The Impact of Health Information System (HIS) Effectiveness on Public Hospital Performance (Clinical, Operational, Financial). Case of Jordan.

Thesis submitted for the degree of doctor of philosophy by

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PhD Abstract

Hospital performance is one of the fundamental tools of assessment through which hospital managers, policymakers and other stakeholders can determine if the investments are paying off. Any investment made should reflect by improving the performance of the hospital. With the integration of technology into the field of healthcare, many hospitals have implemented health information systems with the aim of improving performance. In some cases though, the investment in information systems has failed to pay off due to the systems being ineffective. This research explores the role that Health Information Systems plays on hospital performance, through explored the relationship between Information Systems’ Effectiveness and Hospital Performance. The conceptual framework of this study derived from the Delone and Mclean (D &M) Information System Success Model - which is widely adopted in the IS research - to determine the relationship between Information System effectiveness and hospital performance. Based on a comprehensive literature review on the older and more recent studies the research framework incorporated several new items used by researchers for the measurement of the D&M dimensions.

This research study investigates the impact of health information system effectiveness on public hospital performance in Jordan by examining the performance measurements that are effective in assessing the implementation of HIS effectiveness in public hospitals. There is low uptake of hospital information systems. Uptake of HIS can contribute to improvement in service delivery. However, the implementation of HIS is a costly undertaking. Performance measurement of information systems can create awareness of their contributions to improving processes within organizations. Performance measurements can be used to assess the performance of HIS and improve their uptake in healthcare. However, few studies have been carried out with the aim of developing performance measurments for HIS. Creating effective measures of HIS performance and implementation can help sustain existing HIS and encourage other healthcare institutions and hospitals to adopt them. Creating measures that are specific to HIS can improve the accuracy and sensitivity of performance measurement. This can lead to in better measures of HIS performance that can be used in improving their utility. The current practice of using information system performance measures for HIS has the consequence of utilizing general measures which are not specific to, and fail to capture the peculiarities of HIS. The study findings are significant in addressing failures of existing studies and directing practice in performance measurement of HIS implementations. These failures in literature discourage the effective implementation of HIS, as the performance indicators used may not be appropriate for HIS. In this way, the study aids the minimization of the risk of poor implementation of HIS by providing and ranking key performance indicators that existing and new HIS should use.

The findings of the study contribute to academics and practice through addition of knowledge to the already existing literature. this study extends our knowledge on HIS effectiveness as we adapted and modified DeLone and McLean's model of IS success to incorporate new variables from recent

research. The results show an important statistical link between HIS effectiveness and hospital performance measures. Finally, the study presents, findings from Jordanian hospitals that have adopted HIS providing practitioners with advice for the practices that can lead to possible and realistic benefits.

Acknowledgement

Firstly I am grateful to Allah who gave me the power and bravery to complete this PhD research. I would like to thank my first supervisor Professor Francesco Moscone who pushed me forward throughout my PhD journey.

I would like to express my deepest thankful to my family for givind me all the inspiration and support I need during the stressing time of PhD journey.

Dedication

I dedicated this work to the strongest person I know: me.

I dedicated this research work to my mother, a strong and gentle soul who taught me to trust in Allah, believe in hard work and that so much could be done with little.

I would have made a terrible doctor, Mom. I would much prefer it if you were alive and well.
You will always be in my heart, and in my mind.

MOM. You left fingerprints of grace on our lives. You shan't be forgotten.

I hope to meet you in heaven.
May Allah accept from us our best deeds.
Ameen

Declarations

The author, Heba Hatamlah, confirms that this thesis is her own work conducted for the purpose of a PhD degree at Brunel University London.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter serves to highlight the importance of the study by presenting the research background, the research problem, the aim and objectives of the study, as well as the research motivation and justification of the study, an overview of the conceptual framework and overview of the methodology. In the chapter, the significance of the study is also discussed, in addition to the context of the study. Crucially, the chapter sets the tone for subsequent chapters in the research study.

1.2 Research Background

Healthcare information systems (HIS) are the outcomes of decades of moving towards the integration of information technology application within healthcare (Hu et al. 1999). A HIS is an integrated information system developed to manage every aspect of a healthcare facility's operations (Mattoo et al. 2013). A HIS provides a portal from where every employee can meet his or her information needs (Anema et al. 2013). A typical implementation of a HIS allows administrators, medical staff, and non-medical staff to meet their information needs (Hu et al. 1999). The successful implementation of a HIS often results in streamlined operations, improved communication, better securing of information and data, ease of using business intelligence and analytics, improved service delivery to the client, and cost efficiency in operations (Anema et al. 2013). However, the implementation of HIS plays a crucial role in influencing the gains that stakeholders make. Poorly implemented HIS can be costly, may never realize the expected cost reductions, and can fail to improve efficiency. This was established by collecting data on different measures used by hospitals (Anema et al. 2013). It is therefore imperative to ensure that the implementation of HIS is done in a manner that maximizes its performance and leads to the realization of the associated gains (Anema et al. 2013; Mattoo et al. 2013).

Technological, organizational, and medical changes affect the field of healthcare (Hübner-Bloder et al. 2009). With every passing year, healthcare is becoming increasingly more complex. Modern healthcare service delivery involves more entities, greater data flows, and greater considerations. To manage these changing and mounting requirements, hospitals have been forced to turn to Hospital Information Systems. A HIS is to healthcare what an enterprise resource system is to a corporate business (Mattoo et al. 2013). In fact, HIS can be examined as Enterprise Resource Planning's (ERPs) which means is a technique of using computer technology to connection different functions (Hübner-Bloder et al. 2009). A HIS does support information logistics in healthcare facilities. This is by supporting the flow of information within healthcare organizations. This improves the flow and integrity of information by ensuring that information and data is readily available when required. Furthermore, HIS enforce access policies that ensure that different users can only access the information that they require to complete their responsibilities. This is achieved via the assignment of roles and creation of user groups (Mattoo et al. 2013).

From this perspective, a HIS can be looked at as a socio-technical subsystem of a healthcare enterprise tasked with the information management responsibilities which is made up of all the process of informing processing and all the technical and human actors involved in the respective roles (Häyrinen et al. 2008; Hübner-Bloder et al. 2009) . Whereas the use of HIS cannot guarantee the quality and cost effectiveness of care, they do contribute to and support the attainment of these healthcare goals (Hübner-Bloder et al. 2009).

Due to the increase in the importance attached to efficient information logistics, systematic approaches to information management have gained importance in healthcare facilities. Efficient information logistics entail the creation, directing and monitoring of information systems. In an environment where information influences coordination of activities, failures in the information systems can be catastrophic - the failure of the whole system - (Hübner-Bloder et al. 2009). Performance measures and indicators offer a mechanism for benchmarking and assessing the performance of information infrastructure (Anema et al. 2013). In strategic management, performance measures and indicators are often used in assessing the progress being made towards the set targets. This is also the case in information system strategic management (Hu et al. 1999).

Based on Hamilton & Chervany 1981 the most common definition for IS effectiveness is “the extent to which a specific information system actually contributes to achieve organizational goals, i.e its effect on organizational performance” which is public hospitals that considered as a basic research objective of this theses.

Successful implementation of the health information systems is thus necessary for the realization of healthcare targets. The effectiveness of a health information system is assessed based on the quality of its information product, quality of the system, satisfaction of the system users and its impact on both the individual user and the organization. An effective health information system is one that produces quality information that satisfies the user and impacts positively on both the user and the individual. The positive impact of health information systems result in the realization of healthcare targets and thus an improvement of hospital performance (Dietz et al. 2015).

Organizational performance definition is an open research question according to Kirby, 2005 who explained that consistent definitions and measures of performance are used by limited studies. In other hand Yamin et al. 1999 gave an easy description for the performance which is “how well an organization accomplishes its market- oriented goals as well as its financial goals” (Yamin et al. 1999; Argyropoulou et al. 2015).

Performance in public hospitals is the degree to which these facilities either improve or deteriorate over time and how that improvement or deterioration is achieved and maintained (Nwagbara et al. 2016). Hospital performance is measured by major domains like clinical, operational, and the financial domain (Rodrigues 2000; Briscoe et al. 2016; Grandia & Should 2017; McCone 2017). Performance in a public hospital is usually defined based on the realization of specific goals which may be either administrative, clinical or even both (Kastanioti & Polyzos 2016). In any healthcare system, the ultimate goal is usually better health. The targets used to measure performance in a hospital may be related to the customary hospital functions of clinical measures like diagnosing a disease, treating a disease, caring for patients and rehabilitation, or may be related to research and teaching (Nwagbara et al. 2016). However with the changes in the definitions and functions of hospitals, measures of performance in hospital may today overlap to take into account specific elements of public health and community care (Cheng et al. 2015). The measurement of performance in public hospitals is critical to the improvement of quality. The measurement provides a means of defining what is done by hospitals and setting a comparison with the set targets so as to identify any room for improvement (Nwagbara et al. 2016).

The study surveyed the end users of HIS in five public hospitals in Jordan through the use of a study framework derived from the Delone and McLean (2002) Information System Success Model to determine the relationship between Health Information System effectiveness and hospital performance.

1.3 Research Problem

The problem is the low uptake of hospital information systems (Rawabdeh 2007). The factors that lead to low uptake of HIS, range from institutional ability such as cost, to individual issues like resistance to change and lack of training (Msiska et al. 2017).Uptake of HIS can contribute to improvement in service delivery (Cho et al. 2015). However, the implementation of a HIS is a costly undertaking. Performance measurement of information systems can create awareness of their contributions to improving processes within organizations (Regional Health System observatory 2006). Performance measures can be used to assess the performance of HIS and improve their uptake in healthcare (Mattoo et al. 2013). However, few studies have been carried out with the aim of developing performance measures for HIS (USAID 2013).

Dragomir et al (2013) focused on the development of performance measurements for integrated management systems within healthcare. Hübner-Bloder et al. (2009) carried out a study of measurements that can be used to benchmark the performance of Hospital information systems. McCance et al. (2012) carried out a study to examine the measures for nursing and midwifery. Overall, various studies have addressed measurements in healthcare and some are even specific to hospital information system. The issues that have been covered include benchmarking performance and the performance of integrated management system (Hübner-Bloder et al. 2009). However, none has so far focuses on the measures that are essential to the implementation of health information systems HIS.

Data that can be used to measure performance across entities, nations, or within the industry is not readily available. In particular, data that can be termed as reliable is rarely available or present in nations in the different HIS initiatives. Thus, performance measurement is almost impossible, especially given the prevailing situation of low HIS uptake and lack of associated data (Hypponen et al. 2016). Using various formulated approaches, performance indicators are identified through structure, usability, and functionality of the system. However, the outcomes are yet to be included as key indicators due to lack of an explicit definition of HIS performance measures (Hypponen et al. 2016). As a result, the uptake of HIS continues to be low as their integration cannot be measured.

Creating effective measures of HIS performance and implementation can help sustain existing HIS and encourage other healthcare institutions to adopt them. Creating measures that are specific to HIS can improve the accuracy and sensitivity of performance measurement. This can lead to in better measures of HIS performance that can be used in improving their utility (Hübner-Bloder et al. 2009). The current practice of using information system measures for HIS has the consequence of utilizing general measures which are not specific to, and fail to capture the peculiarities of HIS (Messeri et al. 2013). HIS in the industry is only viewed or used as part of the healthcare system, which impedes the invention and application of performance measures (Grek 2018). Therefore, the concept separates HIS from health indicators, which leads to low uptake of HIS.

Advancement in technology has made the relationship between implementation of information systems and organizational performance an issue of importance for organizational managers, academics and information system practitioners. Various studies have, thus, been conducted in this area making. the available literature broad yet heterogeneous consisting of different approaches and models (DeLone & McLean 2002; Symons 1991). For instance, (Hypponen et al. 2016) use a four phase approach for the different assumed indicators. The approach includes strong aspects though there are challenges such as their lack of definitive monitoring mechanisms.

Evaluation of post implementation of information systems have been applied in different organizational permanence by choosing various measures (Chang & King 2005; DeLone & McLean 1992; DeLone & McLean 2002; Rai et al. 2002). Very few of these studies so far have comprehensively focused on determining how health information systems' effectiveness affects performance in public hospitals (Al-Yaseen et al. 2010; Abdelhak et al. 2014). For instance,Cui et al. (2016) examined the ninth hospital in shanghai on the performance of information system in the, which could only measure in regards to departments but not health outcomes (Urbach & Müller 2012). According to Thong & Yap 1996, most of these studies in actuality only consider that IS's effectiveness in terms of how it contributes to organizational effectiveness. As a construct of

IS, HIS is bound to fall short also of this research and literature inadequacy. The few studies that have been conducted in this area to determine the impact of health information systems in public hospital performance have produced inconclusive findings which range from positive to negative relationships between health information systems implementation and the various measures of hospital performance (Mattoo et al. 2013). This research gap will be identified and filled within this research study.

In addition to the above-mentioned literature gaps, there is also little or no available research that focus on the post-implementation of Healthcare Information Systems. This is because most of the existent literature mainly focuses on the planning, execution, mainatainance and establishment of the Healthcare Information Systems in most countries with lack of literature and research on post-implementation and post-evaluation of HIS (Al-Yaseen et al. 2010). According to Al-Yaseen et al., 2010, post-implementation and evaluation of Healthcare Information Systems in developing countries has been conducted but the availaibility of other collaborative research studies is still wanting. It is imperative to note that this study will fill in certain profoundly neglected literature gaps through its exploration of the effect of Healthcare Information Systems on hospital settings, performance, funcationality and operations.

A studies by (Barua et al. 1995; Banker et al. 1990) found a positive relationship between implementation of information systems and the financial performance. Another studies by (Ezingeard et al. 1998; Zahir & Love 2000) found a negative relationship between implementation of information systems and productivity and profitability in various sectors. On other hand, a studies done by (Kettinger et al. 1994; Dos Santos et al. 1993; Floyd & Wooldridge 1990) found no relationship between investment of Information technology and organizational performance. The relationship between HIS and various aspects of a health-care facility is varied as identified by (Wang et al. 2018). The authors concur that finances, expenses, and productivity have a positive relationship that can be measured using definitive data (Wang et al. 2018; Nguyen et al. 2014; Rezaian et al. 2018) . As a result, there is, thus, the need for a research that follows a framework drawn from pertinent literature on health information systems and hospital performance that will end up producing empirical evidence of a statistically significant relationship between effective health information systems and hospital performance. This is due to the literature gap created by lack of existent literature that correlates the significant relationship between health information systems effectiveness and hospital performance (Abdelhak et al. 2014). Knowledge of this nature will be of help to healthcare managers to weigh the benefits and the costs involved and make informed decisions concerning the implementation of the health information systems (Mattoo et al. 2013).

Prior research concentrated on IS effectiveness measuring perception of user on IS effectiveness (Gorla et al. 2010; Petter et al. 2008). This thesis explained how it managers observe IS effectiveness and how effectiveness IS effects on organizational performance – public hospital.

One of the gaps evidenced in the effectiveness of health information systems is shown by the insufficient skills on the part of health professionals. The situation, thus, reduces their ability to conduct their duties in a way that would contribute towards the improvement of the health outcomes of patients within health facilities (Hübner-Bloder et al. 2009). The situation also reduces the capacity of health professionals from achieving their goals in terms of identifying the needs of patients and dealing with them effectively. Thus quality HIS is important (Goddard et al. 2002). Another gap that exists in the impact of health information systems is based on low levels of coordination of different health information systems. Thus, the situation creates a challenge in terms of reduced chances of integration of the systems with the need to ensure that the personnel can use them effectively in improving the health outcomes of their patients (Lau et al. 2010; Messeri et al. 2013). There is also a gap of reduced level of sharing information among health professionals in terms of the insights that they already hold regarding the use of health information systems (McCance et al. 2012). Thus, the situation is likely to make them less capable in terms of dealing with the problems they have in meeting the health needs of patients.

1.4 Aim and Objectives of the Research

The aim of the study is to investigate the impact of HIS effectiveness on public hospital performance (Clinical, Operational and Financial measurements). To this end, the study focuses on the following objectives:

i. To measure the Health Information System HIS effectiveness in public hospitals.
ii. To determine if there is a positive relationship between HIS effectiveness and hospital performance.
iii. To determine which HIS implementation factors are effective in leading measurements of hospital performance (clinical, operational and financial measurements).

1.5 Research Questions

The following are the research questions:

i. How we measure the Health Information System HIS effectiveness in public hospitals?
ii. Is there positive relationship between HIS effectiveness and hospital performance?
iii. Which HIS implantations factors are effective in leading indicates of hospital performance (clinical, operational and financial measurements)?

1.6 Research Motivations

The researcher was motivated by the need to improve the quality of public healthcare services. The use of HIS has contributed to improvements in the quality of healthcare services in most developed nations. The benefits associated with the use of HIS have led to improved delivery of healthcare services (Mattoo et al. 2013). The public can immensely benefit from the streamlined operations associated with effectively implemented HIS. Secondly, cost effectiveness is a key consideration in public hospitals due to the limited funding they get from governments. Lack of funds is partly the reason for the low adoption of HIS in public hospitals. The researcher realized that improving the implementation of HIS can reduce the operations cost for such hospitals and minimizes the overall cost of implementing and running a HIS (Ajami et al. 2015). Next, cases of effective implementation of HIS can trigger the increased adoption of HIS (Peng et al. 2014).

A preliminary review of studies by the researcher led his to the conclusion that there is minimal research on the use of HIS and the performance measures of HIS, also there is limited information on the effect of health information effectiveness on performance in public hospitals. As such, implementation of HIS in hospitals could be based on performance indicators and measures that are irrelevant to the peculiarities of this context. The current study addresses this issue. Consequently, the implementation of health information systems in hospitals could be impeded by the lack of information on how the hospital could benefit regarding performance when the HIS is successfully implemented (Anema et al. 2013). The current study addresses this issue by providing enough information on how the effectiveness of HIS relates to performance in public hospitals.

Lastly, the researcher was motivated by the need to ensure that healthcare information systems are implemented in a strategic manner to improve the realization of their capabilities and their appeal to hospitals.

1.7 Justification for the Study

The study aims to provide insights for decision maker to improve the quality of healthcare service. Hospital information systems are one of the avenues to bettering the quality of healthcare services. The use of these integrated information systems can make it easier to manage processes in public hospitals. This ease can be translated into improved healthcare service delivery. Improvements in healthcare service delivery in hospitals will have a greater impact on the patients (Al-Yaseen et al. 2010). Secondly, Abu Farha et al. 2014 assert that improvement in healthcare service delivery is dependent on the strides being made in research. Thus, having a body of research on measures that influence the implementation of HIS can stimulate growth and improvements in the implementation of HIS.

A preliminary review of literature reveals that few studies have so far examined the measures for effective implementation of HIS, and it became clear that very few studies had conclusively determined the existence of a statistically significant relationship between HIS effectiveness and hospital performance especially in clinical, operational and financial (Lau et al. 2010). From this perspective, the study is contributes to filling a gap that may impede the current and future implementation of HIS which will also improve public hospital performance. By contributing to meeting this gap, the study contributes to the betterment of healthcare and facilitates future research by making recommendations that can direct future studies and practice in the area of HIS performance measurement or health information systems or hospital performance (Goddard et al. 2002).

The study findings are significant in addressing failures of existing studies and directing practice in performance measurements of HIS implementations and provide information on how the effectiveness of HIS affects performance. These failures in literature discourages the effective implementation of HIS, and how the hospital could benefit regarding performance when the HIS is successfully implemented, as the measures used may not be appropriate for the HIS. In this way, the study aids the minimization of the risk of poor implementation of HIS by providing and ranking measures and indicators that existing and new HIS should use, and by providing enough information on how the effectiveness of HIS relates to performance in public hospitals.

The study has delved deeply into the areas of HIS effectiveness and hospital performance through a research framework drawn from the pertinent literature on organizational performance and information systems. The study has as a result produced empirical evidence of the existence of a statistically significant positive relationship between HIS effectiveness and hospital performance.

1.8 Overview of Conceptual Research Framework

This study used a conceptual framework derived from the DeLone and McLean Information System Success Model (DeLone & McLean 2002).

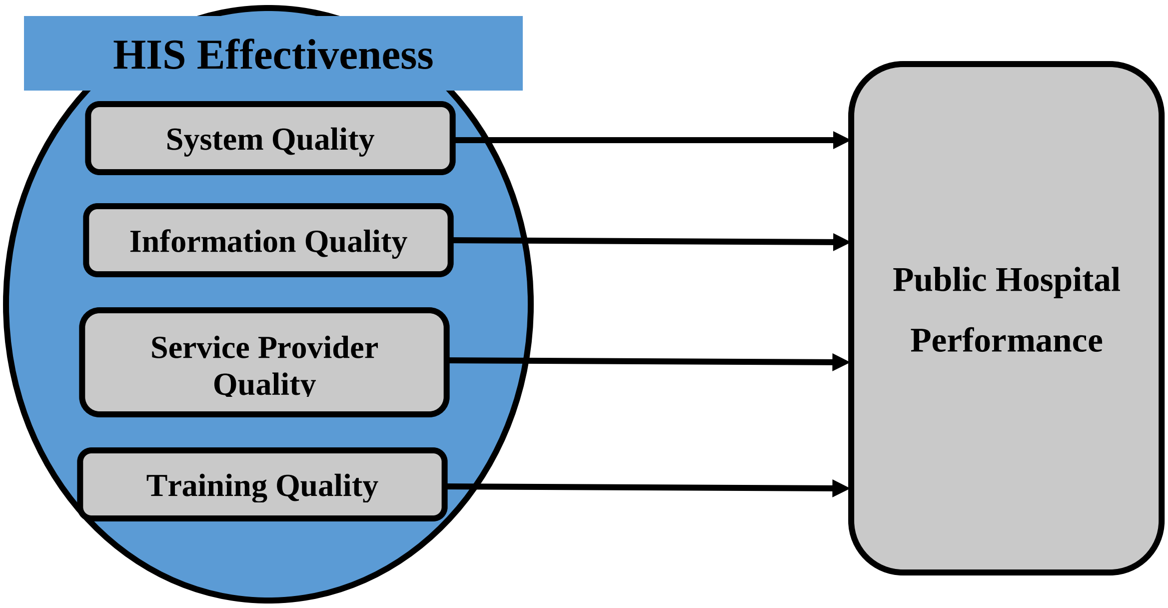


Figure 1. 1: Research Conceptual Framework

From figure 1.1, it is clear that this study explored the relationship between four dimensions of HIS effectiveness (recognized from the literature review) with the public hospital performance (clinical, operational and financial measurements). Consequently, the following major hypotheses were tested in the study:

H1: HIS System quality is positively related to public hospital performance
H2: HIS Information quality is positively related to public hospital performance
H3: HIS Service provider quality is positively related to public hospital performance
H4: HIS training quality is positively related to public hospital performance

The research framework employed in this study incorporates four dimensions of HIS effectiveness mainly drawn from the Information System Success model of DeLone and McLean of 2002 (DeLone & McLean 2002), and Change and King (2005) Input – Output Performance Model. The Information System Success model is a multidimensional model for measuring the success of information systems. The model was created in 1992 by DeLone and McLean (DeLone & McLean 1992), and it measures information systems success by the interdependencies of the six categories of success. Following ten years of research and evaluation, the model was updated and published in 2002. The new model is made up of six interrelated information systems success dimensions. The dimensions include quality of the system, information and service, user satisfaction, use intention and net benefits (Dembla et al. 2015). Importantly, the framework is highly relevant to the study as they both converge on performance measurement for the IS effectiveness and organizational performance (net benefits).

1.9 Overview of the Research Methodology

A quantitative research design is used in the study. Under this design, the focus is on collecting data that can be quantified from the target population (End users of HIS in public hospitals that have implemented a health information system in Jordan). The data collection involves the use of questionnaires. Specifically, the questionnaires are distributed to the entities that are directly responsible for the planning, implementation and using of the hospital information systems. The data is analyzed to determine the factors that influence the implementation of HIS and rank them using statistical techniques, and to establish the nature of the relationship between the HIS effectiveness and public hospital performance.

The research model that was established following a comprehensive literature review was tested from 1st to 25th August 2017 on 25 end users of Health Information System (HIS) in Jordanian public hospital which implementing the HIS. After tested the reliability and validity of the model, the questionnaires were distributed to end users of HIS in five public hospital in Jordan, 408 usable responses were collected from these hospitals from 1st December 2017 to 21th February 2018. The statistical analysis of the model that used to analyses it is the SPSS software and Structural Equation Model (SEM) - Graphic SPSS advanced software -, the statistical analysis involved four steps: Descriptive statistics, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and, finally, Structural Equation Model (SEM) to test the associative relationships of the research hypotheses.

1.10 Significance of the Study

The study contributes to improve the implementation of HIS. The findings of the study can help improve performance measurement of HIS. Improving performance measures contributes to redressing cases of poor performance. Challenges associated with lack of appreciation of the gains associated with HIS implementation such as resistance can also be minimized via the application of the recommendations developed by the study.

The study contributes to improving the uptake of HIS in public hospitals. Uncertainties regarding the performance of HIS can result in slow uptake of HIS. When organizations are unsure of the benefits associated with using HIS, they may be slow to adopt it. Given the vast sums of money required to implement a HIS in public hospital, assurance of its viability and performance is constantly required (Rawabdeh 2007). This study seeks to develop effective measures that can be used to complete this task, also this study seeks to establish that relationship and develop effective measures of performance in public hospital based on Health Information System Effectiveness. The study findings provide measurements and indicators whose use can result in appreciation of the value of HIS effectiveness which could contribute to its uptake by hospitals.

The study contributes to better healthcare service delivery by improving processes that directly influence the quality of care. Healthcare service delivery is influenced by administrative, professional, and procedural factors. The use of HIS can contribute to improving administration and other processes that contribute directly to healthcare service delivery. By influencing the implementation and uptake of HIS by hospitals, the study could contribute to maximizing the health benefits accrued from using HIS which include lower wait times and higher throughput.

1.11 Context of Study

Jordan has one of the most modern healthcare infrastructure in the Middle East (which can be considered as a representative case for the population in the context of health care sector) (Regional Health System observatory 2006). The Jordanian health system is a complex integral of public, private and donor sectors (Regional Health System observatory 2006). The public sector involvement in healthcare services is via the Ministry of Health and Royal Medical Services. The two entities finance and deliver healthcare services. A University-based program such as the King Abdullah Hospital and the Jordan University Hospital are also funded by the public. The nation spends over billion Jordanian Dinars on healthcare yearly. This is approximately one tenth of the nation's GDP (Regional Health System observatory 2006).

Despite the improvements that have been witnessed in the nation's healthcare system, various problems frustrate the nation's effort to improve healthcare service delivery. The problems relate to equity, poor coordination, accessibility and duplication of services among the major providers, inefficiencies in the use of available resources, and inappropriate and poor health information system (Regional Health System observatory 2006). The lack of incentives to improve quality and efficiencies, and lack of information and communication systems have also been highlighted as impeding healthcare service delivery. The nation has a National Health Statistical information system. However, this information system needs improvements in the areas of data collection, data analysis, and the use of the collected data in decision-making (Regional Health System observatory 2006). Most leading hospitals in Jordan have implemented hospital information system. However, the smaller and medium sized hospitals have yet to pick on this trend despite most of them having computers and computer networks. Use of hospital information systems in Jordan is a crucial first step in improving connectivity between the different healthcare service providers.

Lacking integrated healthcare systems limit the extent of gains or strides that can be made by the Jordanian healthcare system (Rawabdeh 2007). Hospital information systems allow for integration of healthcare information functions in a manner that makes it easier to share financial and medical information within and outside a healthcare facility. Therefore, Jordanian public hospitals stand to gain a lot from improved implementation of hospital information system (Almajali et al. 2016). Cases of effective implementation of hospital information systems can encourage others public hospitals to adopt this technology (Regional Health System observatory 2006). In a study of the evaluation of healthcare systems by private hospitals in Jordan, Al-Yaseen (2012) established that there is a tendency to focus on the benefits at the expense of the costs. Evaluation is approached as a formality rather than an important aspect in the operations of health information systems.

1.12 Summary

In summary, the introduction chapter has provided the research background and the thesis overview. The background information provided in this chapter clearly identifies the research gap. The importance of this study is brought out by the research objectives, research questions, research problem and the study justification. The chapter also presents an investigation outline which includes the framework of the research, the research contributions, and the methodological approach.

The next chapter presents a review of studies that have been carried out in the research area. The chapter will analyze several themes relating to the study area whereas presenting the existing information relating to the study area and analyzing the methodologies used.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review, it reviews other previous researches that have been conducted in the fields Health information systems and hospital performance measures. This chapter will revolve around the following matters and expound on the same: Introduction and identification of the literature gap that is existent with regard to health information system (HIS) and its effectiveness and performance of public hospitals, Comparative analysis of existent literate revolving around the health information system (HIS) and its effectiveness and performance of public hospitals through the case study of Jordan.

This chapter develops an understanding of the gaps in knowledge and the state of research in the study area.

2.2 Health Information Technology

According to Devaraj and Kohli (2003), Health Information Technology is an advancement that became alive in the 20th century and has developed more technologically in the 21st century. This makes that available literature existent on the matter still limited and this research will fill this gap through analysis of existent material and advancement of the same through ascertaining or rebutting the paper's hypotheses (Devaraj & Kohli 2003).

Information technology is a term used in reference to technologies that allow for the seamless flow of data with the aid of modern technologies such as computer networks and internet services. Modern technologies specifically internet and computer technology have led to the growth of intranets, extranets and internet that allow and support communication across networks of computers (Oliveira et al. 2011). The existence of technology to support and reduction in the cost of computer technology has led to the availability of information technologies. With each passing year, there has been notable increase in computer processing power and reduction in price. This factor has played a part in improving access to computer technologies by institutions. In healthcare, the internet has allowed for integration of geographically distant institutions and improved the sharing of clinical data (Mattoo et al. 2013). Technology has made it possible to consult and monitor patients in their own residences (Oliveira et al. 2011).

Hospital information systems are special and complex information systems that allow for the integration of data from different departments that typically makeup a hospital. Hospitals information systems allow for ease of access of data on different aspects of a patient from a single portal (Oliveira et al. 2011). For example, in 2014 Moghadam & Fayaz-Bakhsh used a qualitative design to establish that hospital information system allow physicians to access information on patients diagnostic history, drugs invoicing, insurance status, exams, and basic health data from a single portal; yet, this is only the clinical subsystem of the overall hospital information system. Administrators who may have access to management information system subsystem can view different data relating to their administrative responsibilities (Moghadam & Fayaz-Bakhsh 2014).

The primary goal of a HIS is to manage the information that health professionals require to fulfil their responsibilities efficiency and effectively (Moghadam & Fayaz-Bakhsh 2014). The information requirements are typically in the areas of planning, operations, and documentation (Chaudhry et al. 2006). The management of information in hospitals is a costly undertaking. The Friedman and Martin functional model for a HIS includes six major components namely: The core systems, business and financial systems, communication, and networking systems, departmental management systems, medical documentation system and medical support systems (Lee et al. 2013). The core system handles the core function of a hospital such as the scheduling of patients, admission, discharge, and transfers. The integration of clinical and administrative information systems has led to modern HIS. These systems contain rich information that can be used in facilitating decision making across a range of problem areas. Modern HIS integrate electronic medical records, health information exchange, patient reported outcomes, activity based costing and enterprise data warehouse (Collen & Greenes 2015).

Trends reveal a movement towards the integration of clinical decision support, electronic medical records, and data analytics in the implementation of HIS (Somu & Bhaskar 2011). The uptake and change in HIS are being driven by various factors. In the United States, accountable care organizations and value-based healthcare are driving the adoption of HIS. In Jordan and other developing nations, the need for cost and quality control systems are the main drivers to the adoption of HIS. From a technical perspective, the development and adoption of pervasive computing has played a role in the increased use of HIS (Khalifa 2014). Improvement in processing power has made it possible to afford computing devices of different types. Nearly every device in modern healthcare can be linked to a computing device (Somu & Bhaskar 2011).

The implementation of a HIS often is a major change process in hospitals. Due to the high cost of deploying HIS, the expectations for such systems often are very high. The time consumed in implementing the HIS may also influence the expectations that stakeholders have regarding its effect on the performance of a hospital (Somu & Bhaskar 2011). Qiu et al. 2012 established by using a case study design, that the implementation of a HIS may not cause readily observable changes in performance. For instance, the data analytics subsystem of a HIS may require years of data to present business intelligence data that is of use to a hospital. The millions spend on HIS often generate expectation of instant impact (Pan & Fang 2010). The high expectations necessitate the use of performance measurements in assessing the performance and impacts of HIS on different facets of a hospital's operations (Somu & Bhaskar 2011). The next section introduces Hospital information systems.

2.2.1 Hospital Information System

Effective healthcare system plays a vital role in the push for better health outcomes (Mattoo et al. 2013). A strong HIS influences the effectiveness of health systems. A properly functioning HIS allows for the seamless flow of information to the entities that need it when needed. An effective HIS can enable policy making by providing the information, data, and knowledge that managers and other policy makers require in making objective and informed decisions (Garavand et al. 2016; Mattoo et al. 2013). Furthermore, HIS can improve the levels of transparency and accountability by improving access to information at all times. When using an HIS, reports can be generated on the fly. This makes it easy to track the flow of decisions, finances, and even recommendations (Mattoo et al. 2013). However, Jordan as a developing nation has a long way to go before enjoying these benefits in its healthcare system (Almajali et al. 2016).

Adoption of hospital information system is often part of a wider effort to improve the quality and safety of healthcare services. A qualitative inquiry into the drivers of safety and quality in healthcare reveals that they are influenced by market forces, professionalism, and regulations (Mattoo et al. 2013). Members of a profession often set and maintain standards via a governance system. Additionally, healthcare institutions have set rules and regulations that employees have to follow. The use of HIS improves professionalism and the enforcement of regulations by providing an easy mechanism for tracking employees that flout them and enforcing access measures that limit the flouting of certain regulations (Saltman et al. 2006). For instance, HIS use higher levels of security such as encryption for the transmission of financial data and private patient data. Such measures make it hard for non-authenticated entities to access information. Market forces, namely the demands and expectations of the consumers, influence the quality and safety gains in healthcare. In nations where hospitals have widely adopted HIS, the public demands healthcare services of the highest levels (Garavand et al. 2016). It is in the best interest of the public for the public hospitals in Jordan to offer quality services. This is because the monies used to fund these hospitals are derived from their taxes (Almajali et al. 2016). The next section explores performance measurements that measure the performance of hospitals with regard to HIS.

2.3 Performance Measurement

Information is pivotal in promoting advancement in quality and safety of patient care. It is for this reason that high levels of performance have to be maintained for information systems in healthcare (Dragomir et al. 2013). Performance measurement is aimed at promoting accountability to stakeholders and ensuring the set performance targets are being met (Hübner-Bloder et al. 2009). Hospital stakeholders such as the government, clinicians, service users and the public can use performance measures to assess and make decisions on the reliability safety and quality of care offered. This is seconded by Dragomir et al. 2013 who asserts that the performance measures aids in determining the degree to which healthcare organizations are meeting their goals. According to Hübner-Bloder et al. 2009, the best performance measures tend to be highly reliable, sharable, and comparable within the healthcare sector. A good measure for a HIS implementation in a public hospital can therefore be applied to a different HIS implementation in a different public hospital (Hübner-Bloder et al. 2009).

2.3.1 Value of Performance Measurements

Performance indicators play a pivotal role in performance measurement; they aid in the identification and appropriate measurement of the levels of service performance. Hübner-Bloder et al. 2009 employed a Delphi study to establish that the use of performance indicators is widely recognized as an integral constituent in the process of systematically monitoring, evaluating, and continuously improving the quality of care. However, according to Raadabadi et al. 2013, measures by themselves cannot improve the quality of care. Their use can effectively act as flags to identify good practice (Raadabadi et al. 2013), provide comparability with similar services, aid in the identification of opportunities for betterment (Dragomir et al. 2013), and highlight areas that are in need of corrective action, the ultimate goal in using measures is to gain from their contribution to the provision of safe, high quality, and effective care the meets the needs of service users (Hübner-Bloder et al. 2009).

The use of performance measurements has been shown to be a driver for improvement (Strecker et al. 2012). The use of measures enables service users to make decisions and choices based on quality measures (Strecker et al. 2012). This often forces the service providers to provide better services in order to attract more users. In the context of hospital information system, the use of measures can provide the different stakeholders an easy way of assessing the performance of the system. This information can be used by the stakeholders to demand better outcomes from the implementation of a HIS. Thus, the use of performance measures can promote accountability in system implementation by making it easier to point out failures and areas that can be improved (Strecker et al. 2012).

Experts in health information system are in the business of providing the best quality service possible given that their professionalism and reputation is based on how well they perform. Alam et al. 2016 used a survey design to establish that it is the intrinsic desire of every professional to improve their performance when there is room to. Using measures allows for the easier determination of areas that can be improved in HIS. Given that the measurements are often developed with the involvement of the professionals, failures pointed out using the measures are more likely to be taken objectively since there is clear documentation of the expected performance levels (Toroshanko et al. 2014).

Raadabadi et al. 2013 while employing a case study design established that the use of measures can be motivational. Measures can drive improvement by aiding the comparison of performance across individual, teams, and organizations. This comparison when done effectively can generate the desire to maintain performance or improve relative to others (Raadabadi et al. 2013). In the context of HIS, measures can be used in comparing the actual performance to the expected performance (Toroshanko et al. 2014). The variances in performance can be used to develop a case or a call for improvement. If this process is carried out effectively, employees may be encouraged to better their involvement in the implementation of HIS (Toroshanko et al. 2014).

2.3.2 Major Considerations in Performance Measurement

Monitoring healthcare quality is an aspect that has existed for years (Dragomir et al. 2013). However, it is only recently that the monitoring of health information systems, including hospital information systems, has gained extensive coverage in scholarly literature (Rusuaneanu 2014). Monitoring the quality of HIS requires a thorough consideration of the aspects that need to be measured. The first consideration is the quality of information. Having access to good, quality information is possible if there is a systematic process to ensure consistency of the data collected within and across departments in a healthcare facility (Rusuaneanu 2014).

The performance indicators and measures are one of the most frequently used tools to ensure the quality of information and consistency in measurement. Dragomir et al. 2013 support this by stating that performance measures are invaluable during performance monitoring. However, their effectiveness depends on having clear definitions to ensure the collection of high quality data. The definitions need to be reliable, be consistent, and be in line with shared understanding (Zsidó et al. 2015). Furthermore, clear definitions enhance the reliability and validity of the performance measures. The validity of a measures is the degree to which a measures what it was intended to whereas the reliability refers to the consistency of the findings they produce irrespective of the context. According to (Toroshanko et al. 2014), the use of performance measures is more likely to generate safety and quality gains when they are employed for learning at the organizational level. In this way, measures facilitate improvements in local service delivery rather than being solely used for evaluation of service providers at the system level. The use of measures at the local levels can aid organizations in developing insights into effective and safe care processes. Simply, the performance measures developed for the assessment of the implementation of HIS can provide insights into processes and procedures relating to care that can be improved within a hospital (Toroshanko et al. 2014).

Strecker et al. 2012 asserts that the data used in supporting performance measures and indictors should be standardized. The uniformity afforded by standardization helps ensure collection of data in a consistent manner. Notably, standardization of performance measures allows them to support the measurement process and facilitates the development of meaningful comparisons. In practice, this can be achieved by developing a minimum data set that has a list of standardized data that can be used to support the use of measures in performance measurement met (Toroshanko et al. 2014). With the increase in safety and quality orientation in healthcare, performance measures will continue gaining prominence in research and practical work relating to healthcare systems. Use of standardized data can aid the adoption of performance measures (Toroshanko et al. 2014; Strecker et al. 2012).

Rusuaneanu 2014, in a study that employed content analysis, noted that organizations ought to create the best set of dimensions that reflect their business strategy. This is based on the realization that the priorities of businesses may not be the same. For instance, a for-profit organization may have greater interest in the financial than a non-profit organization. Berler et al. 2005 also note that the differences in priorities and business strategy have an impact on indicators that are perceived as special. Botje et al. 2016 revealed by use qualitative investigation of performance measures used by hospitals that most hospitals use indictors to focus on measures that capture internal processes and outcomes. Analysis of indicators used within healthcare reveals that patient health outcomes appear not to be the central focus. Therefore, the design and development of measures should involve thorough consideration of the industry and specific organizations to ensure that the measures used are appreciated and are relevant to the information needs of the key stakeholders (Botje et al. 2016).

Every organization eventually has to determine the number of indicators to include in their performance measurement. This is one of the most common difficulties in performance management. Research by Drnevich & Croson in 2013 reveals that healthcare organizations typically use more than 10 performance indicators. The danger in using too many measures is that it makes it difficult for managers and even casual observers to focus on them. Thus, the number of indicators should be such that it is enough to capture the required performance information. In 2010 Pan & Fang assert that it is of the essence to ensure that the performance measures used focus on both the short term and long-term goals. Some of the long-term dimensions that can be targeted include the payer mix, market share, and competitive position (Raadabadi et al. 2013).

