you ask for it. If I take you to the cash office right now, the only thing visible to the cashier is the cashier's module. If you go to a doctor, the only thing visible to the doctor is the doctor's module. When I take you to the lab, the only thing visible to the laboratory technician is the laboratory module. If you go to the medical records, the only thing visible to the person is the medical records module" (R2, Head of Finance, University of Ghana Hospital)

"So those of us who are super users see everything. If I open my module, you will see all the 25 modules being dropped. The only people who chris-cross are the doctors. A

doctor can see IPD and can see OPD. So, there is strict demarcation” (R2, Head of Finance, University of Ghana Hospital)

By implication, it is evident that the HIS is being utilized by all staff within the University of Ghana Hospital. The basic elements underpinning the use of the Hospital Information System (HIS) is based on access. This means without access one cannot use a particular module. This shows enormous amount of privacy, security and demarcation of roles within the HIS adopted by the University Hospital. Utilization of a particular module is highly dependent on the work and assigned roles of the person.

4.4.1 Effect of Use of System Consult Software (SC) on Service Delivery

With regards to the system consult, the study found that there was difficulty regarding its use across departments and units. Its impact regarding service delivery was poor resulting in delay in quality of service to patients as well as high cost on the part of management.

4.4.2 Effect of Use of EBF Software on Service Delivery

The study found significant number of themes with regards to the use of the EBF software in the University of Ghana Hospital. The themes included service delivery, cost savings, employee impact and management impact.

➤ Service Delivery

Almost the entire respondents intimated, that there has been significant improvement in the quality of service delivered by the Hospital. The service delivery to patients has been quick, effective and efficient.

➤ Cost Savings

The study discovered, that the software has helped the Hospital to save cost. According to the Head of Finance, most costs regarding stationery and laboratory data transmission have been low. This is because the software has an inbuilt patient folder system and laboratory information transmission system which allow the hospital to purchase that equipment through the electronic means.

➤ Employee Impact

Significant number of respondents indicated, that the software has improved the work performance of employees. This is because it is easier to obtain and share information and communicate on important issues without necessarily moving to the other person.

➤ Management Impact

Management has increased their efficiency of work since it is easier to identify the number of patients who have made visits to the hospital in a day, number of patients who have made payments and number of tests that have been conducted as well as number of patients that have been attended to within a specific time frame. These make report writing and management decision making easier and faster.

4.5 Factors Enabling or Constraining the Implementation and Use of Hospital Information System at the University of Ghana Hospital

The second objective of the study was to investigate factors enabling or constraining the implementation and use of hospital information system at the University of Ghana Hospital. In order to ensure effective operation using hospital information system at the University of Ghana

Hospital, the theme development was categorised into two namely: enabling factors and constraining factors.

4.5.1 Factors Enabling the Implementation of SC Software and EBF Software

The study investigated factors that enabled effective implementation of the hospital information system at the University of Ghana Hospital. The study found significant factors that propelled the effective implementation of the system. These are presented as follows:

- Enabling factors of Implementation of SC software

The factor identified by respondents with regards to the implementation of the SC software were the need of the hospital for a software and the software being a gift.

- Enabling factors of Implementation of EBF software

The study identified some factors that enabled the implementation of the EBF software. These factors are presented as follows:

- Effective Collaboration between Staff and Service Providers

The introduction of the new software was the result of the significant level of collaboration between staff of the hospital and providers as well as software developers. This collaboration fostered effective implementation of the software at the Hospital. This is because the software acquired was the proposed and preferred software by staff of the University of Ghana Hospital. According to 11(91.6%) of respondents, this brought effective cooperation between management, experts at the University of Ghana computing systems and other relevant professionals. It also helped in reducing the perception of imposition of software, corruption within top management level and the ability to sabotage the adoption and use of the software.

- Manual system through to the adoption of EBF

It was discovered that the new software (EBF) was a replacement of the old manual system because of the challenges with the manual system and its implementation and not a replacement of the previous software (SC). The total replacement has helped the hospital to move from manual information transmission and operation to the technological information transmission. The current software was found to be far better and has a lot of advantages as compared to the previous one. This was captured in a view expressed by the respondent:

“We totally replaced the SC. In fact, it was causing a lot of problems. The lost was to the extent that, after a year and a half of my presence here, I decided to suspend it and go fully manual. (R1, General Director University of Ghana Hospital)

“Initially, we were going manual, thus, when I came. There were a lot of inefficiencies with the manual system. The system was also slow. If you were called to do analysis, it was difficult because you had a lot of data written that was very difficult to gather. It was usually easier if you had an electronic system. The adoption made the work faster. It also reduced a lot of inefficiencies and helped in timely analysis and ensured reference” (R3, Head of Pharmacy, University of Ghana Hospital)

- Economical and Cost Saving Nature of the Software

The indication from respondents shows that the EBF software is more economical, cost saving, efficient and has the capacity of ensuring effective information transmission which started in full operation on November 2015. This in effect underpins the effectiveness and efficiency of the system. It was intimated that the software developers and providers supported the implementation process throughout. The economic and cost saving nature of the software

allowed management to adopt such software which was far better than the old manual system. It was indicated by the head of finance that:

“The major one I can give you is the reduction of our stationery cost from GHC 16 million to GHC 56 thousand Ghana cedis in 2016”.

4.5.2 Factors Enabling the Use of SC Software and EBF Software

The study investigated factors that are enabling effective use of the hospital information system at the University of Ghana Hospital. The study found significant factors that propel the effective use of the system;

- The Enabling Factors of Use of SC software

The study identified no factor that enabled easier use of SC software at the Hospital.

- The Enabling Factors of Use of EBF software

The study identified significant factors enabling the use of EBF software. These include:

- Training and Education

Training and Education regarding the use of the software was vital to the overall usage process. It was intimated that providing the required training and education on the use of the software was a prerequisite for staff and management to understand and use the software at the Hospital. Training and Education on the use of the software helped staff and management to acquaint themselves with the software in order to ensure its use effectively and efficiently. This fostered the continuous use of the software resulting in improvement in the operation of the institution.

- Easier Use

Almost the entire interviewees indicated that the EBF software is very easy to operate since each one is operated on module forms. The module allowed each person to use the software on the

same platform. The easier use of the software motivated greater number of staff to learn and obtain one-on-one training and education from the software developers.

- Role of the Medical Director or General Director

Another enabling factor attributed by respondents to the success of the implementation and adoption regarding the use of the hospital information system was the critical role played by the medical director of the Hospital. According to respondents, the medical director ensured that the process was transparent, training was provided, collaboration and effective consultation were done, all contributed to the success story of the Hospital regarding HIS. This helped people who were eager to agitate or unwilling to stay as well as technology phobic to adapt significantly to the system. This was captured in an extract of the Head of Finance:

“The software implementation and use became successful mainly because of the medical director. I do not know if you have worked in the hospital before. In the hospital, those who cause a lot of problems are the medical doctors. They did not want to use this software. So the medical director called for a meeting and he said: ‘we have informed the University we wanted a software and they have given us one, so if you think you cannot work with it you can resign. He can go and inform the Vice chancellor, that all his doctors have resigned because of the software. So, let us throw the software away or let us go and bring new doctors. If you think you cannot use it you can resign’. These were the words he used. And that solved the problem.” (R2, Head of Finance, University of Ghana Hospital)

This clearly shows that the top management were willing to succeed regarding the software implementation and utilization. This therefore helped individuals to request for one-on-one and personal training regarding the use of the software. This therefore improved the knowledge level of staff and the use of the software on regular basis.

4.5.3 Factors Constraining the Implementation and Use of SC Software and EBF Software

The study investigated the constraining factors that impeded the smooth implementation and use of Hospital Information System (HIS) at the University of Ghana Hospital.

- Factors Constraining the Implementation of SC software

The study identified the inability to implement the SC software in all the departments as well as the negative attitude and behavior of some medical practitioners as constraining factors.

- Factors Constraining the Use of SC software

The study identified some challenges of the SC that led to the reversion to the manual system, then to the introduction of the new hospital information system (EBF software). The difficulty with the use of SC software included fewer staff that could understand, expensive nature of the SC software, not getting value for money, poor records keeping, inability to do follow up, slower pace of work, unable to raise proper bill, delay in reporting, delay in laboratory result, delay in treatment commencement, frequent folder lost and very costly nature of managing the old system. The SC software was found to have more potholes since some people do not pay for treatment or drugs at the hospital. This was captured in an expressed view of the respondent:

“There was an old system that had been implemented in the hospital which had a lot of challenges. It was only few people who were able to use part of the system. It was virtually like a gift to the institution but it was more expensive because we were not getting the value for money. Also, we were not able to really get our records right and we were

unable to follow up our data. We were unable to raise the proper bill that has to be raised”
(R1, General Director, University of Ghana Hospital)

“There were a lot of inefficiencies with the manual system. The SC software was also slow. If you were called to do analysis, it was difficult because you had a lot of data written that was very difficult to gather. It was usually easier if you had an electronic system. The adoption of EBF software made the work faster. It also reduced a lot of inefficiencies and helped in timely analysis and ensured reference. You don’t need to go and look for books before searching and trying to use them. You just click something then the information will just pops up” (R3, Head of Pharmacy, University of Ghana Hospital)

By implication, the full installation processes started on a slow note and became fully encrypted into the hospital system systematically. Although, some staff had challenges and wanted to relegate to the old system, the vision of the University of becoming a World Class University through advance technological usage led to the continued use of the new software. The new software was found to allow for alteration and addition that suit the operations of the Hospital. It has brought a lot of advantages as intimated by respondents to include proper documentation, adequate record keeping, effective communication, easier linkages within the system, access to required information on time etc. This therefore made people more committed and cooperative during the whole implementation and utilization process. This was captured in an expressed view of the respondent;

“In using this electronic system, we have also realized some of the things that we would have loved to have, that were not part of it and we were very happy to have people who were very cooperative with us” (R1, General Director, University of Ghana Hospital)

It was also found that the constraining factors can be alleviated through constant training on new additions to the software, provision of adequate stand-by power and provision of another server. This will help prevent work halt during power crisis or maintenance work at the University hospital.

- Factors Constraining the Implementation of EBF software

The study discovered that the only constraining factor regarding the implementation of the EBF was the adamant behaviour of some medical doctors. The initial installation process was faced with some unethical behaviour of medical practitioners of the Hospital. However, this was curtailed through the crucial role played by the medical director of the Hospital.

- Factors Constraining the Use of EBF software

The study discovered factors including difficulty in adapting to the new software by staff of the Hospital, few people were able to use the software at the initial stages of installation, initial reluctance of some doctors, difficulty in following up on data using the new software, power problems, server issues, slower pace upon which the new software was adopted and used by staff, and the adamant nature of some staff in accepting the new software.

4.6 Impacts of the Implementation and Use of the Hospital Information System (EBF Software) on service delivery and the Goals of the University of Ghana Hospital

The third objective of the study was to examine the impact of the implementation and use of the hospital information system on service delivery by the University of Ghana Hospital.

Respondents indicated that the implementation of the EBF has helped the University of Ghana Hospital achieve its mandated goals.

The system has been effective with regards to information transmission, record keeping, consumption pattern and tracing of medication, reduction in medical errors, effective treatment of patients on timely basis and identification of challenges within the system. It was intimated that the system allows staff, management and operators to trace and observe critical information and issue from home. This allows for better communication among workers even when workers are out of post. Emergency room and issues can be assessed and observed even at home using the hospital information system.

It was also found that prescribed medication for a patient can be observed as well as effective monitoring of attitudes of workers within the hospital. This has the propensity of reducing or eliminating medical and medication errors which have become some critical issues in Ghana in recent times with regards to healthcare service delivery. The system allows for effective operations within the hospital leading to the achievement of the slated goals of the hospital as well as the University of Ghana as a whole. The system has helped to improve communication between health professionals and ensures confidentiality of patient data and records. Adding to this, the HIS improves quality of healthcare service delivery and facilitates the standardization of medical procedures in order to achieve the slated goals of the University of Ghana Hospital.

The findings of the study showed that “Human factor” played double-edge role in the implementation and use of the Hospital information system at the University of Ghana Hospital.

The human beings were the major factor towards the success of the implementation and use of HIS. Similarly, the human elements were critical factors that played crucial roles regarding the challenges faced during the implementation and use of the HIS. It is clear that the effective management of the human elements during the decision making process, documentation process, procurement process, implementation stage and utilization stage led to the overall achievement of the system at the University of Ghana Hospital. The ‘‘access and use’’ concept also contributed significantly in protecting and securing the system across persons, groups, departments, units and offices. The system also allows for effective operations within the Hospital leading to the achievement of the slated goals of the hospital as well as the University of Ghana as a whole.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0 Introduction

This chapter of the study discusses the findings by making inferences from the analysis of the data obtained from respondents. Various inferences were made by the researcher to describe the findings in relation to literature. The findings of the study were discussed in line with the slated research objectives and questions. This is presented as follows:

5.1 Implementation and Use of hospital information system at the University of Ghana Hospital

The first objective of the study was to investigate how hospital information system was implemented and used at the University of Ghana Hospital. The findings in relation to this objective were discussed based on (1) implementation of HIS and (2) uses of HIS.

With regards to the implementation of Hospital information system, the study found that the Hospital has over a decade implemented two HIS namely System Consult (SC) (Old software) and Equipment Business Frame software (EBF) (New Software). It was found that the SC was implemented on a parallel level, thus, using the electronic and manual system which lasted for only 6 months. However, the EBF was implemented fully and completely on electronic level and still in use since November 2015 using direct conversion and the hybrid implementation approaches. This clearly shows that the Hospital recognises the need for effective HIS in order to help meet the increasing needs of its clients.

The recognition and existence of the EBF in the Hospital indicate the critical evaluation process conducted by Hospital management in order to adopt a software that has less challenges than the SC. By implication, the existence of the EBF premised on the need to deliver timely, effective and quality healthcare service through decisions of management to the growing number of people attending to the facility. This is in congruence with the study by Oyeyemi and Wynn (2014), who discovered that the demand for HIS are in high demand to handle the ever-growing population health needs, help health practitioners with timely services delivery and precision. The existence of HIS is very crucial to social economic development of healthcare agenda.

In addition, the process of implementation of the SC was found to be difficult, expensive and the existence of the manual process did not motivate employees or staff to use the software. The SC implementation process was found to be fraud and no procurement standards were followed since it was a gift.

These were factors considered by management when the EBF was adopted for implementation. The EBF was adopted and implemented through a systematic and internationally approved standard of procedures. The implementation process of the EBF included institution of a committee, engagement or consultation with the University Council, Hospital departments and units, procurement processes, demonstration, installation, education and training. It is clear to indicate that by bringing together diverse people within and outside the Hospital allowed for fairness, transparency, and accountability. By implication, it is succinct to expound that the EBF implementation process was effective by allowing diverse departments and units within the hospital to contribute their quota toward the overall development and adoption of the system. They included staff of the Hospital, Hospital Management, External partners, Technical officers, University Council representation and University computing systems representation.

This was an indication of proper and effective good governance practices at the Hospital. It also suggests that the implementation process was not jeopardized as in the case of the SC, however, was systematically executed, tested and adopted. This is because the process allowed the University which is a public institution to follow the Procurement Act, 2003 (Act 663) of Ghana as well as international standard practices. The findings support the study by Takhti, Rhaman, Abedini and Abedini (2012), who utilized a descriptive-cross sectional study on the impact of hospital information systems, and found a positive view about hospital information system implementation and its use. The authors indicated that engagement of internal and external persons regarding HIS adoption has the propensity of bringing effective management and positive result.

Moreover, the implementation process of the SC was done in a single phase in congruence with the manual process. However, the EBF was carried out on a significant number of phases. It was found that although, the EBF was implemented entirely using the electronic process resulting in total scrapping of the manual system, not all departments or modules were implemented at the same time. This method is called the hybrid implementation approach. The implementation process was found to occur in three stages or phases namely: OPD and IPD, Satellite station, and supporting services as well as in modules. This implies that a systematic process was followed by the Hospital in order to ensure effective implementation of the EBF. The purpose was to reduce the challenges encountered during the implementation of the SC and to provide a good frame for the system to be efficient across departments and units. This suggests that the phase levels of implementation were to ensure that challenges are tackled within phases and across modules in order to ensure that staff embrace the system to the fullest. This confirms the findings by Bakshi and Shakeel (2012), using an exploratory design, found that implementation of HIS

that is carried out in a systematic and in an orderly manner helps to identify challenges at each stage of the process and solutions meted to those challenges at each stage of the process. This according to the authors exerts significant effect on healthcare delivery as well as effective implementation of HIS devoid of problems.