In a study that involved the use of dyadic field data, Homburg et al. 2012 noted that performance measurement should focus on the creation of sustainable and differentiated value to the customers. It is noteworthy that businesses are in place to generate value for clients. This in turn ends in clients paying for this value. Therefore, to ensure that the demand for value is met, organizations should develop an understanding of client expectations and their reasons for paying for the value. Raadabadi et al. 2013 assert that measures such as patient acquisition, patient satisfaction, and patient retention can be used in assessing the value creation process in healthcare. Factors that contribute to the quality of care can also be used in assessing the value being generate to customers. Staffing measures can be used as they have a direct bearing on the levels of patient satisfaction. Zsidó et al. 2015 stated that in a highly competitive environment, the image and reputation of an organization play a pivotal role in its operation. Thus, performance measurement may target measures relating to the image and reputation of organizations (Zsidó et al. 2015).

Another direction in performance measurement is focusing on activities that generate and deliver value to clients. An equally weighty consideration is reducing the cost of producing the components in other perspective. This direction tends to focus on the efficacy of operations (Berler et al. 2005). In a healthcare setting, measures in this perspective may include the drivers to process efficacy. It is possible to incorporate processes that cause innovation and improvement in core processes. Value chain analysis can be used to identify the primary and secondary processes in an organization. After their identification, measures can be developed to assess the performance of individual processes (Rohac & Januska 2015). In healthcare, safety scores such as the number of days without an incident is an example of a measure used in this direction (McCance et al. 2012).

Another performance area that should be focused on is enablers for performance. Intangible assets play a pivotal role in the success of business entities. In a research that utilized content analysis, Harris & Moffat 2013 noted that indicators relating to the human capital include all forms of staff development such as training, continuing education credits, publications, and change management training. The information capital category includes computer networks, infrastructure targets, availability, and use of strategic databases. Drnevich & Croson 2013, noted that assessing continuous innovation may involve considering the number of new research projects, the number of new services, the quality of new services, and the number of institutions with which a healthcare facility is involved with in joint activities. Assessment of organizational capital may include considering staff turnover, staff satisfaction, employee motivation, strategic alliances, culture improvements, absenteeism rate, approval ratings, and communication effectiveness (Drnevich & Croson 2013).

2.3.3 Approaches to Performances Measures

Performance measures in healthcare can be divided into two categories: outcome and process. The outcome performance measures focus on the product or services, whereas the process measures focus on procedures.

i. Outcome Measures

The outcome measures are often used to measure the quality of homogeneous procedures. By examining measure used for patients with Chronic obstructive pulmonary disease COPD, Agarwal et al. 2016 established that outcome measures are best used in cases where there is a strong link between the interventions and the outcomes. Furthermore, outcomes measures are most useful in assessing and monitoring the quality of intervention made to heterogeneous populations that suffer from a common condition (Agarwal et al. 2016).

The first major advantage of using the outcome measures is that they are not easily manipulated (Zachariah et al. 2014). The administration has several incentives for manipulating the findings during performance measurement. The fact that outcome measures are not easily manipulated improves their appeal. The second advantage of outcome measures is that their use encourages the implementation of long-term health-promotion strategies (Rank et al. 2013). This is because outcome measures require the use of large samples to be deemed accurate and representatives. The need for longer assessment periods forces organizations to implement the procedures or tools being assessed for longer. The third advantage of using outcome measures is that they direct attention and health goals to the patient (Smith et al. 2008). The healthcare system is developed with the primary purpose of promoting wellness and health. Patients the core interest of healthcare service providers. Healthcare organizations can easily lose sight of this goal when distracted by the potential afforded by a technology. Use of outcome measures forces healthcare organizations to align the implementation of HIS to the patient. This can help avoid the distraction associated with the implementation of technological solutions within healthcare. The last advantage of using outcome based measures is that they are often more meaningful to the stakeholders (Agarwal et al. 2016). Performance management is partly aimed at providing information to the stakeholders on the performance of different investments made by the management. To ensure that the stakeholders understand performance information, the measures used should be meaningful (Agarwal et al. 2016).

There are several cons associated with the use of outcome measures. The first major disadvantage is that outcome measures can be ambiguous and difficult to interpret since they are the result of multiple factors (Zachariah et al. 2014). For example, improvement in patient satisfaction is an outcome measure caused by several factors, including the nurses' expertise, physician expertise, the clinical setting, and streamlined operations among many other factors. As such, it is difficult to attribute changes in outcome measures to a single intervention or change. The second disadvantage of using outcome measures is they require more time to collect (Kairy et al. 2009). Outcomes are the results of many processes. Thus, outcome measure can only be collected after the completion of all processes. The third disadvantage is that they require a large sample size to detect a statistically significant effect (Smith et al. 2008). Collecting and handling large volumes of data is more demanding in terms of the human and technical resources needed. Furthermore, there is the risk of significant effect sizes being missed when small sample sizes are used for outcome and measures. This can result in the misrepresentation of performance. The last disadvantage of using outcome measures is difficulty in measurement. Some outcome measures can be difficult to measure due to their qualitative nature and difficulty in their determination. Patient satisfaction as an example is a subjective qualitative construct that is quite difficult to measure (Smith et al. 2008).

ii. Process Measures

Process measures focus on the activities and processes that lead to the delivery of healthcare services. The use of process measures is recommended in cases where the emphasis is on the measurement of quality of care and technical skills are relatively unimportant. Secondly, the use of process measures is recommended for the measurement of quality of homogeneous conditions in different settings (Yildiz & Demirörs 2013).

There are several advantages associated with the use of process measures. The first major advantage is process measures can easily be measured without biases and errors (Agarwal et al. 2016). A process measure such as wait times can be measured to the nearest second using established standard units of time measurement. Rank et al. 2013 employed a correlation study to establish that process measures are more sensitive to quality of care. A decline in the quality of care can be detected easily by focusing on the components such as the time taken to receive lab results. Process measures are more likely to change with the slight decline or improvement in service delivery. The third advantage of using process measures is that they are easier to interpret (Yildiz & Demirörs 2013). Since process measures focus on specific processes, the data can easily be matched to a specific area during interpretation. The fourth advantage of process measures is they require smaller sample sizes to detect statistically significant results (Smith et al. 2008). As a result, they do not demand the collection, storage, and manipulation of vast amounts of data. Therefore, from a practical viewpoint, the use of process measures is easier. The fifth advantage is that process measures capture aspects of care that are valued by both the practitioners and the patients (Kairy et al. 2009). Patients value timely completion of processes such as retrieval of records. Process measures capture the efficacy of these procedures (Kairy et al. 2009).

The use of process measures is associated with a host of disadvantages. The first disadvantage is process measures are typically too specific (Zachariah et al. 2014). They tend to focus on particular conditions or interventions. As such, they do not provide the information required to assess the overall impact of an intervention. Secondly, the process measures may be of little value to stakeholders, especially patients, unless they understand how the measures relate to outcomes (Rank et al. 2013). This may affect the overall utility of process measures to stakeholders who are unable to piece how individual processes contribute to health outcomes. The third disadvantage is process measures may be manipulated easily (Kairy et al. 2009). This is a major risk as it affects the validity and overall value of the measures. In general, stakeholders value measures that cannot be manipulated easily. Lastly, process measures can easily become dated with the emergence of new models of care (Smith et al. 2008). The longevity of process measures is therefore threatened by the development of new models of care that place greater emphasis on other measures. Thus, the resulting changes in process measures may make it harder for stakeholders to monitor trends in performance (Smith et al. 2008). The next section explores performance measurement of information system including Best Practices in Developing Measurements for HIS, Technical and Behavioral measurements of HIS, technology acceptance measures, Information System Success Measures and Socioeconomic Measures.

2.4 Performance Measurement of Information Systems

To compete in highly dynamic marketplaces, firms often have to adapt and align their information systems and their competitive strategies. Improving the strategic fit of an organizations information system is recognized as a major goal in information system design (Toroshanko et al. 2014). However, information system planning often is hindered by a lack of empirically validated actionable process theories for assessing the fit competitive strategies and IS capabilities in organizations. Previous strategies have led to the determination of the gains associated with improving the fit between overall IS portfolios or strategies and competitive strategies (McLaren et al.

2011). For instance, McLaren et al. 2011 showed that the fit between IS strategies and overall strategic management contributes to the effective use of information systems in organizations (McLaren et al. 2011).

Several approaches to assessing organizations IS have been proposed. The first approach involves determining the match between the intended and the realized capabilities (McLaren et al. 2011). This approach is based on the strategic alignment model. This is based on the assumption that the intended IS capabilities are based on the intended competitive advantages. Thus, this approach to assessment involves collecting data on the realized capabilities and matching them against predetermined expected capabilities. This approach is prone to measurement difficulties that arise from differences in the actual and stated patterns of strategic behavior in organizations (McLaren et al. 2011).

The second approach involves the definition and determination of a single calculated value for the overall level of fit between competitive strategies and IS capabilities (McLaren et al. 2011). This approach is quite common in empirical literature. Despite the existence of different measures, there is a tendency to determine the overall levels of fit with the goal of explaining or predicting the relationship between it and other variables. This approach is therefore suited for research. The third approach involves determination of the match between the realized and the theoretically ideal IS capabilities. Under this approach, the ideal IS capabilities can be derived from best practices, guidelines and empirical research (McLaren et al. 2011).

Ajami et al. 2015 carried out a review of performance improvement indicators of the medical records department and information technology in hospitals. One of the core goals of a HIS is the management of medical records. A HIS should be able to support the creation, editing, storage, and transmission of medical records. HIS contributes to the delivery of care by among others aiding the management of patient data. In this study, a review strategy was employed. They critically reviewed fifteen articles. They identified several critical performance indicators that are applicable to the use of information technology in medical records management. The critical performance indicators that were identified include learning and growth, process, quality of services, client satisfaction, costs and security and confidentiality (Ajami et al. 2015).

Ajami et al. 2015 identified the features of the measurement of strategic fit of information system. The first requirement is that the measurement should be grounded on research. This requirement stipulates that that the measurements should be arrived at using appropriate research methods. The second requirement is that the measurements must be theoretically grounded. Convincing theoretical arguments should be used to justify the measurement approach used. For instance, the measurement model should be able to differentiate between the intended and realized competitive advantages. Milichovsky & Hornungová 2013 also note the importance of grounding performance measures on theory. The third requirement is that the measurement should be readily corroborated. This requirement stipulates that the measurement outputs should be easily assessable for validity and reliability using other sources such as interviewing the users of the information system. Lastly, the measurement used in assessing the strategic fit of information system should be actionable. Tkalich 2014 also notes the importance of using actionable measures. This requirement stipulates that the measurement approach should have a prescriptive and descriptive utility for the identification of IS capability needs. For instance, the measure should be able to identify the current fit and the specific areas that can be bettered to improve the strategic fit of information system (Tkalich 2014).

Peng et al. 2014 assert that despite the potential of heath information system in reducing medical errors, streamlining clinical processes, containing healthcare costs and ultimately improving the quality of healthcare, their adoption in hospitals has been slow. They studied the adoption process with the aim of understanding the underlying mechanism. They proposed that the absorptive capacity of the potential adopters and the collective disseminative capacity of connected adopters were the two key determinant of knowledge transfer in socioeconomic networks. They further asserted that these two capacities substitute each other in influencing the adoption of health information technologies. Analysis of adoption decisions of more than five thousand hospital across a span of thirteen years using a longitudinal research design revealed a strong support for their hypotheses. Their analysis revealed that knowledge flows in provider networks plat a key role in fostering technology diffusion in the initial years. This facilitates the contagion effect to set in sooner for quicker adoption in later years. They concluded that efforts to create integrated health delivery networks have the capacity to accelerate the adoption of health information technologies. These findings have been corroborated by Alam et al. 2016 who noted that the implementation of integrated health systems encourage the adoption of human information systems in hospitals (Alam et al. 2016).

Research has led to the identification of some of the benefits associated with using measures within healthcare settings. First, the use of measures as part of performance measurement is associated with improvements in performance with respect to safety and quality of healthcare service delivery. Secondly, the use of performance measures aids in benchmarking. The use of measures can facilitate improvements in performance via benchmarking. The use of measures allows organizations to document the quality of services that they offer against established baselines (Anema et al. 2013; Tkalich 2014).

Moreover, Anema et al. 2013 used a case study to establish that the use of performance measures facilitates benchmarking within organizations by highlighting trends in quality and safety improvement. By facilitating benchmarking, the use of measures facilitates the identification of opportunities for improvement and aspects of care that are improving. Next, the use of measures can improve accountability within healthcare organizations. By furthering performance, reporting the use of measures promotes accountability to all stakeholders in healthcare organizations. Use of measurements facilitates comparison with stated objectives and other organizations. Within public hospitals, the use of measures can promote accountability to the central government. Moreover, measures can aid service users in choosing service providers. In cases where performance findings from different providers are readily available, users can compare them across different measures. This makes it easier to make an objective selection of service providers (Anema et al. 2013).

2.4.1 Best Practices in developing measurements for HIS

Research into the considerations when developing performance measurements has led to the identification of risks that have to be considered. These risks have to be considered in advance to ensure that the measures are effective. Using grounded theory, Milichovsky & Hornungová 2013 determined that to maximize the overall effect of performance measurement, the set of measures used should offered a comprehensive view of the services on offer without placing undue pressure on the healthcare organization to collect data. When developing measures, organizations should avoid the temptation of focusing on a particular aspect of care while ignoring others. The use of a limited set of measures may not offer enough information for effective performance measurement. In fact, such an approach may encourage focusing on the activity being measured rather than healthcare services (Milichovsky & Hornungová 2013).

The second consideration is the data quality (Dragomir et al. 2013). The interpretation of performance measures must involve consideration of the data quality and the definitions that make them. The absence of explicit definitions denies the users of measures the opportunity to verify the quality of data being collected. Furthermore, the lack of definition limits the determination of the accuracy if the recording activity thus crippling benchmarking. Therefore, organizations should ensure that there are explicit definitions for each measure and data quality checks to verify the accuracy of the data being collected. This is supported by USAID 2013 who note that a good measure should be specific. An indicator should convey at a glance what is being measured and how the measurement is derived. measures should communicate to the stakeholders clearly what is being done and achieved by the implementation of a HIS (USAID 2013).

The third consideration is the availability of data (Tkalich 2014). The availability of data is a consideration that may make or break a measure. It is impossible to use a measurement for which an organization cannot collect data. However, organizations should not base the selection of performance measures solely on the availability of data. Not every measure for which data can be collected is a good measure. Basing measurements solely on available data can lead to poor performance measures. Thus, availability of data is a consideration aimed at ensuring that performance measurement is practically feasible. This assertion is also supported by USAID 2013 who state that a good measure should be achievable. This is attained by basing performance indicators on attainable measures (USAID 2013).

HIS are often used in the capture and presentation of different indicators relating to the performance of healthcare institutions. The ability to aggregate data from different sources, carry out automated calculations, and develop graphical presentations such as charts makes the use of HIS invaluable in performance monitoring. However, using HIS to capture measures and indicators for the overall performance of a hospital differs significantly from capturing indicators on HIS implementation. The performance measures that are specific to HIS are generally aimed at capturing the impact of HIS implementation on different aspects of interest to hospital stakeholders (Mattoo et al. 2013; Hübner-Bloder et al. 2009). A HIS is likely to be viewed as a success story if its implementation is associated with significant improvement in outcomes that are valued by hospitals. This brings about an overall between the hospital measures and HIS implementation measures. On the other hand, there are measures associated with HIS implementation that are not commonly employed by healthcare institutions. Research has led to the identifications of measures that are of interest to the main stakeholders in healthcare facilities (Hübner-Bloder et al. 2009). The measures are categorized into three main types namely clinical, operational, and financial (Swaminath et al. 2015; Briscoe et al. 2016; Grandia & Should 2017; McCone 2017).

Performance measurements are not created in vacuums. To guarantee their value to decision makers, they ought to be part of a hospitals strategic framework. Thus, the measures should aid in the communication of the strategy and foster common purpose across programs, workforces, and facilities (USAID 2013). Therefore, the development of performance measures starts with good strategic planning. Strategic planning allows for the integration of policy, budgeting, management, planning, and review at different levels. The use of performance indicators and measures can help make policies and priorities explicit. performance indicators , should not be thought of as standalone measures, rather they should be viewed as a product of strategic thinking, analysis and negotiation around policy challenges and responses (Guerra-López & Hutchinson 2013). The process of developing measures entails identifying the problems of needs, developing policies, or measures to address the problem, articulating the desired goals. When designing performance measures for a specific program such as HIS, it is important to consider the inputs, activities, outputs, and outcomes. The inputs are the resources used by the HIS in the delivery of services. Activities refer to the processes and actions undertaken to achieve the delivery of service. A HIS may encrypt data, analyze data, and even transmit data as part of its core functions. Outputs refer to the services that are delivered by the HIS, whereas outcomes refer to the resulting benefits to the hospital fraternity including patient because of using HIS (Guerra-López & Hutchinson 2013).

Researchers have used the SMART acronym to highlight the desired attributes of a good performance indicator and by extension measures (USAID 2013). A good measure should be specific. An indicator should convey at a glance what is being measured and how the measurement is derived. Measurements should communicate to the stakeholders clearly what is being done and achieved by the implementation of a HIS. The second component of the SMART acronym is being measurable. This focuses on the ability to express the measurement as an objective value. It is also concerned with the reliability of the data and ease of data collection (Potter 2004). It is often easier to base indicators on measures that can be easily collected or already exist. The third element of the SMART acronym focuses on achievability. The performance measures should focus on measures that can be achieved.

The fourth element in the SMART acronym is relevant. A good measure should measure the most important results of the implementation of a HIS. This involves determining the measures that the stakeholders' value or perceive as meaningful or valuable (Guerra-López & Hutchinson 2013). The last SMART consideration is the measures need to be time-bound. Good measures should integrate deadlines for the achievement of desired performance levels (Potter 2004). Moreover, the measures should be reported at sufficiently regular intervals to support management decision making and tracking. Thus, the design of measures should ensure that they meet all SMART requirements to maximize their value to stakeholders (Potter 2004).

2.4.2 Technical and Behavioral measurments of HIS

Technical implementations tend to have measures that are technically oriented. It is commonplace to focus on the flexibility and scalability of the resulting system. Since the implementation of a HIS is a costly undertaking, healthcare institutions have to ensure that the resultant system can be expanded with the growth of the hospital (Blakeley 2007). Moreover, a HIS should be able to handle changing operational demands without the need of changing the system components (Weerakkody et al. 2013). In measuring scalability measures, organizations should start the evaluation by highlighting the general elements measured. The first measure is the percentage of successfully established connection, whereas the second measure is throughput and congestion. The percentage of successfully established connections is a measure of performance that is related to usability of the system. This measure us useful in creation combined metrics. Both usability and performance are used in assessing the performance of HIS. Secondly, throughput and congestion are measures related to monitoring. According to (Ko et al. 2012), congestion of a system can result in slow performance and even timeouts when accessing resources. The throughput refers to the number of tasks that are completed successfully. A higher system throughput is desirable. It is imperative to ensure that the definition of both congestion and throughput are clear to avoid misunderstanding and errors during comparison (Mousavi Khaneghah et al. 2014).

Load tolerance is a key scalability measure. Load tolerance is defined as the ratio of the maximum load a system can handle to the normal expected load (Lester & Tran 2008). This provides a measure of the normal load by which a system can temporary upscale in terms of the bandwidth and processing power. Load tolerance is a relative measure that indicates the variations allowed in the system load without affecting the overall performance. The number of users served can have a considerable impact on the load tolerance. Systems with more users tend to have lower load tolerance than systems with fewer users given comparable or the same technical specifications (Lester & Tran 2008).

Another technical dimension of assessing information system is their fault tolerance and reliability. The ability to function despite the existence of faults ensures that the system is resilient to failures. Most resilient systems have inbuilt redundancies aimed at circumventing different forms of failure. Data loss and corruption can severely affect the performance of information systems (Weerakkody et al. 2013). In addition, the failure of system components such as a router can have a significant effect on the flow of data signals. Using network topologies that allow for the inclusion of redundancies and elimination of single points of failure and generating multiple copies of data can help increase the fault tolerance of information systems and their reliability. However, despite these measures, loss of data can still occur. Data loss and corruption should be as low as possible to minimize negatively impacting system performance (Weerakkody et al. 2013).

Performance is an area of critical importance to HIS. The design of information system should involve through consideration of the performance demands of the users. Usability of the entire system is tied to its performance. The first performance measure is bandwidth or network utilization. This measure is lined to monitoring and scalability. However, the levels of network and bandwidth utilization between data centers and core functions should be considered (Leu & Lin 2011). In general, the bandwidth and network utilization should be high enough to validate the use of the infrastructure, but low enough to allow for expected growth in usage. The second measure that can be used is page load times. Given that a HIS has multiple services, this measure should be captured for every single service or function. The fact that lab pages load faster does not guarantee that pharmacy function pages do so too. The last performance measure is system agility. This measure seeks to capture the variance in the efficiency of alignment of IT resources to the workload over time. High variance indicates low agility of the IT domain in responding to changing workload. A problem that is typically associated with inflexibly dedicated resources (Leu & Lin 2011).

Every computer system and network has hardware resources (Tokuno 2012). The type and configuration of hardware can have a considerable impact on the performance of the entire system. The first hardware consideration is the number of CPUs on computers and servers. The number of CPUs on the server and the users' computers has a bearing on performance (Pugh 2008). For example, a quad core CPU has a better response time than a single core CPU. Performance is improved considerably if the user terminals and the servers have high performing CPUs. The second hardware consideration is the available memory (Lopez, V., & Miñana 2012). For the servers and the terminal computers, the amount of memory available has a direct bearing on the processing capability. Performance and scalability are all affected by the available memory. The next hardware resource measurement is the CPU usage (Wandeler et al. 2006). This refers to the proportion of the total CPU used by the HIS. A lower proportion is deemed better to allow for scalability and changes in performance demands. The last measurement is the memory usage. This is the proportion of the total memory used by the HIS. Lower memory usage is ideal to minimize the effects of running a HIS on other computer network functions (Wandeler et al. 2006).

Technology adoption and associated behavioral adoption have been used in the past in developing measures for information systems. Behavioral approaches to developing measures often target assessment of system performance from the end user perspective. Acceptance of HIS and the satisfaction that the user derives from using the HIS are important behavioral perspective measures. (Capece & Campisi 2013) proposed indicators for assessing user satisfaction with technology-based services. The fascination with the assessment of user satisfaction stems from its close association with the usability and overall utility of systems in organizations. Some studies have complied up to 18 different determinants of service quality that can be used in assessing service quality. The determinants that are commonly used in assessing technology-based services include availability, friendliness, reliability, access, aesthetics, and functionality. The SERVQUAL model developed in 1988 is often used in measuring the quality of service. This widely accepted tool includes four dimensions of service quality, namely responsiveness, tangibles, reliability, empathy, and assurance (Jiang et al. 2012). For e-services, a modified version of the SERVQUAL is often used. The modified SERVQUAL measures service quality under the following dimensions: website design, fulfillment, reliability, information (accuracy and comprehensibility), empathy, personalization, and security. Other adaptations of the SERVQUAL for quality evaluation have resulted in the inclusion of more dimension. In 2001, eleven dimensions of service quality were proposed, namely: ease of navigation, responsiveness, access, efficiency, reliability, flexibility, personalization, site aesthetics, assurance/trust, security/privacy, and price knowledge (Mbise, E. R., & Tuninga 2016).

2.4.3 Technology Acceptance measures

The technology acceptance theory has been widely adopted and applied by researchers in their evaluation of electronic services from user perspectives. Over the last three decades, various studies have been carried out on information system acceptance focusing on the reasons for the acceptance or rejection of technologies by users (Butt et al. 2016; Chen et al. 2014). This has resulted in the creation of several models and theories, some of which have been empirically validated. The models include technology acceptance model, the extended technology acceptance model 2, social cognitive theory, the theory of reasoned action, model of PC, theory of planned behavior, innovation diffusion theory, and motivation model (Weerakkody et al. 2013). The unified theory of acceptance and use of technology, which was created in 2003, combines elements of eight previous IS acceptance theories and models (Venkatesh et al. 2016). This theory seeks to explain both the user intention to use an IS and the subsequent usage behaviors. The model associated with this theory has been empirically validated by multiple studies. This was in an effort to redress the challenge faced in selecting a model from the many that have been created on technology acceptance (Venkatesh et al. 2016).

2.4.4 Information System Success Measures

Another stream of research focuses on information system success. This stream of studies focuses on the factors that influence information system success. Individual differences between the users in terms of their attitudes towards technology and compute technology can affect their use of information systems. The Productivity of information systems and computers focuses on the efficiency of the supply of data and the effective utilization of the data processing outputs (Freeze et al. 2010). The importance of user involvement has also been highlighted as a critical success factor of information systems. According to the information success model, information quality, use, user satisfaction, organizational impact, individual impact, and system quality influenced the overall success of an information system. The technology acceptance model and information system success models have extensively been used as theoretical models in the formulation of behavioral information system performance indicators (Petter et al. 2013).

By using the information success model, it is possible to create indicators for HIS implementation. Under system quality, the measures that can be used include flexibility, reliability, integration, accessibility, and timeliness. Reliability refers to the dependability of system operation. Flexibility refers to the way the system adapts to users changing demands. Integration refers to the way the system supports the integration of data from multiple sources. Accessibility refers to the ease with which information can be retrieved from the system. Timeliness is a measure of the degree to which the system offers timely responses for requests for resources and functions (Kablan et al. 2015).

The information quality dimension can generate two measures namely completeness and accuracy. Completeness is the degree to which an information system provides necessary information, whereas accuracy is a measure of the users' perception of the correctness of information provided by the system and its functions (Petter et al. 2013). The service quality dimension can be used to derive three different measures, namely reliability, responsiveness, and empathy. Empathy is a measure of the care and individualized attention that an organization offers to its client. Responsiveness is a measure of the willingness to offer prompt assistance to client and inspire confidence and trust. Reliability refers to the capacity to perform the promised functions accurately and dependably (Delone & McLean 2003).

The information use dimension provides two measures, namely usefulness and ease of use. Usefulness is a measure of the degree to which users believe that information system will enhance their performance in tasks, whereas ease of use is a measure of the degree to which users believe that a HIS would be free of effort. The user satisfaction dimension offers a single measure: system satisfaction. System satisfaction is a measure of the degree to which the users favor the system in relation to its interaction mechanics (Ilias et al. 2008).

2.4.5 Socioeconomic Measures

Socioeconomic issues have to be considered in developing measures for HIS. HIS are implemented in social environments; as such, their implementation should conform to the established values. Economically, organizations should ensure that the implementation of a HIS is economically viable and contributes to improvements in productivity (Chaudhry et al. 2006). The primary economic issue in the implementation of a HIS is cost saving. The implementation of a HIS is expected to reduce the time and money used in the delivery of healthcare services. Money saving is a measure of the productive time saved by using an information system. This time can be converted into money. Time saving is a measure of time saving per service. This typically involves comparison of the time taken to complete a service using a HIS with the time that would have been taken had the HIS not been used (Chaudhry et al. 2006).

Social issues in using a HIS include openness and trust. Openness is a measure of the degree of transparency that organizations HIS offers to its users (Melody 2010). Openness is widely appreciated by the users, and could improve usability. Trust is a measure of the levels of security and privacy afforded by using a HIS (Vance et al. 2008). A HIS system should have integrated security and privacy measures to protect the concerns of the users and patient information. In fact, existing regulations set a minimum set of privacy and security requirements for systems that handle the storage and interchange of patient information (Vance et al. 2008). The next section explores the gaps that have been identified in the literature review.

2.5 Organizational Performance

According to Cameron & Whetten (2013), the performance of any organization is the measure of how successful the organization is in relation to achieving its goals and objectives. It is thus the organizational effectiveness. Petter et al. 2008, advance this statement with the assertion that there are possible methods through which information systems can be measured with respect to dimensions, interrelationships, measures, and models. This was after a research summary that the authors conducted that utilized already existent research and literature relatable to IS's (Information Systems) success that analyzed the relationship revolving around DeLone and McLean (D&M) IS model through its applicability on both organizational and individual contexts (Petter et al. 2008). It is imperative to note that measurement of performance in organizations initially focused only on goal achievement {goal models}(Cameron & Wherren 2013).

Nevertheless, the organizational performance as a measure gradually evolved to take into account all the resources that a company requires in order to achieve these goals (system models), the values on which the company grounds its effectiveness evaluation (competing values models) and the absence of factors of ineffectiveness (ineffectiveness models) which are all applicable in hospital scenarios whereby HIS is being utilized (Davis et al. 2013). In addition, according to Yim and Shin (2014), this evolution was indispensable so as to include in these measurements the aspect of quality control advanced by information quality that enhances job performance (Yim & Shin 2014). The system of quality checks as a metric for assessments and evaluation was advanced since any system that utilizes modern technology needs to offer its clients and consumers information that is easily accessible, possess high quality and is trustworthy (Al-Mamary et al. 2014). Thus, performance measurement is today based on a process perspective that focuses mainly on the internal processes by which actions' effectiveness and efficiency are quantified in relation to set metrics (Cameron &

Wherren 2013). The models of performance have evolved from the initial view where they were based mainly on the financial measures to the present day holistic view where they are based on multiple measures some of which are nonfinancial (Tranmer et al. 2016).

2.5.1 Operationalization of organizational performance and its assessments

Richard et al. (2009), conducted a review on the operationalization of performance. Their review found out that the commonly accepted practices of performance measurement have limited effectiveness. In the study conducted by Pierre et al. (2009), they proposed that the challenge of limited effectiveness of the accepted practices of performance measurement can be addressed by ensuring that researchers who measure organizational performance are well equipped with a strong theoretical rationale on the nature of performance which will enable them implement and incorporate the measures that are appropriate for the research context. As aforementioned, there exists different organizational performance measures that can be utilized in measuring the success of any IS (information systems) such as HIS in majority of hospitals ranging from different dimensions, interrelationships, measures, and models can be measured with respect to (Petter et al. 2008). Once the appropriate measures have been decided, the researchers should rely on the strong theory regarding the nature of the selected measures (Petter et al. 2008).

In most cases, quality as an organizational performance standard metric has been utilized in most cases (Al-Mamary et al. 2014; Yim & Shin 2014). According to a research by Chang and King in 2005, quality is not the only functional scorecard or set metric of organizational performance that can be utilized in assessment and evaluation of IS structures (for instance, HIS systems in hospitals under this case study) since theoretical models such as the input-output model employed in determining the role of IS in supporting business organizational performance and process effectiveness can be utilized. Tranmer et al., 2016 a research carried out to examine triangulation that uses longitudinal data, multiple measures and alternative methodological formulations were able to help in putting different research contexts in line with the measurement of organizational performance (Tranmer et al. 2016).

2.5.2 Models of organizational performance measurements

According to Devaraj & Kohli (2003), various models have been proposed and even successfully utilized to measure and assess performance in healthcare organizations. The first model of assessing the performance of a healthcare organization is the goal/rational model. This model is the implicit and *defacto* model (A defacto model is one that has been tested, assessed and pragmatically utilized and implemented in most running organizations therefore becoming an acceptable standard and metric) that has been used by many analysts and organizational practitioners. According to this model, every organization has specific objectives that it exists to achieve. The performance of an organization is thus evaluated based on the extent to which it attains these objectives through its productivity that results from the use of its available resources (Devaraj & Kohli 2003).

According to Zhijun et al., (2014), the second healthcare performance assessment model is the internal processes model. This model assumes that an organization is performing if it functions smoothly as directed by the norms without drawing unnecessary strains internally. Comparatively, (Al-Mamary et al. 2014), assert that information quality and system quality are imperative constructs that influence the smooth functioning of most organization contributing to high organizational performance in the event that the applicability of these two constructs are done efficiently and strategically. The third model for assessing performance is the resource acquisition model advanced by Zhijun et al., (2014), that stipulated that since an organization is considered as open systems that interact with their environments, resource acquisition and maintenance; it becomes a very critical organizational process when these elements are combined an work interchangeably. According to this model, the operational definition of an organization's purpose is to the managers the acquisition of resources (Zhijun et al. 2014). Performance is thus evaluated based on the organization's success in the acquisition of resources and growth through being flexible, adaptable and benefitting from external support (Devaraj & Kohli 2003).

The fourth performance assessment model is the human relations model. This model is derived from viewing organizations as natural systems or organic. The model places emphasis on stakeholder need satisfaction as well as on other activities which are necessary to support the organization in maintaining itself (Devaraj & Kohli 2003). Devaraj and Kohli (2003) claim that according to the human relations model, an organization's performance is evaluated based on its internal services which is defined by dimensions such as commitment, motivation, morale, and cohesion.

The fifth performance that is used to assess performance in an organization is the strategic constituencies' model. According to this model, performance is evaluated based on the satisfaction of both the internal and external significant stakeholders. The emphasis is placed on satisfaction and compromise (Cameron & Wherren 2013). An organization is highly performing if it minimally satisfies all the significant internal and external stakeholders. Another popular model of performance assessment is the social legitimacy model. The model is proposed by those who view the functioning of an organization from the perspective of population ecology. An organization is considered high performing if it is able to maintain itself and survive by advancing processes and outcomes that meet the social standards, values, and expectations (Devaraj & Kohli 2003).

The models of performance assessment described above all base the assessment on different performance construct conceptualizations. Richard et al., 2009 however, propose methodological models to be used in assessing organizational performance. The three most common methodological models are the comparative high-performance model, fault driven model and the rational system action model (Devaraj & Kohli 2003).

2.6 Hospital Performance

Measurement of hospital performance is not a new issue, neither is it a regional issue. It is a worldwide practice that dates back to as early as the 1980s. The history of healthcare performance measurement dates back to the days of Florence Nightingale in the 19th century when she showed concern for the sanitation conditions in the hospitals (Richard et al. 2009).

2.6.1 Hospital Performance Measurements

There are different theories and models that are utilized in the measurement of hospital performance with examples depicted below intricately.

According to a research by Chang and King (2005), theoretical models such as the Input-Output Performance Model (Information System Theory) are typically employed in determining the role of IS in supporting business organizational performances and process effectiveness that can be utilized as scorecards or set metrics of organizational performance. The input-output model can be utilized in assessment and evaluation of IS structures (for instance, HIS systems in hospitals under this case study) since model that have been developed, tested and implemented successfully are imperative constructs that act as standard metrics for most businesses. Hospital Information System are part of the larger scope of Information Systems which are attributed to the currently increment in hospital performance with regard to patient-physician relationships which enhances understanding and cooperation due to the performance effectiveness that this information system pragmatically intertwines various departments, hospital equipment and hospital management together (Cheng et al. 2015).

Consequently, the theoretical input–output model advanced by Chang and King was applicably a functional scorecard for information systems (ISFS). Information Systems which is a technological construct that is applicable under hospital performance through the input-output model can immensely improve the flow and ease of information within most hospital settings which enhances the effectiveness of both in-patient and out-patient care in major hospitals (Chang & King 2005; Chaudhry et al. 2006). This is because the input-output model as an information systems (IS) functional scorecard (ISFS) incorporates a three output dimensional criteria in its system which comprises information effectiveness, systems performance, and service performance (Chang & King 2005). These three factors of Information Systems can highly positively impact hospital performance when well-coordinated under the theorized input-output model especially in various regional hospital in Jordan (Almajali et al. 2016).

It is imperative to note that performance measurement is aimed at promoting accountability to stakeholders and ensuring the set performance targets are being met (Hübner-Bloder et al. 2009). Hospital stakeholders such as the government, clinicians, service users and the public can use performance measures to assess and make decisions on the reliability safety and quality of care offered. This is seconded by Dragomir et al. (2013), who asserts that the performance measures aids in determining the degree to which healthcare organizations are meeting their goals (Dragomir et al. 2013). According to Hübner-Bloder et al. (2009), the best performance measures tend to be highly reliable, sharable, and comparable to the healthcare sector (Hübner-Bloder et al. 2009).

Several theories as much as models have been applied by different researchers in measuring the performance in hospitals. In 1987 Grosskopf and Valdmanis, used a comparative technique to assess the relative performance of hospitals in California. Using this theoretical technique, the researchers compared hospitals on the basis of their relative technical efficiency. They first constructed a reference technology from the observed output and inputs through the use of programming techniques. Then they employed measures similar to the Farrellian methods (repetitive usage of theories and models under different contexts) to assess efficiency relative to the frontier of the reference (original theory or model) technology (Grosskopf & Valdmanis 1987). The technique they used imposed no pre-specified functional form. The technique also allowed for multiple inputs and outputs. Moreover, the technology yields information about the productive performance of individual hospitals. The findings of this study showed a significant difference in quality of care between public and privately owned hospitals. The authors attributed this difference to the inadequacy of resources in public hospitals and the influence of ownership on performance (Zhu 2014).

In yet another research, Benzaquen et al. (1990), developed and tested the validity of risk adjusted indexes of readmissions, mortality and complications as a measure of hospital performance. The three indices are stable over time and lack the bias that results from teaching status, hospital size or hospital ownership. Validity of construct was observed for all the three indexes when they were tested against hospital care changes (Benzaquen et al. 1990).

2.6.2 Domains of Healthcare Performance - Healthcare Related measurements –

Among the many systems of measurement, several domains of healthcare performance measures exist. The following are the main domains of performance measures in health care:

2.6.2.1 The clinical Measures

The clinical measures have the greatest impact on the outcomes of the core business of healthcare facilities. The primary business of healthcare facilities, especially in the public sector is the provision of healthcare services. This class of measures targets the extent to which the implementation of a HIS has influenced the delivery of healthcare services (Edwards 2009). Among patients, this class of measures is crucial. For a government committed to the wellbeing of the public, measures related to clinical outcomes are used in assessing performance of public health (Edwards 2009).

Hospital incidents is a common clinical measurement used in assessing the contributions of a HIS to reducing avoidable incidents (McCance et al. 2012). Some of the incidents of interest include acquisition of patients in hospitals, transfusion reactions, bedsores, postoperative respiratory failure, deep vein thrombosis, postoperative sepsis, postoperative hematoma, postoperative hip fracture, postoperative hemorrhage, and postoperative pulmonary embolism (McCance et al. 2012; Edwards 2009). These measures provide information on the contributions of the HIS to improvements in the quality of care offered to the patients (McCance et al. 2012).

The second clinical measure is the death rate (Briscoe et al. 2016). The measures of interest include the patients who die during emergency care, postoperative death rate, and post-procedural death rate. Death is a part of healthcare practice. Death is in some cases unavoidable. However, the essence of healthcare practice is averting death where possible. High rates of postoperative and post procedural deaths in a health facility may suggest poor delivery of procedures. Users can benchmark the performance of healthcare facilities against the state and nationwide scores in the areas of postoperative death rate (Swaminath et al. 2015). It is unlikely that a patient can knowing select a healthcare facility with poor or average postoperative and post procedural survival rate. HIS can contribute to postoperative care, ICU care, emergency care, and post procedural care by aiding the timely acquisition of information on the patient and providing a host of features that minimize the risk of medical errors. In this way, a HIS can aid in the reduction of death rates (Briscoe et al. 2016; Swaminath et al. 2015).

The third clinical measure is patient satisfaction rates. It is common practice for healthcare facilities to carry out exit surveys aimed at capturing the quality of care that patients have received (Rusuaneanu 2014; Briscoe et al. 2016). Satisfaction is viewed as part of the quality of care domain. It is, however, usually handled separately from the quality domain. There are a number of standard surveys of satisfaction in healthcare (Zhijun et al., 2014). This domain of hospital performance measure focuses on the satisfaction survey where the patient or the patient’s family gives a report on the extent to which they are satisfied with the services that were offered in the specific healthcare facility (Tsai et al., 2015).

Patient satisfaction can target areas such as the courtesy score for staff, quality of meals offered to in-patients, quality of physician care, quality of nursing care and the housekeeping scores. The Quality of care surveys can be done that capture all these elements using a single instrument. The overall quality of care is a mix of several factors including the medical care that patients receive, the quality of their interaction with the healthcare professionals, and the quality of the healthcare environment such as waiting rooms, wards, and meals (Zhijun et al. 2014; Tsai et al. 2015). However, the focus should be on elements of patient satisfaction that can be influenced directly or indirectly by the HIS. For instance, courtesy scores are seldom influenced by the existence of a HIS. A medical or non-medical staff can be courteous irrespective of the existence of a HIS. On the other hand, the quality of meals can be affected by mix-ups or delays in staff scheduling and the procurement of ingredients (Kim et al. 2010; Fernando & Wijesinghe 2017). As such, a HIS can have a direct impact on the quality of meals (Rusuaneanu 2014; Theurer 2011).

The fourth clinical measure is the quality of care and hospital service effectiveness domain is focused on the clinical aspects of the care that a hospital provides for a specific group of patients. Most of these measures reflect clinical condition treatment patterns that have been accepted. The accepted treatment patterns can be derived from local custom or expert consensus. The patterns can also be derived from treatment guidelines with national recognition or published scientific literature (Saluvan & Ozonoff 2018). Due to the heterogeneous nature of quality of care, this domain entails an infinite number of measures (McCance et al. 2012; Swaminath et al. 2015; Cameron & Whetten 2013). For ease of handling, the measures have been categorized into the outcome, process and structure. The outcome that is measured in this case refers to the change in the patient's health status. The structure refers to the features of the healthcare facility, the health plan or the healthcare system that are stable and facilitate good quality. The process refers to what the healthcare facility or the healthcare system does (Tsai et al. 2015; Griffey et al. 2015).

Hospital service effectiveness can be attributed to the type of employees' qualification at the hospital, the type and convenience of hospital equipment utilized and the criterion of healthcare information system applied and implemented at the hospital. Hospitals service effectiveness starts when its main objectives and goals is to offer exemplary services to its patients. This encompasses hospital services which are offered by the hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists (Briscoe et al. 2016; Swaminath et al. 2015; McCance et al. 2012) .