Further, the net effect of the SC and the EBF was found to be positive for the latter and negative for the former. The effect of the SC on the implementation of HIS at the University of Ghana Hospital was found to be poor and negative resulting in a delay in quality healthcare service delivery and high cost incurred by the Hospital. However, the implementation of the EBF was found to be easy, effective and ensured equitable distribution of modules across all departments. The effect of the EBF software on service delivery was found to be positive and reliable. This suggests that the EBF implementation has been very effective towards the achievement of quality healthcare service delivery by management of the Hospital. The implementation was successful as planned and executed by management of the Hospital. This has the propensity of encouraging other public and private hospitals in Ghana to adopt proper software that would exert significant effect on healthcare delivery in Ghana. The findings confirm the study by Hekmat et al., (2016), who intimated that the main goal of hospital information system is to integrate health information to meet the needs of patients, improve quality of care, reduce costs, and automate tasks such as reporting test results, and entering physician's order. The authors found that effective implementation of hospital information system results in positive outcomes and achievement of overall goal of HIS.

With regards to the use of the HIS at the University of Ghana hospital, the study discovered that, the SC was used by few departments because it was difficult to use leading to the total utilization

of the manual process. However, the EBF was found to be without difficulties because of the process of use adopted by the management of the Hospital.

The process of use included education and training, and access and use. This process allowed staff to be conversant with the software and its use in order to deliver quality of service. By implication, it is evident that, HIS is being used by all staff within the University of Ghana Hospital. This is because all staff including management went through thorough training and education at both group and individual levels. The basic elements underpinning the utilization of the Hospital Information System (HIS) was based on access and use. Without access, one cannot use a particular module. The access and use had strict demarcation for users of the modules. This shows enormous amount of privacy, security and demarcation of roles within the HIS adopted by the University Hospital. Utilization of a particular module is highly dependent on the work and assigned roles of the person. The finding is also consistent with the work by Bakshi and Shakeel (2012), who sets out to study hospital information system in its totality at tertiary teaching hospitals. Using an exploratory design, it was found that about 53% of the hospital staff use hospital information system frequently. It was also indicated that access is a critical component regarding the use of the hospital information system. Access was determined based on work of the person, experience, and position.

Further, the net effect of use of the SC was found to be negative resulting in failure of the system. However, the EBF was found to have significant positive effect on service delivery, management, employees and cost. The EBF have assisted the Hospital in providing quality service delivery, reducing cost, meeting the needs of clients and achieving the overall goal of the University as well as the Hospital. This implies that the use of Hospital information system has brought significant changes within the work system of the Hospital resulting in efficiency,

quality of work on time and within the specific work period. This has contributed in saving lives and providing effective financial prudent system to the University of Ghana Hospital.

This is consistent with the study by Thakare and Khire (2014), which indicated that given the importance of hospital information system, its implementation and use have potential benefits to the healthcare sector. The authors found that effective use of HIS brings about potential benefits such as quality of service, cost savings, reduction in management expenditure and efficiency of work.

5.2 Factors Enabling or Constraining the Implementation and Use of Hospital Information System at the University of Ghana Hospital

The second objective of the study was to investigate factors enabling or constraining the implementation and use of hospital information system at the University of Ghana Hospital. The findings in relation to this objective were discussed based on (1) enabling factors and (2) constraining factors.

With regards to enabling factors, the study found significant factors that propelled the effective implementation of the system (EBF). These factors included effective collaboration between staff and service providers, replacement of the manual system with the EBF, and economical and cost saving nature of the EBF. This shows that strategic alliance called collaboration was very important in enabling the effective implementation of the EBF. By implication, management were highly critical in saving cost and providing the best for the Hospital. The replacement strategy adopted shows the visionary nature of the hospital management with regards to HIS adoption and implementation. This supports the study by Boonstra and Brockhuis (2010), who found that the critical enabling factors for ensuring effective implementation of HIS include vision of management, collaboration with employees and cost saving of the system.

Further, the enabling factors that ensured effective use of HIS thus, the EBF included adequate training and education, easier use of the software, and role of medical director or management. By implication, it is clear that training was one of the critical indicators that provided staff with knowledge regarding the use of the software in the Hospital. The training and education gave staff and management confidence in the use of the system. It is clear that the friendly nature of the EBF propelled its use. In addition, the role of management most especially the hospital director, made staff to be more committed and cooperative during the whole utilization process. This supports the findings by Correia et al., (2013), which employed a survey design and discovered that, a high use of hospital information system was revealed in the areas of financial planning and management decision-making. The factors that, enable the use included management decision making, staff training and effective collaboration between staff and software providers.

The study investigated the constraining factors, that impeded the smooth implementation and use of hospital information system (HIS) at the University of Ghana Hospital. With regards to implementation constraining factors, the study discovered that, the SC was difficult in its implementation as well as adoption. Further, the attitude and behaviour of some medical practitioners during the implementation process constrained timely implementation of the EBF.

Moreover, with regards to use, it was found that the SC had significant number of constraints including fewer staff who could understand, expensive nature of the SC, not getting value for money, poor records keeping, inability to do follow up, slower pace of work, unable to raise proper bill, delay in reporting, delay in laboratory result, delay in treatment commencement, frequent folder lost and very costly nature in managing the SC. Further, SC was found to have

more potholes since some people do not pay for treatment or drugs at the hospital. The EBF was found with few constraints.

These constraints included difficulty in adapting to the new software by staff of the Hospital, few people were able to use it at the initial stages of installation, initial reluctance of some doctors, difficulty in following up on data using the EBF, power problems, and server issues. By implication, each software has its own peculiar problems with regards to implementation and use of the software. However, although the EBF was found to have some level of constraints; the constraints were not with regards to the software itself as in the case of the SC. The problems were found to be external to the software including power and server issues. This resulted in successful implementation and use of the EBF as compared to the SC at the University of Ghana Hospital. Despite the constraint regarding the implementation and usage of the software, the EBF was instituted effectively. This has result in effective running of the Hospital and its operations.

The findings regarding constraining factors support several studies which identified constraint to the implementation and use of hospital information system. Boonstra & Brockhuis (2010) Smelcer et al., (2009); time consuming (Tossy, 2014) technology and technical problems such as complex system and integration problems (Farzandipur, Jeddi, & Azimi, 2016; Kimiafar et al. 2015); fundamental problems such as lack of computer skills, complex tasks, complex function (Ajami & Bertiani; 2012; Khalifa (2013).

5.3 Impacts of the Implementation and Use of the Hospital Information System (EBF) on Service Delivery by the University of Ghana Hospital

The third objective of the study was to examine the impact of the implementation and use of the hospital information system on service delivery leading to the achievement of the goals of the University of Ghana Hospital.

The study found that the SC failed to exert significant impact on service delivery of University of Ghana Hospital.

However, the EBF implementation and use has helped the University of Ghana Hospital achieve its mandated goals through effective service delivery. The EBF has been effective with regards to information transmission, record keeping, consumption pattern and tracing of medication, reduction in medical errors, effective treatment of patients on timely basis and identification of challenges within the system. The findings suggest that the contributions of the EBF to management and staff regarding effective service delivery have been enormous. The system has given the Hospital an international recognition.

Even though some studies have revealed that impact of hospital information system on goals of Hospitals have not been achieved in some African countries such as Nigeria, Kenya etc (Benson, 2011; Batra & Pall, 2015), this does not belittle the study by Cilliers and Flowerday (2013). Cilliers and Flowerday (2013) employed a quantitative survey approach to seek for the views of rural health workers and urban health workers on HIS impact on Hospital goals. From the study, it was revealed that rural health workers viewed telemedicine more useful as compared to urban health workers. However, all the workers viewed telemedicine as haven contributed to the goals of their Hospitals. Further, the contrary finding does not disparage the discovery in the study that HIS in University of Ghana Hospital within the past three years has helped in the achievement of the slated goals of the Hospital.

5.4 Theoretical Implication

The findings of the study contributed greatly to the stakeholder theory adopted by the study. The theory aroused from a recognised need to measure the success of an organisation above the financial indicators and considering the vital role of stakeholders. The findings from the study

regarding HIS in the University of Ghana Hospital provided enabling and constraining factors which helped to understand the performance or success of the Hospital.

This gives more insight into its current status regarding future plans of the Hospital in providing effective healthcare service.

The findings also provided a clear understanding of the strategy of the Hospital within the frame of the mission and vision of the University which is a critical component of the stakeholder theory. It was found that the implementation and use of Hospital information system has been successful despite some few challenges, suggesting the achievement of the Hospital with its use.

The findings showed clearly that the decision of management of the Hospital as well as Staff was not based on emotions and assumptions but based on accurate information that would ensure effective delivery of healthcare services to patients. With regards to the technological world, modern Hospital and business models are critically based on intangible assets such as employee skills, willingness, capacity, knowledge level, relationship with heads and managers and innovative culture which underscore the effective implementation and use of HIS at the University of Ghana Hospital. These critical factors were considered carefully by management which support the assumption underlying the stakeholder theory.

The findings showed that a number of consultations and collaborations were done during decision making at managerial level, documentation stage, procurement stage, implementation stage through to utilization stage. It is clear that diverse stakeholders such as management of the University, staff of the Hospital, University of Ghana Computing systems, Representation of departments and units at the Hospital, IT developers and other relevant bodies within the frame of HIS adoption and implementation were sourced. These consultations, discussions, training and development led to the eventual implementation and use of the Hospital information system. The

collaboration and engagement with diverse stakeholders helped in building effective relationship between management and other relevant stakeholders.

Confidence was developed and built by all stakeholders resulting in positive attitudes towards the implementation process and the use of the software. This therefore supports the stakeholder theory which is an organisational management and business ethics indicator that seeks to address morals and values in the organisation.

5.5 Practical Implication

The findings of the study showed that “Human factor” played double-edge role in the implementation and use of the Hospital information system at the University of Ghana Hospital. The human beings were the major factor enabling the success of the implementation and use of the HIS. Similarly, the human elements were factors that played crucial role regarding the challenges faced during the implementation and use of HIS. It was clear that the effective management of the human elements during the decision making process, documentation process, procurement process, implementation stage and utilization stage led to overall achievement of the system at the University of Ghana Hospital.

The “access and use” concept also contributed significantly in protecting and securing the system across persons, groups, departments, units and offices. The system also allowed for effective operations within the Hospital leading to the achievement of the slated goals of the hospital as well as the University of Ghana as a whole.

5.6 Limitation of the Study

This study focused on hospital information system. This limited the scope of empirical data used in the study. This implies that discussion centering on the findings of the study was narrowed to only hospital information system and not health information systems in general.

Incidentally, this also pointed out the uniqueness of the study as most empirical studies encountered focussed on health information systems. Focusing the study on the University of Ghana hospital also defined the scope of the study. It means that the study does not consider other healthcare institutions. This also goes to emphasize that the findings of the study was interpreted in light with what pertains at the University of Ghana Hospital. Furthermore, employing an interpretive case study design also limited the scope of this study in terms of the number of respondents used.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION, CONTRIBUTIONS OF THE STUDY AND RECOMMENDATIONS

6.0 Introduction

The purpose of the study was to investigate ICT-led hospital information system in the management of health services with particular reference to University of Ghana Hospital. This chapter of the study presents the summary of findings, conclusion, contributions and recommendations of the study with regards to the topic under investigation. The summary of findings was presented in line with the posited research objectives and questions. The chapter also provides thorough conclusion drawing inferences from the findings of the study. In addition, the contributions of study covered two critical areas including literature or theory and policy which is subdivided into micro and macro policies. Also, recommendations for practical and future research were made.

6.1 Summary of Findings

In recent times, Hospital Information System (HIS) is regarded as a significant part of the healthcare system, on which the processes of healthcare service delivery in hospitals and different types of healthcare organisations depend on. Therefore, its role in providing adequate healthcare has not been a debate. The implementation and use of HIS has been there for decades most especially in developed countries including the middle-east. At the beginning of HIS, the primary development was for healthcare professionals mainly physicians.

However, now the implementation and use cover administrative staff, supporting staff, nurses, patients and even the family of patients. This has therefore made the development of HIS software difficult and challenging. In light of this, the study stipulated three objectives and three research questions to examine the implementation and use of HIS at the University of Ghana Hospital. The summary of the findings are presented as follows:

The first objective of the study was to investigate how hospital information system was implemented and used at the University of Ghana Hospital. With regards to the implementation of Hospital information system, the study discovered that the Hospital had a need for HIS. Therefore, the Hospital has over a decade implemented two HIS namely System Consult (SC) (old software) and Equipment Business Frame software (EBF) (New Software). It was found that the SC was implemented on a parallel level thus using the electronic and manual system which lasted for only 6 months. However, the EBF was implemented fully and completely on electronic level and still in use since 2015 using direct conversion and hybrid implementation approach.

Further, the process of implementation of the SC was found to be difficult, expensive and the existence of the manual process did not motivate employees or staff to use the software as compared to the EBF which was found to be easier. It was discovered that the implementation went through a systematic and internationally approved standard of procedures including institution of a committee, engagement or consultation with University Council, Hospital departments and units, procurement processes, demonstration, installation, education and training. Moreover, the implementation process of the SC was done in a single phase in congruence with the manual process. However, the EBF was carried out on three phases namely OPD and IPD, External Agencies, and supporting services. The effect of the SC on the implementation of HIS at the University of Ghana Hospital was found to be poor and negative

resulting in delay in quality healthcare service delivery and high cost incurred by the Hospital. However, the implementation of the EBF was found to be easy, effective and ensured equitable distribution of modules across all departments. The effect of the software on service delivery was found to be positive and reliable.

With regards to the use of HIS at the University of Ghana hospital, the study discovered that the SC was used by few departments because of its difficulty in using, resulting into total utilization of the manual system. However, the EBF had limited number of challenges. The processes of use included education and training, and access and use. The basic elements underpinning the utilization of the Hospital Information System (HIS) was based on access and use. Without access one cannot use a particular module.

The second objective of the study was to investigate factors enabling or constraining the implementation and use of hospital information system at the University of Ghana Hospital. With regards to enabling factors, the study found significant factors that propelled the effective implementation of the system (EBF). These factors included effective collaboration between staff and service providers, reversion of the SC to the manual system and the replacement of the manual system with the EBF, and economical and cost saving nature of the EBF. The enabling factors that ensured effective use of the HIS, thus, the EBF included adequate training, easier use of the software, and role of medical director or management.

Moreover, with regards to implementation constraining factors the study discovered that there was difficulty in the implementation as well as adoption of the SC software. Further, the attitude and behaviour of some medical practitioners during the implementation process constrained timely implementation of the SC. Moreover, with regards to use, it was found that the SC had significant number of constraints including fewer staff that could understand, expensive nature of

the SC, not getting value for money, poor records keeping, inability to do follow up, slower pace of work, unable to raise proper bill, delay in reporting, delay in laboratory result, delay in treatment commencement, frequent folder lost and very costly nature in managing the SC

The third objective of the study was to examine the impact of the implementation and use of the hospital information system on service delivery by the University of Ghana Hospital. The study discovered that the SC failed to exert significant impact on the goals and service delivery by the University of Ghana Hospital. However, the EBF implementation and use has helped the University of Ghana Hospital achieve its mandated goals. The EBF has been effective with regards to information transmission, record keeping, consumption pattern and tracing of medication, reduction in medical errors, effective treatment of patients on timely basis and identification of challenges within the system.

6.2 Conclusion

The effective implementation and use of Hospital Information System (HIS) successfully is really significant with regards to the University of Ghana Hospital. The expectation is that the successful implementation and use should have the capacity of increasing legibility, reduction in material errors, limit costs and improve the quality of healthcare. From the findings, it was clear that the University of Ghana Hospital have implemented successfully the HIS called EBF. This has contributed significantly with regards to quality of healthcare diminishing the previous challenges associated with the use of SC and the manual system. Despite this contribution, the Hospital management continue to espouse the benefits and opportunities emanating from HIS in order provide greater transformation of the healthcare system at the hospital. Nonetheless, the journey to this ideal HIS is fraught within some level of challenges.