According to Mattoo et al. (2013), through a study conducted to determine patient care of various hospitals through the Management Information System, it is prudent to assert that the objectives, aims and goals of any hospital are what detemrines its effectiveness in offering both preventive and curative services. Hospital sevcie effectivness can be well presented by the prime example of the research that was conducted in Pakistan proved the essense of clincal activities that enhanced the care management offered to patients which was largely dependent on the strategic location of the hospital, its operative soundness and the efficiecy through which its management systemms were being operated, monitored and controlled. These aspects navigate and direction whether a given hospital will offer effectives services or not to its patients (Mattoo et al. 2013).

Hospital service effectiveness depends largely on the Healthcare Information System that is applied on any given hospital since it is the one that navigates through the activities of the various hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists and its patients. Therefore, a well updated and highly functional Healthcare Information System will definitely increase chances of a given hospital offering good services which will lead to patients' satisfaction (Kastanioti & Polyzos 2016). Hospital service effectiveness can be theorized as a construct that is measurable through the satisfaction metric which is part of the quality of care domain. It is, however, usually handled separately from the quality domain. There are a number of standard surveys of satisfaction in healthcare (Zhijun et al. 2014). Satisfaction as a standard metric for measuring the effectiveness of hospital service and hospital performance focuses on the satisfaction survey where the patient or the patient's family gives a report on the extent to which they are satisfied with the services that were offered in the specific healthcare facility (Tsai et al. 2015).

Hospital service effectiveness can be assessed to be good or bad through evaluating patient satisfaction can only be justified through the type, degree and criterion of hospital efficiency employed ranging from parameters such as good, bad, high, low, evolving, and effective among others (Chaudhry et al. 2006). Hospital efficiency is paramount in determining patient satisfaction since it navigates the various hospital's systematic parameters in the form of a review. Hospital efficiency through the feedback checks offered the patients and their family members impacts the technology of health information on various matters such as efficiency, quality, and costs of medical care which is imperative for determining the level of hospital service effectiveness (Chaudhry et al. 2006; Collen & Greenes 2015).

Hospital service effectiveness depends largely also on the type of clinical activity carried out by a given hospital. In the country of Jordan, clinical activity is vital in the determination of whether a public hospital is considered developed or under-developed (Almajali et al. 2016). This also imperatively resonates well with the identification of the various performance indicators that revolve around nursing fraternities and also midwifery agencies as part of hospital management systems which all operate under given protocols and a workable consensus approach (McLaren et al. 2011). The structure of hospital management when well-organized and maintained contributes to exceptional clinical performance which increases hospitals' service effectiveness (NHS Executive 1999).

Clinical activity as a construct of quality of care domain is difficult sometimes to maintain since in reality, hospitals are very expensive to build and to operate. Administrators and professionals have to be extremely cost conscious (Nwagbara et al. 2016). Effective computerized systems and procedures need to be implemented to ensure proper utilization of limited resources toward quality health care (Somu & Bhaskar 2011; Ruland & Ravn 2001). This report tries to cover giving an insight to the Hospital Management Information system. The system can provide quality patient care service. The computerized system will enable the medics to serve their customers with a smile and to meet the corporate objective (Somu & Bhaskar 2011).

The main challenge in using clinical measures in assessing the performance of HIS is in determining the change in the clinical measures that is attributable to the implementation of HIS. The patient satisfaction rates, death rate, and hospital incidents can be affected by the professional expertise and involvement of the medical staff (Shirley et al. 2016). For instance, high rates of medical errors and misdiagnosis of medical conditions that affect all three measures can be attributed to negligence by physicians and nurses (Inelmen et al. 2010). Thus, when using clinical measures in assessing the performance of a HIS, organizations should partition the effect such that the actual contribution of a HIS is captured. Statistical techniques such as ANOVA can be used to partition the effects. Strategies such as blocking can also be used to establish the effects of HIS on clinical measures independent of the influence of medical and non-medical staff (Grandia & Should 2017).

2.6.2.2 The Opearational Measures

The operational measures are oriented towards the employees than the patients (Rusuaneanu 2014; Swaminath et al. 2015). The operational measures affect productivity, morale, and patient satisfaction. In general, this class of measures focuses on processes and issues that ultimately have a direct bearing on the quality of care. Most of these processes are directly affected by the implementation of HIS. In fact, HIS are implemented to facilitate processes within healthcare facilities. As such, this class of measures is often perceived as the most relevant when assessing the impact of HIS implementation (Rusuaneanu 2014).

The first operational measure is the admission process score. This is a measure the degree of ease with which a patient is admitted into a medical facility (Ma et al. 2010). Admission is a process that can be problematic, especially if there are problems in coordinating the acquisition of the required patient information. HIS facilitates the sharing of patient data among hospitals in a secure manner. In addition, the entry of patient data and maintenance of their profiles, including the retrieval of their profile data that has both medical and non-medical data, should be seamless when using a HIS. Thus, this measure contributes to capturing the effects of HIS implementation on the data sharing and retrieval processes associated with patient admission (Ma et al. 2010)..

The second operational measure is medication error. HIS support various technologies that help avoid miscommunication of patient data and prescriptions (Phillips-Wren & McKniff 2015). Moreover, HIS includes functionalities that provide allergy alerts. Since medication, errors are often caused by miscommunication or lack of information on specific aspects of a patient’s health history, the improvement in communication brought about by the use of a HIS and its components should result in a reduction in medication errors. The different dimensions of medication error such as providing wrong medication to the right patient, providing medication to the wrong patient, and the wrong dosage can be averted by using a HIS (Phillips-Wren & McKniff 2015).

The third operational measure is patient wait time. This is formally defined as the time taken by patients while waiting for the provision of services. Patient wait time is a measure of the throughput of different facilities within a hospital (Zhijun et al. 2014; Northcott & Llewellyn 2004). Wait times can focus on core areas such as admission, discharge, triage, diagnosis and ambulance. Wait times are influenced by throughput and the number of patients being served. Implementation of a HIS can affect the throughput by making it easier to retrieve patient information, transmit laboratory results, transmit prescriptions, and make a diagnosis. Therefore, the implementation of a HIS is expected to reduce the patient wait time (Swaminath et al. 2015).

The fourth operational measure is the Average Length of Stay (ALOS). ALOS is a measure of efficiency (Ma et al. 2010). Generally, a shorter discharge is associated with less cost per discharge. Notably, it shifts care from the costly inpatient care to the less costly outpatient care. However, the ALOS should not be too small to result in higher readmission rates and poor quality of care (Ma et al. 2010). Generally, ALOS is aimed at ascertaining the time it takes a hospital to restore patients into a functioning state. Implementation of a HIS should reduce the ALOS in a healthcare facility by aiding different aspects of the management of inpatients such as diet and clinical monitoring (Ma et al. 2010; Chen et al. 2006).

The fifth operational measure is the asset utilization rate. This measure focuses on the equipment idle time, bed utilization rate, equipment maintenance time and equipment utilization time (Northcott & Llewellyn 2004; Swaminath et al. 2015). In general, assets generate revenue when they are put to use. In a public hospital setting, the utilization of assets is a measure of the effectiveness of the facility in meeting its mandate to the public. Lower utilization is associated with loss of revenue, whereas extremely high levels of utilization can increase wait times and overworking in medical and non-medical staff. Implementation of a HIS is expected to aid in scheduling of maintenance tasks and monitoring trends in service and resource utilization. As a result, the implementation of a HIS should end in better (balanced) resource utilization (not too high nor too low) (Rusuaneanu 2014; Ruland & Ravn 2001).

Unlike the quality domain, this domain measures clinical activity regardless of whether they are the right activity or not. It is a reflection of the organization administrative efficiency (Zhijun et al. 2014). Some performance measures are a reflection of both quality of care and utilization. An example of such a measure is the rate of hospital readmission (Griffey et al. 2015). The utilization domain on clinical readmission can be high when the hospital has an effective and highly efficient performance measure with most underlying the quality element of hospital performance (Zhijun et al. 2014).

According to Al-Mamary et al. (2014), information quality and system quality are imperative determinants of clinical activity since they increase the organizational performance of hospital settings. This is monitoring and controlling that is achieved through the presentation of information to various users who are mainly patients in an easy-to-understand procedure and format which makes it effective for utilization of information systems within a particular hospital domain. Precisely, high quality information leads to creation of high quality systemic information sharing which increases the quality of clinical activity (McCance et al. 2012).

2.6.2.3 The Financial Measures

The financial measures affects the topline and the bottom-line. One of the core reasons for the implementation of a HIS is to improve cost efficiency (Suarez et al. 2011). This class of measures focuses on the effects of HIS implementation on different measurements of financial performance. Even though public hospitals are not for profit institutions, they are accountable to the public and the government. The hospitals have to show that they are being run in a cost effective manner (Suarez et al. 2011).

This domain of hospital performance entails measures that provide a detailed analysis of the balance between the hospital expenditure and revenues. According to Cameron and Whetten (2013), the efficiency of the financial management process is also reflected by measures like day's cash on hand and days in account receivables. According to Davis et al. (2013), financial domains of most hospitals are best implemented, maintained and controlled through Informational Systems which determines the effectiveness, efficiency, and equity of health performance in different dimensions. This includes finance obligations to the patient, government grants and subsidies and hospital efficiency in treating, admitting and taking care of its patients (Davis et al. 2013; Ruland & Ravn 2001). Creswell and Sheikh (2013) identified 13 systematic reviews from a total of 121 systematic reviews including organizational issues encompassing implementations of health information technology, they identified that Hospital effectiveness justifies the finance capability and performance of each healthcare facility since an effective Health Information System will offer quick, dependable, effective, secure and highly reliable financial system domain which enhances patient interaction between hospital personnel and its patients (Cresswell & Sheikh 2013).

The first financial measure is payer performance. This measure provides insights into the performance of payer contracts and the ones that may need to be renegotiated. This measure focuses on the percentage of claims paid the reimbursement amount volume. Payers such as insurance companies play a valuable role in sustaining the operations of both public and private hospitals (Trends 2013; Lighter 2015). The implementation of a HIS can make it easier to collect and visualize data on different payers. This can result in the negotiation of better payment contracts (Wang et al. 2018).

The second financial measure is physician performance. This measure focuses on the revenue per physician and reimbursements per physician. This is a measure of the objective performance of each physician in the hospital in terms of revenue earned per case, the number of cases they handle, bonuses, penalties and their utilization per case. In general, high level of physician utilization is desirable; however, it could result in the erosion of their performance and burnout (Briscoe et al. 2016; Scholle et al. 2009; Scholle et al. 2008). HIS can be used to facilitate the scheduling of physicians to ensure that there is a proper balancing of their workload. Thus, the implementation of a HIS is expected to ensure a uniformity and improvements in physicians' performance (Scholle et al. 2009).

The third financial measure is hospital performance. This measure focuses on aging days and clinical cost reimbursements. This measure offers a real time snapshot of an institution's performance in terms of profit, margins, revenues and reimbursements vs utilization costs (Suarez et al. 2011).

Given that public hospitals in Jordan have to supplement the funding received from the government with monies made from their operations (public healthcare is cheaper), the implementation of a HIS is expected to minimize recurrent expenditures such as the money used in procuring stationery and communicating. The use of HIS as is the case in using ERPs in business enterprises makes it easy to capture the financial state of a hospital in real time (Wang et al. 2018). This makes it easier for administrators and other members of the administrative staff to report their finances and remain accountable (Suarez et al. 2011; Ruland & Ravn 2001).

The fourth financial measure is expenses incurred by the hospital. Expenses are incurred when running a hospital. A large public hospital incurs expenses running into millions daily. Specific expense items that can be influenced by the implementation of a HIS include recurrent expenses, overtime hours, and test result errors (Wadsworth et al. 2009; Rahimi et al. 2016). The use of a HIS improves efficiency that in turn reduces the need for overtime. Thus, HIS implementation should be associated with a reduction in overtime. The laboratory component of the HIS is laden with various tests and facilitates calculations; as such, HIS implementation should be associated with a reduction in test errors. Since all information transmitted via a HIS is logged, its use can facilitate cause analysis when lab and even prescription errors occur (Igira 2012; Wagenaar et al. 2016). Such analysis can avert the occurrence of similar errors in the future (Wadsworth et al. 2009).

The fifth financial measure is referrals to outside centers. Hospitals can refer patients to other centers due to the complexity of caring for the condition, lack of the required equipment, lack of the required expertise, and non-availability of the required expertise (Briscoe et al. 2016). Referring patients is costly and can have negative effects on patient outcomes. Specialist non-availability can occur due to poor scheduling, leave, and sickness. This problem can be averted by the use of the scheduling functions that are an integral part of every HIS. As such, the use of a HIS is expected to reduce the number of referrals made by a hospital (Briscoe et al. 2016).

2.7 Relationship between Health Information Systems (HIS) and Hospital Performance

According to Huffman et al. (2015), through a research study aimed at assessing and evaluating the statistical reliability of different hospital profiling models, it was deduced that it is necessary for all hospitals to implement Health Information Systems which have the potential to quantify all disease management aspects, preserve and track patient outcomes data, gather information about multiple segments of business and lastly provide modeling formulas that are predictive (Huffman et al. 2015). This clearly shows the need for hospitals to invest in technology for the various hospital that are located in different regions in Jordan (Almajali et al. 2016).

According to Al-Yaseenet al. (2010), these group of authors assessed Healthcare Information Systems' implementation with regard to variables such as system quality, information quality, service provider quality and training in various developing countries and came up to the conclusion that technology is a fundamental part of the efforts by healthcare facilities to meet current standards which translates into meaningful outcomes both of financially, operationally and clinically (Al-Yaseen 2012; Al-Yaseen et al. 2010). This is because the various variables of system quality, information quality, service provider quality and flexibility of services are largely dependent on the technology due to the fact that technology tends to advance and revolutionize the various types of Healthcare Information Systems that are being utilized by hospitals (Al-Yaseen 2012; Al-Yaseen et al. 2010). This is to assert that on top of the routine information demands, healthcare administrators need particular information types that will help them in addressing specific issues of management (Zhijun et al. 2014). It is a serious administrative challenge to keep up with the constantly changing type and quantity of the information that is required to handle issues of management (Al-Yaseen et al. 2010).

According to a research on information systems application on healthcare paradigms, Balaban et al. (2013), came to the conclusion that the demand for information by external agencies like the government and insures is also on the rise and the nature and quantity of the information that is demanded is dynamic which affects service provider quality of most hospitals (Balaban et al. 2013). This has been authenticated and supported through another research done on information technology in 2003 by Devaraj and Kohli which concluded that the constant shift in information dynamics is reshaping the healthcare industry thus making it necessary to rely on practices of good information management such as training which is focused on the controllers of Health Information Systems such as hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists (Devaraj & Kohli 2003). This reliance requires that hospitals adopt new technology, train its employees and implement health information systems which are effective and can help them in keeping up with their dynamic demand for information since information quality is a vital construct of HIS (Tsai et al. 2015).

According to (Zhijun et al, 2014), academics and practitioners have continued to be interested by the relationship that exists between hospital performance and the investment in Information Technology by the hospital which determines three factors, that is, system quality, information quality and service provider quality (Zhijun et al. 2014). Many of the researches that have been conducted in this area have failed to determine the impact of individual technologies controlling system quality, information quality or service provider quality on the performance of the hospitals (Devaraj & Kohli 2003). This failure can be attributed majorly to the nature of the research designs that different researchers have employed to study this multidimensional relationship (Zhijun et al. 2014).

Sarv and Rajiv (2003), attempted to prove through a study that the driver of the impact of Information Systems is not just the investment in the information systems but the actual use of the technology. They tested this proposition through a longitudinal healthcare system that was made up of eight hospitals. They analyzed monthly data on the various nonfinancial and financial measures of technology use and hospital performance over a three year period. They triangulated the analysis using three technology usage measures (Devaraj & Kohli 2003). The study found a significant positive association between technology use and hospital quality and revenue occurring after time lags (Devaraj & Kohli 2003). Based on the findings of this study, it is clear that the actual usage of technology is a key variable while seeking to explain how technology impacts on the performance of any organization. The findings which can also be likened to the findings of Zhijun et al. point towards a claim that the omission of the variable of actual usage of technology may be a missing link for studies that aim at analyzing how investment in technology pays off for hospitals (Devaraj & Kohli 2003; Zhijun et al. 2014).

2.7.1 Conceptualization of Public Hospital Performance and Health Inormation System HIS

A high-quality health information system provides the chance to make public hospitals offer the best services and provides the opportunity to improve upon the level of customer satisfaction, also high-quality health information system is important in improving upon the level of hospital administration (Urbach & Müller 2012; Ibrahim et al. 2016), Lau et al. 2010 agreed that by indicating that a high quality of health information system is important in that it improves upon the knowledge levels that personnel in public hospitals have. Thereby, they become successful in delivering on their mandate. Information technology has a positive effect on performance of organizations, Particularly, through the use of health information systems, hospitals have a chance to perform well in terms of quality of healthcare that they offer patients (Devaraj & Kohli 2003; Sligo et al. 2017)

McCone 2017 argued that the quality of information provided by health information system is important in showing the weak areas in the management of public health facilities and dealing with them. In addition Nguyen et al. 2014 stated that a high quality health information system is important in documenting pertinent information concerning patients. Thus, it enables health professionals deal with the specific problems that they experience well. a high-quality health information system is important in improving upon the level of hospital administration (Rahimi et al. 2016).

Rezaian 2018 argued that Health Information Systems HIS create the ease of identifying health challenges of patients and deal with them effectively, also the quality of health information system enables the teams in hospitals deal with complex problems that they happen to face effectively. A high quality health information system is important in ensuring that teams in public hospitals work together towards the advancement of the health of patients (Sligo et al. 2017; Urbach & Müller 2012; Goddard et al. 2002). In addition the quality information systems and improving service quality are important in ensuring that public health institutions properly harness the use of information systems that provides the chance to make public hospitals offer the best services (Rezaian et al. 2018; Sligo et al. 2017; Cho et al. 2015).

2.8 Information System (IS) Effectiveness

When a company develops and implements information systems, there is need to assess the system to see how it is performing. The measure of how the system is performing in relation to the expectations of the organization is known as the effectiveness or the success of the information system (NHS Executive 1999). Evaluation of information systems is an old practice that dates back to 1949 (Shannon & Weaver 1960), when DeLone and McLean first developed a mechanism for assessing the impacts of information systems (DeLone & McLean 1992). As technology advances, there have been advancements in the studies that aim to measure the performance of information systems (Hamilton & Chervany 1981; Thong & Yap 1996).

The effectiveness of systems can be defined through two main views which include the goal oriented view and the system resource view (Campbell 1977; Molnar & Rogers 1976). The goal oriented view evaluates how effective a system is depending on how it has aided the achievement of predetermined objectives. In this view, effectiveness is determined by comparing the performance of the system to the set objectives (Molnar & Rogers 1976). The system resource view on the other hand evaluates the effectiveness of a system based on resource viability as opposed to specific task objectives (Hamilton & Chervany 1981) .

2.8.1 The causal relationships between the constructs of information system IS

It is imperative to note that the DeLone and McLean (D&M) model that was developed for primary purpose and goal of measuring information systems has been instrumental in the research of IS and has resultantly led to further empirical modifications, adjustments and testing within this particular filed (Au et al. 2002). As explained earlier, Petter et al. advanced this statement in 2008 with the assertion that there are possible methods through which information systems can be measured with respect to dimensions, interrelationships, measures, and models. This was after a research summary that the authors conducted that utilized already existent research and literature relatable to IS's (Information Systems) success that analyzed the relationship revolving around DeLone and McLean (D&M) IS model through its applicability on both organizational and individual contexts (Petter et al. 2008).

Most of experimental studies that examine the Information System Success Models have tested the effect of IS on individual impact instead of organizational impact. For example, Petter et al. 2008 reviewed 180 articles published between 1992 to 2007 theses articles related to IS success and based on that the author analyzed the relationships between the constructs (six) of the Delone and Mclean model. Based on this analysis Petter at al found some support for associations of the 15 pairwise at the individual level. On other hand this reviewed study found some support for just 3 of the 15 associations (i.e., system quality and net benefits, system quality and use, and use and net benefits). On other hand there is one relationship has empirical support and was positive like, the relationship between system quality and organizational performance (benefits) (Petter et al. 2008).

Sabhwere et al 2006 determine the relationship between the variables of IS (users satisfaction, system use, perceived usefulness, and system quality), and context based constructs and user related constructs. They used meta-analysis and their research based on 121 prior studies published between 1980-2004, Sabherwal et al. (2006) found positive associations between system quality and user satisfaction, use and net benefits, also they found support associations between use and net benefit and the opposite, the authors analyzed the net benefit at the individual level (Sabherwal et al. 2006).

According to Au et al. (2002), there are various relationships and interdependencies existent with regard to the criteria of implementing IS under different model types which created different levels of achievements and IS's effectiveness. This is after a research conducted that focused on the intricate reviews of IS classification under the determinant factor of each IS's effectiveness in meeting its intended goals, aims and tasks (Au et al. 2002). However, there is still the need for commencement of such implementation of IS under different construct and in the hospital settings, the question is the type of hospital care units, department or agency that uses the information system and the type of patients the hospital settings deals with on a daily basis (Chaudhry et al. 2006).

Notably, the various differentiated constructs of IS have been long determined by the type of business that needs the information system and the end goal of this business or organization (Avison & Fitzgerald 2003). This same constructs occur healthcare industry in that there are differentiated health information systems that are all part of the larger Jordanian Healthcare Ministry meaning that different health information systems derived from IS domains/criteria are applicable in the country (Almajali et al. 2016). For instance, healthcare industry or ministries have hospital that are categorized differently such a private hospitals, public hospitals, medical nursing homes, medical laboratories, pharmaceutical centers among others. All these different elements in the medical industry also have different departments which initiates the need for different Information Systems being utilized and implemented by each (Pan & Fang 2010).

Nevertheless, due to these inconsistencies in research due to different constructs that revolve around IS, there have been several developed meta-analyses that have managed to synthesize existent literature through the utilization of both qualitative and also quantitative data that has been reported across different research studies (Sabherwal et al. 2006; Hwang et al. 2000; Mahmood et al. 2001). According to Sabherwal al. (2006), it is through research that the DeLone and McLean (D&M) model has been validated as an effective model for navigation of various constructs together by making different relationships between elements work together smoothly (Sabherwal et al. 2006). The DeLone and McLean (D&M) model is suitable for both organizational and individualistic performances and as an IS metric, there is a significance in the links associated by different constructs that lead to the assertion that there is a strong relationship between IS implementation and the success of constructs (Petter et al. 2008).

Based on the review done by Petter at al. (2008) delivered the best information so far on the corroborated causal relationships between the Information System –IS- constructs and the findings are showed in Tables below 2.1– 2.30 at an individual level of analysis and at an organizational level of analysis.

Table 2. 1: Tested pair wise relationships Petter et al. (2008)

System quality	➡	System use
System quality	➡	User satisfaction
System quality	➡	Net benefits
Information quality	➡	System use
Information quality	➡	User satisfaction
Information quality	➡	Net benefits
Service quality	➡	System use
Service quality	➡	User satisfaction
Service quality	➡	Net benefits
System use	➡	User satisfaction
System use	➡	Net benefits
User satisfaction	➡	System use
User satisfaction	➡	Net benefits
Net benefits	➡	System use
Net benefits	➡	User satisfaction

Table 2. 2: The Relationship between system quality and system use at an individual level of analysis. Source: Petter et al. (2008)

System quality and use **Empirical studies**	**Study result**
(Halawi et al. 2008)	Positive in a significant way
(Po-An Hsieh & Wang 2007)	Positive in a significant way
(Iivari 2005)	Positive in a significant way

System quality and use **Empirical studies**	**Study result**
(Rai et al. 2002)	Positive in a significant way
(Hong et al. 2001/2002)	Positive in a significant way
(Venkatesh & Davis 2000)	Positive in a significant way
(Venkatesh & Morris 2000)	Positive in a significant way
(Igbaria et al. 1997)	Positive in a significant way
(Suh et al. 1994)	Positive in a significant way
(Kositanurit et al. 2006)	Mixed
(Venkatesh et al. 2003)	Mixed
(Agarwal & Prasad 1997)	Mixed
(Goodhue & Thompson 1995)	Mixed
(Adams et al. 1992)	Mixed
(Klein 2007)	not in any way significant
(McGill et al. 2003)	not in any way significant
(Lucas Jr & Spitler 1999)	not in any way significant
(Gefen & Keil 1998)	not in any way significant
(Straub et al. 1995)	not in any way significant
(Markus & Keil 1994)	not in any way significant
(Subramanian 1994)	not in any way significant

Table 2. 3: The Relationship between System Quality and User Satisfaction at an individual level of analysis. Source: Peter et al. (2008)

System quality and user satisfaction **Empirical studies**	**Study result**
(Chiu et al. 2007)	Positive in a significant way
(Halawi et al. 2008)	Positive in a significant way
(Po-An Hsieh & Wang 2007)	Positive in a significant way
(Leclercq 2007)	Positive in a significant way

System quality and user satisfaction Empirical studies	**Study result**
(Kulkarni et al. 2006)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Almutairi & Subramanian 2005)	Positive in a significant way
(Iivari 2005)	Positive in a significant way
(McGill & Klobas 2005)	Positive in a significant way
(Wixom & Todd 2005)	Positive in a significant way
(McGill et al. 2003)	Positive in a significant way
(Bharati 2003)	Positive in a significant way
(Devaraj et al. 2002)	Positive in a significant way
(Gelderman 2002)	Positive in a significant way
(Kim et al. 2002)	Positive in a significant way
(Palmer 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Guimaraes et al. 1996)	Positive in a significant way
(Seddon & Kiew 1996)	Positive in a significant way
(Yoon et al. 1995)	Positive in a significant way
(Seddon & Yip 1992)	Positive in a significant way

Table 2. 4: The Relationship Between System Quality and Net Benefits at an individual level of analysis. Source: Petter et al. (2008)

System quality and net benefits Empirical studies	***Study result***
(Po-An Hsieh & Wang 2007)	Positive in significant way

System quality and net benefits Empirical studies	***Study result***
(Klein 2007)	Positive in significant way
(Bharati & Chaudhary 2006)	Positive in significant way
(Wixom & Todd 2005)	Positive in significant way
(Shih 2004)	Positive in significant way
(Yang & Yoo 2004)	Positive in significant way
(Rai et al. 2002)	Positive in significant way
(Devaraj et al. 2002)	Positive in significant way
(Hong et al. 2001/2002)	Positive in significant way
(Venkatesh & Davis 2000)	Positive in significant way
(Venkatesh & Morris 2000)	Positive in significant way
(Agarwal & Prasad 1997)	Positive in significant way
(Lucas Jr & Spitler 1999)	Positive in significant way
(Gefen & Keil 1998)	Positive in significant way
(Seddon & Kiew 1996)	Positive in significant way
(Kositanurit et al. 2006)	Mixed
(Kulkarni et al. 2006)	not in any way significant
(Wu & Wang 2006)	not in any way significant
(McGill & Klobas 2005)	not in any way significant
(Chau & Hu 2002)	not in any way significant
(Goodhue & Thompson 1995)	not in any way significant
(Subramanian 1994)	not in any way significant

Table 2. 5: The Relationship Between Information Quality and system Use at an individual level of analysis. Source: Peter et al. (2008)

Information quality and use Empirical studies	**Study result**

Information quality and use Empirical studies	Study result
(Halawi et al. 2008)	Positive in a significant way
(Kositanurit et al. 2006)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Goodhue & Thompson 1995)	Mixed
(McGill et al. 2003)	not in any way significant
(Iivari 2005)	not in any way significant

Table 2. 6: The Relationship Between Information Quality and User Satisfaction at an individual level of analysis. Source: Peter et al. (2008)

Information quality and user satisfaction Empirical studies	Study result
(Chiu et al. 2007)	Positive in a significant way
(Halawi et al. 2008)	Positive in a significant way
(Leclercq 2007)	Positive in a significant way
(Kulkarni et al. 2006)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Almutairi & Subramanian 2005)	Positive in a significant way
(Iivari 2005)	Positive in a significant way
(Wixom & Todd 2005)	Positive in a significant way
(McGill et al. 2003)	Positive in a significant way
(Bharati 2003)	Positive in a significant way
(Kim et al. 2002)	Positive in a significant way

Information quality and user satisfaction Empirical studies	Study result
(Palmer 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Seddon & Kiew 1996)	Positive in a significant way
(Seddon & Yip 1992)	Positive in a significant way
(Marble 2003)	not in any way significant

Table 2. 7: The Relationship Between Information Quality and Net Benefits at an individual level of analysis. Source: Peter et al. (2008)

Information quality and net benefits Empirical studies	Study result
(Bharati & Chaudhary 2006)	Positive in a significant way
(Kositanurit et al. 2006)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Shih 2004)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(D'Ambra & Rice 2001)	Positive in a significant way
(Seddon & Kiew 1996)	Positive in a significant way
(Gatian 1994)	Positive in a significant way
(Kraemer et al. 1993)	Positive in a significant way
(Hong et al. 2001/2002)	Mixed
(Kulkarni et al. 2006)	not in any way significant

Table 2. 8: The Relationship Between Service Quality and Use at an individual level of analysis.

Source: Peter et al. (2008)

Service quality-use Empirical studies	**Study result**
(Choe 1996)	Mixed
(Halawi et al. 2008)	not in any way significant
(Kositanurit et al. 2006)	not in any way significant

Table 2. 9: The Relationship Between Service Quality and User Satisfaction at an individual level of analysis. Source: Peter et al. (2008)

Service quality-user satisfaction Empirical studies	**Study results**
(Halawi et al. 2008)	Positive in a significant way
(Leclercq 2007)	Positive in a significant way
(Shaw et al. 2002)	Positive in a significant way
(Yoon et al. 1995)	Positive in a significant way
(Kettinger & Lee 1994)	Positive in a significant way
(Leonard-Barton & Sinha 1993)	Positive in a significant way
(Devaraj et al. 2002)	Mixed
(Chiu et al. 2007)	not in any way significant
(Marble 2003)	not in any way significant
(Aladwani 2002)	not in any way significant
(Palmer 2002)	not in any way significant
(Choe 1996)	not in any way significant

Table 2. 10: The Relationship Between Service Quality and Net Benefits at an individual level of analysis. Source: Peter et al. (2008)

Service quality-net benefits **Empirical studies**	**Study result**
(Agarwal & Prasad 1999)	Positive in a significant way
(Gefen & Keil 1998)	Positive in a significant way
(Leonard-Barton & Sinha 1993)	Positive in a significant way
(Blanton et al. 1992)	Positive in a significant way
(Igbaria et al. 1997)	Mixed
(Kositanurit et al. 2006)	Not in any way significant
(Yoon & Guimaraes 1995)	Not in any way significant

Table 2. 11: The Relationship Between Use and User Satisfaction at an individual level of analysis. Source: Peter et al. (2008)

Use -user satisfaction **Empirical studies**	**Study result**
(Chiu et al. 2007)	Positive in a significant way
(Halawi et al. 2008)	Positive in a significant way
(Iivari 2005)	Positive in a significant way
(Guimaraes et al. 1996)	Positive in a significant way
(Seddon & Kiew 1996)	not in any way significant

Table 2. 12: The Relationship Between Use and Net Benefits at an individual level of analysis. Source: Peter et al. (2008)

Use-net benefits **Empirical studies**	**Study result**
(Halawi et al. 2008)	Positive in a significant way
(Burton-Jones & Straub Jr	Positive in a significant way

Use-net benefits **Empirical studies**	**Study result**
2006)	
(Kositanurit et al. 2006)	Positive in a significant way
(Almutairi & Subramanian 2005)	Positive in a significant way
(Vlahos et al. 2004)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(D'Ambra & Rice 2001)	Positive in a significant way
(Torkzadeh & Doll 1999)	Positive in a significant way
(Weill & Vitale 1999)	Positive in a significant way
(Yuthas & Young 1998)	Positive in a significant way
(Abdul-Gader 1997)	Positive in a significant way
(Guimaraes & Igbaria 1997)	Positive in a significant way
(Igbaria & Tan 1997)	Positive in a significant way
(Seddon & Kiew 1996)	Positive in a significant way
(Goodhue & Thompson 1995)	Positive in a significant way
(Yoon & Guimaraes 1995)	Positive in a significant way
(Wu & Wang 2006)	not in any way significant
(Iivari 2005)	not in any way significant
(McGill et al. 2003)	not in any way significant
(Lucas Jr & Spitler 1999)	not in any way significant
(Ang & Soh 1997)	not in any way significant
(Vlahos & Ferratt 1995)	not in any way significant

Table 2. 13: The Relationship Between Use and Net Benefits at an individual level of analysis.
Source: Peter et al. (2008)

User satisfaction-use **Empirical studies**	**Study result**
(Chiu et al. 2007)	Positive in a significant way
(Halawi et al. 2008)	Positive in a significant way
(Bharati & Chaudhary 2006)	Positive in a significant way
(Kulkarni et al. 2006)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Iivari 2005)	Positive in a significant way
(Wixom & Todd 2005)	Positive in a significant way
(McGill et al. 2003)	Positive in a significant way
(Kim et al. 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Torkzadeh & Doll 1999)	Positive in a significant way
(Khalil & Elkordy 1999)	Positive in a significant way
(Winter et al. 1998)	Positive in a significant way
(Yuthas & Young 1998)	Positive in a significant way
(Abdul-Gader 1997)	Positive in a significant way
(Guimaraes & Igbaria 1997)	Positive in a significant way
(Igbaria & Tan 1997)	Positive in a significant way
(Collopy 1996)	mixed
(Vlahos et al. 2004)	not in any way significant

User satisfaction-use **Empirical studies**	**Study result**
(Ang & Soh 1997)	not in any way significant
(Vlahos & Ferratt 1995)	not in any way significant

Table 2. 14: The Relationship Between User Satisfaction and Net Benefits at an individual level of analysis. Source: Peter et al. (2008)

User satisfaction-net benefits **Empirical studies**	**Study result**
(Halawi et al. 2008)	Positive in a significant way
(Iivari 2005)	Positive in a significant way
(McGill & Klobas 2005)	Positive in a significant way
(Vlahos et al. 2004)	Positive in a significant way
(McGill et al. 2003)	Positive in a significant way
(Morris et al. 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Torkzadeh & Doll 1999)	Positive in a significant way
(Yuthas & Young 1998)	Positive in a significant way
(Ang & Soh 1997)	Positive in a significant way
(Guimaraes & Igbaria 1997)	Positive in a significant way
(Igbaria & Tan 1997)	Positive in a significant way
(Vlahos & Ferratt	Positive in a significant way

User satisfaction-net benefits Empirical studies	**Study result**
1995)	
(Yoon & Guimaraes 1995)	Positive in a significant way

Table 2. 15: The Relationship Between Net Benefits and Use at an individual level of analysis
Source: Peter et al. (2008)

Net benefits –use Empirical studies	**Study result**
(Po-An Hsieh & Wang 2007)	Positive in a significant way
(Klein 2007)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Malhotra & Galletta 2005)	Positive in a significant way
(Wixom & Todd 2005)	Positive in a significant way
(Yang & Yoo 2004)	Positive in a significant way
(Venkatesh et al. 2003)	Positive in a significant way
(Chau & Hu 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Hong et al. 2001/2002)	Positive in a significant way
(Venkatesh & Morris 2000)	Positive in a significant way
(Agarwal & Prasad 1999)	Positive in a significant way
(Gefen & Keil 1998)	Positive in a significant way

Net benefits –use Empirical studies	Study result
(Igbaria et al. 1997)	Positive in a significant way
(Subramanian 1994)	Positive in a significant way
(Compeau et al. 1999)	Mixed
(Agarwal & Prasad 1997)	Mixed
(Straub et al. 1995)	Mixed
(Adams et al. 1992)	Mixed
(Kulkarni et al. 2006)	not in any way significant
(Lucas Jr & Spitler 1999)	not in any way significant

Table 2. 16: The Relationship Between Net Benefits and User Satisfaction at an individual level of analysis. Source: Peter et al. (2008)

net benefits - user satisfaction Empirical studies	Study result
(Po-An Hsieh & Wang 2007)	Positive in a significant way
(Leclercq 2007)	Positive in a significant way
(Bharati & Chaudhary 2006)	Positive in a significant way
(Kulkarni et al. 2006)	Positive in a significant way
(Wu & Wang 2006)	Positive in a significant way
(Devaraj et al. 2002)	Positive in a significant way
(Rai et al. 2002)	Positive in a significant way
(Abdul-Gader 1997)	Positive in a significant way

net benefits - user satisfaction Empirical studies	Study result
(Guimaraes et al. 1996)	Positive in a significant way
(Seddon & Kiew 1996)	Positive in a significant way
(Yoon et al. 1995)	Positive in a significant way

Table 2. 17: The Relationship Between System Quality and Use at an organizational level of analysis. Source: Peter et al. (2008)

System quality-use Empirical studies	Study result
(Fitzgerald & Russo 2005)	Positive in a significant way
(Caldeira & Ward 2002)	Positive in a significant way
(Premkumar et al. 1994)	Mixed
(Gefen 2000)	not in any way significant
(Gill 1995)	not in any way significant

Table 2. 18: The Relationship Between System Quality and User Satisfaction at an organizational level of analysis. Source: Peter et al. (2008)

System quality-user satisfaction Empirical studies	Study result
(Scheepers et al. 2006)	Positive in a significant way
(Benard & Satir 1993)	Positive in a significant way
(Premkumar et al. 1994)	not in any way significant

Table 2. 19: The Relationship Between System Quality and Net Benefits at an organizational level of analysis. Source: Peter et al. (2008)

System quality-net benefits **Empirical studies**	**Study result**
(Wixom & Watson 2001)	Positive in a significant way
(Gefen 2000)	Positive in a significant way
(Weill & Vitale 1999)	Positive in a significant way
(Farhoomand & Drury 1996)	Positive in a significant way
(Bradley et al. 2006)	mixed

Table 2. 20: The Relationship Between Information Quality and Use at an organizational level of analysis. Source: Peter et al. (2008)

Information quality-use **Empirical studies**	**Study result**
(Fitzgerald & Russo 2005)	Positive in a significant way

Table 2. 21: The Relationship Between Information Quality and User Satisfaction at an organizational level of analysis. Source: Peter et al. (2008)

Information quality-user satisfaction **Empirical studies**	**Study result**
(Scheepers et al. 2006)	Positive in a significant way
(Coombs et al. 2001)	Positive in a significant way
(Teo & Wong 1998)	Positive in a significant way

Table 2. 22: **The Relationship Between Information Quality and Net Benefits at an organizational level of analysis**. Source: Peter et al. (2008)

Information quality-net benefits Empirical studies	Study result
(Wixom & Watson 2001)	Positive in a significant way
(Teo & Wong 1998)	Positive in a significant way
(Farhoomand & Drury 1996)	Positive in a significant way
(Bradley et al. 2006)	Mixed

Table 2. 23: The Relationship Between Service Quality and Use at an organizational level of analysis. Source: Peter et al. (2008)

Service quality – use Empirical studies	Study result
(Fitzgerald & Russo 2005)	Positive in a significant way
(Caldeira & Ward 2002)	Positive in a significant way
(Gill 1995)	Positive in a significant way

Table 2. 24: The Relationship Between Service Quality and User Satisfaction at an organizational level of analysis. Source: Peter et al. (2008)

Service quality –user satisfaction Empirical studies	Study result
(Coombs et al. 2001)	Positive in a significant way
(Thong & Yap 1996)	Positive in a significant way
(Thong et al. 1994)	Positive in a significant way
(Benard & Satir 1993)	not significant

Table 2. 25: The Relationship Between Service Quality and Net Benefits at an organizational level of analysis. Source: Peter et al. (2008)

Service quality –net benefits **Empirical studies**	**Study result**
(Gefen 2000)	Positive in a significant way
(Thong & Yap 1996)	Positive in a significant way
(Thong et al. 1994)	Positive in a significant way

Table 2. 26: The Relationship Between Use and User Satisfaction at an organizational level of analysis. Source: Peter et al. (2008)

Use-user satisfaction **Empirical studies**	**Study result**
(Gelderman 1998)	Mixed

Table 2. 27:The Relationship Between Use and Net Benefits at an organizational level of analysis. Source: Peter et al. (2008)

Use-net benefits **Empirical studies**	**Study result**
(Leclercq 2007)	Positive in a significant way
(Zhu & Kraemer 2005)	Positive in a significant way
(Devaraj & Kohli 2003)	Positive in a significant way
(Teng & Calhoun 1996)	Positive in a significant way

Use-net benefits Empirical studies	Study result
(Belcher & Watson 1993)	Positive in a significant way
(Gelderman 1998)	not in any way significant

Table 2. 28: The Relationship Between User Satisfaction and Net Benefits at an organizational level of analysis. Source: Peter et al. (2008)

User satisfaction-net benefits Empirical studies	Study result
(Gelderman 1998)	Positive in a significant way
(Law & Ngai 2007)	Positive in a significant way

Table 2. 29: The Relationship Between Net Benefits and Use at an organizational level of analysis. Source: Peter et al. (2008)

Net benefits –use Empirical studies	Study result
(Gefen 2000)	Positive in a significant way
(Gill 1996)	Positive in a significant way
(Belcher & Watson 1993)	Positive in a significant way
(Premkumar et al. 1994)	mixed

Table 2. 30: The Relationship Between Net Benefits and User Satisfaction at an organizational level of analysis. Source: Peter et al. (2008)

Net benefits –user satisfaction **Empirical studies**	**Study result**
(Jones & Beatty 2002)	mixed
(Teo & Wong 1998)	mixed
(Premkumar et al. 1994)	mixed

2.8.2 The cauasual reltionships between IS constructs and Public hospital Perofmnce

Based on the review done by different authors delivered the best information so far on the corroborated causal relationships between the Information System –IS- constructs and the findings are summarized and showed in tables below 2.31– 2.34 at an individual and organizational level of analysis of hospital performance.