The challenges ranged from issues arising from the very nature of HIS, external factors, end-user problems to issues pertaining to the hospital information system (EBF) being used by the Hospital. In light of this, the Hospital has achieved its desired outcome of meeting the needs and expectations of patients, achieving the goals of the Hospital and providing generally quality healthcare. There is also clear indication that the implementation of the HIS in the University of Ghana Hospital focused critically on stakeholder integration, socio-cultural milieu of the Hospital whilst exploiting recent development within cloud technologies. These indications clearly underpin the success story of the Hospital. The findings generally indicated improvement in quality of service from the Hospital. This suggests that the criteria role played by HIS with regards to quality of healthcare delivery cannot be underestimated. It is important to understand that the implementation of HIS at the University of Ghana Hospital relate to a great organisational change that incorporates critical element of primary healthcare best practices. This change occurred at two critical levels namely: individual and group. With regards to individual, it provided new knowledge and understanding in terms of health technologies. Whiles the group level brought about transformation in relationships among staffs. Effective collaboration was found to be exceptional rather than norm as the system was a coordinated system of efforts. The implementation and use of HIS at the University of Ghana Hospital created a unique breadth and scope in effective health system management resulting in strong primary health care services.

6.3 Contributions of the Study

The contributions of the study are categorised into two sections. These include contribution to literature and contribution to Policy at the micro and macro levels.

6.3.1 Literature

This study provides inputs to the existing body of knowledge on ICT-led hospital information system in the management of health services which is unique to the University of Ghana Hospital but not others.

This was achieved by providing a critical insight to the implementation and use of hospital information system at the University of Ghana Hospital. It shows how strategic managerial steps are required in order to obtain a relevant software for effective healthcare service delivery. These include the need to follow procurement laws in Ghana as well as other relevant regulations on hospital information system implementation and use.

Further, there is a clear indication that involvement of diverse number of people in health care decision making and administration leads to the achievement of the slated goals. This adds to existing knowledge on effective stakeholder involvement in decision making at the hospital.

Also, the study contributes to improvement to existing implementation and use procedures by providing innovative policy framework needed to be followed for successful implementation and use of HIS at the hospital level.

Finally, the study adds to existing knowledge on implementation approaches by showing the need to adopt the direct and hybrid implementation approaches rather than the parallel implementation approach that have been touted in literature.

6.3.2 Policy

6.3.2.1 Micro

- The findings of the study would enable University of Ghana Council and the University of Ghana Hospital management to initiate or come out with a policy for the successful design and implementation of HIS implementation procedures and use.

- The findings of this study can help management of the hospital in the design and implementation of appraisal policy for hospital information system and more importantly assess the difficulties that militate the effective and efficient use of the system in hospitals.
- The findings will inform policy makers at the University of Ghana Council and the University of Ghana Hospital management to come out with a policy that calls for the policy makers to liaise effectively with the University of Ghana Computing Systems so that technical challenges are continuously addressed.
- The findings of the study would inform policy makers of the University of Ghana Council and University of Ghana Hospital management about how enabling and constraining factors affect the implementation and use of hospital information system in the hospital. Hence, its impact on healthcare service delivery by the hospital.

6.3.2.2 Macro

- The findings of the study would enable the Ministry of Health and other collaborating institutions to initiate or come out with necessary reforms from their respective institutions for successful design and implementation of HIS implementation procedures and use.
- The findings of this study can help Ministry of Health in the design and implementation of appraisal policy for hospital information system and more importantly assess the difficulties that militate the effective and efficient use of the system in Ghana.
- The findings of the study would inform policy makers at the Ministry of Health and other collaborating bodies about how enabling and constraining factors affect the

implementation and use of hospital information system in hospitals in Ghana. Hence, its impact on healthcare service delivery in Ghana.

6.4 Recommendations

The study recommendations were categorized into two namely practical/policy recommendations and recommendations for future research;

6.4.1 Practical/Policy Recommendations

Based on the findings of the study, the following recommendations are provided;

- The Hospital should liaise effectively with the University of Ghana Computing System so that technical challenges such as network issues and computers are working adequately. This will ensure continue working of servers as well as maintenance of software challenges through technical support.
- The Hospital must also continually ensure that HIS systems are upgraded most especially the models in order to meet the changing demands of patients and the university communities. This will ensure continue use of upgraded technology in meeting international standards in order to become a world class hospital.
- Since HIS implemented and used by the Hospital satisfies different users' needs, it vital that performance evaluation is conducted at least quarterly across models in order to prevent any information lost. This can be achieved through effective implementation of back-up plans.
- For effective evaluation to be achieved by the Hospital, it is recommended that the Hospital should adopt data standards which are essential step in ensuring data validation of the system. Consequently, this will ensure quality, accuracy and reliability of information or data source.
- Observing some challenges patients go through, is important that the Hospital increase the number of computer terminals at it point of care most especially OPD section.

- The Hospital should continue improve the vital role and benefits of using HIS by adopting multi-phase approach. The will begin with directors, managers, medical practitioners, nurses, public health workers through to kitchen staff. This will make all staff feel part with regards to HIS education.
- Improving the knowledge based on Hospital staff using HIS through training should not be an end but a continuous process. This will ensure regular and timely education of staff on new development within the HIS system.
- Further, the Hospital should develop in-house orientation and training programs through the support of University of Ghana Computing system. This will ensure proper orientation for newly appointed staff or staffs who have moved to different department to have the knowledge required for the work. It also helps newly recruited staffs to overcome negative beliefs and impressions regarding HIS use.
- Improving motivation of healthcare professionals at the Hospital to learn and train on using HIS by providing them with direct and indirect incentives will help ensure successful implementation and use of HIS. This will help curtail the human challenges affecting the operation of HIS at the Hospital.

6.4.2 Recommendations for Future Research

The following recommendations are provided for future research;

- Future researchers can investigate the role HIS in improving quality healthcare in some selected Hospitals in Ghana
- Future researchers should explore effective plans for implementation and use of HIS in Ghana
- Future researchers can examine implementation difficulties of HIS in Ghana

- A comparative study can be conducted to examine differences between implementation of Health Information System and Hospital Information System in Ghana.

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APPENDIX 1 (INTERVIEW GUIDE)

UNIVERSITY OF GHANA BUSINESS SCHOOL (UGBS)

DEPARTMENT OF HEALTH SERVICES MANAGEMENT

INTERVIEW GUIDE

Section A: Bio-data of the interviewee

1. How many years have you been working at the Hospital?
2. What is your position?
3. What is your age?
4. What is your marital status?
5. What makes the University of Ghana Hospital unique from other University Hospitals in Ghana?

Section B: Find out interviewee's department

1. Which department of the hospital information system do you belong to?
2. What are the existing departments in this hospital?
3. What is your role as a department of the hospital information system?
4. What are your goals as a department?

Section C: Find out why the implementation and use of hospital information System.

5. Why did your department choose to implement and use hospital information system?
(explore the importance)
6. How long has the existing hospital information system been implemented and used in this department?

7. Which hospital information system was implemented and used in this department prior to the implementation of the existing one?
8. What factors informed the choice of this particular hospital information system?
9. Can you elaborate the procedures or the processes followed in the implementation and use of the current hospital information system?

Section D: Find out how the hospital information system's implementation and use were enabled

10. What factors enabled the implementation of the hospital information system in this department?
11. What factors enabled the use of the hospital information system in this department?

Section E: Find out how the hospital information system's implementation and use were constrained.

12. What constrained the implementation of the hospital information system in this department?
13. What constrained the use of the hospital information system in this department?
14. How were constraints of implementation and use handled by your department?

Section F: Find out the outcome of the implementation and use of hospital information system?

15. What are the successes or goals achieved with the implementation and use of the system as a department?
16. Were the goals achieved within the broader organisation or Hospital goals or mission?

17. What are the failures encountered with the implementation and use of the system as a department?
18. In your own opinion, what can be done to alleviate these failures?

THANK YOU FOR YOUR ATTENTION, THIS ENDS THE INTERVIEW

APPENDIX II (LETTER OF INTRODUCTION)



UNIVERSITY OF GHANA
BUSINESS SCHOOL
DEPARTMENT OF PUBLIC ADMINISTRATION
AND HEALTH SERVICES MANAGEMENT

UGBS
University of Ghana Business School

Ref. No.: PAHS/26

21st December, 2017

The Administrator
University of Ghana Hospital
Legon

Dear Sir/Madam,

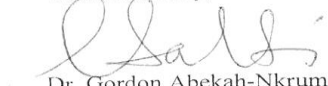
LETTER OF INTRODUCTION

The bearer of this letter, Rev. Fr. Gabriel Kojovi Liashiedzi is a final year student of the University of Ghana Business School, Legon. He is undertaking a course leading to the award of Master of Philosophy (MPhil) in Health Services Management. As part of the requirements of the programme, he has chosen to research and interview the Heads of various Departments, Doctors and Nurses on the topic: *Understanding how the implementation and use of hospital information system enables or constrains management of Health service.*

I would be most grateful if you could give him the necessary assistance to facilitate his data collection.

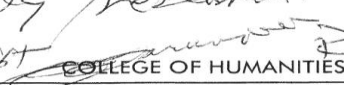
Thanks for your cooperation.

Yours faithfully,


Dr. Gordon Abekah-Nkrumah
Senior Lecturer/Supervisor

22/12/17
ADM for Reps uses & HOP

*Permission has been granted
for this study/research.
Sandy Adet*

 **DIRECTOR**
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APPENDIX III (SAMPLE TRANSCRIPT)

T1:

Interviewer: Good afternoon Dr. I am Gabriel K. Liashiedzi and with me is Jacob Ashemond. We are here to interview you on hospital information system and how it is linked to your department.

Interviewer: For how many years have you been working here?

Interviewee: I was transferred here on the 1st of July 2012. So its 5 years now.

Interviewer: What is your Position?

Interviewee: Am the head of the finance department

Interviewer: Can you give as your age range?

Interviewee: Am 40+ years

Interviewer: What is your marital status?

Interviewee: Am married with three children.

Interviewer: What makes University of Ghana Hospital unique from other university hospitals in Ghana?

Interviewee: We fall under the Quasi- governmental hospitals, however, Komfo Anokye and Korle- Bu are Teaching Hospitals. The new Teaching Hospital in the University of Ghana is higher than Korle- Bu and Komfo Anokye Teaching Hospitals. That, is what is called Quaternary, which is for referral cases only. It is not meant to train fresh doctors. It is only for those who are doing specialisations in pediatric, surgery, cardio, etc who are trained there,

University of Ghana Teaching Hospital. Is mainly for specialised clinics. They will not be dealing with ordinary malaria and others.

Interviewer: What makes this hospital unique?

Interviewee: The unique thing I can say about this hospital is that, everything is computerised. You don't need paper to do anything. Everything is electronic.

Interviewer: What are some of the existing departments in this hospital?

Interviewee: We have 17 departments in this hospital which are continuing but when you talk to the administrator you will have more facts?

Interviewer: Just mention few?

Interviewee: We have 6 wards. Also we have departments such as the dental, public health, physio, dietary, OPD, emergency, administration, finance, mortuary, medical records, laboratory, pharmacy, etc

Interviewer: What is the goal of your department with regards to hospital information system?

Interviewee: Basically, we wanted to harmonize our data and then also, achieve efficiency. Initially when I came here, when searching for a data for someone, it took days. So the question was how to harmonize our data at any point in time. Also, how do we achieve efficiency. So with the old system, anyone at all could come to the hospital. Once you know someone, you could go through the system without paying anything but now it is not possible. Once you don't come in as a staff but as a private patient it is not possible because we pick the data of the staff directly from the university system. So, if the university has not registered you as a staff or staff dependent, there is no way you can have free treatment. If a staff brings the child who has not

been registered by the University of Ghana Hospital, that child becomes unknown to the hospital. Since the child's information is not in the system, you have to register the child as a private client and this calls for payment. Until you sort out with the university to regularize the child, there is no way free treatment can be offered. You may be the Vice chancellor, so far as your child's name is not in the system, you have to pay.

Interviewer: Does it mean the hospital gives priority to students and staff as compared to outsiders?

Interviewee: As for students, I can say yes because the students' clinics are different from our clinics. They don't come here because they have a student clinic on campus where they attend. We have one at Korle- Bu, main campus, and city campus. As for the staff, yes but as they come we suppose to give the senior members preference. When the senior member is present we expect the senior member to be attended to than others. Contrary, in the medical field they have what we call Triage Signs, where a nurse can pick critically ill patient over a senior member because the patient's life is at stake at that moment. Children are also picked because they are vulnerable. Since the children have their clinic, they normally don't go through the main. They have the pediatric section they normally consult. So basically, that is what happens.

Interviewer: What are some of the reasons that underpin the choice of the hospital information system and its implementation and use?

Interviewee: The peculiar reason I can give you is, that you are here at work and someone comes to tell you, "I came to the hospital yesterday and today they can't find my folder". May be someone has misfiled it. They can comb through files but not find it, and all they have to do is to prepare another folder. This was a problem, but now the story of my folder is missing will

now not occur again. Even when you come without your small card, we have 6 main items we can use to search for your information. These are your card number which is unique to you, your name either with the first name or the last name, your date of birth, your telephone number, place of residence. Even you are supposed to use the thumb print but we have not gotten the gadgets for that yet. Otherwise, we could take your finger print which can be typed when you come. Now as soon as the result are run, they translated into the system and the names will be mentioned for you to collect your result. Everything is connected and once the results are ready, it translates into their dockets. It will go into the folder of whoever requested it and any doctor can access it.

Interviewer: How has it helped improve your department that is finance?

Interviewee: It has helped us make drastic improvement. Now I know everything that happens within a twinkle of an eye. I know the number of people who came to the hospital, I can quickly cross check with my revenue to see all these. No one can come to the facility without paying since this can be noticed. The system is such a way that it encourages people to make deposits at any point in time because if you reach a threshold the system will hung on you. Those measures have been put in place to know the number of people who came to the hospital who paid, Weather they paid in cheque or cash. I can just go to the system and see what is happening, so at any point in time what is at the bank and what is on the system should tally.

Interviewer: How long has this system been in existence?

Interviewee: It started in November 2015. That is 2 years now.

Interviewer: Was there an existing one before this one?

Interviewee: No but there was an existing one that was scrapped years ago and until this one came we were using manual. This did not come to replace the old software

Interviewer: Let us look at some of the factors that informed management regarding the choice of this particular system but not any other system.

Interviewee: What actually happened was that when we came to conclusion that we needed a software; a letter was written to the university management and they agreed that a software ought to be acquired. A team was formed at the hospital to document our processes. We documented our processes and told the university what we want to see in any software they are acquiring for us. After documentation and agreement was the advertisement. Three companies bided for it and each day was set for each company to come and do the demonstration. A team comprising of the hospital with every unit being represented was formed. International advert was placed by the university. Each unit was represented by two representatives including technical unit from university of Ghana computing services and all of us agreed to select this particular one. It is a fact that the UGCS wanted a particular software but the hospital staff fell in love with this particular one. A decision was made in favour of the hospital staff since they would use the system. This was to avoid the failure of the system. Their director agreed with the point we made. He said if the staff think this is what they want, it must be given them otherwise the system will fail. So, what the hospital staff decided, though we have the technical eye, they thought the three were good and any of them could be chosen. If you don't allow them, they will sabotage it. They might think that the 'big men' have gone to collect money want to impose on them what they want. Finally, they had their way out. Then the university went ahead to make their choice and implementation was done in November 2015. That is what we have been using up to date.

Interviewer: Let us look at the costing. Do you think the one selected was less costly than the others?

Interviewee: That is purely procurement work. Once it was an international bidding they will do the technical evaluation before they open the bids to see the values. We were not part of this, so the best place to get these figures is from the procurement authority. The figure I can provide is for the one that was selected and paid for, but for the two, no. I was not part of that process so I don't know their bidding.

Interviewer: Was management part of the process?

Interviewee: Not for procurement. They were brought in for evaluation for those who have the technical- know- how to select. So, after the technical evaluation was done, they selected the three for them to do the presentation and the demonstration for us to choose. So, that was when we came in but as to what criteria they used in selecting the three companies was not in our domain.

Interviewer: What factors enabled effective implementation of the system?