Table 2. 31: Summrizing the Relationship between system quality and Net benefits of hospital performance

System Quality-Net Benefits **Empirical studies**	**Result of the study**
(Au et al. 2002)	Positive in a significant way
(Al-Mamary et al. 2014)	Positive in a significant way
(Petter et al. 2008)	Positive in a significant way
(Pan & Fang 2010)	Positive in a significant way
(Mahmood et al. 2001)	Positive in a significant way
(McGlynn et al. 1998)McGlynn, 1998	Positive in a significant way
(Sabherwal et al. 2006)	Positive in a significant way
(Almajali et al. 2016)	Mixed
(Bernroider 2008)	Mixed
(McCance et al. 2012)	Mixed
(Ma & Liu 2004)	Mixed
(Moghadam & Fayaz-Bakhsh 2014)	Mixed

System Quality-Net Benefits Empirical studies	Result of the study
(Jennex et al. 1998)	Not in any way significant
(Coombs et al. 2001)	Not in any way significant
(Davis et al. 2013)	Not in any way significant
(Avison & Fitzgerald 2003)	Not in any way significant

Table 2. 32: Summrizing the Relationship between information quality and Net benefits of (hospital performance)

Information Quality-Net Benefits Empirical studies	Result of the study
(Au et al. 2002)	Positive in a significant way
(Al-Yaseen et al. 2010)	Positive in a significant way
(Petter et al. 2008)	Positive in a significant way
(Great Britain, 1999)	Positive in a significant way
(DeLone & McLean 2016)	Positive in a significant way
(Hovenga & Grain 2013)	Positive in a significant way
(Chang & King 2005)	Positive in a significant way
(Oliveira et al. 2011)	Positive in a significant way
(Bradley et al. 2006)	Positive in a significant way
(Hwang et al. 2000)	Positive in a significant way
(Davis et al. 1989)Davis, 1989	Positive in a significant way
(Almajali et al. 2016)	Mixed
(Baroudi & Orlikowski 1988)	Mixed
(Ma & Liu 2004)	Mixed
(Jennex et al. 1998)	Not in any way significant
(Devaraj & Kohli 2003)	Not in any way significant
(Kettinger et al. 1994)	Not in any way significant

Table 2. 33: Summrizing The Relationship between service provider quality and net benefit hospital performance

Service provider Quality-Net Benefits Empirical studies	Result of the study
(Au et al. 2002)	Positive in a significant way
(Petter et al. 2008)	Positive in a significant way
(Pan & Fang 2010)	Positive in a significant way
(Great Britain, 1999)	Positive in a significant way
(Hwang et al. 2000)	Positive in a significant way
(Sabherwal et al. 2006)	Positive in a significant way
(Almajali et al. 2016)	Mixed
(Moghadam & Fayaz-Bakhsh 2014)	Mixed
(Ma & Liu 2004)	Mixed
(Fraser & Salter 1995)	Not in any way significant
(Avison & Fitzgerald 2003)	Not in any way significant
(Kaplan et al. 1996)	Not in any way significant
(Kasper 1985)	Not in any way significant

The measure of information systems effectiveness is integral to many organizations. It helps them determine how much the investment in information systems is translating into the desired results. Several models have been developed for use in the assessment of information systems effectiveness. These models include the Technology Acceptance Model, Information System Success Model, and Information System Input-Output Performance Model.

2.8.3 Major findings between each dimension of Health Information system HIS and public hospital performance (Clinical, operational and financial)

Based on the review done by different authors delivered the best information so far on the corroborated causal relationships between each construct of the Information System (IS), the findings are summarized and showed in tables below 2.34– 2.45 at an individual and organizational level of analysis of public hospital performance.

Table 2. 34: Findings between the System Quality of HIS and Clinical Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Devaraj & Kohli 2003)	The quality of the health information system provides the opportunity to improve upon the level of customer satisfaction.	Monthly data for three-year period used through an archival research study	The use of causality tests and omitted variable tests
(Cho et al. 2015)	Quality information systems and improving service quality are important in ensuring that public health institutions properly harness the use of information systems	Qualitative study conducted	Analysis based on the DeLone and McLean IS Success Model
(Ibrahim et al. 2016)	The quality of health information system enables the teams in hospitals deal with complex problems that they happen to face effectively.	Qualitative study	Analysis based the DeLone and McLean theory model

Table 2. 35: Findings between the System Quality of HIS and operational Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Urbach & Müller 2012)	A high-quality health information system provides the chance to make public hospitals offer the best services.	Qualitative Study	Qualitative analysis
(Sligo et al. 2017)	Information technology has a positive effect on performance of organizations. Particularly, through the use of health information systems, hospitals have a chance to perform well in terms of quality of healthcare that they offer patients.	Archival research	Qualitative analysis
(Nguyen et al. 2014)	A high quality health information system is important in documenting pertinent information concerning patients. Thus, it enables health	Systematic literature review was applied	Analysis was conducted basing on the DeLone and McLean's dimensions

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
	professional's deal with the specific problems that they experience well.		
(Urbach & Müller 2012)	A high-quality health information system provides the chance to make public hospitals offer the best services.	Qualitative study	Qualitative analysis
(Sligo et al. 2017)	The quality of health information system enables the teams in hospitals deal with complex problems that they happen to face effectively.	Archival research	Qualitative analysis
(Nguyen et al. 2014)	High quality health information system is important in documenting pertinent information concerning patients. Thus, it enables health professionals' deal with the specific problems that they experience well.	Systematic literature review was applied	Analysis was conducted basing on the DeLone and McLean's dimensions

Table 2. 36: Findings between the System Quality of HIS and financial Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Rahimi et al. 2016)	The use of health information systems in public health facilities is likely to increase on the level of evaluation, which is likely to aid in cutting down on financial public performance	The study used mixed research method, where qualitative and quantitative study was used.	Qualitative and Quantitative study
(Ibrahim et al. 2016)	The quality of health information system is important in improving staff administration, which is bound to reduce cost of operation of the facility.	Qualitative study	Analysis based on the DeLone and McLean theory model
(Sligo et al. 2017)	A high-quality health information system is important in cutting down the cost of managing health facilities.	Archival research	Qualitative analysis

Table 2. 37: Findings between the Information Quality of HIS and Clinical Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Urbach & Müller 2012)	The quality of health information system is important in enabling personnel be more willing in creating necessary changes within the public health facility.	Qualitative study	Qualitative analysis
(McCone 2017)	The quality of information provided by health information system is important in showing the weak areas in the management of public health facilities and dealing with them.	Archival research study	Qualitative analysis
(Rezaian et al. 2018)	The quality of information in health information system is important in showing the specific areas of care that health professionals need to focus on more.	Mixed research method	Qualitative and quantitative analysis

Table 2. 38: Findings between the Information Quality of HIS and Operational Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Goddard et al. 2002)	A high quality information system is important in enabling the management attain the necessary skills to run hospitals well	Systematic literature review was applied	Qualitative analysis
(Lau et al. 2010)	A high quality health information system is important in that it improves upon the knowledge levels that personnel in public hospitals have. Thereby, they become successful in delivering on their mandate.	Quantitative research study	Quantitative analysis
(Rahimi et al. 2016)	A high-quality health information system is important in improving upon the level of hospital administration.	The study used mixed research method where qualitative and quantitative study was used.	Qualitative and Quantitative study

Table 2. 39: Findings between the Information Quality of HIS and Financial Public ospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(McCone 2017)	A high-quality health information system is important in reducing the cost of running of public health facilities due to the ease of use of incentives.	Archival research study	Qualitative analysis
(Nguyen et al. 2014)	The use of health information systems in public health institutions has a negative input of increasing upon the level of workflow. Thus, in the short-run, it is likely to increase the cost of operation due to hiring more employees to assist in reducing the workflow.	Systematic literature review was applied	Analysis was conducted basing on the DeLone and McLean's dimensions
(Goddard et al. 2002)	The use of health information systems in public health hospitals is likely to nurture innovations. Therefore, it is likely to reduce on the unit cost of operation.	Systematic literature review was applied	Qualitative analysis

Table 2. 40: Findings between the Service Provider Quality of HIS and Clinical Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Rahimi et al. 2016)	A high-quality health information system is important in aiding the process of hospital administration, making it easy to manage.	Mixed method study	Qualitative and Quantitative study
(Lau et al. 2010)	A high-quality health information system is important in that, it improves upon the process of integrated decision-making in public hospitals.	Quantitative research study	Quantitative analysis
(Goddard et al. 2002)	The use of quality health information systems in public health hospitals is important in aiding the process of evaluation of performance. It, therefore, creates an ease of showing the areas of improvement that may be deemed necessary.	Systematic literature review was applied	Qualitative analysis

Table 2. 41: Findings between the Service Provider Quality of HIS and Operational Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Rahimi et al. 2016)	The use of key performance indicators is important in comparing the performance of different public health facilities. Thus, it shows the ones that are doing well as opposed to those which need to improve.	Mixed method study	Qualitative and Quantitative study
(Ibrahim et al. 2016)	A quality health information system is important in boosting upon the level of public health performance.	Qualitative study	Analysis by using the DeLone and McLean theory model
(Sligo et al. 2017)	Provider quality of health information system is important in ensuring teams are well coordinated to take care of patients effectively.	Archival research	Qualitative analysis

Table 2. 42: Findings between the Service Provider Quality of HIS and Financial Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Sligo et al. 2017)	Service provider quality of health information system is important in cutting down unnecessary costs, thereby, being of benefit to public health facilities.	Archival research	Qualitative analysis
(Urbach & Müller 2012)	The use of health information systems is important in enabling public health facilities cut down on future surge in costs.	Qualitative study	Qualitative analysis
(McCone 2017)	Investing in a high-quality health information system is important in reducing the cost of input for running public health facilities.	Archival research study	Qualitative analysis

Table 2. 43: Findings between Training Quality of HIS and Clinical Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Lau et al. 2010)	Providing personnel managing health information systems with appropriate skills is important in making them offer proper clinical services.	Quantitative research study	Quantitative analysis
(Goddard et al. 2002)	Training personnel manning health information systems in public health facilities is important in improving upon their innovation capabilities.	Mixed research method whereby qualitative and quantitative are integrated	Qualitative and quantitative analysis
(Urbach & Müller 2012)	Training personnel dealing with health information systems in public health facilities is important in improving their competencies in taking proper care of patients.	Qualitative study	Qualitative analysis

Table 2. 44: Findings between Training Quality of HIS and Operational Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Sligo et al. 2017)	Providing personnel with skills in health information systems is important boosting operational public hospital performance.	Archival research	Qualitative analysis
(Ibrahim et al. 2016)	Training health personnel on health information systems is important in providing high-quality services.	Qualitative study	Analysis based on the DeLone and McLean theory model
(Rahimi et al. 2016)	Providing personnel with the necessary skills set is important in improving upon the evaluation process of a public health facility.	Mixed research method where qualitative and quantitative study was used.	Qualitative and Quantitative study

Table 2. 45: Findings between Training Quality of HIS and Financial Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Lau et al. 2010)	Training health personnel on the use of health information systems is likely to cut on the cost of operation eventually.	Quantitative research study	Quantitative analysis
(Nguyen et al. 2014)	Training health personnel dealing with health information systems increases the costs of operation in the short-run.	Systematic literature review was applied	Analysis was conducted basing on the DeLone and McLean's dimensions
(Rahimi et al. 2016)	Training health personnel dealing with health information systems helps in making them more innovative.	The study used mixed research method where qualitative and quantitative study was used.	Qualitative and Quantitative study

2.8.4 The total impact of Health Information System (HIS) Effectiveness on Public Hospital Performance (Clinical, Operational and Financial)

Based on the assessment done by different authors distributed the best information so far on the total effect of Health Information System (HIS) Effectiveness on Public Hospital Performance (Clinical, Operational and Financial) are summarized in the following tables 2.46 – 2.48:

Table 2. 46: The Impact of Health Information System (HIS) Effectiveness on Clinical Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Rezaian et al. 2018)	Health information systems create the ease of identifying health challenges of patients and deal with them effectively.	The study used mixed research method where qualitative and quantitative study was used.	Qualitative and quantitative analysis
(Ibrahim et al. 2016)	Health information systems provide an ease of sharing information among health professionals, thereby, enabling them to serve patients better.	The study applied a qualitative study methodology.	Analysis based on the DeLone and McLean theory model
(Nguyen et al.	Health information systems provide timely information	The study applied systematic literature	Analysis was conducted basing on

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
2014)	concerning patients, thereby, creating an ease in dealing with such problems better.	review.	the DeLone and McLean's dimensions

Table 2. 47: The Impact of Health Information System (HIS) Effectiveness on Operational Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Rahimi et al. 2016)	Proper use of health information systems in public health facilities is important in boosting the administration practices.	The study applied a mixed method study in which both qualitative and quantitate studies were used.	Qualitative and Quantitative study
(Rezaian et al. 2018)	The use of health information systems in public health facilities is important in showing the specific areas that need to be improved on while running the hospitals.	Mixed research method	Qualitative and quantitative analysis
(Goddard et al. 2002)	Using health information systems is important in improving coordination among health professionals in public health facilities.	Systematic literature review was applied	Qualitative analysis

Table 2. 48: The Impact of Health Information System (HIS) Effectiveness on Financial Public Hospital Performance

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
(Sligo et al. 2017)	The use of health information systems in public health facilities is important in cutting down unwanted costs.	The study used archival research in which information obtained from secondary sources of data was used.	Qualitative analysis
(Nguyen et al. 2014)	Training health personnel on the use of health information systems is likely to increase upon the costs in the short-run.	The study applied systematic literature review in which it sourced information	Analysis was conducted basing on the DeLone and McLean's dimensions

Authors	Arguments (Result of the study)	Methodology	Methods used to analyze
		from various literature to show the influence that training personnel dealing with HIS has on health management.	
(Rahimi et al. 2016)	The use of health information systems is likely to increase the evaluation process of the financial performance of a public health facility. Thereby, appropriate measures may be established to cut down on wastage of resources.	The study used mixed method study in which qualitative and quantitative study was used.	Qualitative and Quantitative study

2.9 Theories Related to the Research Area

There are various theories that are related to this research area including the theoretical constructs of the Technology Acceptance Model, Information System Success Model (Revised Deloen and Mclean Model (2002)) , and Information System Input-Output Performance Model (Chang and King 2005)) which were first hypothesized before being researched upon and empirically developed. According to McGlynn (1998), the Information System Input-Output Performance Model from a theoretical analysis encompasses he various stakeholders who contribute to the input and also the output of the hospital performance (McGlynn et al. 1998). They include relevant healthcare purchasers, consumers, healthcare providers, and health system administrators. All these stakeholder influence the manner and method through which healthcare services are integrated as data sources into Healthcare Information Systems (Moghadam & Fayaz-Bakhsh 2014). The other theories utilized and applicable in this research such as the theoretical application of the Technology Acceptance Model have been explained below.

2.9.1 The Technology Acceptance Model

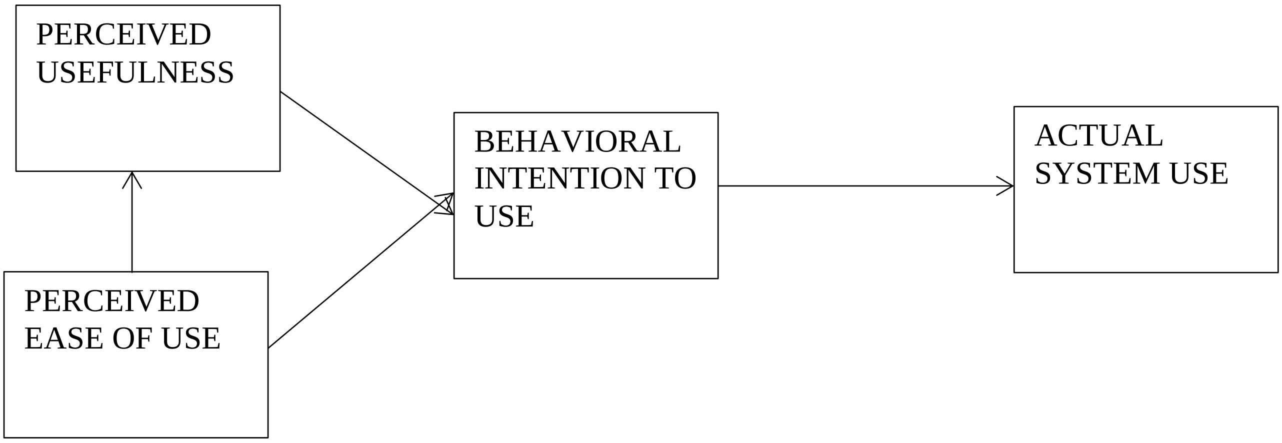


Figure 2. 1: The Technology Acceptance Model (Ma & Liu 2004)

The theoretical model presented in figure 2.1 provides information on how users of a technology accept and put the new technology into use. The theory is one of the most used in researches that involve the acceptance of a new technology. The model suggests that when a new technology is presented, the decision by users on how and when to use it is influenced by some factors (Marangunić & Granić 2015). The theory was first proposed by Davis in 1989 (Cresswell & Sheikh 2013). There are two beliefs encompassed in this model as the determinants of the users' attitudes towards the adoption of new technology. These beliefs are the perceived ease of application and the perceived utilities of the new technology. By employing these two beliefs, the technology acceptance model aims to determine how users will behave towards a particular technology (Basak et al. 2015).

According to the model, a technology that is perceived as more useful and easy to use by users is easily accepted and adopted for use within a system. Perceived utility or usefulness refers to the extent to which a user sees technology as having the potential to enhance productivity or performance at work. Perceived ease of use, on the other hand, refers to the level of effort that a user requires to put in to adopt the new technology (Marangunić & Granić 2015). The users' perceived ease of use of technology influences their perceived utility or usefulness of the particular technology. Over the years, the technology acceptance model has undergone modifications extending it to include normative beliefs as well as the social influence (Gao et al. 2015).

The reliability and validity (the extent to which the model is dependable, without ethical issues and applicability constraints) of the technology acceptance model were established through two different studies. The first study compared the perception of workers on the usefulness and the ease of use of a technology in the workplace while the other compared the same out of the workplace (Cresswell & Sheikh 2013). The results of both studies revealed a more pronounced relationship between the perceived utility and use than between use and perceived ease of use. Further analysis of the findings of both studies suggested that perceived utility of a technology was influenced by its perceived ease of use (Basak et al. 2015).

The technology acceptance model was originally applied to new technology adoption in the workplace focusing on computer technology. The focus has continued, and it has presently encompassed the perception of healthcare workplace adopters like nurses and physicians (Gao et al. 2015). Wilson and Lankton (2004), were able to deduce from their research the conclusion that the applicability of the technology acceptance model to assess the acceptance of health information through technology is helping patients with better management of chronic diseases (Marangunić & Granić 2015).

2.9.1.1 Researches Applying the Technology Acceptance Model

The technology Acceptance Model has been applied by many researchers in different studies to evaluate the employee behavior regarding a newly introduced technology in different companies (McLaren et al. 2011). Some studies have applied the model in its original form while others found it fit to modify the original model and add to it other variables which improved its predictive ability (Gao et al. 2015). Following the advances made in technology, it was necessary for researchers applying the technology acceptance model to modify it and improve its ability to provide explanations to the behavior of technology users in the work environment (Marangunić & Granić 2015).

In a 1999 study by Hu et al., the technology acceptance model was used to evaluate physician acceptance of the telemedicine technology in hospitals in Hong Kong. The study applied the Technology Acceptance Model in its original form without any alteration of the variables. The model successfully provided a relevant depiction of the intention by the physicians to use the telemedicine technology (Hu et al. 1999). In another study by Dishaw and Strong 1999, the technology acceptance model was modified and variables added leading to the development of a framework that was referred to as the technology fit model which provided a much deeper explanation to the influence of attitude on the use of the internet by employees at their workplace (Dishaw & Strong 1999).

The Technology Acceptance Model fits in this research study due to the fact that each and every hospital operating under a given Healthcare Information System needs its system update and the various stakeholder’s information and relevancy to the hospital paradigm well-defined in the information system. In addition, technology revolutionizes Healthcare Information System increasing aspects of Healthcare services by defining the specific roles, tasks and duties of each human resource individual working collaboratively under HIS. This includes the various controllers of Health Information Systems such as hospitals’ physicians, health practitioners, nurses, psychotherapists, and psychiatrists (Oliveira et al. 2011).

2.9.1.2 How Technology Acceptance Model (TAM) related to this research study

In addition, the Technology Acceptance Model fits in this research study through its operationalization of the financial criteria of Healthcare Information systems of various hospitals. It is through the Technology Acceptance Model that most hospitals are accountable financially and able to account for the revenue accrued and the changes needed in terms of capital investment, for instance, purchase of new outpatient equipment and its integration into the existent Healthcare Information System at the hospitals (McCance et al. 2012; Orlikowski & Baroudi 1991). This the Technology Acceptance Model offers a construct through which hospital performance can be measured so as to provide a detailed analysis of the balance between the hospital expenditure and revenues. According to Cameron and Whetten (2013), the efficiency of the financial management process from a technological perspective is easier since it can be reflected by measures like day’s cash on hand and days in account receivables (Cameron & Wherren 2013). According to Davis et al. (2013), financial domains in technologically maintained systems that are regularly updated in most hospitals are best implemented, maintained and controlled through Informational Systems which determines the effectiveness, efficiency, and equity of health performance in different dimensions (Davis et al. 2013). This is why the Technology Acceptance Model fits in this research study.

2.9.2 Information System Success Model

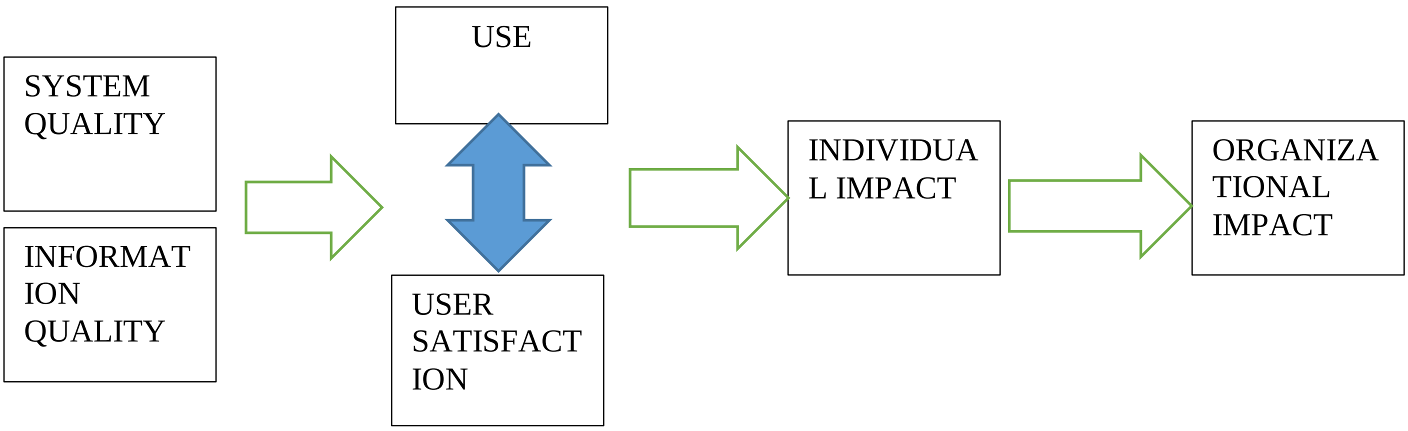


Figure 2.2: Information Systems Success Model (DeLone & McLean 1992)

The theoretical model presented in figure 2.2 is a multidimensional model for measuring the success of information systems. The model was created in 1992 by DeLone and McLean, and it measures information systems success by the interdependencies of the six categories of success (Petter et al. 2008). Following ten years of research and evaluation, the model was updated and published in 2002. The new model is made up of six interrelated information systems success dimensions. The dimensions include quality of the system, information and service, user satisfaction, use intention and net benefits (Dembla et al. 2015). The net benefits realized have an influence on the subsequent use of the system and user satisfaction. This influence can be negative or positive depending on the nature of the realized benefits (DeLone & McLean 2003).

According to this model, the evaluation of an information system can be based on the quality of service, information, and system. The quality of these characteristics influences the user satisfaction and the use or the intention to use the information system. The use of the system will result in certain benefits. The net benefits realized will then have an influence on the subsequent use of the system and user satisfaction. This influence can be negative or positive depending on the nature of the realized benefits (DeLone & McLean 2016).

a. System quality

   The concept of system quality takes into account the processing system itself or the performance of the system. Several measures have been suggested by different authors and researchers to assess system quality. Ease of use, response time, reliability, content and accuracy are some of the most common measures of this concept (Dembla et al. 2015).

b. Information quality

   This concept deals with the measurement of the quality of the basic output of the system which is mainly in the form of reports. Common measures of this concept include clarity, readability, uniqueness, relevance, usefulness, and reliability (DeLone & McLean 2016).

c. Information use

   This is one of the oldest measures that have been reported for information system effectiveness. Many past studies measured information system effectiveness based on the difference between discretionary or voluntary users. Some of the most common measures of this concept include the number of computer enquiries, number of processed client records, and number of used computer functions and the length of time spent by a user on the computer (DeLone & McLean 2016).

d. User satisfaction

   This concept measures the level of interaction between the information product of the system and the recipients. Some of the most common measures of this concept include enjoyment, overall satisfaction, satisfaction with the specifics, and the difference between the information needed and the information received (DeLone & McLean 2016).

e. Individual impact

This concept deals with the impact that the information product of the system has on an individual user of the system (Basak et al. 2015). Some of the most common measures of the concept of individual impact include task performance, willingness to pay for information, improved productivity, learning and task performance. Other researchers have also included as a measure of this concept the effectiveness of decisions. According to this measure, the correctness, the quality and the time required to make a decision all add up as important factors (Dembla et al. 2015).

f. Organizational impact

This measure deals with the impact of the information product of the system on the performance of the organization. Common measures that have been considered to assess organizational impact include the reduction of the operational costs, service effectiveness, and staff reduction, gains in productivity and increase in revenue, profits, market shares and sales (Basak et al. 2015). This measures are imperative for the organizational impact of any hospital since they are the very constructs that regulate, assess, evaluate, change and continue the implementation of Healthcare Information System in various hospital settings (DeLone & McLean 1992).

2.9.2.1 Criticism on the original D&M model

Although the original Delone ad McLean Model was adopted by many researchers in the information system fields in the period from 1993 till 2003, but have a lot of criticism about it.

The criticisms were that the model had not been tested empirically; it was only a good clarifications. The scholars like (Goodhue & Thompson 1995; Hunton & Flowers 1997; Seddon & Kiew 1996) started to test factors of the six constructs in the old D&M framework. In 1996 Seddon & Kiew gave the best contribution for the D&M Model after they using a structural equation model to test four categories (system quality, information quality, use, and user satisfaction) of the Delone and Mclean Model, then they substituting “use” with “usefulness” which was driven from the TAM Theory by the construct of perceived usefulness (Davis et al. 1989).

After one year, in 1997 Seddon introduced a casual framework for the six constructs of the original D&M Model; because he argued that the D&M Model was mixing procedure and fundamental clarifications of information system success (Seddon 1997). Also he claimed that the category of IS “use” in the D&M Model replaced with perceived usefulness from the TAM framework for (Davis et al. 1989); because as Seddon claimed the IS “use” is not the appropriate measure for success, and the perceived usefulness is more suitable to capture a notion that helps as an predecessor of net benefits (Seddon 1997).

After several years Rai et al. 2002 tested (in a quasi-voluntary) the two models; Delona and McLean Model 1992 and Seddon 1997 (DeLone & McLean 1992; Seddon 1997), Rai et al. argued that both models had revealed realistic acceptable with their data that collected from 274 of an integrated students IS at a University (Rai et al. 2002). On other hand there are many researchers recommended that the quality of service provider should be an essential construct in the Delon and MacLean Model also they accepted all the six categories of D&M as well. Theses authors had been motivated by frameworks derived from marketing believer the SERVQUAL model (Parasuraman et al. 1985; Parasuraman et al. 1988). Based on the study by Parasuraman et al. 1985 this SERVQUAL model had been widly used as a measrung tool of service qulirty, and as an indicator of likely differences between expectations of customer and perceptions as presented in figure 2.3, Parasuraman et al. 1985 found 10 factors of service qulaity as following: politeness, communcations, reliabilty, safety, competence (skills and ability), access, responsiveness, integrity, underdatnding the custemores needs and percepitible (Parasuraman et al. 1985). After many interviews did in-depth and many pilot studies as well did by (Parasuraman et al. 1985; Parasuraman et al. 1988), they finished to decide five dimensions to be employed as general framework to measure the service quality in all industries, the dimensions as the following:

1. Assurance (the ability to motivate confidence and trust)
2. Responsiveness (the skills to serve customers)
3. Reliability (the skills of service provider to do the promised service)
4. Tangible (like equipment and aesthetics, the physical facilities)
5. Empathy (the skills to treat in good way with customers and care of their needs). Source (Parasuraman et al. 1985; Parasuraman et al. 1988).

Although service quality is major construct but in 1995 Pitt et al assessed another tool for the service quality characterized the quality of service provided by the department of information Technology IT and this idea adopted by modern researchers like (Jiang et al. 2002).

There is another critics for the original D&M Model, there is a research calming that the 71 implantations of IS has an impact on different levels and not just on users or organization like there are numerous other stakeholders involved occasionally like customers (Brynjolfsson 1996) , workgroups (Prybutok et al. 1997) and society (Seddon 1997).

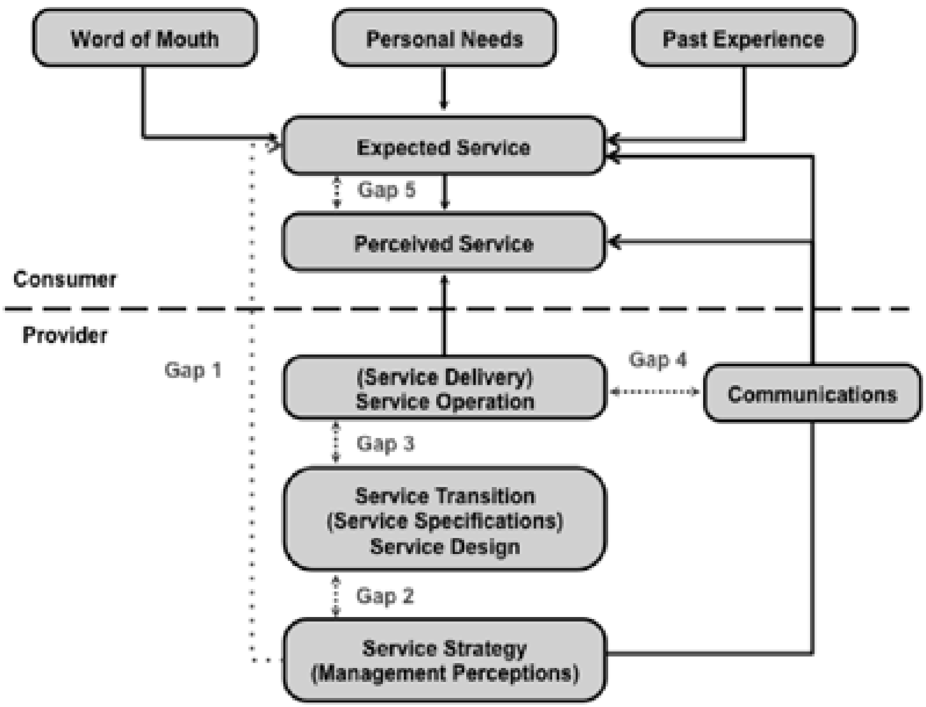


Figure 2. 3: The SERVQUAL. Source: (Parasuraman et al. 1985; Parasuraman et al. 1988)

2.9.3 The New Information System Success Model – Delone and McLean (D&M) Model – IS (Healthcare) Success

Healthcare as an imperative part of human society can be structured under newly updated and revolutionized model such as the new D&M model. The model in figure 2.4 is devoted to a detailed review of the pair relationships between the D&M model constructs. According to DeLone and McLean (2003), the new model comprises a new construct which revolves around 'net benefits' and 'service quality' which offer a broader and more intricate impact and perspective of IS. There are also constructs that were part of the original D&M model which had slight changes and additions such as the 'use' construct that incorporated the 'satisfaction' function to become 'user satisfaction' which is operative in 'causal sense' (Delone & McLean 2003). This in the healthcare spectrum is important as user satisfaction is both needed and necessary for the users of Healthcare Information Systems and the benefactors of these systems who are the patients. With relation to healthcare, the new D&M model can be broken down to the following parameters (Delone & McLean 2003):

This *concept of System Quality* in relation to healthcare covers and navigates through the different technical aspects that comprise differentiated measures, for instance, ease of utilization, functionality, data quality, flexibility, reliability, and integration with other differentiated systems (Delone & McLean 2003). In the medical and healthcare world, these measures are imperative as they assist in ensuring the Healthcare Information systems are working for the benefit of hospitals' patients. The construct of 'net benefits' here is a newly coined term under the new D&M model that comprises of the different measures that add to the achievement and success of different groups in the IS success's spectrum, namely, organizations, individuals, and firms (DeLone & McLean 1992; Delone & McLean 2003).

In the healthcare fraternity, relevant stakeholders, that is, healthcare purchasers, consumers, healthcare providers, and health system administrators do contribute and make up this different groups. This means that the new D&M model IS success model navigates through the patients' needs and the relevant hospital employees such as hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists through the information systems which have to be successful when well implemented (Delone & McLean 2003).

Information Quality means quality of the outcome reports (DeLone & McLean 1992; Delone & McLean 2003), it measure by completeness, accuracy, and Consistency.

Service Quality refers to the quality of the services provided by the department of IT support and it measures by a number of measures like technical competence, reliability, responsiveness, and empathy of the IT people (DeLone & McLean 1992; Delone & McLean 2003).

System Use is the way the people capitalise on the competences of the system,

Example: level of use, frequency of use and purpose of use (DeLone & McLean 1992; Delone & McLean 2003).

User Satisfaction includes all the measures related to the user's satisfaction with the

system as presented in the previous section 2.10.2 (DeLone & McLean 1992; Delone & McLean 2003).

The 'Net Benefits' is mix between individual impact and organizational impact Delone and McLean in 2002 did update to their model and they created the net benefit construct that mix between individual and origination impact, this construct includes the measures that contribute to the effectiveness of different groups involved in the information system success IS success: individuals, industries and organizations. These can be productivity, efficiency, effectiveness, cost reduction, clinical, operational and any other appropriate benefits for the different stakeholders (DeLone & McLean 1992; Delone & McLean 2003).

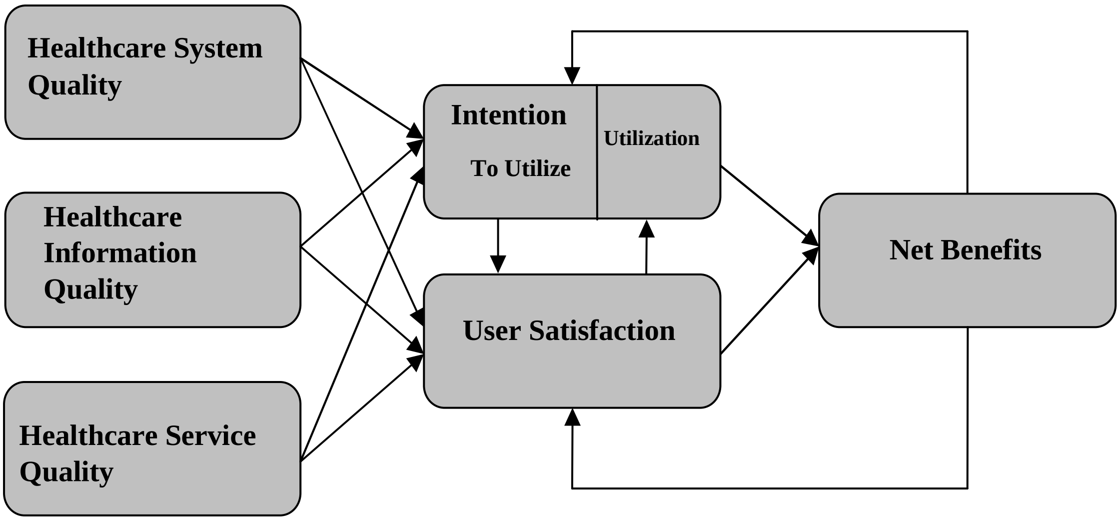


Figure 2. 4: The New integrative DeLone & McLean Model (Delone & McLean 2003)

2.9.3.1 How the Information System Success Theory fits to the research study

The IS success model is appropriately relevant for this research since it assists to determine the how hospital manage to structure, implement, update and maintain their Healthcare Information Systems and how this system is able to interact the relevant stakeholders, that is, healthcare purchasers, consumers, healthcare providers, and health system administrators, with the hospital patients. This means that the IS success model navigates through the patients' needs and the relevant hospital employees such as hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists through the information systems which have to be successful when well implemented (Cresswell & Sheikh 2013).

The IS success model is appropriately relevant for this research also since it depicts ensure that the hospital in functioning well financial even through it is directed by its goals, aims and objectives stipulated in the hospital's MoU (Memorandum of Understanding) - Association between the International Network of Health - is a voluntary contract between listed hospitals to deliver common assistance and help at the time of emergency circumstances or disaster (Siple 2014). This includes finance obligations to the patient, government grants and subsidies and hospital efficiency in treating, admitting and taking care of its patients (DeLone & McLean 2016). The Information Systems Success Model combines the system quality, information quality, information use, user satisfaction, individual impact and organizational impact in order to ensure that the hospital's effectiveness justifies the finance capability and performance of each healthcare facility since an effective Health Information System will offer quick, dependable, effective, secure and highly reliable healthcare system which will enhance the patients' interaction with the hospital's personnel (Cresswell & Sheikh 2013).

2.10 The Information System Success Model and organizational impact in the literature

Based on many of IS success models that have been tested and published by sedera and Gable in 2004 concluded that the D&M Model was the most appropriate model to measure the success of system enterprise in the organizational perspective (Sedera & Gable 2004).

The new IS success model motivates many researchers to apply it in their studies, because the dimension that has which is six dimensions delivered the podium for most of the following frameworks of IS Success that tried to measure the effect of IS on organizational performance. The New D&M model inspires many authors to us it as whole or partly or use it to additional modifications, for example (Bernroider 2008; Gorla et al. 2010) use it as partly, (Wang & Liao 2008) use it as whole but (Chang & King 2005) use it to additional modifications.

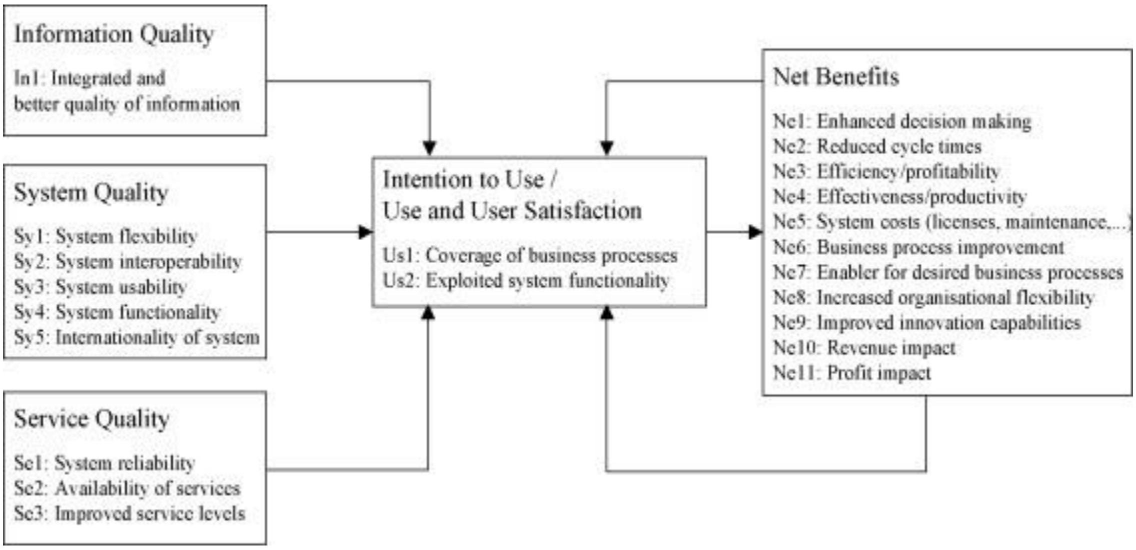


Figure 2. 5: Framework of (Bernroider 2008)

In 2008 Bernroider did test for the dimensions of new D&M as see in (Fig 2.5) and the result was that the model consistent with the general dimensions of success and, they might yield a single valid measure of ERP success when combined (Bernroider 2008).