Interviewee: The software implementation and use became successful mainly because of the medical director. I do not know if you have worked in the hospital before. In the hospital, those who cause a lot of problems are the medical doctors. They did not want to use this system. So, the medical director called for a meeting and he said: 'we have informed the University we wanted a software and they have given us one, so if you think you cannot work with it you can resign. He can go and inform the Vice chancellor that, all his doctors have resigned because of the system. So, let us throw the software away or let us go and bring new doctors. If you think you cannot use it you can resign'. That was the word he used. And that solved the problem. Everyone wanted to use the folder which he objected to. We did the implementation in phases. Though they have gone through the training they went there for nothing. This led to retraining of

members since they asked for it. We started working with them in the consulting room, teaching them what they need to do. After three or four patients have gone through the system, we left them. For the first three days it was terrible but we persevered and moved on and now we are where we are today. So, he was a major contributing factor to the success of the implementation.

Interviewer: What about the training. Was it really effective?

Interviewee: Yes, as I said, as for the training everybody went through, but during the implementation we needed to go and work with them again because some of them have apparently have just come to sit there. After the implementation, we needed to go round and see to it that they did the right thing. We implemented them in phases and now we are done with the last one. We are even asking for more.

Interviewer: How was the Phases done?

Interviewee: I think the OPD was implemented at a go. When we talk of OPD we are talking of medical records module, laboratory module, pharmacy module, doctor's module and the nurse's module. So, the IPD was supposed to follow but because of the intervention and what happened we needed to roll that also together". What we did not roll were transport, mortuary, catering, finance, and laundry modules, but as for the other 20 modules we pushed all of them. We did not also roll city campus and Korle- Bu. So, at the hospital everything was working at the same time with the exception of mortuary, laundry, catering and physiotherapy. After that, we did the physiotherapy, dietary, dental and the others. After these, we added the catering, the transport, mortuary and others. Finance, was the last phase because all of them feed into it.

Interviewer: Can anyone at any other department have access to the financial records?

Interviewee: NO. Even in finance, it is not everyone who can see everything in the finance department unless you ask for it.

If I take you to the cash office right now, the only thing visible to the cashier is the cashier's module. If you go to a doctor, the only thing visible to the doctor is the doctor's module. When I take you to the lab, the only thing visible to the laboratory technician is the laboratory module. If you go to the medical records, the only thing visible to the person is the medical records module. There is no way a nurse in Ward A can see what is happening in the children's ward or ward B or surgical ward. You can see only what is happening in ward A. The only people who Chris-cross is the doctor. A doctor can see IPD and can see OPD. Let us say a dentist, if we don't give a folder at ward A to you, you will not see what is happening there. Strict demarcation

Interviewer: What about security issues of the system?

Interviewee: UGCS can certify that, because i am not a computer expert. They think it is good. Once they have certified it, we are supposed to use it. The security aspect is within their domain but not in our domain. Once my reports are working, I am ok. Weather someone will hark into it or not, there are people whose job is to make sure that, no one touches the university system.

Interviewer: You were talking about super users and those who can Chris-cross. Who are these people?

Interviewee: Myself and one of my staff are super users, so can see what happens in the department.

Interviewer: Your department alone?

Interviewee: No, everything and department within the hospital. The doctor can chris-cross so will see only the OPD and IPD but not finance. It is one module at a go. You can be in one module but not assigned to everything. You may be working in the pharmacy, but it is not everyone in the pharmacy who can request for a drug or who can approve even though it is done over there.

It is not everyone who can request for items in a ward and not everyone who can approve of the items. There are levels depending on what you are in the ward. It is within almost all the units. The powers given to you determines what you can do.

Interviewee: What factors enable the use of the system?

Interviewee: Everyone was given training and access. If you come in today, you will be taken through training and then we give you access. No training No Access. That is the slogan. Our director has decreed that we need to have training next year because we normally do an upgrading. We will have two trainings next year, January will be the first training followed by a second training. If you are not certified after the training and presentation, we will block your usage. If you don't go through that training you will not have access.

Interviewer: Let us look at the factors that constrain the implementation of the system?

Interviewee: With regards to the implementation, the only constraining factor was the human factor. Any system of this nature needs the human factor. The human factor was the major one. As for the place, the whole place was networked again and we were given a new generator as a standby power supply. Basically, unless the whole university system goes down, that we cannot work. Now the major issue is, that at times when the university is doing some maintenance, we are not able to work. Now we have resolved, that this year they should give us another server and

I think when the university is doing maintenance we will switch on to the other when maintenance is ongoing. So basically, that is what is happening other than that everything is fine.

Interviewer: Let us look at the success story with regards to the system. Have you been successful?

Interviewee: I wished I will not say this, because I was the coordinator of the project and have become the super user. The major one I can give you, is I must say our stationery cost has reduced from GHC 16 million to GHC 56, 000 in 2016. We were buying folders and these small cards every now and then. Everyone can write, pick it and destroy it. The stationary has reduced that huge. But now no one will come and tell you my folder is missing, it will not happen. No one will say they took my blood sample and I cannot find my result. The system transmits the result unless they did not feed in the system. So those complains are now no more there.

Interviewer: So, you think the vision of the university as well as the hospital is on course?

Interviewee: For now, I will say yes, from my perspective. Now I can tell the number of paracetamols we have bought this year. I can tell the number of paracetamols that have been served all our clinics whiles sitting here. Initially, you have to call for the data to be given you and you need someone to give you the recorded data. Today for instance, they needed a stock taking, I just came and run the report on the stock levels and gave it to them. For now, you can get almost everything but we are asking for more things. We initially used our hands to count stocks at all the wards such as city campus, Korle-Bu etc so we needed a software because we are leaving in an era of technology where once the thing is there, you scan and send. We have listed a lot of things we need. We do not want you to walk here as students or staff to see a specialist. You should be able to sit comfortable in your room or home and do the booking and

we will give you a time you need to come and see the doctor. We are thinking about all these things. For example, if there is a particular doctor you want to see, you can go to the apps and see if the person is in or not. If the person is on leave the app will tell you that the person is on leave. So, you may choose to come or not. These are some of the things we are asking to be added unto the the system to make it more user friendly than what it is now. Now you need to walk here but we want people to do it at the comfort of their homes. I think if it comes it will be the best.

Interviewer: Thank You.

Interviewee: Thank you very much.

T2:

Interviewer: Do you have any information system in place?

Interviewee: Yes, we do have hospital information system.

Interviewer: How was it implemented?

Interviewee: We had to go through a lot of processes regarding every department, the staff and the vendors. We had to sit down to look at the processes that take place in a hospital environment from department to department, from unit to unit.

Interviewee: So we had to engage various vendors to let them know what we want. A committee was set up when the bidding was done at the University of Ghana computer systems together with our membership and with other external people to look at the implementation process.

We also involved every individual in the process from the word go. The thinking process, the suggestions, everything. All of us contributed to making up what we want to have. After, that through the procurement processes we had to shortlist some people who came to do the demonstrations for us. After the demonstration, we sat down to finalise what was done. Every department was scored. Then we asked questions for clarifications and discussions. After which we decided on which one to take and also looked for value for money.

At the end of the day, we chose one of the software that was brought by the software provider, that is, IPMC whose technical name I will you later. This was the beginning of the processes that went into procurement.

After the installation of the HIS, we had to go through an initial trial of the system. Firstly, all the various individuals were retrained to use what is applicable to them in their departments. We had a demo version that we used and everyone was supposed to make at least some minimum number of entries within a certain number of months. When this period was over, we actually had to let the people know, that we were not going to follow the usual standard of implementation. This involved implementation in phases where you have paperwork and software work because of lessons from the past, the situation in which we find ourselves and the type of people we have. Once you know the nature of the people you have, you know how to handle them and to move them.

There was an old system that had been implemented in the hospital before. That had a lot of challenges. It was only few people who were able to use part of the system. It was virtually like a gift to the institution but it was more expensive because we were not getting the value for money. Besides, we were not able to really get our records right, we were unable to follow up our data,

we were unable to raise the proper bill that had to be raised. We realized that not every gift is costless. Sometimes it will be costlier than actually having something that you paid for.

The other thing is, that generally when people do not pay for things, they take it for granted and do not take it seriously. When they are paid for then we must make sure that it is used. We were not prepared for continuous spending of money on printing hard paper that is not necessary, particularly where we do not have sufficient space to stock them. With very limited amount to carry out functions, we need to be very economical in whatever we are going to do.

So, we knew about some people who fear gadget, computer etc. Sometimes we call them BBC (Born before computer). We had to encourage them, that when you make mistakes you can always correct them. When people laugh at you, do not give up but rather persevere and you will become perfect at what you do. So, we encouraged even those who were near to retirement to be friendly with their computers. We put computers in all the departments and ensured that they all started practicing with the keys to familiarize themselves with the various note.

After all these, we gave them the day for the installation. It was going to be like the way military operations are carried out. It is either you go in and get killed or you go in and win the battle. There is no turning back. So that very faithful day, that was November 2015, three years ago, the installation took place. We decided to withdraw all paperwork and the system had to start in earnest which led to a lot of pandemonium, a lot of delay, a lot of confusion but we had the implementers and the software providers along with us throughout the process. They supported the departments to get their ways clear. This kept on moving slowly, people were complaining but we decided that regardless of the complaints we were not going to go back. Going back will mean everything we have put in will be down to the dust, they will be wasted so we decided that

come what may, we must succeed. So, we made them aware that they are in a University whose vision is to be a world class research intensive university, we are a premier university and if other people fail we must not fail. We want to be the pacemakers, we want to be the point of reference and we want to tell people, that they should put their hearts to it because any possible thing can be done. We also, want to let people know, that the status-quo is not always worth because a lot of institutions do fail in the implementation process and do not succeed. Some institutions failed not because they were not able to do it, but because they knew that personal gains may be minimized and organisational gains will be maximized. In our case, I guess because most of the people here have the institutional interest in mind more than the personal gains, we thought that it was going to be very successful. Like I said, in the past only few people could use it. Even those who could use it, sometimes intercepted the cables such that you cannot follow the processes, so we decided not to fix the cables along the floor or walls again. We had an underground system of deploying our cables and then we took them to the roof/ceiling. Then as you can see, the system drops from the ceiling down there. It is easy to trace any point interfered with and who is intercepting the process. Learning from the past failures of other institutions, we thought that we must do it in a different way and we think that worked very well and within three months everything was almost perfect. I must say we were very happy to have people who were very cooperative with us and supported us to do the changes to suit the line of operations. So, this is a summary of how we were able to get this far.

Interviewer: So, if I am not mistaken, from your response, it means prior to the implementation of the existing HIS you had a former one which was a gift?

Interviewee: Yes, it was a gift, and could not link all the departments.

Interviewer: So, it has been replaced now?

Interviewee: Totally replaced. In fact, it was causing a great lost to the extent that after a year and a half of my presence here I decided to suspend it to go fully manual and then from fully manual we went to full implementation of the EBF in all the departments simultaneously.

Interviewer: Okay, if you are saying that comparatively the present one is far better than the old one, you have mentioned some of the reasons why the present HIS is far better than the previous one. In the hospital also, your main aim is health delivery, you have goals. By implementing the new one, will you say comparatively again, the new HIS is helping you achieve your goals?

Interviewee: Yes, very much so, because you can virtually see everything happening in the departments by the click of the mouse. You can write your reports, you know your consumption pattern, you know where the medication are reaching, their reorder and minimum level, you know when people are having challenges in the units and departments, you can actually go into the system as a director or manager and look at what my staff are doing even if I am not locally present. I can be at home and I have access to the emergency room, I can see when emergencies arrived, I can see how long it took for the people to attend to this emergency, I can see when the medication was prescribed, I can see when it was dispensed, I can see when it was administered and I can see the history that is taken and I can determine whether the decision the doctors on the grounds are making is coherent to the history that they have taken or not. So, I could monitor a lot of things and it is much much better. So, people could be there and I could make a call and let you know that this patient haven not been asked A B C question, I suspect that this patient will be having this or that and have you considered that? Or you will look at the medication and say

you think that since this and that are not working, I guess this one might be a better option. So, it makes communication also very great.

Once the staff knows that whatever they do can be seen, their attitudes will also change accordingly. I am not saying that we need to know that eyes are on us before we do the right thing, but this helps you to know that you can always go back to audit your work because we have peer review and see whether whatever you are doing is right or not. I think for service delivery, using systems like this is the best.

Interviewer: So, if I may ask which year was the present one implemented?

Interviewee: That was, as I said, November 2015.

Interviewer: And the old one?

Interviewee: The old one was a gift and has been here before I came. Several years before I came.

Interviewer: Despite the advantages of the new one, will you say there are some constraints as far as the usage is concern?

Interviewee: Yes, to some extent because they are not major constraints. The first thing is that most of us who are not very good at typing may get it very slow and so you may spend more time trying to put in the information in than you could when you were writing. We know there are other facilities we could have used. For instance, we could have used transcribers, where I can just write and it will be transcribing into the system as though I was typing, but financial constraints will not let us have some of these additional things. There are other components of

the hospital information system that we have not fully started implementing. For instance, biometric capturing of data, but we are going to do it because when for instance some body is rushed in, who has not been in the system before and cannot talk, you just put the person's finger on the biometric machine and every information of the person will just drop down and you can easily access the information of that person. So, it is something that we will be doing.

Interviewer: So those who are not fast in typing and they are in the system in some of the departments, what are you doing to help them?

Interviewee: As I said, the more you practice the better you become. Some have some of this software downloaded on the apps to guide them. There are times that some of the younger ones who are very good at the keyboard use them to do the entry. It is like part of the training and learning, so the person gets to know how the senior person is thinking, how he or she is taking decisions. It is sort of mutually beneficial.

Interviewer: What are some of the factors enabling the implementation and use of the system?

Interviewee: As I said, it was a holistically engagement of all the stakeholders.

All departments were involved. Every individual contributed to it, we had the training about a year into the implementation and people were made aware of what was going to happen. They were made to learn new things and unlearn some of the old things. We decided that we are going the world class way which is our vision.

We also discussed the advantages and people saw very frankly that indeed this is a better option. Once you know the benefits of whatever you are doing and realize that it is going to improve the

system, you will put in the right attitude. On the other hand, if you do not have good understanding of what you are doing, then you will care less because you do not know what benefit it brings on board, what damage it brings when it is not used. So, I will say everybody is happy.

The other thing is when decisions are taken just by the top hierarchy and pushed down the throat of the other people, it is done just because they are asked to do it. But if everybody contributed to the discussion the person is proud that he made such a suggestion which is included in the decision making. The person believes that if there is success it is all of us, if it fails, we all failed and so it is not like we will see whether they will be able to do it.

Interviewer: Will you say what happens in every department is a function of the success of the hospital as a whole as far as the HIS is concern?

Interviewee: Definitely everything is interdependent, so if one thing goes wrong at one point or right at the other point it may reflect at the other side. For instance, if somebody is discharged and the person is not discharged out of the system, the system will continue to bill the person. Assuming the person was not able to pay his bill on the day of discharge but comes the following day, the bill would have increased by a day's bill. So, everybody must be active and watch each other.

Interviewer: Will you say that the HIS is having a positive effect on management of health services delivery?

Interviewee: Very much so. We are able to capture data very well, we can reintegrate, we can do all permutation, we can have all the reports we need. It is very helpful and we think that we

should be coming out with a lot of papers, suggestions and hopefully we can be a point of reference.

In fact, haven said that, we actually been having people visiting us. We have people from institutions like the Tema general hospital, we have people from the ministry of health coming, we have other university health services coming to see what we are doing. Even the new university of Ghana medical center have come to look at our system and how robust it has been. I must say Korle- Bu Teaching Hospital was trying to implement a similar system. They were going according to the normal standard of doing it, thus, going slowly with the paper and paperless together and they never succeeded. I am not too sure whether any single department have been able to implement it but we have.

Interviewer: So how many departments do you have here?

Interviewee: We have 17 departments so far and are unfolding and continuing. We have clinical departments and we have non-clinical departments.

The clinical areas include surgery, dental, pediatric, internal medicine, obstetrics and gynaecology, pharmacy, emergency, physiotherapy, laboratory, with the non-clinical including store and procurement, kitchen, and other satellite units like the students' clinics in all the major campuses.

Interviewer: Thank you very much for your time.

Interviewee: You are welcome.