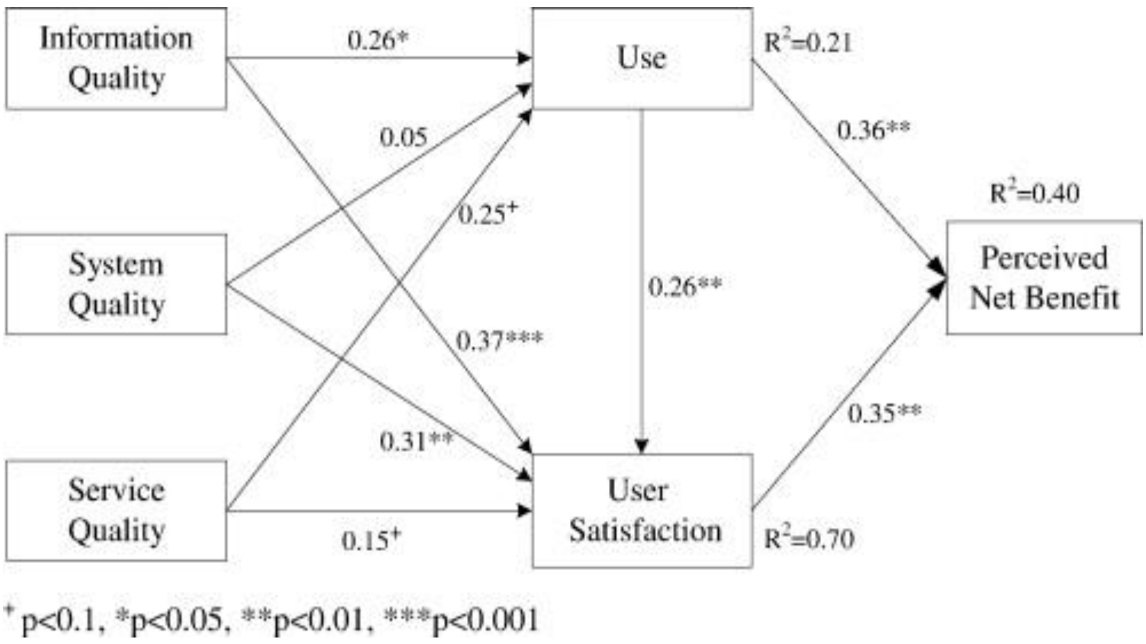


Figure 2. 6: The Research framework of Wang, and Liao (2008)

The figure 2.6 represents a new empirical test provided by Wang and Liao in 2008 of an adaption of the D&M Model in the Government to citizen G2C eGovernment context. As shown in Fig 2.6 all the relationships between the hypotheses amongst the variables of six IS success were positively supported by their data with exception of the relationship between system quality and use ($p<0.1$) (Wang & Liao 2008).

According to Gorla, Somers and Wong (2010), the four dimensions that are applicable in the DeLone and McLean (D&M) model assist in the determination of information quality, the quality of services, and the quality of IS systems relating to how these constructs affect and impact organizational performance as mention in the figure 2.6 The model advanced by this researchers comprised of four differentiated constructs that are highly motivated by the elemental structure of the D&M model. On precise terms, service and system qualities are two primary constructs that make up the independent variable while information quality was both an independent and a dependent variable, and dependent variable is represented by the organizational impact as a construct on its own (Gorla et al. 2010).

Through the research carried out by Gorla, Somers and Wong (2010), it was deduced that there is a linkage existent between information quality, system quality and the construct of organizational impact. This is even after the realization that organizational impact as a construct portrays variance which can be addressed and fully articulated through IS quality as a variance in itself. This simply implies and means that information as a quality construct is the key and paramount mediator that exist between the construct of organizational impact and system quality (as mention in Fig. 2.7) (Gorla et al. 2010,p13).

The primary goal and the resultant finding was that there exist a significant and meaningful indirect or direct organizational impact that results from information quality as a construct, system quality as a construct and service quality as a construct (This has been depicted under Fig. 2.8).

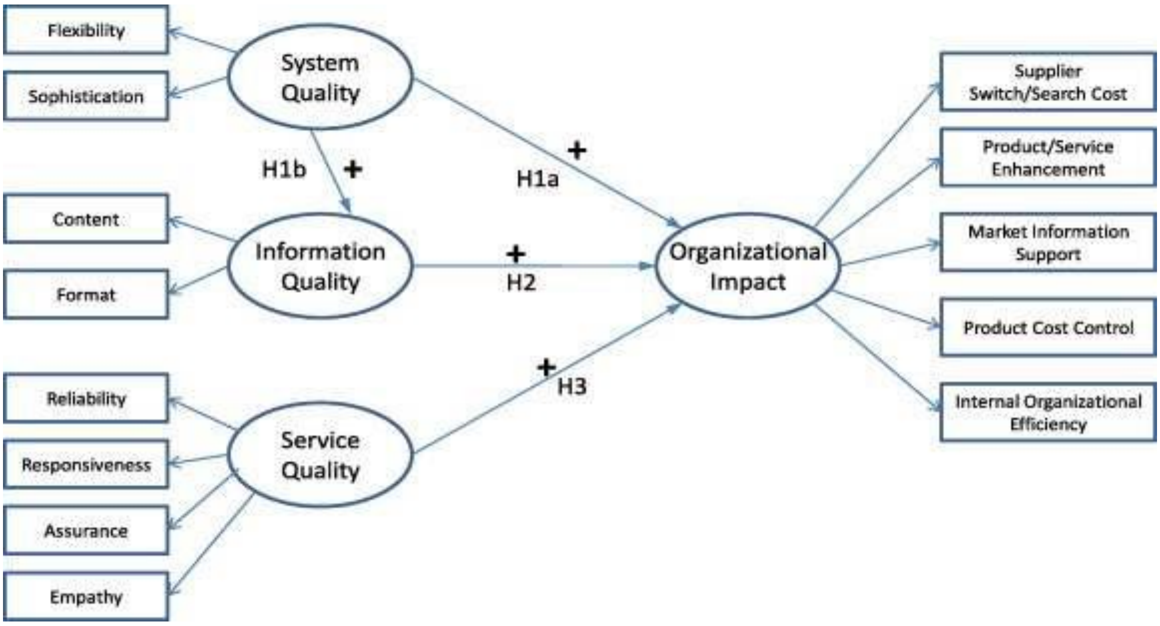


Figure 2. 7: The Research Model on IS success derived from (Gorla et al. 2010).

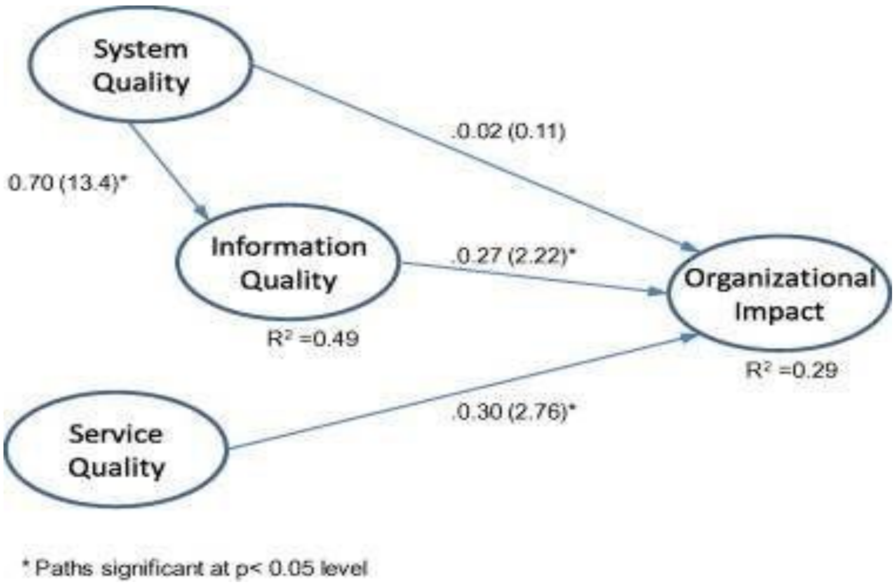


Figure 2. 8: Structural depiction of the PLS Model derived from (Gorla et al. 2010).

It is imperative to note that the four differentiated dimensions that are related to the new D&M model are applicable in most healthcare Information Systems. These dimensions or measures include service quality, organizational impact, and information quality and IS system quality (Gorla et al. 2010). These constructs can be asserted as being entirely motivated and advanced by the new D&M model with service and system qualities making up the independent variables while organizational impact makes up the dependent variable: information variable makes up both dependent and independent variable (Gorla et al. 2010). It is easier to navigate through these dimensions which are all imperative as constructs that make up a well-defined and well-articulated Healthcare Information System which will actually assist the different stakeholders in any given hospital settings (Lin et al. 2013).

Service quality, organizational impact, and information quality are very instrumental in the influence of the variance that impacts organizational performance of HIS since they control organizational impact through IS system quality as their primary variance (see Fig 2.8) (Gorla et al. 2010). This in simple terms implies that information quality is the primary mediator that exist between organizational impact and system quality (Gorla et al. 2010,p13). In the healthcare, system quality and organizational impact largely are dependent on the type of information quality navigates and shared within a given healthcare information system. When the quality is dependable and great in term of ease of movement, privacy, confidentiality, reliability, precision and other factors, all the relevant stakeholders from hospitals' physicians, health practitioners, nurses, psychotherapists, and psychiatrists to its patients become beneficiaries of HIS (Gorla et al. 2010; Cresswell & Sheikh 2013).

According to the system theory and on the theoretical input–output performance model, Chang and King (2005) argued that an IS system is an open system which has inputs and outputs and based on that they extended the IS success Model from Delone and Mclean (fig. 2.9).

2.11 Information Systems Input- Output Performance Model

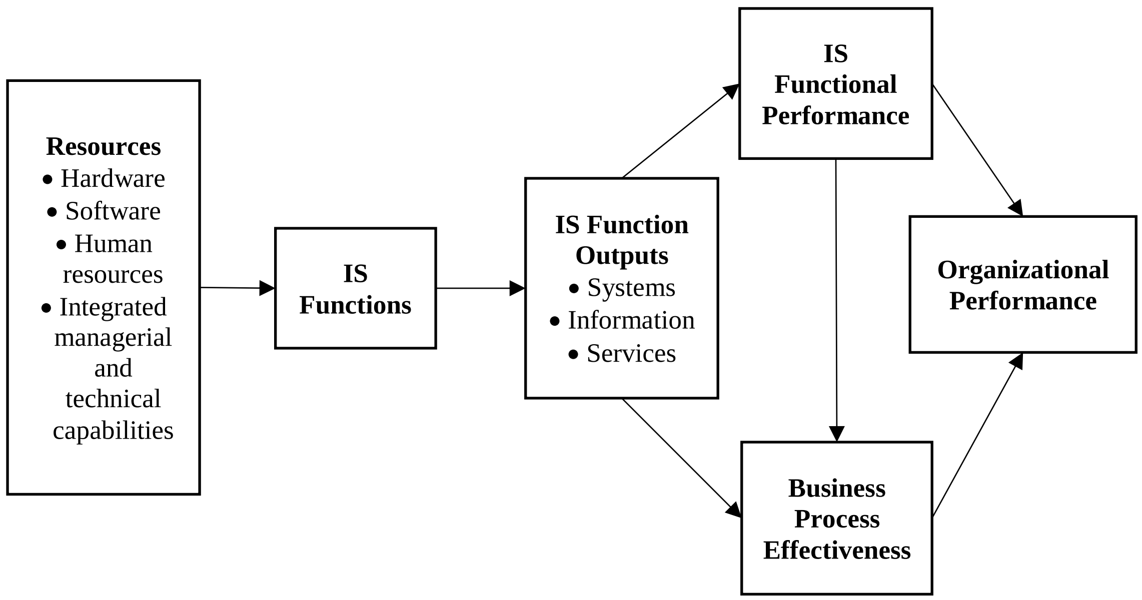


Figure 2. 9: Theoretical Input Output Performance Model - Information system functional scorecard (ISFS)

The theoretical model presented in figure 2.9 provides information on the utilization of information systems in organizations. The framework is a simple input-output model where the IS function utilizes resources to generate IS performance (system, information and service provider) based on the system's approach (Segars, A.H. and Hendrickson 2000). The IS performance in turn affects the organizational performance and business process effectiveness (Chang & King 2005; Hall et al. 2013) . The resources used by the IS function include human resources, integrated managerial and technical capabilities, hardware and software. Under this model, the IS function results in the generation of systems, information and services that collectively influence the information system's functional performance which is Information system functional scorecard ISFS (Chang & King 2005; Lenzen et al. 2014). This functional performance can be assessed using a balanced scorecard targeting the IS functions. The model also reveals an appreciation of the role of IS in driving business process effectiveness and influencing organizational performance. From an information system perspective, assessment should focus on the capabilities and contributions of an information system. The assessment of an HIS should target its contributions to the hospitals and its capabilities (Chang & King 2005).

IS capabilities refers to the sets of software, human skills, management processes and software that serve to translate financial investments in information systems into performance. The effectiveness or success of an information system can only be captured using a multidimensional measure (Chang & King 2005). One such measure is service quality. Another quality that has been widely mentioned is the usability of the functional components. IS usability and IS service quality are related but different measures that influence the contributions an information system makes to an organization. A critical evaluation of information system assessment reveals a tendency to focus on the IS function outputs. The appeal of focusing on the outputs is that the approach matches the conventional approach to assessment, where the focus is on the product rather than potential or capabilities. From a technical perspective, it makes sense to assess the IS from a functional view. This approach targets the assessment of the performance of IS functions. However, the lack of validated metrics limits the efficacy of this approach. Thus, there are three key areas when assessing information system performance, namely system performance, information effectiveness and service performance, the dimension that use to measure these constructs in table 2.34 (Chang & King 2005) .

System performance is used in assessing the quality aspects of a system that have a direct impact on the user interaction with the system. Some of the aspects targeted under system performance include response time, ease of use, and reliability. In a HIS, analysis of systems performance should include users of the different subcomponents that make up the entire system (Chang & King 2005).

Information effectiveness focuses on assessing the quality of information. This dimension of information system assessment focuses on the use, value, design, and operation of information in the information system (Luo et al. 2012). Another aspect covered under information effectiveness is the effects of information on the end users obligations and responsibilities. Overall, this aspect is essential from a strategic view of information system implementation (Chang & King 2005).

The service performance dimension focuses on the users' experiences with the services offered by IS functions in relation to quality and flexibility. Each function offered by a HIS can be viewed as a service (Chang & King 2005; Luo et al. 2012).

This model is one of the most frequently used models in the field of microeconomics. Its application however expanded greatly with computerization to include other fields like healthcare where it is used to measure the performance of health information systems (Hall et al. 2013). When it was first founded in 1936, the founder of the model, Wassily Leontief based its first application on the liner relationship that exists between expenditure and goods production as well as the goods production level (Lenzen et al. 2014).

The model is today applied in the healthcare sector to assess the health expenditure levels in one country, region or health facility in comparison to the expenditure levels in other countries, regions or health facility. The comparison helps in determining the performance of the health information system in the country or region under consideration (Hall et al. 2013). The model allows for the inclusion of both quantitative information and information that reflects the quality of health services. This way, it is possible to identify and point out the input combinations that are most effective (Chang & King 2005). This is important since the essence of the research allocation process is to choose a combination of input and output levels that are most effective (Abdelhak et al. 2014).

According to the DeLone and McLean (D&M) model after the service quality and mix the individual performance and organization with net benefit were coupled as separated construct to the D&M model, the model become more effective as an IS metric. This is because the IS use was deemed not being a measure or metric of success and consequently replaced with the D&M's IS 'perceived usefulness' that took place of the initial IS's 'Use". This was a paramount inclusion into the DeLone and McLean (D&M) model so as to capture the concept that in actuality serves as an irrefutable antecedent of the model's net benefits. As depicted in the figure 2.4, the new construct that was created comprised the 'net benefits' and the 'service quality' which offers a more integrated and comprehensive impact of the diverse IS field (Delone & McLean 2003).

Table 2. 49: Sub-ISFS Constructs adopted and furthered by (Cha -Jan Chang and King 2005)

Systems performance	**Information effectiveness**	**Service performance**
Impact on job Impact on external Constituencies Impact on internal Processes Effect on knowledge and learning Systems features Ease of use	Intrinsic quality of information Contextual quality of information Presentation quality of information Accessibility of Information Reliability of Information Flexibility of Information Usefulness of Information	Responsiveness Reliability Service provider Quality Empathy Training Flexibility of Services Cost/benefit of services

2.12 Summary of the most significant frameworks a in the Information system IS literature

The construct of effectiveness is continuously existing in the literature of Information Systems IS and researchers have tried to operationalize and conceptualize it using diverse frameworks (e.g. DeLone & McLean, 1992; Ballantine et al., 1996; Goodhue, 1995; Chang & King, 2005; Gorla, Somers & Wong, 2010). Many papers in the literature were reviewed for the identification of the most significant frameworks in the field of Information system assessment. It became obvious that the way to assess the success or effectiveness of IS changed over time as the purpose, use and influence of IT changed over time. The main finding of this comprehensive review was that almost all scholars examined or expanded the Technology Acceptance model TAM (see Table 2.50) or the Information System success model proposed by DeLone and McLean (see table 2.51).

The Technology Acceptance Model has been broadly used (in its original or reviewed form) from all scholars pointing at “expecting the acceptance, adoption, and use of information technologies” (Chen, Li and Li 2011). Though, acceptance, was not proposed to be equal to success, although acceptance of an information system is a requirement for success (DeLone & McLean, 1992; 2003) and based on that reason additional stream of research concentrated on the six IS dimensions that might measure success of IS.

Numerous researchers and authors approved on the existence of IS benefits at diverse levels, as numerous other stakeholders were recognized (DeLone and McLean, 2003; Peter, DeLone and McLean, 2012). Based on this reason the DeLone and McLean model was reviewed in 2003 to include a broad dimension under the term ‘net benefits’.

Table 2. 50: Frameworks based on TAM. Source: (Chen et al. 2011)

Frameworks	Presenting authors
Original TAM	(Davis 1989), (Davis et al. 1989)
TAM-TPB	(Taylor & P. A. Todd 1995), (Taylor & P. Todd 1995)
TAM2	(Venkatesh et al. 2003)
TRAM	(Lin et al. 2007)
Task-technology fit	(Chang 2008)

Table 2. 51: Frameworks based on the IS success model

Frameworks	Presenting authors
Original IS success framework	(Bernroider 2008); (Gorla et al. 2010); (Sedera & Gable 2004); (Wang & Liao 2008)
Extended IS framework	(Chang & King 2005)

2.13 How Information System Success Model fit this Research Study

The DeLone and McLean IS success model motivated this research study. Apart from its word-wide acceptance this framework was deliberated as the most suitable model because it encompassed both: the ever going comprehensive measures and instruments of IS success such as system quality and information quality and service quality and the comprehensive instruments of net benefits i.e. the impact of implementation IS on the whole organization.

2.13.1 Reasons of removing the intermediate variables of IS Success Model

While this research bases on D&M IS success models because of their importance in providing intermediate effects of Information system IS on IS success, the framework of this research does not include the intermediate variables IS user satisfaction and IS use for the following reasons.

While IS satisfaction and IS use were well studied in the past, the importance of these variables in IS success models has been interrogated (Seddon 1997; Bradley et al. 2006; Rai et al. 2002; Gable et al. 2003). Seddon (1997) indicates the problems with Delone and McLean IS Success Model with signal to the concept of the construct of use. He specified three potential meanings for Information system IS use: use as a substitution for benefits from use; use as a behavior signifying ‘‘future use”; and use as a result in a process going to net benefits. He declared that the last two meanings of IS use have no location in IS success models as they do not indicate success. Only the first meaning (i.e., use as a substitution for benefits from use) symbolizes an IS success measure (Seddon 1997).

So, based on Bradley et al (2006) who claimed that IS use does not play a role in the measure of IS success, for the reason that it is not the use of Information system IS itself that is significant; actually, it is the effect of IS use on organizations that are significant and symbolizes a success measure (Bradley et al. 2006). As this research study concentration on analysis of organization level as part from net benefits, this study uses organizational impact (as part of net benefits) of the new model of D&M IS Success Model, it uses as an IS success measure to symbolize benefits from IS use. On the other hand, while Seddon (1992) clarified the IS use as use as a substitution for benefits from use in optional systems, IS use delivers for small variability in obligatory systems and later can be removed (Sedera & Gable 2004; Petter et al. 2008).

Regarding the mediator variable (IS user satisfaction), in the past this variable had been an extensively used single measure of IS success (DeLone and McLean, 1992). A number of researchers (such as, Bailey & Pearson 1983; Doll et al. 1994) have established instruments to measure user satisfaction. However, based on Gable et al. (2003) explained that several items in the instruments of satisfaction easily map to items measuring system quality and information quality (Gable et al. 2003). For instance, Doll and Torkzadeh established a twelve items instrument to measure end user computer satisfaction (EUCS), which contains of the items accuracy, content, timeliness, format, , and ease of use. Rai et al.(2002) clarifies that user satisfaction can be measured indirectly through system quality, information quality, and other variables (Rai et al. 2002).

Based on a study regarding investments of IT and organizational performance, Teo and Wong (1998) finished that satisfaction is not a distinctive dimension. On other hand, in a study done by Sedera and Gable (2004) about the enterprise systems success model, they observed that when run factor analysis the items of satisfaction loaded under system quality. Therefore, as items of user satisfaction are already involved in system quality or information quality, based on this reason I chose not to include satisfaction in our framework at this research study.

The next paragraph discusses the programs of training as another significant construct recognized in the literature that has been related to the effectiveness of Information Systems.

2.14 Role of User Training on the Success of Health Information Systems

Training the end users of any Information System implementation has been stated as a main success factor in a number of studies (e.g. Al-Mashari et al. 2003; Nelson & Cheney 1987; Santhanam & Sein 1994; Somers & Nelson 2004). Companies employ a lot of money investing in the recent technologies in their tried to stay competitive. Nevertheless, this investment can be effective only when the function of IS responds to the computing requirements of the users (Rondeau et al. 2010). Whereas, the question is how the training programs are effective to assist users to familiarize themselves with these Information technologies, improve their computing skillfulness, and lastly employ the new skills to develop their reproduction (Rondeau et al. 2003; Rondeau et al. 2010).

The definitive target of any training program is skillfulness development that, in turn, develops organizational results (Eldridge & Nisar 2006). Previously research specified that effective programs of training are those that run into the ever-changing of user demands and are oriented to organisational goals (Huang 2002). The definition of the effectiveness of training program indicates to management's recognise if training of IS (Rondeau et al. 2010), and is established on the traditional analysis motivated by Donald Kirkpatrick in 1998 . The second question, therefore, is how top managers can evaluate a training program and how the effect of the training is transferred to workplace (Mahapatra & Lai 2005). therefore, The next question is how managers in top levels can estimate a training program and how the effect of the training is conveyed to the workplace (Mahapatra & Lai 2005). Until now Research has shown that there is not greatly information about how to measure the effectiveness of training by managers (Mahapatra & Lai 2005; Rondeau et al. 2010). This question moved to another centric point for the ensuing research on the effectiveness of Information system which requires to search senior managements' conception of the Information system training that received by end-users (Rondeau et al. 2010).

The failure of many health information systems has been the result of inadequate training of the intended users (Dietz et al. 2015). The introduction of a new technology like is the case in the adoption of the health information systems leads to significant changes in an organization (Cresswell & Sheikh 2013). It is, therefore, necessary to provide the users with adequate training on the use of the new technology so that they can adapt to these changes. Without the adequate levels of training, the system may operate, but it may not achieve the original expectations of performance (Ram et al. 2014).

A comprehensive training provides the users with a concrete understanding of the functionalities and the capabilities of the healthcare information systems' interactive platforms. Training also speeds up the adoption and proper utilization of the system by the staff (Khalifa 2014). Most importantly, proper education ensures that the system achieves its intended benefits which include improvement in communication, improvement in the quality of care, streamlining workflow and centralizing information for ease of access (Cresswell & Sheikh 2013).

2.15 Healthcare System in Jordan

The Hashemite Kingdom of Jordan is an Arab country located in the Middle East. It has one of the most advanced health care systems in the region. Its healthcare system is driven by three key sectors, namely, public, private and donors (Alsarayreh et al. 2017). Health prosperity in the country began in the decades following its independence from Britain in 1946. Health development was procedural. On December 1950, the ministry of health (MOH) was established (Ajlouni 2016). The ministry was further sub-divided into six departments to coordinate health affairs over each of the kingdom's districts. The country's first nursing school was launched in 1953, and in the preceding year, the medical workers' association was created. Another key milestone was the building of the Princess Mona nursing college in 1962 followed in 1965 by the implementation of the country's maiden civil health insurance over its nationals. In 1973, the King Hussein Medical Center (KHMC) was established while in 1980 the country's first pharmacy faculty was launched at Jordan University (Ajlouni 2016).

Currently, the country's health program is financed and delivered by the Ministry of Health MOH, Royal Medical Services (RMS) as well as various university-based programs such as King Abdullah Hospital in Irbid (Ajlouni 2016). The regime is dedicated to making health care available and accessible to all its citizens. It has a national health strategic plan whose goal is to create a comprehensive health care program. This plan is pegged on both public and private service providers (Rawabdeh & Khassawneh 2018). As per the Public Health Law No. 54 that was issued by a Royal decree in 2002, all health matters of the kingdom are under the MOH. Its specific duties include the provision of both curative and preventive services as well as disease monitoring. It is also in charge of supervising health services by both public and private hospitals. The ministry also provides health insurance for the country's nationals as well as establishing the training curriculum for health institutions (Rawabdeh & Khassawneh 2018; Ajlouni 2016).

On the other hand, the private sector also plays a vital role in both financing and delivery of health services. Due to the nation's absence of a strict regulatory environment, this sector has flourished and grown steadily. A majority of private medical firms provide health care coverage for their staff. The health insurance is achieved through both self-insuring and purchase of private cover. 49% of all the country's health expenditure flows into the private health industry according to data from Jordan's National Health Accounts (JNHA) (Ajlouni 2016). As such, it attracts a good number of patients from neighboring Arab countries. Jordanians with public health insurance still tend to purchase private coverage using direct-out-of-pocket system. Another feature of private health firms is that they provide over 36% of the nation's hospital beds. Furthermore, the sector is the employer of about 61% of the kingdom's health personnel (Ajlouni 2016).

In terms of financing, Jordan's health care system is funded by four main sources, namely, public funding, household spending, private firms and donor contribution. Public funding which covers 46% of the health budget comes from general taxation and premiums that are paid by public firms (Department of Statistics et al. 2018). The health budget is well over 9% of the kingdom's Gross Domestic Product (GDP). Nonetheless, this expenditure has been declining. For instance, it dropped from 51% in 1990 to 35% in 2001 (Department of Statistics et al. 2018). This decline is due to the increasing prominence of private health services (Rawabdeh & Khassawneh 2018).

Household spending refers to revenues received from workers' payroll deductions for their health cover, user fees paid to health centers as well as money used to buy pharmaceuticals. This constitutes 47.7% of all health funding. On the other hand, private funding refers to funds received from private and commercial insurance firms as well as out-of-pocket payment for medical services and deductions of insurance premiums for their staff (Abed 2018). About 6.3% of funding comes from donor contribution. The largest of these donors is the United Nations Relief and Works Agency (UNRWA) that takes care of Palestinian refugees residing in Jordan (Ajlouni 2016). The health care system comprises of such staff as all doctors, nurses, midwives, pharmacy staff, laboratory workers, dentists as well as administrative staff (The Hashemite Kingdom of Jordan:The High Health Council 2019).

The Jordanian health system delivers various services to its citizens including primary care, secondary or tertiary pharmaceuticals. The ministry of health has an extensive covering primary health care network which covers dental care, health education, pest control, food hygiene as well as sanitation. As such, the ministry has established 260 village health clinics and 353 maternity centers (Department of Statistics et al. 2018). In addition, it also runs about 12 chest complaints centers and

251 dental clinics. This is a very high-density care system by global measures. On its part, the UNRWA runs 21 primary care centers in addition to 30 specialized care centers for Palestinian refugees (Paolucci et al. 2019). The private sector is mainly responsible for primary health in urban areas while the public sector runs the rural one. The kingdom's health sector also provides secondary and tertiary care. These usually receive patients referred to them by primary care for specialized treatment. Among the health issues dealt with at this level are surgeries such as plastic, cardiac and neurosurgery, and other complications like burnt treatment and cancer management (Department of Statistics et al. 2018). Additionally, the health sector also supplies pharmaceuticals. Accordingly, Jordanians are able to acquire drugs for various medications from health centers as well as chemists (The Hashemite Kingdom of Jordan:The High Health Council 2019).

The total number of hospitals in Jordan is 106. They cumulatively have a bed capacity of 12,081 with public hospitals accounting for 67% of these. As a result, the kingdom has a hospice bed ratio of 18 beds per 10,000 people which is the highest in the Arabic region. However, majority of these are concentrated around the capital, Amman. The ratio has only subsided to suboptimal following the influx of refugees from Iraq and Syria (Department of Statistics et al. 2018).

In terms of staff, the kingdom has an impressive rate of 28.6 doctors and 17.8 pharmacists for every 10,000 Jordanian nationals (Department of Statistics et al. 2018). This rate is higher than in more developed nations such as the US and Britain. While the private sector funds private hospitals, the ministry of health runs 1245 primary health care centers in addition to 27 hospitals. This number constitutes 37% of the entire nation's bed space. The kingdom's military also operates about 11 hospitals under its Royal Medical Services unit, and these represent 24% of all hospital bed space. The remaining 3% of beds belong to the nation's Jordan University Hospital (Department of Statistics et al. 2018).

Jordanian hospitals offer cutting edge health services for their patients. For example, it has one of the best cancer treatment health facilities internationally. As a result, thousands of patients from different parts of the world, Americans, Iraqis, Syrians, Canadians, Egyptians and Sudanese, travel to Jordan seeking treatment. Annually, over 250,000 foreign patients visit there. This has seen the kingdom generate over $ 1 billion from this medical tourism (Alsarayreh et al. 2017). Another outcome of the advancement of health care in Jordan is the overcrowding of hospitals as people from various places travel to seek treatment. This problem is coupled with brain drain as a good number of skilled healthcare workforce immigrate to work in other countries where they are paid better. The migration has led to shortage of physicians in some of the kingdom's health centers (Alsarayreh et al. 2017).

In terms of Information system, many countries across the world have adopted the Electronic Health Record (EHR) system so as to enhance and raise the quality of healthcare. EHR forms the core of e-healthcare model through such functions as storage of health data and information, aiding administrative processes as well as enabling electronic connectivity between patients and hospitals (Othman et al. 2015). In terms of the information system, Jordan has focused on providing excellent health services to improve its quality and efficiency. Accordingly, digital transformation has started sweeping across the healthcare industry in Jordan. For example, King Abdullah University Hospital (KAUH) has embarked on this digital revolution of healthcare provision. KAUH provides health services to over 1 million residents. Additionally it is also an advanced teaching hospital and is associated with the Jordan University of Science and Technology. The hospital was facilitated by DXC Technology to design, install and implement an ultra-modern healthcare information system. This system provides end-to-end information intending to control costs while improving patient care (Klaib & Nuser 2019).

The health information system serves various functions, which also include data analysis and administrative roles. It runs an electronic medical file that has all the details about the hospital's patients. Accordingly, this information is readily available to such health practitioners as doctors who may need it. This information is also relayed fast and accurately and is thus very useful in times of intensive care whereby fast decisions need to be made. This stored data is also strictly private and very secure. Additionally, new health technology has enhanced continuous staff training. Training its medical personnel on the latest technological advancements in healthcare has opened new opportunities for them to work not only in the hospital but also abroad. It has also enabled the hospital's technical staff to keep up to date with new and techno-savvy medical devices (Klaib & Nuser 2019).

In 2009, His Majesty King Abdullahi Bin Al-Hussein launched the country's version of EHR which is called Hakeem. Its goal was to automate the public healthcare sector in the kingdom through provision of high-quality healthcare via EHR (Othman et al. 2015).

The Kingdom of Jordan inaugurated the Hakeem system as its e-health model to connect all public health institutions in the country. Under Hakeem, healthcare personnel such as physicians and pharmacists electronically access patients' medical records by just entering their identification card (ID) numbers. To pilot the new system, the government used various medical centers to implement it but presently over 100 hospitals and healthcare centers are connected to the system (Othman et al. 2015).

One of these hospitals that adopted Hakeem is the King Hussein Cancer Center (KHCC). KHCC is the best cancer treatment center in the Arab world, where it offers top-notch comprehensive cancer care. Its patients are not only Jordanians but include those from neighboring countries such as Palestine, Iraq, Sudan, Yemen and Syria (Khader et al. 2012). With the inception of Hakeem, the center expanded both its inpatient wing and outpatient tower so as to double the number of patients attended. Additionally, it has installed technologically cutting-edge medical facilities to offer treatment in tandem with international best practices in terms of cancer treatment. Furthermore, Hakeem has improved the quality of research and education into new areas as testicular cancer care and radiography therapy among its medical personnel (Khader et al. 2012).

Prince Hamza Hospital also adopted the Hakeem system. Among the benefits derived from the e-healthcare system is improved quality of health care, reduced costs of medication, better information system as well as increased learning for the hospitals' staff. It has also led to an integrated space and method for providing patient care (Othman et al. 2015). The other health center which adopted Hakeem is the al-Bashir Hospital. It consists of four sub-hospitals; gynecology, pediatrics, surgery and internal medicine units. The hospital and its facilities underwent automation under Hakeem which increased innovation and creativity in such critical areas as anesthesia care, blood bank and surgery package (Aljadid 2018).

Al Karak Government Hospital has also installed the Hakeem e-health system. This made it the first governorate to attain full automation in its operations. To aid in this automation, the hospital underwent renovation of its obstetrics, neonatal and emergency departments so as to improve its quality of healthcare. The hospital also upgraded its delivery ward, operating theatre and the outpatient clinic. To support the new technology of electronic connectivity, such facilities as new neonatal incubators, resuscitators, vital signs monitors and tables for use during delivery and operation were brought in so as to do away with the dilapidated ones (Klaib & Nuser 2019). This new equipment also guaranteed safety during medical treatments (Klaib & Nuser 2019).

The other institution is Rahma Paediatric Hospital. This is the only hospital that is specialized in pediatrics in the whole country. In order to embrace Hakeem, the institution improved its standards of engineering so as to facilitate automation of its services. One cardinal feature of the hospital's e-health is adoption of health informatics through which it has been able to acquire, store and retrieve for use its healthcare information. This stored information also includes that of its patients. As such, it has fostered collaboration between its healthcare services and patients. The renovation has also helped it to cope with influx of refugee from neighboring countries in need of medical attention (Klaib & Nuser 2019).

2.16 Research Gap

From the literature review, it is clear that studies have been carried out to establish the measremnets for HIS implementation. The existing studies outline the importance of using measures when assessing the performance of health information systems and HIS. Moreover, some studies go so far to outline the measures that should be used in monitoring the implementation of a HIS. There is also a notable paucity of studies with strong methodologies. Most studies are descriptive or qualitative. Experimental designs, systematic analysis, and meta-analysis are very few in this study area. In addition, most studies use small samples. This is probably a result of the challenge in getting many hospitals that are willing to let their assessment of the information system and HIS be closely scrutinized by a third party (researchers). In addition, the fact that HIS have not been implemented by all hospitals makes it hard for researchers to include many HIS in their analysis. The studies on performance measurement and indicators in relation to information system often target a single implementation. As a result, the majority of the studies on key performance indicators in HIS employ a case study design. The main limitation of a case study design is that it affects the overall generalizability of the findings. However, the use of a case study design supports extensive investigation; this has led to the identification of multiple indicators that can be used in assessing HIS. The use of small sample sizes in a majority of the study is the result of practical considerations. This leads to a near ubiquitous use of non-probabilistic. However, this has so far not been a major problem since most studies limit the data analysis to the descriptive level.

Information obtained from the literature review has aimed to provide the effectiveness of Information syste IS within an organization (Gable et al. 2008; Gorla et al. 2010; Petter et al. 2008). The insight provided by the research have been criticized for its "'*inability to create a common theoretical base*' and '*incompatibly across the IS studies'* (Petter et al., 2008; Thong & Yap, 1996)." Thus, there is limited number of studies that capture the impact of IS on the performance of a company. The studies that attempted to measure the impact providing conflicting results (Brynjolfsson 1996; Sircar et al. 2000; Petter et al. 2013).

To sum up, most empirical studies done in the past pertaining to the success of IS models have touched on the individual benefits as opposed to how organizations might benefit (Petter et al. 2008; Sabherwal et al. 2006). There are no elaborate studies that touch on the interrelationships that exist between; information quality and service quality, system quality as well as the combined effect. The measures done in the past relate to the cost related measures or profitability (Petter et al., 2008). The studies only relate to the partial measure of the impact of information technology on organizations. Some of the past studies were focused only on special organizations which include, entrepreneurial or governmental organizations. Therefore, the results obtained could not be relied upon as they cannot apply to formal businesses.

One of the gaps evidenced in the effectiveness of health information systems is shown by the insufficient skills on the part of health professionals. The situation, thus, reduces their ability to conduct their duties in a way that would contribute towards the improvement of the health outcomes of patients within health facilities (Hübner-Bloder et al. 2009). The situation also reduces the capacity of health professionals from achieving their goals in terms of identifying the needs of patients and dealing with them effectively. Thus quality HIS is important (Goddard et al. 2002). Another gap that exists in the impact of health information systems is based on low levels of coordination of different health information systems. Thus, the situation creates a challenge in terms of reduced chances of integration of the systems with the need to ensure that the personnel can use them effectively in improving the health outcomes of their patients (Lau et al. 2010; Messeri et al. 2013). There is also a gap of reduced level of sharing information among health professionals in terms of the insights that they already hold regarding the use of health information systems (McCance et al. 2012). Thus, the situation is likely to make them less capable in terms of dealing with the problems they have in meeting the health needs of patients. The next (table 2.52) shows the the findings used to show the research gap that formed the guided the research.

Table 2. 52 findings that formed guided for the research.

Author and Year	Insights of Purpose	contribution
(Dragomir et al. 2013)	This article presents a methodology for designing a roadmap for KPIs for integrated management systems. It is noteworthy that HIS are integrated systems.	Further in-depth research focused on developing KPIs that have been included since the KPIs developed by this study may be insufficient for some organizations is required. KPIs are specific to the needs of organizations.
(Hübner-Bloder et al. 2009)	To identify the KPIs for HIS than can be used in HIS benchmarking	Research is required to validate and operationalize KPIs and the provide open repositories for a comparison with HIS benchmarks of different hospitals
(Raadabadi et al. 2013)	To investigate the functional indicators change resulting from the implementation of an information system in a hospital	The study suggests that the implementation of HIS does not have a dramatic effect on functional indicators. There is therefore need to establish why this is the case.
(Toroshanko et al. 2014)	This study involved the application of mathematical optimization techniques to determine the relative importance of KPIs.	This study raises questions about the possibility of using other optimization techniques other than Eigen vectors to order KPIs based on their importance.
(Strecker et al. 2012)	This paper looks at whether domain specific modelling method can address essential requirements to a reflective design of performance measurement systems.	The paper is an effort towards comprehensive modelling of performance measurement. There is need for further research into other modelling methods to

		determine their capacity to meet the essential requirements in performance measurement.
(McLaren et al. 2011)	To address the need for a more fine-grained approach to assessing the specific areas of misfit between a firm's competitive strategies and IS capabilities	This resource offers information on the importance of strategic fit in implementing HIS
(Drnevich & Croson 2013)	To explore business level strategic roles of IT and discuss several proactive implications and future research directions in converging strategy domains and information systems	This resource is essential in supporting the use of HIS in hospitals
(Al-Yaseen et al. 2010)	To investigate the current practice of evaluating healthcare information systems after their implementation	This article identifies some of the indicators that Jordanian hospital focus on when assessing their information systems

2.17 Summary

The findings of the literature review have clearly revealed a significant lack of literature on quantitative researches on the specifics of the topic of investigation of this research. When closely scrutinized, it is clear that the results of earlier studies on the measurement of performance in public hospitals and success of health information systems are incomplete since they lack the connection between the implementation of Health information systems and performance in public hospitals unless IS constructs are thoroughly integrated in the health information systems utilized by public hospitals. For instance, the DeLone and McLean (D&M) model assists in the determination of hospital information quality, the quality of hospital services, and the quality of IS systems relating to how these constructs affect and impact organizational performance in most public hospitals. In addition to this, various significant works have considered the role of effectiveness of HIS on the performance of hospital performance and it is for this reason that it is possible to draw a theoretical framework that is appropriate for this research from the literature review utilizing the DeLone and McLean Information System Success Model on HIS's role in Jordanian public hospitals.

CHAPTER THREE

CONCEPTUAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

3.1 Introduction

This chapter is concerned with the conceptual framework of this study and discusses all the theoretical issues that are related to the measurement of Health Information System. Importantly, the chapter presents the theoretical framework for the study and development of hypotheses. This chapter presents the proposed model of the relationship between health information system effectiveness and hospital performance.

3.2 The Study Conceptual Framework

This research used a conceptual framework drawn from the information system success model of Delone and Mclean (2002). The Health information system effectiveness construct used in this research study reveals essentially the model adopted by Delone and McLean (2003) and Chang and King (2005) which in turn was grounded on the model of Pitt et al. (1995). The conceptual framework of this study is derived from the six dimension of the DeLone & McLean Information System Success Model which is the dimension of the Organizational impact. These measures of organizational impact which are easily measurable are used to assess the relationship between health information system effectiveness and public hospital performance.

This Dimension assesses the success of the information system from the level of influence. It analyzes how the information product of the information system interacts with its recipients. Three measures of organizational impact as a dimension of information system success were considered in the formulation of this conceptual framework on the basis of their being easy to measure. Based on the literature review about the Information system IS effectiveness discovered that it's not easy to measure it from a single dimension and that the most commonly used constructs derived by the D&M (2002,2003).

Though, the framework encompasses extra dimension which is training quality. This could result in significant findings just in case the training was delivered by a diverse entity. This dimension of training quality was treated as a separate dimension to capture the main informants' perception on HIS effectiveness without relating it to the service provider's quality.

The conceptualization of public hospital performance according to this conceptual model as showed in figure 3.1, and based on numerous studies that relevant to literature review which not used objective measures it used perceptual indicators. Regarding the review of related studies that concerted on the public hospital performance and on the impact of HIS on public hospital performance (Grandia & Should 2017), there are three measures are directly related to the three domains of measuring public hospital performance: the clinical, operational and financial domains (Grandia & Should 2017; Briscoe et al. 2016; Swaminath et al. 2015; McCone 2017).

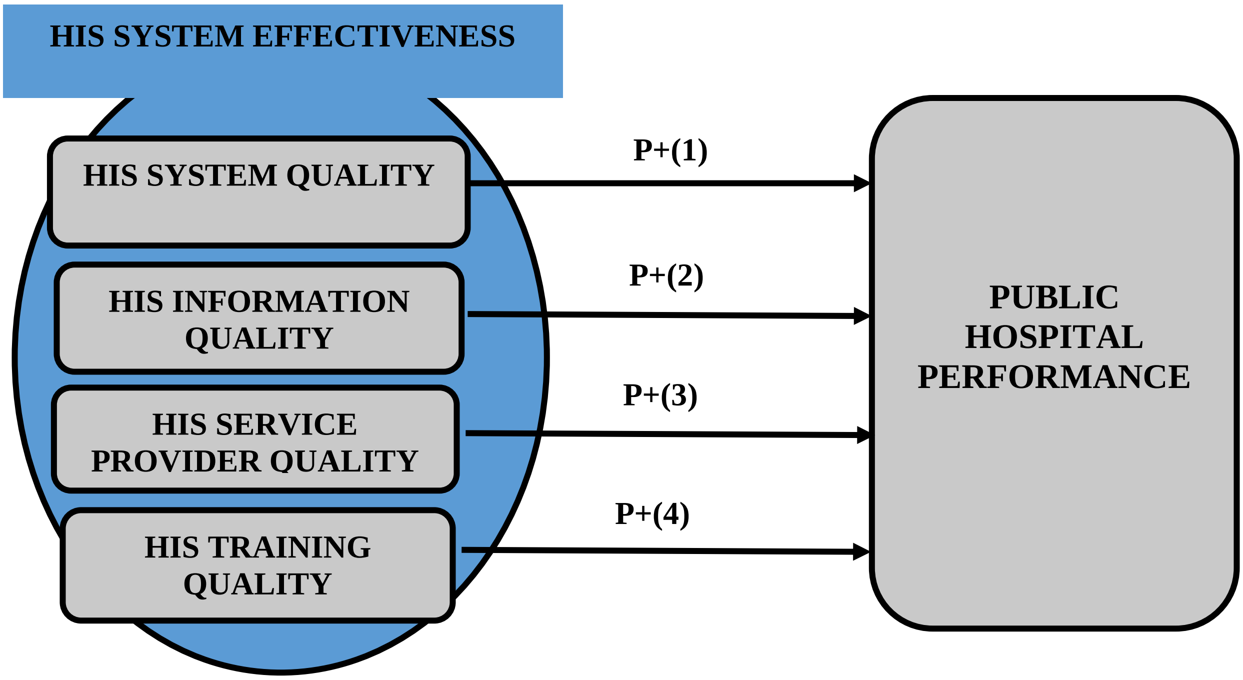


Figure 3. 1: The Conceptual Research framework - Health Information Systems' Effectiveness and Public Hospital Performance -

This study used a conceptual framework derived from the DeLone and McLean Information System Success Model. The items designated for the constructs were mostly modified from previous studies to guarantee content validity of the scales that used in the research study. The residual of the chapter explains in detail the conceptualization of the two key constructs as well as the structure of propositions and hypotheses.

3.3 Conceptualizing HIS effectiveness

As widely examined in the second chapter the HIS as part of the IS construct is commonly utilized as a part of the relevant literature. According to Rai, et al. (2002), the normal result indicated in the literature review was that it is difficult to gauge the effectiveness of IS from a solitary measurement. However, a large portion of the analysts utilized the accompanying sub-constructs, framework quality, the level of the quality of data and service to quantify it; system quality, information quality and service quality (Rai et al. 2002; Chang & King 2005; Bernroider 2008; Gorla et al. 2010). A detailed discussion of the sub-constructs is presented in the sections below.

3.3.1 Dimension one- Quality of HIS System as depicted in existing Literature

A properly composed, established, and executed system framework guarantees viable IS effectiveness usage (Delone & McLean 2003). The expected convenience is the measure as often as possible utilized, for this measurement as explained by Davis 1989 (Davis et al. 1989). However, Bernroider (2008) mentioned that the measure does not attract the whole construct where it can be seen that several scientists tried various parameters (for example, Rai et al. 2002; Gorla et al. 2010). This is why different hospitals install different informational systems dependent on the measures they intend to run and the performance criterion they operate on (Gorla et al. 2010). Table 3.1 shows various measures and indicators for system quality of HIS effectiveness.

Table 3. 1: HIS System quality measures

Source: (DeLone & McLean 1992)**;** (Gorla et al. 2010)

Measures of HIS system quality	Literature
Response time	(Bailey & Pearson 1983); (Gorla et al. 2010); (Wang & Strong 1996); (Nelson et al. 2005); (Barki & Huff 1985); (Belardo et al. 1982); (Srinivasan 1985); (Swanson 1974); (Davis et al. 1989); (Doll & Torkzadeh 1988); (Miller & Doyle 1987); (Sedera & Gable 2004); (Hamilton & Chervany 1981); (Franz & Robey 1986); (Goslar et al. 1986); (Hiltz & Turoff 1981); (Rivard et al. 1997); (Alloway 1980); (Kriebel 1979); (Kriebei & Raviv 1980); (Lehman et al. 1986);
Maintainability	
Integration of systems	
Perceived usefulness of IS	
Reliability	
Ease of use	
Accessibility	
Ease of learning	
Investment utilization	
Usefulness of DSS features	
User friendly	
Usefulness of specific functions	
Stored record error rate	
Resource utilization	
Flexibility of system	
I/S sophistication (use of new technology)	
Realization of user expectations	
Convenience of access	

Measures of HIS system quality	Literature
	(Mahmood 1987); (Emery 1971); (Morey 1982)

3.3.1.1 Operationalization of HIS's System Quality for this study

This research utilized the parameters and indicators that Chang and King (2005) developed in their studies, but it also included a few things drawn from the recently conducted studies. It was in 2005 that Chang and King presented a more enhanced construct that was named under the performance of the system, which had an objective of assessing the effect of the system on the processes of different organizations and users. The model developed by Chang and King in 2005 utilized various elements developed by DeLone and McLean (2002) for IS which can be incorporated in various frameworks for HIS while drawing some knowledge from other previously developed models, for example, (Ryker & Nath 1995), (Doll & Torkzadeh 1988), (Baroudi & Orlikowski 1988), (Davis et al. 1989), (Kraemer et al. 1993), (Mirani & King 1994) and (Goodhue & Thompson 1995).

The researchers gathered all things utilized by Chang and King (2005) including traits for HIS system quality that were found in different reviews as demonstrated in the comprehensive literature review. The traits for system quality have been applied in most healthcare polices for hospital maintenance since quality as a metric for performance is fundamentally imperative for healthcare and hospital settings (McGlynn et al. 1998). The associated inquiries utilized as a part of this exploration instrument contributed to the second part of the questionnaires used in the research (Appendix A). Table 3.2 shows measures and indictors that used in this research study.

Table 3. 2: Conceptualization of HIS System quality – 38 Items employed in this study

Measures of HIS system Performance	Literature
1. Improve decisions	(Bailey & Pearson 1983); (Gorla et al. 2010); (Wang & Strong 1996); (Nelson et al. 2005); (Barki & Huff 1985); (Belardo et al. 1982); (Srinivasan 1985);
2. Give confidence to accomplish job	
3. Increase participation in decision making	
4. Improve work quality	
5. Enhance the ability of problem solving	
6. Facilitate collective group decision making	
7. Facilitate collaborative problem solving	

<table>
<tr><th>Measures of HIS system Performance</th><th>Literature</th></tr>
<tr><td>8. Facilitate learning</td><td rowspan="24">(Swanson 1974);
(Davis et al. 1989);
(Doll & Torkzadeh 1988);
(Miller & Doyle 1987);
(Sedera & Gable 2004);
(Hamilton & Chervany 1981);
(Franz & Robey 1986);
(Goslar et al. 1986);
(Hiltz & Turoff 1981);
(Rivard et al. 1997);
(Alloway 1980);
(Kriebel 1979);
(Kriebei & Raviv 1980);
(Lehman et al. 1986);
(Mahmood 1987);
(Emery 1971);
(Morey 1982);
(Chang & King 2005);
(Zmud et al. 1983);
(Baroudi & Orlikowski 1988);
(Mirani & Lederer 1998)</td></tr>
<tr><td>9. Facilitate knowledge transfer</td></tr>
<tr><td>10. Facilitate internal relationships</td></tr>
<tr><td>11. Enhance information sharing with internal departments</td></tr>
<tr><td>12. HIS system is reliable</td></tr>
<tr><td>13. HIS system is flexible</td></tr>
<tr><td>14. HIS System is responsive to meet changing needs</td></tr>
<tr><td>15. HIS system meet expectation</td></tr>
<tr><td>16. HIS System is easily upgraded</td></tr>
<tr><td>17. HIS System is well integrated</td></tr>
<tr><td>18. System provides benefits for the entire hospital</td></tr>
<tr><td>19. HIS System is useful for problem identification</td></tr>
<tr><td>20. HIS System is helpful for decisions making</td></tr>
<tr><td>21. HIS system coverages of medical knowledge bases</td></tr>
<tr><td>22. HIS System is ease to use</td></tr>
<tr><td>23. HIS System is easy to learn</td></tr>
<tr><td>24. HIS System is cost effective</td></tr>
<tr><td>25. HIS Make easier to do work</td></tr>
<tr><td>26. HIS have fast response time</td></tr>
<tr><td>27. HIS System is accessible in timely manner</td></tr>
<tr><td>28. HIS system is easily maintained</td></tr>
<tr><td>29. It is easy to become skillful in using systems</td></tr>
<tr><td>30. Reduce process cost</td></tr>
<tr><td>31. Reduce cycle times</td></tr>
</table>

Measures of HIS system Performance	Literature
32. Increase work productivity	
33. Contribute to achieve the strategic goals of the medical, nursing and administrative management	
34. Increase awareness of job-related information	
35. Improve job performance	
36. Improve patient satisfaction	
37. Speed service delivery	
38. Help manage relationships with other departments	

3.3.2 Dimension Two- Information quality of HIS as depicted in existing literature

Doll et al., (1994) argued that data quality is utilized broadly in the form of a construct or the measurement of client fulfillment gauging tools (Baroudi & Orlikowski 1988). A few research specialists like Fraser & Salter (1995) built up a bland size of data quality, and others utilized the parameters of data quality from the initially developed model of D&M developed by Wang and Strong (1996). However, another group of researchers changed the D&M (2003) paradigm which is applicably suitable for HIS frameworks including things from diverse important models (Gorla et al. 2010; Coombs et al. 2001). Table 3.3 shows various measures and indicators for Information quality of HIS effectiveness.

Table 3. 3: HIS's Information Quality Measures.

Source: (DeLone & McLean 1992); (Gorla et al. 2010)

Measures of Information quality of HIS	Literature
Currency	(Swanson 1974); (Gallagher 1974); (Olson & Lucas Jr 1982); (Ahituv 1980); (Munro & Davis 1977);
Accuracy	
Relevance	
Precision	
Reliability	
Clarity	

Measures of Information quality of HIS	Literature
Conciseness	(Bailey & Pearson 1983);
Sufficiency	(Srinivasan 1985);
completeness	(Larcker & Lessig 1980);
Timeliness	(Wang & Strong 1996);
Format	(Nelson et al. 2005);
Understandability	(King & Epstein 1983);
Perceived importance	(Kahn et al. 2002);
Free of bias	(Gorla et al. 2010);
Perceived usefulness of reports	(Jones & McLeod 1986);
Comparability	(Huh et al. 1990)
Quantitativeness	(Hübner-Bloder et al. 2009)
Relevance for decisions	(Al-Mamary et al. 2014)

3.3.2.1 Operationalization of Information Quality for this particular HIS Research

DeLone and McLean (1992) alleged that the quality of data is theorized as the nature of results generated by the IS, implying the reports but it can be used to allude to how clients (users) esteem the general data that they access. According to McGlynn, (1998), the quality of IS enhances the traits of information quality which is applicable in most healthcare polices for hospital maintenance since information quality as a metric for performance is fundamentally imperative for healthcare and hospital settings. Our measurement reflects the diverse sub-measurements and utilizations the Chang and King (2005) aspects for data viability alongside a few new things presented in the previously conducted studies. The associated set of questions was used as the third part of the questionnaire adopted in this research (Appendix A). Table 3.4 shows measures and indictors that used in this research study.

Table 3. 4: Conceptualization of HIS Information quality – 35 Items employed in this study

Measures of Information performance of HIS	Literature
1. Information is easily updated	(Swanson 1974);
2. Information is easily integrated	(Srinivasan 1985);
3. Information is easily changed	(Bailey & Pearson 1983);
4. Information is easily maintained	(Ahituv 1980);

Measures of Information performance of HIS	Literature
5. Information can be used for multiple purpose	(Wang & Strong 1996); (Chang & King 2005); (King & Epstein 1983); (Kahn et al. 2002); (Gorla et al. 2010); (Doll et al. 1994); (Hübner-Bloder et al. 2009)
6. It is easy to identify errors in information	
7. Information can be easily compared to past information	
8. Information is reliable	
9. Information is verifiable	
10. Information is interpretable	
11. Information is understandable	
12. Information is concise	
13. Information is important	
14. Information is relevant	
15. Information is well organised	
16. Information is well defined	
17. Information is available	
18. Information is up-to-date	
19. Information is received in timely manner	
20. Information is accessible	
21. Information is complete	
22. Information is accurate	
23. Information is clear	
24. Information is usable	
25. Information is believable	
26. Information is unbiased	
27. Information is secure (data protection)	
28. Information is useful for defining problems	
29. Information is useful for making decision	
30. Information is identifying problems	
31. Information is useful for problem solving	
32. Information meets your requirements	
33. Information improve your efficiency	

Measures of Information performance of HIS	Literature
34. Information improve your functional productivity	
35. Information improve decision effectiveness	

3.3.3 Dimension Three- Service Provider Quality as depicted in existing Literature

This model is used to evaluate the level of quality demonstrated in the services done by different hospital departments. The construct proposed that IT experts who have excellent skills in communication can give steadfast and immediate assistance to IT users (Kettinger & Lee 1994). This includes IT users embedded in hospital maintenance and hospital organizational strategies. The construct also emphasizes the need to have vendors who can collaborate and are approachable to enhance the implementation of an effective information system (Coombs et al. 2001; Argyropoulou et al. 2007; Gefen & Keil 1998). According to Hovenga & Grain (2013), the quality of IS enhances the traits of information quality as well as service quality which is applicable in most healthcare polices for hospital maintenance since information quality as a metric for performance is fundamentally imperative for healthcare and hospital settings. Table 3.5 shows various measures and indicators for service provider quality of HIS effectiveness.

Table 3. 5: HIS Service Provider quality measures

Source: (DeLone & McLean 1992)**;** (Gorla et al. 2010)

Measures of HIS Service Provider quality	Literature
Responsive people	(Parasuraman et al. 1988); (Kettinger & Lee 1994); (Gorla et al. 2010); (Pitt et al. 1995); (Carr 2002);
Dependable	
Empathy	
Assurance	
Reliability	
Tangible	
Know their job	
Have the users' best interests at heart	
Give users individual attention	
Are there when needed	

3.3.3.1 Operationalization of Service Provider Quality for this particular HIS Research

The evidence gathered from the literature review demonstrated the ways in which this construct can be applied even under different hospital settings. A section of research intellectuals evaluated the value of the quality of the services provided basing their argument on hospital providers' skills and dependability. On the other hand, the latest research works have included the parameters to evaluate the empathy of the providers (Parasuraman et al. 1988). Some researchers measured the quality of services provided, placing emphasis on the reliability and skills of the IS providers (for example, (Gorla et al. 2010; Kettinger & Lee 1994; Parasuraman et al. 1988)). As an IS constructs, the same reliability offered and skill sets are applicable in majority of the hospital information systems in Jordan (Almajali et al. 2016).

According to Coombs et al. (2001), a few research works have shown the capacity of honoring the agreement of contract as a part of the success in the implementation of an effective IS. This also implies that any HIS can equally be implemented successfully (Hovenga & Grain 2013). This research employed a model that consisted of 16 items as developed by Chang and King (2005), but the research included other items from previously conducted studies. The associated set of questions was used as the fourth part of the questionnaire adopted in this research (Appendix A). Table 3.6 shows measures and indictors that used in this research study.

Table 3. 6: Conceptualization of "Service Provider" (SP) in accordance to its contribution to Hospital Information System (HIS) - 23 items used in this research-

measures of Service Provider (SP) Quality with HIS operatives	Relevant Literature
1.SP are polite	(Chang & King 2005) (Parasuraman et al. 1988); (Kettinger & Lee 1994); (Gorla et al. 2010); (Argyropoulou et al. 2007) (Pitt et al. 1995); (Carr 2002);
2. Has your best interest at heart	
3 SP are sincere	
4. SP are helpful to you	
5. Solve your problem as if they were their own	
6. Show respect to you	
7. SP are pleasant to work with	
8. SP are willing to help you	
9. SP Have a knowledge and skills to do their job well	
10. SP are dependable people	
11. SP Instil confidence in you	
12. SP Understand your specific needs	
13. SP are efficient in performing their services3	

measures of Service Provider (SP) Quality with HIS operatives	Relevant Literature
14. SP Help to make you a more knowledgeable computer user	
15. SP Gives you individual attention	
16. SP Responds in timely manner	
17. SP Complete its services in a timely manner	
18. SP dependent in providing services	
19.Can provide emergency services	
20. Has a sufficient people to provide services	
21. SP are reliable people	
22. SP Provides a sufficient variety of services	
23. Has sufficient capacity to serve all its users	

3.3.4 Dimension Four- Training Quality

Training Quality is related to Service provider quality, but in this research we study this dimension alone as a separate dimension of service provider quality. This dimensions are measured by items derived from change and king 2005 as shown in table 3.7.

3.3.4.1 Operationalization of training quality for this particular HIS Research

The dimension of training quality are measured by seven items in this research study, The associated set of questions was used as the fifth section of the questionnaire adopted in this research.(Appendix A). Table 3.7 shows the items used to measure the training quality.

Table 3. 7: Training Quality Measures - 7 items employed in this study

Source: (Chang & King 2005)

Training Quality Measures	Literature
1. Training programs ae useful	(Chang & King 2005)
2. Have a variety of training programs	
3. The current training programs are cost effective	
4. Training programs cover your needs	
5. Training programs are instructive	
6. Training programs are sufficient	
7. Training programs help you to learn the numerous uses of HIS system	

3.4 Public Hospital Performance Measures

Health information system is an important competent in the running and proper performance of public hospitals. It provides the chance for personnel to share information with one another on the areas of challenges that they happen to experience (Ibrahim et al. 2016). As a result, they attain the ability to put in appropriate measures that are deemed appropriate in terms of being more successful in dealing with patients. The use of health information systems is also important in enabling health professionals track the progress that patients experience (Rahimi et al. 2016). As a result, they have the chance to improve on the practices they engage in with the view to be more successful in meeting the specific needs of the patients.

Health information systems is important in the public health field as it helps to show the specific ways in which health professionals are likely to be important in terms of providing high-quality services to patients. For instance, they have the chance to use the information they gather through the use of health information system to document the improvements that may need to be done in terms of the health of patients. As a result, the approach is deemed important in regards to ensuring that patients are well taken care (Rahimi et al. 2016).

Kirby (2005) stressed that the definition of the performance in an organization has created a heated debate whereby some of the recent studies have applied regular definitions and dimensions. Kirby (2005) and Kettinger & Lee (1994) are vital reviews that discuss the aspect of performance since the field motivates research experts due to its relationship with practices of management. Additionally, there exist of different parameters of performance that assume the role of diverse approaches as indicated by (Hyvönen 2007). The way this construct operates is reliant on its relationships with other adopted models. It was noted that all research studies applied either objective or subjective measures whereby the two adopted strategies have their strengths and weaknesses. This study applied subjective parameters depicted to be intelligible with the objective set of measures, which assists in the enhancement of the legitimacy and dependability of construct evaluation (Kirby 2005) (Venkatraman & Ramanujam 1986).

In this regard, Dess & Robinson Jr (1984) upheld that subjective impressions of relative change have unequivocally corresponded with objective parameters of the supreme changes in returns on resources and deals over a similar time. Concerning the relationship to IS, it ought to be specified that there are a few past and the latest field research workers that have investigated the impact of data frameworks and utilized hierarchical execution parameters used in the dependent variables (Bernroider 2008; Chang & King 2005; Chervany & Dickson 1974).

This also implies that any HIS framework can equally be implemented successfully since hospital information systems are affected by the impact of data frameworks and utilized hierarchical execution parameters used in the dependent variables (Hovenga & Grain 2013; Chang & King

2005). Some of them incorporate financial parameters such as profits as presented by Hamilton and Chervany (1981), the rate of profitability as indicated by Hyvonen (2007), and asset returns as demonstrated by Kirby (2005). Other financial parameters used were stock value developed by Kaspar and Cerveny (1985), an overall reduction of cost as shown by Hyvonen (2007) or profits generated per net resources (Kettinger & Lee, 1994). On the other hand, some researchers apply nonfinancial parameters such as quality of products, the level of productivity, and innovation to investigate the effect on IS on these factors (Kirby, 2005).

Nevertheless, the financial parameters applied demonstrated how the main informants view the influence of the IS on the performance of organization on financial grounds (Hyvönen 2007; Law & Ngai 2007). This is equally applicable on hospital settings since most hospital information systems operate on the same parameters. On the other hand, the influence of IS such as on HIS's clients, tactical goals, and the organization positions in the different markets such as different hospital settings are incorporated in non-financial parameters (Kasper 1985; Dess & Robinson Jr 1984). Other factors included in the in non-financial parameters are aspects developed in the recent studies focusing on internal competencies (Wu & Wang 2007). Table 3.8 presents the particular measured of public hospital performance along with the relevant literature. The associated set of questions was used as the Sixth section of the questionnaire adopted in this research (Appendix A).

Table 3. 8: Conceptualization of "Public Hospital Performance" - 23 items used in this research study

<table>
<tr><th>Public hospital performance measures</th><th>Relevant Literature</th></tr>
<tr><td>1. Reducing avoidable incidents</td><td rowspan="12">(Cho et al. 2015)
(Devaraj & Kohli 2003)
(Goddard et al. 2002)
(Ibrahim et al. 2016)
(Lau et al. 2010)
(McCone 2017)
(Nguyen et al. 2014)
(Rahimi et al. 2016)
(Rezaian et al. 2018)
(Sligo et al. 2017)
(Urbach & Müller 2012)
(McInnes et al. 2006)
(Hübner-Bloder et al. 2009)</td></tr>
<tr><td>2. Reducing Medical errors</td></tr>
<tr><td>3. Reducing death rates</td></tr>
<tr><td>4. increased Patient satisfaction</td></tr>
<tr><td>5. increased quality of care offered to the patients</td></tr>
<tr><td>6. increase hospital service effectiveness</td></tr>
<tr><td>7. meet the corporate objective</td></tr>
<tr><td>8. Admission process score.</td></tr>
<tr><td>9. sharing of patient data among hospitals in a secure manner</td></tr>
<tr><td>10. retrieval processes associated with patient admission (timly acquisition of information on patients)</td></tr>
<tr><td>11. reduction in medication errors</td></tr>
<tr><td>12. reduce patient waiting time</td></tr>
</table>

Public hospital performance measures	Relevant Literature
13. reduce Average length of stay ALOS	(Edwards 2009) (Briscoe et al. 2016) (Swaminath et al. 2015) (Zhijun et al. 2014) (Tsai et al. 2015) (McCance et al. 2012) (Griffey et al. 2015) (Davis et al. 2013) (Mattoo et al. 2013) (Kastanioti & Polyzos 2016) (Chaudhry et al. 2006) (Somu & Bhaskar 2011) (Shirley et al. 2016) (Inelmen et al. 2010) (Rusuaneanu 2014)
14. scheduling of maintenance tasks and monitoring trends in service and resource utilization	
15. better resource utilization	
16. Collect and visualize data on different payers.	
17. scheduling of physicians	
18. Uniformity and improvements in physicians' performance (revenue and reimbursments per physician)	
19. minimizing recurrent expenditures	
20. capturing the financial state of a hospital in real time	
21. Monitoring of administrators and other members	
22. reduce expenses incurred by the hospital	
23. number of referrals made by a hospital to outside centres	

3.5 Research propositions

3.5.1 System quality and HIS's public hospital performance

An excellently executed IS that is acknowledged by the clients is an imperative aspect for an organization to receive rewards, which entail both financial and non-financial ones (Bernroider 2008). This also implies that any HIS framework can equally be implemented successfully since hospital systems are affected by the impact of data system frameworks on the basis on their quality therefore utilize hierarchical execution parameters used in the different dependent hospital variables (Hovenga & Grain 2013). A framework that enables individuals to improve their performers is emphatically connected with net benefits (Bernroider 2008). A well-planned framework from a specialized perspective positively affects hierarchical productivity as indicated by Bradley et al. (2006) in an exploration including entrepreneurial organizations and the overall positive effect on firms as demonstrated by Gorla et al. (2010). Besides, a framework that enhances the processes that mold businesses because of coordination of software, for example, ERP and SCM can prompt increased benefits consequently improving the competitive edge of the organization (Hyvönen 2007; Hendricks et al. 2007). This is easily depicted in most modern-day public hospital's information systems especially in the country of Jordan (Almajali et al. 2016). Based on the given information this study proposes that:

P1: System quality is positively related to public hospital performance

3.5.2 Information quality and HIS's Public Hospital performance

According to Gorla et al. (2010), considering the reports as the principle results of any IS, is straightforward that these items ought to have the fundamental qualities of timeliness and dependability that influence performance. Law and Ngai (2007) indicated that Poor information and the quality of reporting would have an adverse influence on the clients, the process of making decisions, and tactical goals will be problematic to document. Likewise, the data ought to have the traits of value to the users and patients since the HIS achievement depends on the necessities of present and future healthcare providers and patients (Wu & Wang 2007; Hovenga & Grain 2013). In this way, the study proposes that:

P2: Information quality is positively related to public hospital performance

3.5.3 Service Provider Quality and HIS's Public Hospital Performance

The research literature furnished readers with a few reviews that considered the effect of the quality of service providers on the performance of organizations. The elements of an effective IS provider have been covered in details as an essential aspect for IS effectiveness (Bernroider 2008; Gorla et al. 2010). According to the report by U.S Government accountability office in 2017, this is also applicable for hospital information systems. The provision of quality services is fundamental for the accomplishment of the organizational performance objectives because they are emphatically linked to client unwaveringness, higher productivity, higher incomes, and the competitive edge in the market (Hyvönen 2007). Various analysts discovered qualities of compassion (Chang & King 2005), that are of significance for HIS usage in that capacity components of the providers constitute the "feeling respectable" requirement that builds up a trustful bond (Kirby 2005). Therefore, the research proposes that:

P3: Service provider quality is positively related to Public hospital performance

3.5.4 Training Quality and HIS's public Hospital Performance

Holding training sessions to IS end users is necessary, and the topic has been covered in details in the literature review (Dess & Robinson Jr 1984; Al-Mashari et al. 2003; Lee et al. 1995; Kraut et al. 1989). Irani (2002) and Braam & Nijssen (2004) alleged that the poor support of the organization system by the stakeholders arise from the lack of training opportunities (Irani 2002; Braam & Nijssen 2004). On the other hand, whereas Amoako-Gyampah and Salam (2004; 2007) and Kirby (2005) claimed that training was vital in the elimination of challenges that develop from the complexity of the technology (Kirby 2005; Amoako-Gyampah 2007; Amoako-Gyampah & Salam 2004). According to Chang & King (2005), training quality can be in the form of variants of the ISFS which stands for the Information Systems Functional Scorecard which comprises of three colossal IS dimensions namely, information effectiveness, systems performance and service performance. In a study related to ERP systems implementation, based on Irani (2002) explained that shortage of training leads to reduced support of the system among its stakeholders, while another study by Amoako-Gyampah and Salam (2004) claimed that training eliminates all difficulties for success that develop from technological complication. Consequently, this study proposes that:

P4: HIS training quality is positively related to public hospital performance

3.6 Summary

This chapter presented the conceptual framework that is associated with this, based on the inclusive literature review this chapter concentrated on the operationalization of the key constructs of this research study: Health Information System Effectiveness and Organizational (public hospital) Performance. A conceptual model of relationship between health information system effectiveness and public hospital performance that is based on the De Lone & McLean Information system success model was proposed and presented in this chapter. The dominant concepts surrounding this conceptual model were discussed with the view of theoretically explaining the relationships and formulating hypotheses to guide the analysis and interpretation of the study findings. Four hypotheses were formulated in the process and they are presented in the chapter under the discussion of the relationships. The hypotheses formulated in this chapter will be tested to address the main research questions. The next chapter discusses the methodology that was monitored to test the propositions.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The conceptual model developed in the previous chapter helped to create an understanding of the impact of HIS effectiveness on the performance of public hospitals (case of Jordan) consequently bridging the gap present in the literature. The previous studies show the significance of HIS in hospitals whereby the four relationships were hypothesized with five being constructs. This chapter will address various methodologies in research to find the right method to evaluate this hypothesis and the conceptual model of the research. Therefore, the chapter explains in details the way the researchers conduct an empirical investigation to prove the developed hypotheses of the research. This chapter has also shown various research philosophies in line with research approaches and strategies.

4.2 Research Philosophies

Saunderset et al (2009) defined a research philosophy as the conviction on the approach used to collect, analyse, and use data. The research philosophy is also defined as the creation of knowledge and its nature (Saunders et al. 2009; Saunders 2011). It is vital for individuals to understand the basic research philosophies assumptions developed because it assists in the clarification of research design and identifying designs outside the coverage of the research (Blumberg et al. 2014). On the other hand, Collis and Hussey (2013) played a crucial role in addressing epistemological and ontological assumptions (Collis & Hussey 2013). Epistemological issues entail the question of the aspects that should be considered as suitable knowledge in a certain field, while ontological issues entail the aspects of the reality nature and social entities (Bryman & Bell 2015; Saunders & Lewis 2012).

Besides, Orlikowski and Baroudi (1991) explained that epistemology develops a collection of suitable strategy and method of research that help to gather empirical evidence (Orlikowski & Baroudi 1991). According to Blumberg et al. (2014), have proposed two epistemologies that researchers can employ in their researches, they are: interpretive and positivist were two epistemologies that were raised. Several other philosophies of research arise from the two epistemologies, which include realism that shows the principles of the two epistemologies (Blumberg et al. 2014). The sections below have explained the two most vital epistemologies and the discussion of the important epistemology in this study.

4.2.1 Positivism

Blumberg claimed that research philosophers adopted positivism from natural sciences (Blumberg et al. 2014). Besides, Orlikowski and Baroudi (1991) referred positivism studies based on the presence of deductive fixed relationships, which occur in situations evaluated using planned instrumentation (Orlikowski & Baroudi 1991). Based on Blumberg et al (2014) the observation of the objective facts can assist in the investigation of social reality consequently developing the knowledge. Therefore, the hypothesisation of fundamental laws and the summing up supportive objectives necessary for the hypothesis validation are vital in the development of a theory (Blumberg et al. 2014). Some of the assumptions implied include the following:

- The collection of objective facts help to observe the social world and,
- Social world made up of several simple components that can be reduced.

The research does not engage in the observable facts that are considered as external, and the facts are regarded as objective by the research studies that use this philosophy. Accordingly, Collis and Hussy (2013) specified that in positivism, social phenomena can be measured and are related to analytical quantitative approaches, whereby the quantitative research data is analysed statically (Collis & Hussey 2013).

4.2.2 Interpretivism

According to assumptions made by interpretive studies, as individuals continue to interact with the surrounding world, they develop their meaning and relate their inter-subjective and subjective ideologies. Therefore, the research tried to comprehend the phenomena using the senses that the phenomena are allocated (Orlikowski & Baroudi 1991). In such research, positivists and interpretivists disagree in value-free. Interpretivists have the mentality that it is impossible to understand social phenomena through the analysis of simple fundamental laws, which is different from the belief of positivists. The development of the knowledge and theory building begins through the induction of ideas sourced from the observation and interpretation of social constructions (Blumberg et al. 2014). The interpretivists have developed two assumptions in the interpretation of the social constructions (Ozawa & Pongpirul 2013; Blumberg et al. 2014). For instance,

- The meanings and viewpoints that people give about the social world by people help to observe the social world.
- The other assumption states that observing the totality can be vital in the understanding of the social phenomena.

Interpretivism concentrates on the comprehension of social phenomena through the exploration of the reasons behind the individuals having diverse experiences and by comprehending the way such differences bring differences in meanings and constructions of the social world provided by people (Ozawa & Pongpirul 2013; Blumberg et al. 2014). A summary of interpretivism and positivism philosophies are summarized in Table 4.1 in relation to the above discussion. The summary shows the impact of the Health Information system HIS effectiveness on the performance of public hospitals. Diverse measurable hypotheses acquired from the previous studies have been developed along the conceptual model in the current research. Therefore, the adoption of positivism philosophy is eminent in this research to assist in the fulfilment of its major objective of testing the conceptual model to enhance the comprehension of the value that the HIS has developed in terms of enhancing the performance of hospitals. The four indicators of HIS effectiveness and the three indicators of public hospital performance based on chapter three can be measured (measurable indicators –items-) additionally the researcher being independent.

Table 4. 1: The comparison between the approaches of positivism and interpretivism source: (Blumberg et al. 2014)

	Positivism	**Interpretivism**
Basic Principles		
Perspectives of the world	World considered objective and external	World is considered subjective and socially constructed
Researchers' involvement	Researchers considered autonomous (independent)	Researcher included as part of the study and enthusiastically cooperates
Impact of researchers	A value-free research	Researcher controlled by the personal values
Assumptions		
Things under observation	Quantitative and objective realities	Meanings interpreted subjectively
The knowledge development	Aspects and phenomena reduced to simple components signifying universal laws	Total and broad phenomena view to explain beyond the prevailing understanding

4.3 Research Design

Saunders, et al., (2009) defined the research design as an overall plot of the procedures that researchers follow to solve questions in research. It gives structure and outline to gather and conduct data analysis (Bryman & Bell 2015) . On the other hand, Bryman and Bell (2015) explained the research design as a mirror of choices concerning preferences that occur in a selection of various dimensions found in the process of the research. This research has three stages, which include the research design, date collection, and data analysis respectively. The research design entails finding a detailed literature review of the challenges that affect the performance of public hospitals in Jordan, and the allocation of the most vital parameters that measure the process of the improvement that result from the implementation of effective Health Information system. Then, the development of the research model that included four hypotheses followed, and the research strategy for the research was a survey study.

During the data collection stage, the research conducted a pilot study to evaluate the validity and reliability of questionnaires designed and the amendments were carried out accordingly. Apart from the data collected from employees from different selected hospitals, the questionnaire feedbacks gathered from experts were included to satisfy the research objectives and model validation (Saunders et al. 2009). A copy of the corrected research questionnaire was given to the target sample population. The discussion and analysis of empirical outcomes are the final research phases whereby the necessary statistical software is used. The figure 4.1 below has shown different phases of research design and the procedures employed in every phase.

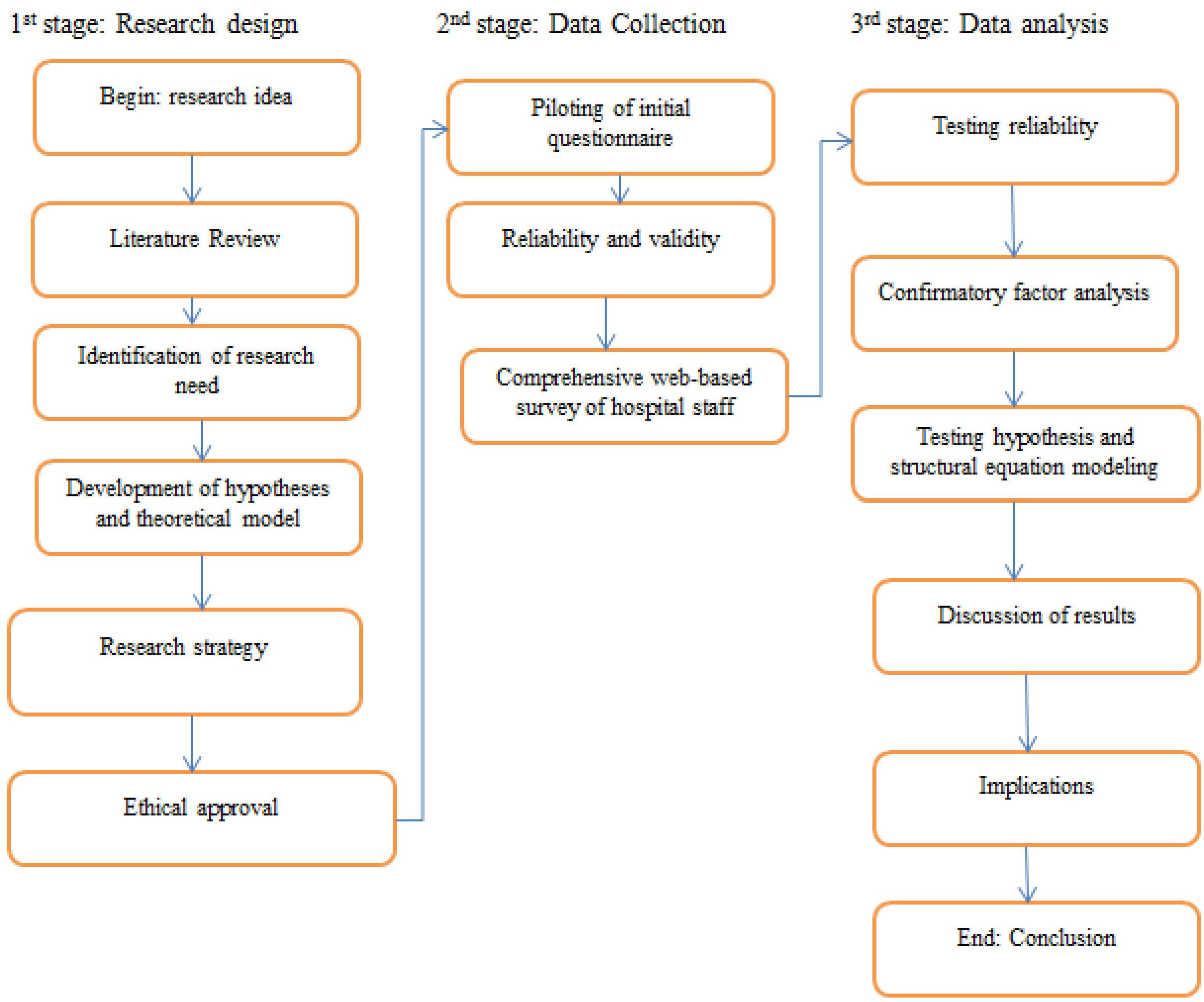


Figure 4. 1: A representation of a research design of the process the PhD research

4.4 Research paradigms: Quantitative vs. Qualitative

Quantitative and qualitative research paradigms are applied in literature to help in the fulfilment of research objectives. The quantitative is viewed as positivist, experimental, and traditional or an empirical paradigm. On the other hand, the qualitative is regarded as naturalistic, interpretative, or constructivists approach that express the postmodern views or post positivist (Creswell 1994). The two paradigms are applied appropriately to conduct an investigation on the technological impact on various firms. Johnson and Onwuegbuzie (2004) addressed the strengths and weaknesses of paradigms as presented in Tables 4.2 and 4.3 (Johnson & Onwuegbuzie 2004).

Quantitative methods consider the reality as singular and objective with regard to ontological assumptions and focusing on the research philosophy. The research philosophy is based on positivism, and all phenomena are said to be consolidated to empirical measures, which showed the truth, likewise, epistemologically, the researched and researcher are considered as independent (Johnson & Onwuegbuzie 2004). The aim of quantitative paradigm is to evaluate the casual links between variables that are within the value free structure (model) and the evaluation of such relationships whereby a large sample size is required during the investigation process (Guba et al. 1994; Denzin & Lincoln 1994).

On other hand, in contract of quantitative paradigm the qualitative one is based on constructivism (Guba et al. 1994) and interpretivism (Secker et al. 1995). The qualitative paradigm describes reality as multiple and subjective as viewed by the study participants based on the ontological consideration. However, based on epistemological level, Smith (1983) argued that there lack contact to reality independent of the views of people (Smith & Heshusius 1986; Smith 1983). Qualitative paradigm differs from the quantitative paradigm since the qualitative paradigm assumes the researchers and the study object to be linked interactively to enable the mutual creation of results based on the situational context (Guba et al. 1994; Denzin & Lincoln 1994). Based on smith (1983) this means that has no being previous to the investigation. Qualitative studies entail focus and detailed group interviews and the observation of much smaller sample population of participants than the quantitative study while the quantitative studies apply survey methods Based the methodological consideration (Reid 1996).

What mentioned in the paragraph above has explained assumptions on quantitative paradigm and qualitative paradigm have given rise to various expertise, various funding sources various journals, and various methods furthermore to the differences in the language that used to explain them which is scientific language (Sale et al. 2002). A summary of quantitative and qualitative studies has been presented in Table 4.2 below.

Table 4. 2: Assumptions present in qualitative and quantitative approaches (source: Creswell 1994)

Assumption	**Question**	**Quantitative**	**Qualitative**
Ontological	What is the reality nature?	Singular and objective reality with the except of researchers	Multiple and subjective reality as viewed by study participants
Epistemological	What is the connection of study objective and researcher	Study objectives and researcher are independent	Interaction is seen between the study objectives and researchers
Axiological	What is the values' role?	Unbiased and value-free	Biased and value-laden
Rhetorical	What is the research language?	• Voice is impersonal • Formal • Application of recognized quantitative words • Approach dependent on the given definitions	• Recognized qualitative words • Use of personal voice • Based on the evolving ideologies and decesions • Informal
Methodological	What is the research study process?	• Process is deductive • Reliable and correct due to dependability and validity • Free context • Effect and cause • Static design where groups are separated prior to the study • Comprehension, prediction, and explanations result from generalization	• Process is inductive • Verification brings about reliability and accuracy • Bound to a specific context • Understanding was made effective by the development of theories and patterns • Factors are

Assumption	Question	Quantitative	Qualitative
			mutually shaped simultaneously • Identified categories of emerging design through research process.

4.5 Criterion for Paradigm Selection

According to Creswell (1994), a guidance to assist the researcher in choosing the right paradigm that guides them to complete their study process is necessary as shown in Table 4.3. The world perspective of the researchers is vital since to enables the researchers to emphasize on the characteristic of the problem whereby the qualitative research will be conducted in the explanatory research phenomenon with unidentified variables and is not based on theories. The literature of the application of technology on the organizations' performance is sufficient with variables being identified and discussed in the previous research studies (Krauss 2005). Therefore, the researchers who intend to conduct studies on the impact of HIS effectiveness on the performance of hospitals in Jordan are encouraged to use a quantitative approach.

Table 4. 3: Criteria of Selection (source: Creswell 1994)

Criteria	Quantitative Approach	Qualitative Approach
The worldview of researchers	The research comfortable with axiological, ontological, rhetorical, epistemological, and methodological assumptions of quantitative approach	The research comfortable with axiological, ontological, rhetorical, epistemological, and methodological assumptions of qualitative approach
Researcher's experience and	Skills of library, skills of	Skills of library, skills of

Criteria	Quantitative Approach	Qualitative Approach
training	computer statistical, skills of technical writing	literary writing, and skills of text analysis in computers
The psychological characteristics of researchers	Time available for short studies, ambiguity receives a low tolerance, and approach comfortable with guidelines and rules of carrying out the study	Comfortable with the lack of specific guideline and rules followed in carrying out research study, ambiguity receives a high tolerance, Time available for long study
Problem’s nature	Use of existing theories and known variables with the literature body using the previous studies depicting its existence	Unknown variable , research is exploratory, theory base not necessary, and context is vital
Study audience (such as readers, editors of journals, and graduate committee)	People used to and support quantitative research approach	People used to and support qualitative research approach

4.5.1 The principles of selection

Strengths of the quantitative design have benefited this study such as the validation and testing of the research model and hypotheses being proposed. Other benefits include the capability of generalizing the results of the study, the ability to eradicate the contradicting influence arising from several variables, and improved data credibility, among others, and permitting one to more credibility evaluate reason – and – result relationship (Creswell 1994). Therefore, the research studies have same goals of the evaluation of the impact of health information system (HIS) effectiveness and performance in public hospitals and how this applies in a quantitative paradigm, most of these studies were explained in chapter two with the method that used.

4.6 Research Strategy

Basically, a strategy can be defined as a disposition of actions to attain an objective, whereby Symon and Cassell, (2012) defined the strategy as the plot adopted by the researcher to find solutions to the developed research question (Symon & Cassell 2012). Additionally, the research strategy can be described as a methodological relationship between successive methods choices used in the gathering and examination of vital data and the philosophy (Denzin & Lincoln 1994). Some of the examples of research strategies are the survey, experiments, case study, grounded theory, ethnography, narrative inquiry, action of research, and documentary or archival research (Saunders et al. 2009; Symon & Cassell 2012). Surveys and experiments are mainly connected with quantitative research approach while the case studies, documentary research, and archival research apply to both qualitative and quantitative research paradigms and the case of a mixed design where the two approaches are used. However, ethnography, action research, narrative inquiry, and grounded theory are exclusively applied in the qualitative research approach (Saunders et al. 2009).

The selection of the appropriate strategy will be based on the objectives and research questions presented by the researcher. The correct selection of the research study assists the research in the achievement of a rational level of consistency in the process of their research design, which encourages the researchers to find solutions to specific research questions and attain their goals (Saunders et al. 2009; Symon & Cassell 2012). The research strategy for this study will use the survey as the study design after the adoption of the quantitative paradigm.

4.7 The Surveys Strategies

The researchers use surveys in the data collection from sample populations, whereby it assists in the statistical analysis of the collected data and the generalization of findings to a given population (Collis & Hussey 2013). It is a major strategy applied in the management and business research studies, and it permits researchers to gather quantitative data used in the suggestion of explanations regarding the links between various variables to demonstrate models of such links (Saunders et al. 2009; Saunders & Lewis 2012). The survey design is recognized for its good control on the research process while saving money and time during data collection from a large sample population (Saunders et al. 2009; Saunders & Lewis 2012).

A deductive method will be applied after the adoption of the survey approach (Saunders et al. 2009), which begins with theory followed by the research model and the development of the hypothesis, and finally, the validation and rejection of each of the developed hypotheses will follow (Bryman & Bell 2015). The two types of survey described were analytical survey and descriptive surveys as explained by Collis and Hussey (2013) in their research (Collis & Hussey 2013). The descriptive survey is applied when researchers are collecting the information about the views and personalities of people. However, the analytical survey is applied in the provision of answers to research questions or testing the hypotheses by applying the logic acquired from the field (Altinay & Paraskevas 2009). To this regard, the applied this study has applied a quantitative research design because the study will require the collection of a large amount of data. Besides, the survey was viewed as the best-suited approach in this research because it assists researchers in the gathering of huge data quantities required while saving the time, cost, and the applied effort.

4.8 Strategies of sampling and sample size

Based on technique of sampling which assist the researcher to reduction the amount of data which required to collect by bearing in mind just data from a sub- group instead of all probable elements or cases (Saunders & Lewis 2012; Saunders 2011). Choosing a sample is important for the research whether the researcher is preparation to use questionnaires or interviews or observation or some other technique for data collection; Sampling provides an effective alternative to a survey when it would be unviable for the researcher to survey the whole population and when the budget of researcher and time restrictions avoid the researcher from measuring or surveying the entire population (Saunders & Lewis 2012; Saunders 2011). Because the population target of the current research (study) is hospitals' staff, so it is nearly impossible and unrealistic to collect and analyse the data from each employee in hospitals in Jordan country due to the constraints of time and budget. Based on Barnett (2002) was claimed that using sampling makes probable a higher accurateness than a census (Barnett 2002), and taking sampling for fewer cases mean that the researcher can gather information that is more comprehensive and detailed (Saunders 2011). Based on that, Willoughby (2015, p. 15) has offered numerous various methods that can be employed when selecting a sample from the target population of the interest of the researcher including: quota, cluster, convenience, simple random, stratified and systematic sampling (Willoughby 2015).

This research study is adopting a method of the convenience sampling which includes selecting a convenient people who are available to be questioned. This method was addressed by Willoughby (2015, p. 17) as it can be executed rapidly, cheap, and a frame of sampling comprising information about each member in the population is not required. Sample size will aid in the popularization the findings, therefore; the sample size should be adequate and enough to permit the researcher creating the research question (Collis & Hussey 2013).

4.9 Development of Questionnaire

This study uses a questionnaire, in order to evaluate the impact of health information system effectiveness HIS on public hospital performance. The items that used in the questionnaire are collected from studies were done before. The total constructs of framework as mentioned in chapter three are planned with suitable measurement items. Consequently, for rating the questions in the questionnaire this study used the Likert scale (Bryman & Bell 2015)**.** This study used 5 points rating scale as (1: strongly disagree, 2: disagree, 3: neutral, 4: agree, and 5: strongly agree). The items in the questionnaire that used to measure the constructs in this research study are primarily adopted from comparable studies where their core purpose was to measure the change on the performance of organization and its precursors as a result of applied a new tools**.** Thus, all the measures used in this study are high reliability**.**

4.9.1 Health Information System Effectiveness

The questionnaire begins by identifying the constructs of Health Information System effectiveness HIS implemented accompanied by the extent of this implementation, in order to measure and investigate the impact of HIS effectiveness on public hospital performance in Jordan as a case study. As showed in figure 3.1, using the HIS effectiveness and its constructs (the four constructs) presents level one of the framework and it is the main to all of the hypotheses of this research study. The items that used to measure the four constructs of HIS effectiveness were conducted from the literature and all the items were high reliability, all the items that used to measure this use presented in chapter three before. Those measurement items investigate the degree of usage in public hospital performance.

4.10 Pilot Testing of Study

To execute a pilot testing and to save costs and time, a copy of the prepared questionnaire is disseminated to experts and part of the staff of the targeted population in this study. The main goals of pilot test is to improve the questionnaire by improve the questions, also the pilot test helps the researcher to evaluate the validity and reliability of the measurable items (Saunders et al. 2009). In order to validate the model and achieve the aim and objectives of the research, the feedback from experts and staff in targeted population were collected to assist in verifying the ability of questions. Consequently, the questionnaire was validated by expert group at Brunel University London. This expert group requested to make a check of the desirability and clarity of the questions. Whereas the reliability focuses on the consistency of responses to the questions based on saunders et al., (2011). After checking the questions and make sure all of them are associated, simple and understood based on the feedback from part of the targeted population, then the refined questionnaire will be distributed as a first run to expert and the targeted population. The reliability of the questionnaire should be double checked through the perspectives of targeted population. The Cronbach's Alpha is the most common method to check the reliability of items loading for each construct by using internal consistency (Hinton et al. 2004; Hair et al. 2010).

4.11 Procedure of Data Collection

According to Churchill and lacobucci (2006), the procedure of data collection considers in collecting views, opinions and beneficial information about the research topic by the target population (Churchill & Iacobucci 2006). Consequently, to collect data there is many various methods such as e-mails, face-to-face method , phone cells, posting methods, and a mixture of those methods (Sekaran 2002; Sekaran & Bougie 2016; Cooper et al. 2006).

According to Saunders et al., 2009 it is of main important to decide of data collection between qualitative and quantitative approach once doing business research. The qualitative approach produces the data as non-numerical one while the quantitative one produces a data as a numerical data (Saunders et al. 2009). A qualitative method used observation, interviews, action research or case studies, and it is based on procedures of non-mathematical as a descriptive procedure. While the quantitative method used to test the correlation between variables and to check, test and verify hypotheses, the researcher used a statistical analysis in this method to test the research hypotheses to formulate conclusions (Saunders et al. 2009).

Other researchers used mixed method (combine between two approaches). Though, recent research has explained some barriers to the mixed method. Bryman 2007 argues that in most cases the whole design is not conceptualized in enough combined way so that why it’s difficult to take such findings together (Bryman 2007). As a reason of the difficulties of mixed method, the current research study focus on the only use of primary quantitative method to gather the data, which is experienced in systematic scientific research, then continue with analyze the data in order to verify hypotheses and to create conclusions.

The questionnaires were distributed to five public hospitals that implemented the Health Information System (HIS). The total number of responses that received is 420 responses. 12 of them were deleted as they were found outliers. The final number was used for analysis is 408 observation and the final response rate was 40.8%.

4.11.1 Subjective and objective data collection

Another significant issue regarding to data collection approach was the connected of data we were looking for to collect. There are two approaches adopted by the researchers for data collection: subjective and objective. Subjective is data related to well-being or pain (i.e. data that haven’t “objective external referent”. On other hand the objective data contain reports that do mention to some objective external reality (Orlikowski & Baroudi 1991). This research study has applied a subjective approach for data collection which generated extra consideration on the usage of scales which are discussed before and will discuss more here below.

4.11.2 Scales

Rensis likert (1932) developed one of the most usually used scales, he created a technique to increase the difference in the probable scores from which a respondent can select. This scale very common in research on social science with some argument. Much debate has been around the subject of this scale being ordinal or interval. Likert scale is ordinal in nature than interval as assumed by some academics but researchers used it as an interval estimate (Likert 1932).

On other hand, there is another method slimier to likers scale called semantic Differential, this method developed by Osgood et al (1957), this method uses 5 points scale extending from one extreme to the other, include middle category representative as neutral. Though, the most common opposites in this method are not strongly disagree and strongly agree as the same of Likert scale; but sets of adjectives sets which define dissimilar circumstances (Osgood et al. 1957).

There are some advantages related to Likert scale like flexibility, reliability and ease of use made the Likert scale to be used commonly in quantitative research. Liket scales have been examined in addition to the effect of the number points of scale based on the type 1 and type 11 error rates of statistical tests and the reliability (Likert 1932). The better validity and reliability could be gained by raising the number of rating points as reported by Churchill and peter in 1984 (Churchill Jr & Peter 1984). Cicchetti et al 1985 reported that the effects of points number of scale from two (2) to one hundreds (100) and they determined that reliability augmented gradually from a two point scale to a seven point scale but there was not any important effect after the seven point scale (Cicchetti et al. 1985).

Based on the number of points (5 versus 7), Lissitz and green 1975, said that for the use of 5 or 7 point scales by comprehensive results (Lissitz & Green 1975). On other hand, Gregoire and driver 1987 argued that when using five point scale there is a thoughtful effect on the error rates of type 1 and type 11. Though, after the five or seven scale points, the values of reliability are levelled off (Gregoire & Driver 1987). On other hand, there is another study by Rasmussen 1989 point out that the type 1 and type 11 error rates are not extremely compromised by using data of ordinal scale also Rasmussen 1989 indicate that in these scales the accurateness of statistics is not influenced provided that the scales have points around five or more (Rasmussen 1989).

Summary for this section that we deliberated the Churchill and Peter (1984) findings in favor of an increased number of scales. Keeping in mind the above analysis and the findings of the pre-testing phase, this research study adopted five-point scales through the questionnaire.

4.12 Data Analysis

The process of data analysis contains two phases: first one is data cleaning and the second one is data modeling. Stage of data cleaning will use SPSS to crop the reliability tests to make sure all the measurements are consistency, also create a descriptive statistics as an outline of the population sample, showing means and standard deviations to check the missing data and outliers. On other hand, the stage of data modeling will use Structural Equation Model (SEM) to validate the conceptual framework, the SEM is a statistical process using for testing measurements items, predictive, functional, and causal hypotheses (Bagozzi & Yi 2012). The benefits of SEM are easy to use, also it checks the reliability of measures in hypothesis testing in ways going beyond an average of multimeasures of constructs. In addition, it is general instrument which delivers a broad, and integrative function transmission the complementarity and synergy amongst several diverse statistical methods. Also, SEM beneficial in survey or experimental research studies, test the hypothesis accomplishments, longitudinal studies or cross-sectional, also SEM proposes a novel hypotheses eventually not deliberated (Bagozzi & Yi 2012).

4.13 Ethical approval (considerations)

In the field of research of business studies needs to ethical approval which includes a set of standards and behavioral values (Sekaran & Bougie 2016). Thus, considerations of ethical approval is so important in this research study because this research has selected the method of questionnaire as a data collection, it means have human participation (Hesse-Biber & Leavy 2010). So, Bryman and Bell (2011) classified the ethical principles and this research was guided by these principles which are (Bryman & Bell 2015):

- The questionnaire has no personal information and the privacy of participants in this research was highly respected.
- There is no any type of harm to any participant.
- The researcher will not be involved in cheating by disguise the aim of the study

- The participants were evidently presented to the research purpose and they have agreed to the right to take part in this research or reject.

before beginning the process of data collection the researcher has considered the ethical commitments on each phase of the research study and the Research Ethics Committee of Brunel University London has offered the researcher with the official approval (please see Appendix B) and the ethical codes of university are in place to protect the participants.

4.14 Summary

The goals of this chapter therefore are:

1. To justify and briefly explore the research methodology design that was employed in this research.
2. To introduce the population and sample of the study and justify their selection

In this chapter, the research methodology that was employed by the study is introduced focusing on how the methodology guided the processes of data collection, data analysis and theory development. The first section of this chapter provided a justification for the research methodologies employed by the study and studied the general research philosophies, the positivism was found to be the best suitable one for this study. Also, the main research paradigm were explained in this research which are quantitative and qualitative. The present study adopted the quantitative approach based on the selection criteria by Creswell (1994) and will assist in checking and validating the suggested research framework. The second section of the chapter introduced the population and the sample of the study. In the third section of the chapter, the process of data collection was presented.

The chapter concluded with an explication of the approach used to analyze the data collected by the discussed methodology. The two theoretical models discussed in the theoretical framework chapter provide means by which hospital performance and effectiveness of Health Information Systems can be measured. This research project examines the relationship between the effectiveness of Health Information Systems and the performance of public hospitals.

The selection of the research study strategy is guided by the goals and objectives of research, and the selection based on that the researcher reach a realistic level of comprehensible thru the research design (Saunders et al. 2009). Thus, this research study was adopted a survey strategy. In order to appropriate the context of this research study the items of the questionnaire were adopted and revised from the literature. After tools of data analysis, a brief discussion were explained as a separate section accompanied by consideration of research ethics. For testing predictive, functional, measurement, and causal hypotheses the researcher will use the SEM as process of statistics (Bagozzi & Yi 2012).

CHAPTER FIVE

ANALYSIS AND RESULTS OF PILOT STUDY

5.1 Introduction

In this chapter, the researcher provides the results of the pilot analysis. The data was first entered into an excel files and exported into SPSS 20.0 version. The Sample size is taken for the pilot study is n=25. Internal consistency of the data computed through reliability analysis using Cronbach's alpha value. Exploratory Factor Analysis (EFA) is a technique within factor analysis whose overarching goal is to identify the underlying relationships between measured variables. The analysis carried out was percentage analysis to find out the demographical information of respondents.

In the main analysis, two phases such as data cleaning and data modeling are done. The missing data and outliers are checked in the first stage of data cleaning. SPSS is used in this stage. This software also performs descriptive statistics as an overview of the sample. Mean, standard deviation, and reliability tests are done so that the measurements can be ensured to be consistent. The conceptual model is validated in the latter stage by employing the structural equation model SEM that is a statistical procedure testing the measurement, functional, predictive, and causal hypotheses (Bagozzi & Yi 2012).

Regarding to Bagozzi and Yi, 2012 SEM might offer numerous benefits, as generic instrument which provides a comprehensive, integrative function transmission the interaction and complementarity amongst several diverse statistical methods. Also, as it was explained earlier. SEM also in tests of hypotheses, it considers reliability of measures and often proposes novel hypotheses originally.

Pilot Study-Results

5.2 Pilot Study

In order to empirically examine the conceptual model and the hypotheses, a survey questionnaire is performed. Before to the full study, scholar's highly recommended a pilot test as it saves costs and time by presenting the weaknesses of the full-scale study (Hair et al. 2010). The pilot test is an important procedure in the way to measure development (Churchill Jr 1979). The main role of pilot studies was addressed by (Hassan et al. 2006; Leon et al. 2011) by:

- Identifying unexpected problems that may impact the validity of the main study.
- Examining the validity and reliability of the instrument used for data collection.
- Inspecting that the time of completion is appropriate.

Therefore, the surveys for the pilot study were distributed by hand to the staff of public hospitals in Jordan for this research study. From 1st to 25th August 2017, 25 responses were collected to be used for this study. 11 of the responses were at the managerial level, the average time was 10 minutes for each survey. The results of the pilot study are discussed in the next section of reliability and validity.

Table 5. 1: Frequency of demographic characteristics (n=25)

Demographic Characteristics	Frequency (n)	Percent (%)
Gender		
Male	9	36.0
Female	16	64.0
Age (in years)		
18-25	3	12.0
26-39	10	40.0
40 or above	12	48.0
Position in the Hospital		
Managers	11	44.0
Staff	14	56.0
Experience		
1-3 years	8	32.0
More than 3 years	17	68.0
Using HIS System		
Between 30% and 49%	6	24.0
50% or more	19	76.0
HIS System Implementation		
1-3 years	3	12.0
3-5 years	11	44.0
More than 5 years	11	44.0

Table 5.1 reveals the frequency for demographic variables. Majority 64% of the respondents are female and 36% are male. When position in the hospital is considered majority 56% of the respondents are staff and 44% of the respondents are managers. The age group is categorized into three groups. Maximum 48% of the respondents are 40 years or above while, 40% are 26-39 years and 12% are 18-25 years. Majority 68% of the respondents are more than 3 years of experience while 32% are 1-3 years of experience. When using HIS system is considered, maximum 76% of the respondents are using HIS system 50% or more while 24% are using HIS system 30% to 49%. When HIS system implementation is taken into account, majority each 44% of the respondents have 3-5 years and more than 5 years long the health information system have implemented in this hospital and 12% of the respondents have 1-3 years.

5.3 Reliability Analysis

Reliability refers to the extent to which a scale produces consistent results, if the measurements are repeated a number of times. The reliability is defined as "the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable" as (Joppe 2000, p.1) define it, which means that the reliability indicates to which measures without bias (error free) in order to evaluate the goodness of measure with consistency and stability (Sekaran 2002 p. 206). The analysis of reliability is called reliability analysis. Reliability analysis is determined by obtaining the quantity of systematic variation on a scale, which can be done by determining the association between the scores obtained from different administrations of the scale. Thus, if the association in reliability analysis is high, the scale yields consistent results and is therefore reliable. Based on Churchill, 1979, the most common test of reliability is Cronbach's coefficient alpha (Churchill Jr 1979).

Based on the Cronbach's alpha value, we concluded the following about the data (Sekaran, 2000):

- If $\alpha \geq 0.9$ – Excellent
- If $0.7 \leq \alpha < 0.9$ – Good
- If $0.6 \leq \alpha < 0.7$ – Acceptable
- If $0.5 \leq \alpha < 0.6$ –Poor
- If $\alpha < 0.5$ – Unacceptable
- Cronbach's alpha value – What amount of internal consistency existing among the data of items.
- Cronbach's alpha if item deleted – It gives the information about which item appeared to have low consistency among other items.

Table 5. 2: Reliability Analysis

Factors	No. of items	Mean	SD	Cronbach's Alpha
HIS System Quality				
Factor 1	14	3.63	0.86	0.943
Factor 2	11	3.56	0.87	0.929
Factor 3	7	3.64	0.92	0.918
Factor 4	6	3.53	0.95	0.883
HIS Information Quality				
Factor 1	14	3.61	0.87	0.943
Factor 2	12	3.57	0.90	0.938
Factor 3	9	3.60	0.77	0.889
HIS Service Provider Quality				
Factor 1	14	3.57	0.94	0.949
Factor 2	9	3.52	0.86	0.908

HIS Training Quality				
Factor 1	7	3.54	0.89	0.871
Public Hospital Performance				
Factor 1	9	3.65	0.89	0.929
Factor 2	8	3.51	0.91	0.906
Factor 3	6	3.48	0.94	0.888

Table 5.2 illustrates the reliability analysis of the study factors for each multi-item measure utilizing Cronbach's alpha along with descriptive statistics of the public sector. Generally, the study stated that the strong reliability with Cronbach's alpha ranging from 0.888 to 0.943 which proved that scale proves good reliability, and can be interpreted that items in each construct were independent measures of the same notion.

5.4 Factor Analysis

Exploratory factor analysis (EFA) is a statistical technique used to reduce data to a smaller set of summary variables and to explore the theoretical structure of the phenomena. In order to determine underlying dimensions of multi-item measurement scales used in this study, principal components analysis with varimax rotation using SPSS 20.0 was performed for all constructs in the analysis.

Table 5. 3: Exploratory Factor Analysis (Factors Loading) for HIS System Quality

	Factors			
	1	2	3	4
HIS_SQ_F1				
HIS system is easily maintained	.798	.		
HIS System is cost effective	.795			
HIS System is useful for problem identification	.784			
HIS System is easy to learn	.780			
Enhance the ability of problem solving	.763			
HIS System is responsive to meet your changing needs	.699	.		
HIS system is reliable	.690			
Contribute to achieve the strategic goals of the medical, nursing and administrative management	.675			
HIS system meet your expectation	.672			
Improve your decisions	.650			
HIS Make easier to do your work	.645			
Improve patient satisfaction	.596			
HIS System is ease to use	.587			
Facilitate collaborative problem solving	.582			

HIS_SQ_F2				
Increase your work productivity		.778		
Give you confidence to accomplish your job		.775		
It is easy to become skillful in using systems		.765		
Improve your job performance		.758		
Facilitate collective group decision making		.698		
HIS System is well integrated		.690		
HIS have fast response time		.688		
HIS System is easily upgraded		.678		
Help you manage relationships with other departments		.661		
Facilitate knowledge transfer		.598		
Reduce cycle times		.590		
HIS_SQ_F3				
Speed service delivery			.784	
Enhance information sharing with internal departments			.776	
HIS System is helpful for decisions making			.770	
HIS System is accessible in timely manner (ease with which information can be retrieved from the system)			.774	
HIS system coverages of medical knowledge bases			.698	
Facilitate your learning			.594	
Increase your awareness of job-related information			.489	
HIS_SQ_F4				
HIS system is flexible				.767
Reduce process cost				.697
Improve work quality				.691
Increase participation in decision making				.689
System provides benefits for the entire hospital				.688
Facilitate internal relationships				.683

The thirty eight items are considered in a factor analysis for HIS System Quality. All thirty eight questions are reduced into four factors. The three factors are Factor 1, Factor 2, Factor 3 and Factor 4, and we gave names for these factors as the following:

- ➔ Fourteen items were loaded under Factor one with loading ranging from 0.582 to 0.798. Hence it is named as “Factor 1”.
- ➔ Eleven items were loaded under Factor Two with loading ranging from 0.590 to 0.778. Hence it is named as “Factor 2”.
- ➔ Seven items were loaded under Factor Two with loading ranging from 0.489 to 0.784. Hence it is named as “Factor 3”.
- ➔ Six items were loaded under Factor Two with loading ranging from 0.683 to 0.767. Hence it is named as “Factor 4”.

Table 5.3 reveals the outcomes of the factor analysis and a complete explanation of each item for each of the four main factors. Factor loadings ranged from 0.489 to 0.798.

Table 5. 4: Exploratory Factor Analysis (Factors Loading) for HIS Information Quality

	Factors		
	1	2	3
HIS_IQ_F1			
Information is useful for problem solving	.792		
Information is well defined	.785		
Information is easily updated	.764		
Information is understandable	.744		
Information improve your functional productivity	.699		
Information is available	.684		
Information can be easily compared to past information	.682		
Information is relevant	.679		
Information is usable	.675		
Information is complete	.660		
It is easy to identify errors in information	.658		
Information is important	.655		
Information is unbiased	.643		
Information is received in timely manner	.581		
HIS_IQ_F2			
Information is identifying problems		.817	
Information meets your requirements		.787	
Information is accurate		.780	
Information improve decision effectiveness		.776	
Information is interpretable		.776	
Information is secure (data protection)		.689	
Information is verifiable		.684	
Information is believable		.681	
Information is concise		.595	
Information is reliable		.589	
Information is up-to-date		.584	
Information is clear		.580	
HIS_IQ_F3			
Information is accessible			.783
Information can be used for multiple purpose			.737
Information is easily integrated			.718
Information improve your efficiency			.711
Information is well organised			.689
Information is useful for making decision			.667

Information is easily maintained			.661
Information is easily changed			.658
Information is useful for defining problems			.598

The thirty five items are considered in a factor analysis for HIS information Quality. All thirty five questions are reduced into three factors. The three factors are Factor 1, Factor 2 and Factor 3, and we gave names for these factors as the following:

- ➔ Fourteen items were loaded under Factor one with loading ranging from 0.581 to 0.792. Hence it is named as "Factor 1".
- ➔ Twelve items were loaded under Factor Two with loading ranging from 0.580 to 0.817. Hence it is named as "Factor 2".
- ➔ Nine items were loaded under Factor Two with loading ranging from 0.598 to 0.783. Hence it is named as "Factor 3".

Table 5.4 reveals the outcomes of the factor analysis and a complete explanation of each item for each of the three main factors. Factor loadings ranged from 0.580 to 0.817.

Table 5. 5: Exploratory Factor Analysis (Factors Loading) for HIS Service provider Quality

	Factors	
	1	2
HIS_SPQ_F1		
Are polite	.889	
Are helpful to you	.832	
Complete its services in a timely manner	.746	
Provides a sufficient variety of services	.746	
Are efficient in performing their services	.715	
Are sincere	.712	
Have a knowledge and skills to do their job well	.689	
Help to make you a more knowledgeable computer user	.677	
Has your best interest at heart	.675	
Solve your problem as if they were their own	.635	
Responds in timely manner	.628	
Has sufficient capacity to serve all its users	.595	
Instill confidence in you	.589	
Can provide emergency services	.575	
HIS_SPQ_F2		
Understand your specific needs		.785
Are dependable people		.750
Are willing to help you		.694
Show respect to you		.693
Are pleasant to work with		.684

Has a sufficient people to provide services		.687
Gives you individual attention		.687
Are reliable people		.665
Dependent in providing services		.663

The twenty three items are considered in a factor analysis. The total twenty three questions are reduced into two factors. The two factors are Factor 1 and Factor 2, and we gave names for these factors as the following:

- ➔ Fourteen items were loaded under Factor one with loading ranging from 0.575 to 0.889. Hence it is named as “Factor 1”.
- ➔ Nine items were loaded under Factor Two with loading ranging from 0.663 to 0.785. Hence it is named as “Factor 2”.

Table 5.5 reveals the outcomes of the factor analysis and a complete explanation of each item for each of the two main factors. Factor loadings ranged from 0.575 to 0.889.

Table 5. 6: Exploratory Factor Analysis (Factors Loading) for HIS Training Quality

	Factor
	1
HIS_TRQ_F1	
Training programs are instructive	.809
Have a variety of training programs	.800
Training programs are useful	.791
Training programs cover your needs	.773
Training programs are sufficient	.726
The current training programs are cost effective	.707
Training programs help you to learn the numerous uses of HIS system	.643

Table 5.6 reveals the outcomes of the factor analysis and a complete explanation of each item for the HIS Training Quality factor. Factor loadings ranged from 0.643 to 0.809. The factor accounted for 57% of the variance.

Table 5. 7: Exploratory Factor Analysis (Factors Loading) for HIS Public Hospital Performance

	Factor		
	1	**2**	**3**
HIS_PHP_F1			
Implementation of a HIS minimizing recurrent expenditures such as the money used in procuring stationery and communicating.	.884		
HIS reducing avoidable incidents by contributions to improvements in the quality of care offered to the patients	.783		

HIS facilitate in capturing the financial state of a hospital in real time	.723		
HIS Reducing Medical errors	.714		
HIS Increased patient satisfaction by contributions to improvements in the quality of care offered to the them	.693		
HIS helps in scheduling of maintenance tasks and monitoring trends in service and resource utilization	.683		
HIS make it easier to collect and visualize data on different payers.	.620		
HIS Facilitate administrators and other members of the administrative staff to report their finances and remain accountable.	.606		
HIS increase hospital service effectiveness	.587		
HIS_PHP_F2			
HIS reduce the number of referrals made by a hospital to outside centers		.784	
HIS increased the quality of care by creation of high quality systemic information sharing		.782	
The computerized system enables the medics to serve their patients with a smile and to meet the corpo4rate objective		.778	
Implementation of a HIS end in better (balanced) resource utilization (not too high nor too low)		.680	
HIS ensure uniformity and improvements in physicians' performance (revenue per physician and reimbursements per physician).		.676	
HIS facilitate the scheduling of physicians to ensure that there is a proper balancing of their workload		.671	
HIS reduce the average length of stay ALOS (ascertaining the time it takes a hospital to restore patients into a functioning state)		.669	
HIS aid in the reduction of death rates by aiding the timely acquisition of information on the patient that minimize the risk of medical errors		.604	
HIS_PHP_F3			
HIS facilitates the sharing of patient data among hospitals in a secure manner			.837
HIS makes the admission process score more seamless.			.782
HIS reduce the patient wait time while waiting for the provision of services			.679
HIS reduction the expenses incurred by the hospital (by reduction in overtime and test errors)			.669
HIS reduction in medication errors (by support various technologies that help avoid miscommunication of patient data and prescriptions)			.651
HIS facilitates retrieval processes associated with patient admission			.623

The twenty three items are measured in a factor analysis for Public Hospital Performance. All twenty three questions are reduced into three factors. The three factors are Factor 1, Factor 2 and Factor 3, and we gave names for these factors as the following:

- ➔ Nine items were loaded under Factor one with loading ranging from 0.587 to 0.884. Hence it is named as “Factor 1”.
- ➔ Eight items were loaded under Factor Two with loading ranging from 0.604 to 0.784. Hence it is named as “Factor 2”.
- ➔ Six items were loaded under Factor Two with loading ranging from 0.623 to 0.837. Hence it is named as “Factor 3”.

Table 5.7 reveals the outcomes of the factor analysis and a complete explanation of each item for each of the three main factors. Factor loadings ranged from 0.587 to 0.884.

5.5 Validity

Validity is defined as the accuracy of measurements (Burns & Bush 2013); it regulates whether the research truthfully measures that it is planned to measure or how the results of research are truthful (Joppe 2000). Limited types of validity tests are used to test the goodness of measure and they were classified under three categories: content validity, criterion-related validity, and construct validity. In this study, content validity, discriminant and convergent validity test (construct validity test) is applied.

5.5.1 Discriminant and Convergent Validity test

Discriminant validity refers to the extent to which items in a construct does not correlate with items measuring other constructs (Wang et al. 2015). Discriminant validity in this research study was observed by comparing the Cronbach’s alpha coefficients for individual constructs with correlation coefficients of other constructs (Raykov 2011). Discriminant validity was assured when the Cronbach alpha coefficients for individual constructs were greater than their correlation. Table 5.8 depicts the Discriminant and Convergent Validity test for the Health Information System (HIS) effectiveness and public hospital performance

Table 5. 8: Discriminant and Convergent Validity Test (using Exploratory Factor Analysis EFA-)

Factors	No. of Items	AVE	CR
HIS System Quality			
Factor 1	14	0.487	0.929
Factor 2	11	0.491	0.913
Factor 3	7	0.498	0.871
Factor 4	6	0.494	0.854

HIS Information Quality			
Factor 1	14	0.483	0.928
Factor 2	12	0.490	0.919
Factor 3	9	0.480	0.892
HIS Service Provider Quality			
Factor 1	14	0.488	0.929
Factor 2	9	0.493	0.897
HIS Training Quality			
Factor 1	7	0.565	0.901
Public Hospital Performance			
Factor 1	9	0.497	0.897
Factor 2	8	0.501	0.888
Factor 3	6	0.505	0.858

Note: AVE- Average Variance Extracted, CR- Composite Reliability

The Average Variance Extracted (AVE) should be superior 0.5 and Composite Reliability (CR) should be larger than equal to 0.7. Here, all the factors of AVE values are approximately equal or greater than 0.5 and CR value is 0.9 which greater than equal to 0.7 hence Convergent and Discriminant validity exists.

5.5.2 Content Validity Test

Content validity makes sure that the measure involves a representative and adequate set of items that tap the concept (Sekaran 2002). It is subjectively agreed among the professionals that the measurement scales should reflect what needs to be measured (Cooper et al. 2006). In case of this research, content validity was verified first while all the items were extracted from earlier researches, second by asking the academics for their feedback and comments, and third by conducting a pilot study by involving the similar subjects as that of the study population (MFIs employees). Some minor comments were taken into consideration and the questionnaire was improved.

Content validity refers (also known as logical validity) to the extent to which measure represents all facets of a given construct. Aiken's V (1985) content validity coefficient,

$$V = \frac{\in S}{[n * (c - 1)]}$$

Where,

n = number of experts

Let lo = the lowest possible validity rating (usually, this is 1 on the Likert-scale)

Let r = the rating by an expert

Let S = r – lo

Aiken's V is then V = S / [n*(c-1)]

c = n experts rate the degree to the item

The range will be from 0 to 1

A score of 1 is interpreted as all raters giving the item the highest possible rating
From the above equation,

n is 25 (i.e. sample size for pilot study is 25)
c is represent as Likert scale (i.e. highest scale is 5)

5.5.2.1 Content validity ratio (CVR)

Content validity ratio (CVR) equation to compensate for the inadequacy in content validity that is used in determinations using logical analysis. This CVR equation can be used to quantify degree of the content validity through single indictors from -1 to 1 and degree of agreement of the experts with respect to content validity of one item.

Table 5. 9: Content Validity test

	System Quality				Information Quality			Service Provider Quality		Training Quality	Public Hospital Performance		
Items	**F1**	**F2**	**F3**	**F4**	**F1**	**F2**	**F3**	**F1**	**F2**	**F1**	**F1**	**F2**	**F3**
1	.798	.778	.784	.767	.792	.817	.783	.889	.785	.809	.884	.784	.837
2	.795	.775	.776	.697	.785	.787	.737	.832	.750	.800	.783	.782	.782
3	.784	.765	.770	.691	.764	.780	.718	.746	.694	.791	.723	.778	.679
4	.780	.758	.774	.689	.744	.776	.711	.746	.693	.773	.714	.680	.669
5	.763	.698	.698	.688	.699	.776	.689	.715	.684	.726	.693	.676	.651
6	.699	.690	.594	.683	.684	.689	.667	.712	.687	.707	.683	.671	.623
7	.690	.688	.489		.682	.684	.661	.689	.687	.643	.620	.669	
8	.675	.678			.679	.681	.658	.677	.665		.606	.604	
9	.672	.661			.675	.595	.598	.675	.663		.587		
10	.650	.598			.660	.589		.635					
11	.645	.590			.658	.584		.628					
12	.596				.655	.580		.595					
13	.587				.643			.589					

14	.582				.581			.575					
Mean	**.69**	**.70**	**.70**	**.70**	**.69**	**.69**	**.69**	**.69**	**.70**	**.75**	**.70**	**.70**	**.70**

Table 5.9 depicts the content validity test for the impact of Health Information System (HIS) effectiveness on public hospital performance. There are thirteen factors are utilized for content validity test. The outcome of this study stated that content validity coefficient for each statement ranged from 0.489 to 0.889. Researcher (Lawshe 1975) suggested the content validity ratio (CVR) equation to compensate for the inadequacy in content validity that is used in determinations using logical analysis. This CVR equation can be used to quantify degree of the content validity through single indictors from -1 to 1 and degree of agreement of the experts with respect to content validity of one item.

CHAPTER SIX

ANALYSIS AND RESULTS OF THE MAIN STUDY

6.1 Introduction

This chapter presents the statistical findings pertaining to data collected from the respondents of the research study. Discussion relating to the statistical results of the research study is also given in this chapter. In the chapter, the researcher provides the results of the quantitative data. The data was first put into an excel file and transferred into SPSS 20.0 version. Thus, using SPSS software the present study results analysed. The sample size for the study is n=408. The study has considered HIS system quality, HIS information quality, HIS service provider quality and HIS training quality as independent variables and Public Hospital Performance is a dependent variable.

In the main analysis, two phases such as data cleaning and data modeling are done. The missing data and outliers are checked in the first stage of data cleaning. SPSS is used in this stage. This software also performs descriptive statistics as an overview of the sample. Mean, standard deviation, and reliability tests are done so that the measurements can be ensured to be consistent. The conceptual model is validated in the latter stage by employing the structural equation model SEM that is a statistical procedure testing the measurement, functional, predictive, and causal hypotheses (Bagozzi and Yi, 2012).

Regarding to Bagozzi and Yi, 2012 SEM might offer numerous benefits, as generic instrument which provides a comprehensive, integrative function transmission the interaction and complementarity amongst several diverse statistical methods. Also, as it was explained earlier. SEM also in tests of hypotheses, it considers reliability of measures and often proposes novel hypotheses originally.

This chapter and chapter seven contains the following

- ❖ Demographic Variables relating to participants of the Study.
- ❖ Descriptive Analysis of the Variables is relating to the Study.
- ❖ Test for normality relating to the Study.
- ❖ Convergent and Discriminant Validity tests using CFA.
- ❖ Reliability Analysis relating to Variables and its Dimensions in this Research Study.
- ❖ Exploratory Factor Analysis relating to Variables of the Research Study.
- ❖ Correlation analysis results relating to the Research Study.
- ❖ Linear Regression Analysis Results relating to the Research Study.

- ❖ Multiple Regression Analysis Results relating to the Research Study.
- ❖ Structural Equation Model SEM
- ❖ Confirmatory Factor Analysis (CFA) relating to Variables of the Research Study.

Main Study-Results

6.2 Frequency of demographic characteristics

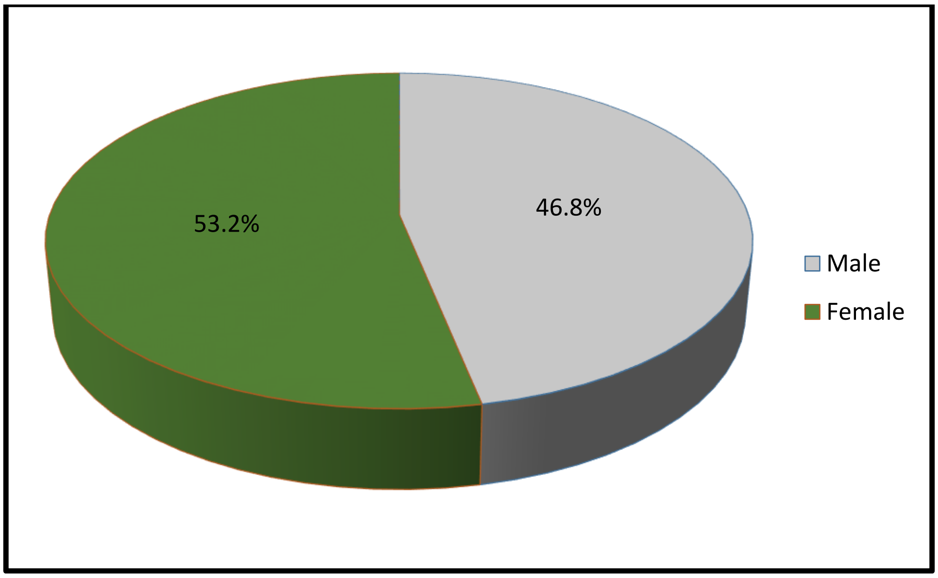
6.2.1 Frequency of gender

Table 6.1 shows the gender of the participants and the figure 6.1 shows the percentage of gender. The study has 408 sample sizes. Of 408 participants, Maximum 53.2% of the participants were female and 46.8% of the participants were male.

Table 6. 1: Frequency of gender

	Frequency (n)	Percentage (%)
Male	191	46.8
Female	217	53.2
Total	**408**	**100.0**

Figure 6. 1: Percentage of gender



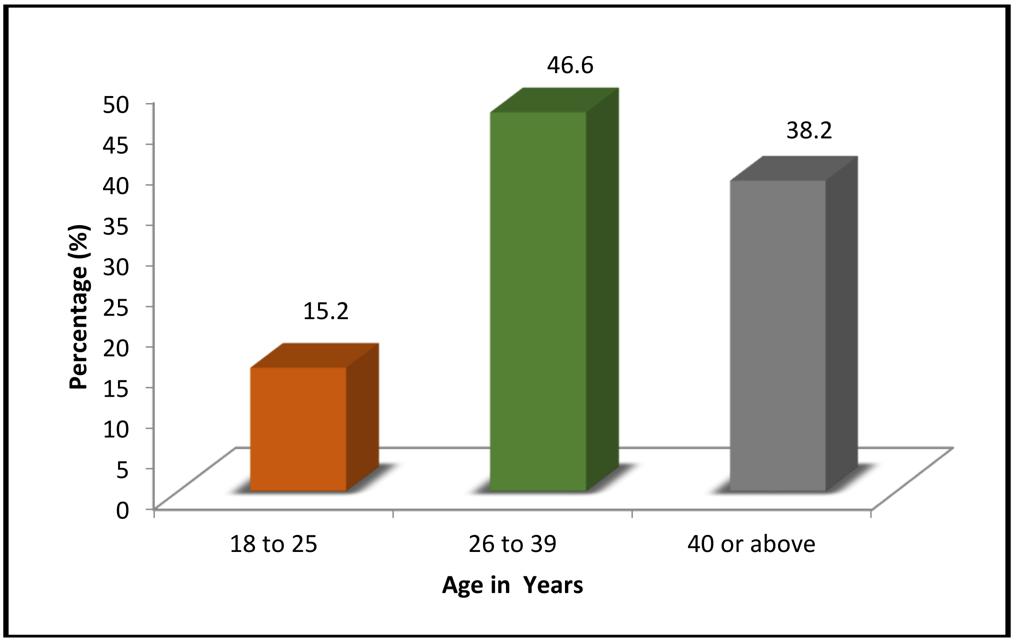
6.2.2 Frequency of age

Table 6.2 depicts the age of the participants and figure 6.2 shows the percentage of age. The age has divided into three categories. Maximum 46.6% of the participants belong to 26-39 years age category followed by, 38.2% of the participants belong to 40 years and above and 15.2% of the participants belong to 18-25 years age category.

Table 6. 2: Frequency of age

	Frequency (n)	Percentage (%)
18 to 25	62	15.2
26 to 39	190	46.6
40 or above	156	38.2
Total	**408**	**100.0**

Figure 6. 2: Percentage of age



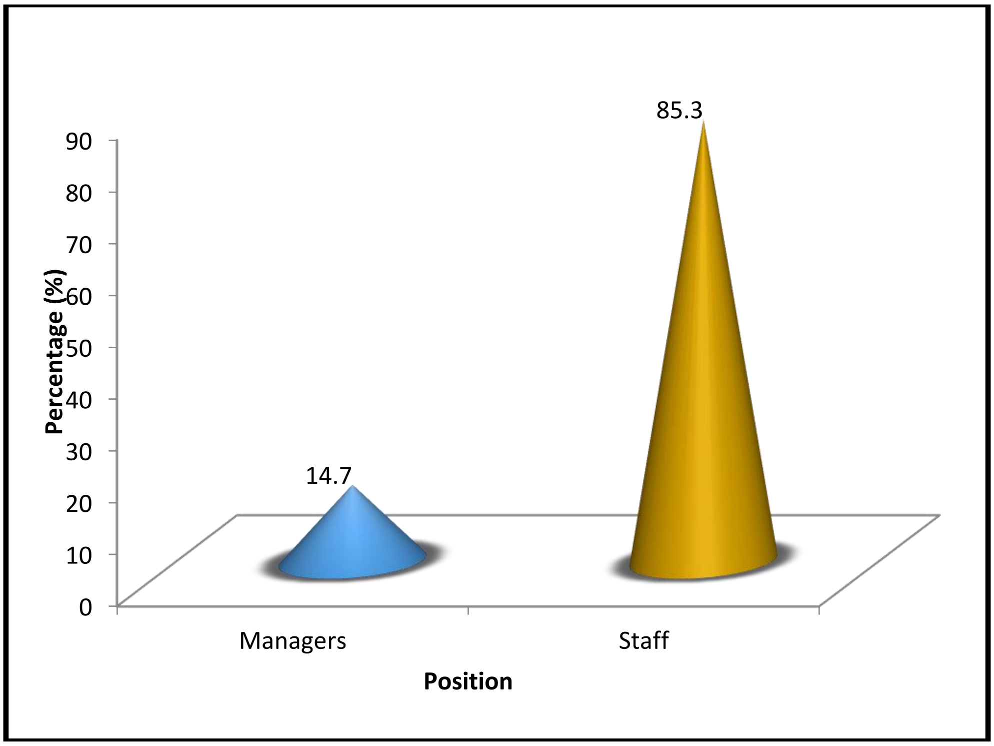
6.2.3 Frequency of position

Table 6.3 presents the number of positions of the participants and figure 6.3 shows the percentage of position. Out of 408 participants, majority 85.3% of the participants are staff while 14.7% of the participants are managers.

Table 6. 3: Frequency of position

	Frequency (n)	Percentage (%)
Managers	60	14.7
Staff	348	85.3
Total	**408**	**100.0**

Figure 6. 3: Percentage of position



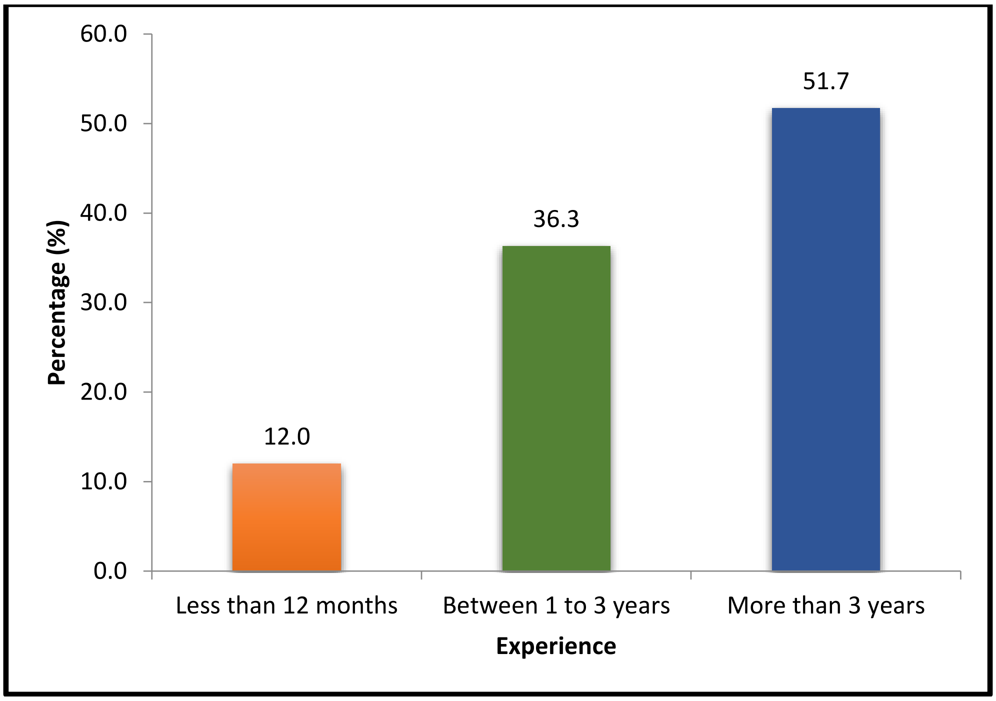
6.2.4 Frequency of experience

Table 6.4 depicts the number of experience of the participants and Figure 6.4 shows Percentage of experience. Maximum 51.7% of the participants have more than years of experience in their field followed by, 36.3% of the participants have 1-3 years and 12% of the participants have less than 1 year.

Table 6. 4: Frequency of experience

	Frequency (n)	Percentage (%)
Less than 12 months	49	12.0
Between 1 to 3 years	148	36.3
More than 3 years	211	51.7
Total	**408**	**100.0**

Figure 6. 4: Percentage of experience



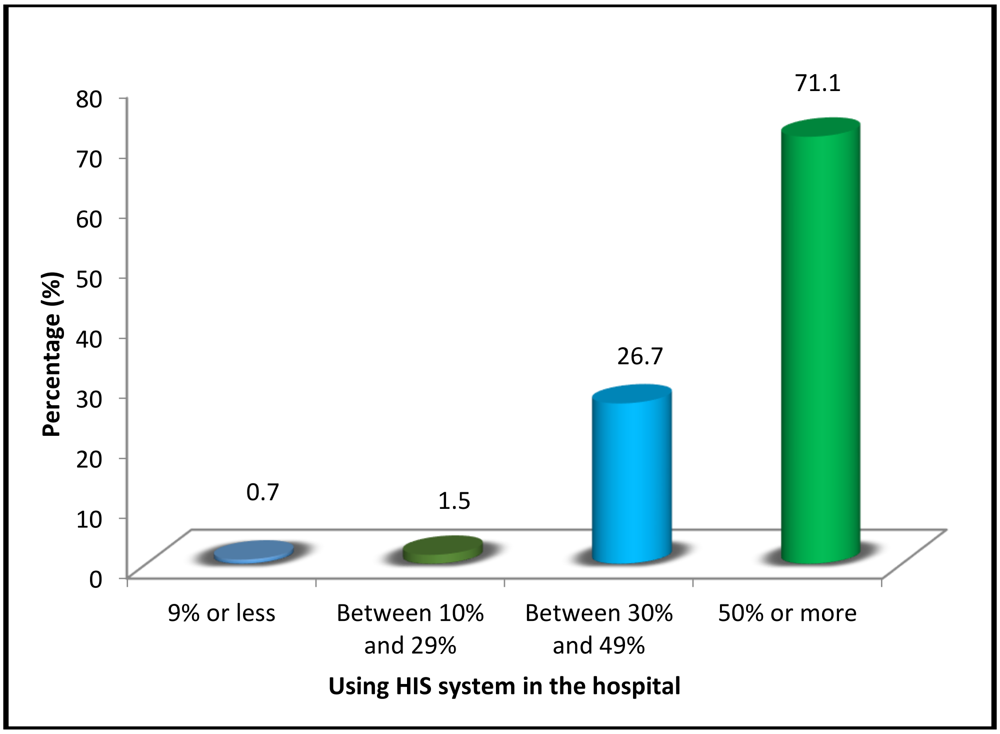
6.2.5 Frequency of using HIS system in the hospital

Table 6.5 represents the using of HIS system in the hospital and Figure 6.5 represents percentage of using HIS system in the hospital. Extreme 71.1% of the participants were using HIS system more than 50% in the hospital, 26.7% of the participants were using HIS system 30%-49% and 1.5% of the participants were using HIS system 10%-29% and 0.7% of the participants were using HIS system less than 9% respectively.

Table 6. 5: Frequency of using HIS system in the hospital

	Frequency (n)	Percentage (%)
9% or less	3	0.7
Between 10% and 29%	6	1.5
Between 30% and 49%	109	26.7
50% or more	290	71.1
Total	**408**	**100.0**

Figure 6. 5: Percentage of using HIS system in the hospital



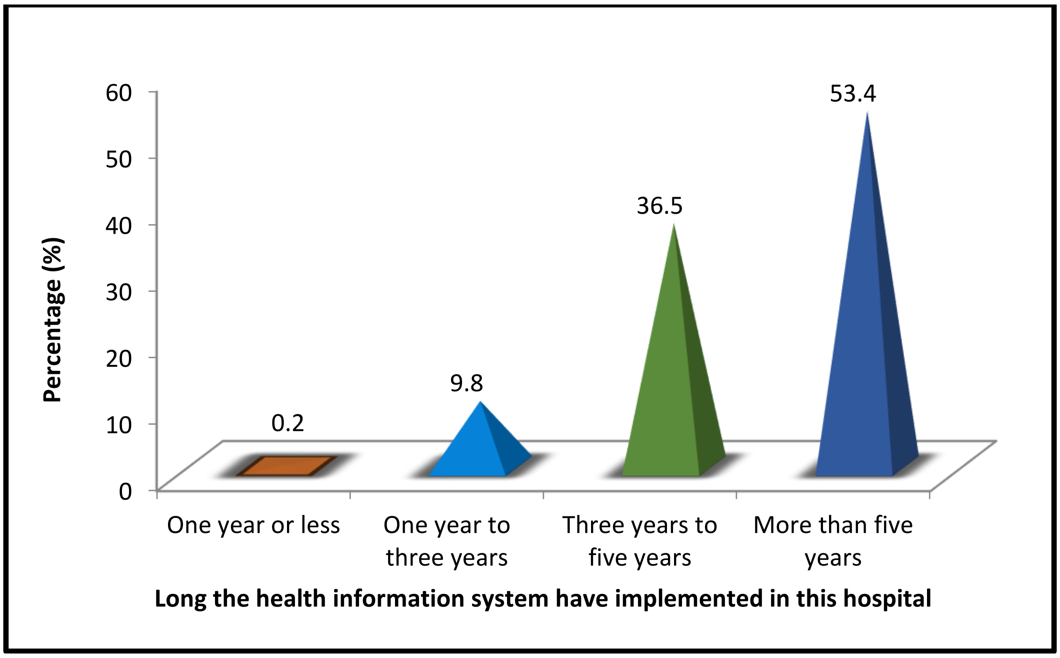
6.2.6 Frequency of long the health information system have implemented in the hospital

Table 6.6 represents the frequency of long of HIS has implemented in this hospital and Figure 6.6 shows the percentage of long the health information system have implemented in the hospital. Majority 53.4% of the participants stated that HIS has implemented more than 5 years, 36.5% of the participants stated that HIS has implemented 3-5 years, 9.8% of the participants stated that HIS has implemented 1-3 years and 0.2% of the participants stated that HIS has implemented less than 1 year respectively.

Table 6. 6: Frequency of long the health information system have implemented in the hospital

	Frequency (n)	Percentage (%)
One year or less	1	0.2
One year to three years	40	9.8
Three years to five years	149	36.5
More than five years	218	53.4
Total	**408**	**100.0**

Figure 6. 6: Percentage of long the health information system have implemented in the hospital



6.3 Data Screening: Missing Data and Outliers

Data screening is the subsequent move after gathering all responses from the whole study. Before furthering on to the chief examination, the gathered data requires to be verified. This method is to assure that the employed data is mistake-free and perfect by recognizing lost data and outliers. To carry out the study online, Bristol Online Survey (BOS) was employed. It was produced and operated by the University of Bristol. A complete needed response element was planned, that stops study data submission unless some components are attended to.

For the present study, this element was executed for all questions which diminished lost data to zero. Outliers are explained as "observations with a unique combination of characteristics identifiable as distinctly different from the other observation" (Hair *et al.*, 2010, p.64). Hence, Tabachnick and Fidell (2007) dealt with the significance of finding out and handling outliers as it may influence the normalcy of the info and can fully misrepresent statistical tests and they recommended that intense ones ought to be eliminated while holding the gentle-outliers. Hair *et al.*, (2010, p. 66) recognized two procedures to find out the outliers: Univariate detection, bivariate detection, and multivariate detection.

- ***Univariate*** detection explores the dispensation of perceptions for every variable in the study and chooses as outliers those cases descending at the outward extents of the dispensation. As recommended by Kline (2010), recognizing the univariate outliers for the sample ought to be carried out by ascertaining frequency dispensations of z-score; the present survey executed SPPS 20 for this aim. Though there are no particular regulations to recognize intense values in literature, for a big sample (above 80), a value of up to ± 3.29 can be approved as a limit and this research removed the row that has more than 2 univariate outliers from the data set.
- ***Bivariate*** outliers can be identified by taking into account pairs of variables to be evaluated together by means of a scatterplot (Hair *et al.*, 2010, p.66). Segregated points in the scatterplot are instances that fall distinctly beyond the extent of the other perception.
- ***Multivariate*** identification entails above two variables at one time. In the present survey, Mahalanobis D^2 measure, which is a multi-dimensional version of a z-score, was employed to ascertain the multivariate outlier (Hair *et al.*, 2010; Kline, 2010). Hair *et al.,* (2010) clarified that this procedure gauges each perception's distance in multidimensional space from the mean centre of all views, providing one value for each view. Hence, higher values of the Mahalanobis D^2 portray views farther eliminated from the common dispensation of views in this multidimensional space.

Hence, on the basis of the debate furnished above, a verification was carried out to recognize all types of outliers before moving ahead to the subsequent phase, and altogether 7 outliers were discovered and eliminated.

6.4 Reliability Analysis

Before moving ahead to check the suggested sample theory, it is quite significant to verify the legitimacy and dependability of the steps as this influence the result of the study (Hair *et al.,* 2010). Both legitimacy and dependability ought to be verified as a step may have big dependability (uniformity) but not be legitimate (exact), and a step may have big legitimacy (precision) but not be dependable (persistent) (Holmes-Smith, 2001).

Cronbach's alpha method is applied in this study for calculating each multi-item scale in reliability analysis. Table 6.7 reveals the reliability analysis outcomes along with descriptive statistics for each factor of System acceptance, Effectiveness of business process, System usefulness, System use, Quality of report, Effectiveness of information, Information usefulness, Reliability, Empathy, Training Quality, Clinical measurements (performance), Operational measurements (Performance) and Financial measurements (Performance). Overall, these results specify the strong reliability with coefficient alphas ranging from 0.869 to 0.936. Hence, there is a good internal consistency exists among the items of each factor.

Table 6. 7: Reliability Analysis

Factors	No. of Items	Mean	SD	Cronbach's Alpha
HIS System Quality				
System acceptance	11	3.60	0.84	0.909
Effectiveness of business process	9	3.59	0.85	0.900
System usefulness	9	3.59	0.86	0.904
System use	9	3.59	0.85	0.899
HIS Information Quality				
Quality of report	14	3.59	0.85	0.936
Effectiveness of information	14	3.62	0.84	0.934
Information usefulness	7	3.59	0.85	0.874
HIS Service Provider Quality				
Reliability	13	3.60	0.84	0.928
Empathy	10	3.62	0.87	0.910
HIS Training Quality				
Training Quality	7	3.60	0.88	0.869
Public Hospital Performance				
Clinical measurements (Performance)	8	3.62	0.84	0.885
Operational measurements (Performance)	8	3.62	0.87	0.890
Financial measurements (Performance)	7	3.57	0.89	0.885

6.5 Descriptive Statistics

Table 6.8 reveals the descriptive statistics of the current study factors. The factors Effectiveness of information, Empathy, Clinical measurements (Performance) and Operational measurements (Performance) has higher mean score 3.62 in each which answered by the participants while compared to the factor financial measurements (Performance) has low mean score 3.57 with Standard deviation 0.89.

Table 6. 8: Descriptive Statistics

	N	Mean	SD	Maximum	Minimum
HIS System Quality					
System acceptance	408	3.60	0.84	4.82	1.45
Effectiveness of business process	408	3.59	0.85	4.67	1.22
System usefulness	408	3.59	0.86	4.89	1.33
System use	408	3.59	0.85	4.89	1.22
HIS Information Quality					
Quality of report	408	3.59	0.85	4.62	1.46
Effectiveness of information	408	3.62	0.84	4.71	1.36
Information usefulness	408	3.59	0.85	4.86	1.29
HIS Service Provider Quality					
Reliability	408	3.60	0.84	4.69	1.54
Empathy	408	3.62	0.87	4.88	1.38
HIS Training Quality					
Training Quality	408	3.60	0.88	4.86	1.29
Public Hospital Performance					
Clinical measurements (Performance)	408	3.62	0.84	5.00	1.00
Operational measurements (Performance)	408	3.62	0.87	5.00	1.38
Financial measurements (Performance)	408	3.57	0.89	5.00	1.14

6.6 Kaiser-Meyer-Olkin (KMO) and Bartlett's tests

Before we move ahead to the subsequent step of corroborative component study, it is recommended to carry out Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. As per Hinton *et al.,* (2004), KMO test is planned to verify multicollinearity as it calculates if variables are so extremely related that we cannot differentiate between them, the thumb of KMO value for acceptable component study is 0.5 and the bigger the superior, while Bartlett's test of Sphericity probes whether there is a connection between the variables. A p value < 0.05 indicates that we can carry on with the component study as there are connections between the variables.

6.6.1 KMO and Bartlett's Test for HIS System Quality

Table 6.9 reveals the KMO and Bartlett's Test for HIS System Quality by using factor analysis. When considered Kaiser-Meyer-Olkin, it measures must be greater than 0.5 and Bartlett's test of sphericity should have the p-value less than 0.05. Further, it is suggested that the KMO value is greater than 0.5 is acceptable, values inside 0.5 and 0.7 are average, values ranges 0.7 and 0.8 are fine, More than 0.8 are great and superb (Hutcheson & Sofroniou 1999; Kaiser 1974). Therefore, from the below table, both values are expected to be fit as per the suitable and excellent criteria's, KMO value is excellent 0.984 and p value is significant and <0.01 which conclude that we can continue to the next step of factor analysis.

Table 6. 9: KMO and Bartlett's Test for HIS System Quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.984
Bartlett's Test of Sphericity	Approx. Chi-Square	9303.310
	df	703
	Sig.	.000

6.6.2 KMO and Bartlett's Test for HIS Information Quality

Table 6.10 reveals the KMO and Bartlett's Test for HIS Information Quality by using factor analysis. When considered Kaiser-Meyer-Olkin, it measures must be greater than 0.5 and Bartlett's test of sphericity should have the p-value less than 0.05. Further, it is suggested that the KMO value is greater than 0.5 is acceptable, values inside 0.5 and 0.7 are average, values ranges 0.7 and 0.8 are fine, more than 0.8 are great and superb (Hutcheson & Sofroniou 1999; Kaiser 1974). Therefore, from the below table, both values are expected to be fit as per the suitable and excellent criteria's KMO value is excellent 0.986, and p value is significant and <0.01 which conclude that we can continue to the next step of factor analysis.

Table 6. 10: KMO and Bartlett's Test for HIS Information Quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.986
Bartlett's Test of Sphericity	Approx. Chi-Square	8588.621
	Df	595
	Sig.	.000

6.6.3 KMO and Bartlett's Test for HIS Service provider Quality

Table 6.11 reveals the KMO and Bartlett's Test for HIS Service provider Quality by using factor analysis. When considered Kaiser-Meyer-Olkin, it measures must be greater than 0.5 and Bartlett's test of sphericity should have the p-value less than 0.05. Further, it is suggested that the KMO value is greater than 0.5 is acceptable, values inside 0.5 and 0.7 are average, values ranges 0.7 and 0.8 are fine, more than 0.8 are great and superb (Hutcheson & Sofroniou 1999; Kaiser 1974). Therefore, from the below table, both values are expected to be fit as per the suitable and excellent criteria's KMO value is excellent 0.981 and p value is significant and <0.01 which conclude that we can continue to the next step of factor analysis.

Table 6. 11: KMO and Bartlett's Test for HIS Service provider Quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.987
Bartlett's Test of Sphericity	Approx. Chi-Square	11729.842
	df	1035
	Sig.	.000

6.6.4 KMO and Bartlett's Test for HIS Training Quality

Table 6.12 exposes the KMO and Bartlett's Test for HIS training Quality by using factor analysis. When considered Kaiser-Meyer-Olkin, it measures must be greater than 0.5 and Bartlett's test of sphericity should have the p-value less than 0.05. Further, it is suggested that the KMO value is greater than 0.5 is acceptable, values inside 0.5 and 0.7 are average, values ranges 0.7 and 0.8 are fine, more than 0.8 are great and superb (Hutcheson & Sofroniou 1999; Kaiser 1974). Therefore, from the below table, both values are expected to be fit as per the suitable and excellent criteria's KMO value is excellent 0.912, and p value is significant and <0.01 which conclude that we can continue to the next step of factor analysis.

Table 6. 12: KMO and Bartlett's Test for HIS Training Quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.985
Bartlett's Test of Sphericity	Approx. Chi-Square	7106.389
	df	435
	Sig.	.000

6.6.5 KMO and Bartlett's Test for Public Hospital Performance

Table 6.13 exposes the KMO and Bartlett's Test for Public Hospital Performance by using factor analysis. When considered Kaiser-Meyer-Olkin, it measures must be greater than 0.5 and Bartlett's test of sphericity should have the p-value less than 0.05. Further, it is suggested that the KMO value is greater than 0.5 is acceptable, values inside 0.5 and 0.7 are average, values ranges 0.7 and 0.8 are fine, more than 0.8 are great and superb (Hutcheson & Sofroniou 1999; Kaiser 1974). Therefore, from the below table, both values are expected to be fit as per the suitable and excellent criteria's KMO value is excellent 0.983, and p value is significant and <0.01 which conclude that we can continue to the next step of factor analysis.

Table 6. 13: KMO and Bartlett's Test for Public Hospital Performance

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.985
Bartlett's Test of Sphericity	Approx. Chi-Square	37201.769
	df	7875
	Sig.	.000

6.7 Factor Analysis

The key concept of factor analysis is that multiple observed variables have similar patterns of responses because they are all associated with a latent (i.e. not directly measured) variable. In every factor analysis, there is the same number of factors as there are variables. Each factor captures a certain amount of the overall variance in the observed variables, and the factors are always listed in order of how much variation they explain.

6.7.1 Factor Analysis of HIS System Quality

Table 6.14 reveals the factor analysis related to the impact of health information system (HIS) effectiveness on public hospital performance. The thirty-eight statements are considered in the factor analysis for HIS System Quality. The total of thirty-eight questions are reduced into four factors. The four factors are System acceptance, Effectiveness of business process, System usefulness and System use**.**

- ➔ System acceptance is the first factor which has eleven statements and ranging from 0.403 to 0.670 and has 50% of the variance.
- ➔ The effectiveness of the business process is the second factor which has nine statements and ranging from 0.451 to 0.672 and has 2.2% of the variance.
- ➔ System usefulness is the third factor which has nine statements and it's ranging from 0.407 to 0.639 and has 2.1% of the variance.
- ➔ System use is the fourth factor which has nine statements and it's ranging from 0.412 to 0.661 and has 2% of the variance.

Table 6. 14: Exploratory Factor Analysis (Factors Loading) for HIS System Quality

	Factors				% of Variance
	1	2	3	4	
System acceptance					
Speed service delivery	.670				50.07%
Enhance information sharing with internal departments	.644				
Increase participation in decision making	.596				
HIS System is easy to learn	.513				
HIS System is helpful for decisions making	.487				
The system provides benefits for the entire hospital	.487				
HIS system is easily maintained	.447				
HIS have a fast response time	.443				
HIS System is ease to use	.437				
It is easy to become skilful in using systems	.421				
Give you the confidence to accomplish your job	.403				
Effectiveness of business process					2.172
HIS system coverages of medical knowledge bases		.672			
HIS System is cost effective		.630			
Reduce process cost		.577			
HIS Make easier to do your work		.540			
Contribute to achieving the strategic goals of the medical, nursing and administrative management		.509			
Facilitate knowledge transfer		.505			
Facilitate your learning		.496			
Increase your awareness of job-related information		.489			
Help you manage relationships with other departments		.451			
System usefulness					2.121
HIS System is accessible in a timely manner (ease with which information can be retrieved from the system)			.639		
Reduce cycle times			.613		
Improve your decisions			.587		
HIS system is reliable			.550		
HIS System is responsive to meet your changing needs			.536		
Facilitate internal relationships			.479		
HIS System is easily upgraded			.465		
HIS System is well integrated			.454		
Increase your work productivity			.407		
System use					2.019
HIS system is flexible				.661	
Facilitate collective group decision making				.618	
Improve work quality				.566	

Facilitate collaborative problem solving				.474	
Improve your job performance				.469	
Enhance the ability of problem-solving				.446	
HIS System is useful for problem identification				.432	
HIS system meet your expectation				.431	
Improve patient satisfaction				.412	

6.7.2 Factor Analysis of HIS Information Quality

Table 6.15 reveals the factor analysis related to the impact of health information system (HIS) effectiveness on public hospital performance. The thirty-five statements are taken into account in the factor analysis for HIS Information Quality. The total of thirty-five questions are reduced into three factors. The three factors are Quality of report, Effectiveness of information and Information usefulness.

- ➔ Quality of report is the first factor which has fourteen statements and ranging from 0.444 to 0.689 and has 50.8% of the variance.
- ➔ The effectiveness of information is the second factors which have fourteen statements and it's ranging from 0.441 to 0.689 and has 2.4% of the variance.
- ➔ System usefulness is the third factor which has seven statements and it's ranging from 0.477 to 0.718 and has 2.3% of the variance.

Table 6. 15: Exploratory Factor Analysis (Factors Loading) for HIS Information Quality

	Factors			% of Variance
	1	2	3	
Quality of report				**50.860**
Information is verifiable	.689			
Information is clear	.651			
Information is interpretable	.648			
Information is important	.592			
Information is unbiased	.565			
Information can be used for multiple purposes	.556			
Information is available	.507			
Information improve your functional productivity	.499			
Information is understandable	.483			
Information is relevant	.481			
Information is useful for problem-solving	.475			
Information is useful for defining problems	.472			
Information is easily updated	.460			

Information is usable	.444			
Effectiveness of information				**2.369**
Information is accessible		.689		
It is easy to identify errors in the information		.638		
Information is well organised		.596		
Information is believable		.573		
Information is up-to-date		.567		
Information is concise		.558		
Information is received in a timely manner		.538		
Information is useful for making a decision		.518		
Information can be easily compared to past information		.509		
Information is easily changed		.494		
Information is accurate		.486		
Information improve your efficiency		.479		
Information is complete		.445		
Information improve decision effectiveness		.441		
Information usefulness				**2.281**
Information is easily integrated			.718	
Information is reliable			.681	
Information is easily maintained			.577	
Information is secure (data protection)			.548	
Information meets your requirements			.531	
Information is identifying problems			.521	
Information is well defined			.477	

6.7.3 Factor Analysis for HIS service provider Quality

Table 6.16 reveals the factor analysis related to the impact of health information system (HIS) effectiveness on public hospital performance. The twenty-three statements are taken into account in the factor analysis for HIS Service Provider Quality. The total of twenty-three questions are reduced into two factors. The two factors are Reliability and Empathy**.**

- ➔ Reliability is the first factor which has thirteen statements and ranging from 0.531 to 0.704 and has 50.4% of the variance.
- ➔ Empathy is the second factor which has ten statements and it’s ranging from 0.508 to 0.792 and has 3.2% of the variance.

Table 6. 16: Exploratory Factor Analysis (Factors Loading) for HIS service provider Quality

	Factors		% of Variance
	1	2	
Reliability			**50.356**
Understand your specific needs	.704		
Dependent on providing services	.702		
Gives you individual attention	.699		
Has a sufficient people to provide services	.635		
Are efficient in performing their services	.623		
Solve your problem as if they were their own	.612		
Have knowledge and skills to do their job well	.601		
Instil confidence in you	.580		
Has sufficient capacity to serve all its users	.572		
Help to make you a more knowledgeable computer user	.571		
Can provide emergency services	.567		
Responds in a timely manner	.541		
Are willing to help you	.531		
Empathy			**3.198**
Are reliable people		.792	
Are dependable people		.681	
Complete its services in a timely manner		.669	
Show respect to you		.656	
Are Polite		.604	
Are helpful to you		.597	
Are pleasant to work with		.573	
Are sincere		.567	
Has your best interest at heart		.564	
Provides a sufficient variety of services		.508	

6.7.4 Factor Analysis of HIS Training Quality

Table 6.17 reveals the factor analysis related to the impact of health information system (HIS) effectiveness on public hospital performance. The seven statements are taken into account in the factor analysis for HIS training Quality. Seven statements with efforts from participants fixed under Factor one with loading ranging from 0.709 to 0.783 and denoted it is by “Training Quality”. The factor “Training Quality” has 50.869% of the variance.

Table 6. 17: Exploratory Factor Analysis (Factors Loading) for HIS Training Quality

	Factors	% of Variance
	1	
Training Quality		
Training programs cover your needs	.783	**50.869**
Training programs are useful	.778	
The current training programs are cost-effective	.748	
Training programs are sufficient	.744	
Training programs are instructive	.744	
Training programs help you to learn the numerous uses of HIS system	.731	
Have a variety of training programs	.709	

6.7.5 Factor Analysis for Public Hospital Performance

Table 6.18 reveals the factor analysis related to the impact of health information system (HIS) effectiveness on public hospital performance. The twenty-three statements are taken into account in the factor analysis for Public Hospital Performance. The total of twenty-three questions are reduced into three factors. The three factors are Clinical measurements (performance), Operational measurements (Performance) and financial measurements (Performance)**.**

- ➔ A clinical measurement (performance) is the first Factor which has eight statements and it's ranging from 0.679 to 0.744 and has 49.370% of the variance in these whole factors.
- ➔ An Operational measurement (Performance) is the second factor which has eight statements and it's ranging from 0.671 to 0.792 and has 3.2% of the variance in these whole factors.
- ➔ A financial measurement (Performance) is the third factor which has seven statements and it's ranging from 0.687 to 0.778 and has 3% of the variance in these whole factors.

Table 6. 18: Exploratory Factor Analysis (Factors Loading) for Public Hospital Performance

	Factor			% of Variance
	1	2	3	
Clinical measurements (performance)				
Implementation of HIS end in better (balanced) resource utilization (not too high nor too low)	.744			**49.370**
HIS increase hospital service effectiveness	.733			

HIS help in the scheduling of maintenance tasks and monitoring trends in service and resource utilization	.725			
HIS Reducing Medical errors	.696			
HIS aid in the reduction of death rates by aiding the timely acquisition of information on the patient that minimize the risk of medical errors	.695			
HIS Increased patient satisfaction by contributions to improvements in the quality of care offered to the them	.694			
HIS reduction in medication errors (by support various technologies that help avoid miscommunication of patient data and prescriptions)	.692			
HIS increased the quality of care by the creation of high-quality systemic information sharing	.679			
Operational measurements (Performance)				**3.182**
The computerized system enables the medics to serve their patients with a smile and to meet the corpo4rate objective		.792		
HIS reducing avoidable incidents by contributions to improvements in the quality of care offered to the patients		.729		
HIS facilitates the sharing of patient data among hospitals in a secure manner		.721		
HIS makes the admission process score more seamless.		.712		
HIS reduce the patient wait time while waiting for the provision of services		.693		
HIS reduce the average length of stay ALOS (ascertaining the time it takes a hospital to restore patients into a functioning state)		.691		
HIS reduction the expenses incurred by the hospital (by a reduction in overtime and test errors)		.679		
HIS facilitates retrieval processes associated with patient admission		.671		
Financial measurements (Performance)				**2.916**
HIS ensure uniformity and improvements in physicians’ performance (revenue per physician and reimbursements per physician).			.778	
HIS Facilitate administrators and other members of the administrative staff to report their finances and remain accountable.			.754	
HIS facilitate the scheduling of physicians to ensure that there is a proper balancing of their workload			.698	
HIS facilitate in capturing the financial state of a hospital in real time			.697	
HIS make it easier to collect and visualize data on different payers.			.691	
Implementation of HIS minimizing recurrent expenditures such as the money used in procuring stationery and communicating.			.689	
HIS reduce the number of referrals made by a hospital to outside centres			.687	

6.8 Construct Validity

Before moving ahead to check the suggested exemplar theory, it is quite significant to verify the validity and dependability of the steps since this influence the result of the study (Hair et al. 2010). Both validity and dependability ought to be verified as a measure may have exalted dependability (uniformity) but not be valid (precise), and a measure may have exalted validity (precision) but not be dependable (persistent) (Yanamandram & White 2006). Validity was described as the range to which a set of gauged variables truly portray the theoretical dormant construct they are planned to gauge (Hair et al. 2010). Hair *et al.,* (2010) recommended that construct validity can be studied by convergent validity, discriminant validity.

6.8.1 Convergent Validity

Indicates the ranged to which measures of a particular construct ought to converge or share a lofty percentage of variance in general (Hair *et al.,* 2010). 3 pointers could be employed to assess the convergent validity: Composite Reliability (CR), Average Variance Extracted (AVE), and factor loading. CR is regarded as a suitable instrument to gauge the internal permanence dependability which is the 1st formation to be evaluated. CR is a value in the extent 0-1 and the greater value means greater dependability. Hair *et al.*, (2014) recommend that CR value below 0.6 means want of inner permanence dependability. They also recommended that AVE value above 0.5 means that the construct describes above half of the variance of its pointers whereas more mistakes stay in the products than the variance described by the construct when AVE is below 0.5. Moreover, satisfactory factor loading ought to be above 0.5.

As AMOS does not compute the AVE and CR on each construct, two formulae will be employed for this aim subsequent to Fornell and Larcker (1981) and Chau and Hu (2001).

AVE = (summation of squared factor loadings) / (summation of squared factor loadings) * (summation of error variances)

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

CR = (square of summation of factor loadings)/ (square of summation of factor loadings) + (summation of error variances)

$$CR = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)}$$

Where:

- λ is factor loadings (standardised regression weights)
- i is the number of items
- δ represents the error variance term for each latent construct

6.8.2 Discriminant Validity

Discriminant Validity is explained by Hair *et al.*, (2010, p. 125) is "the degree to which two conceptually similar concepts are distinct", otherwise stated, the range to which a construct is unsual and dissimilar from others grounded on experimental paradigm. For the purpose of checking it, the analyst equates the average variance extracted (AVE) values for two constructs with the square of relationship appraisal between these two constructs. Discriminant validity is important when average variance extracted is bigger than squared relationship appraisals between constructs. As illustrated in Table 6.19, a considerable level of discriminant validity was set as AVE, which is greater than the squared relationship appraisal for all the constructs.

Table 6. 19: Discriminant and Convergent Validity test (using Confirmatory Factor Analysis CFA)

Factors	No. of items	AVE	CR
HIS System Quality			
System acceptance	11	0.498	0.920
Effectiveness of business process	9	0.499	0.899
System usefulness	9	0.512	0.904
System use	9	0.498	0.899
HIS Information Quality			
Quality of report	14	0.510	0.935
Effectiveness of information	14	0.503	0.934
Information usefulness	7	0.498	0.784
HIS Service Provider Quality			
Reliability	13	0.499	0.930
Empathy	10	0.503	0.910
HIS Training Quality			
Training Quality	7	0.487	0.870
Public Hospital Performance			
Clinical measurements (Performance)	8	0.500	0.899
Operational measurements (Performance)	8	0.506	0.891
Financial measurements (Performance)	7	0.510	0.849

Note: AVE- Average Variance Extracted, CR- Composite Reliability

The table 6.19 reveals Convergent and Discriminant Validity Test by using confirmatory factor analysis. The Composite Reliability (CR) would be greater than equal to 0.7 and the Average Variance Extracted (AVE) must be larger 0.5 Hair *et al.*, (2010, p. 125). From the above findings, all the factors of AVE values are greater or equal to 0.5 and CR value greater than equal to 0.7 hence Convergent and Discriminant validity exists.

6.9 Testing the Normality Assumption

Normality is the predominantly key presumption in multivariate study as it indicates the shape of the data dispensation for a personal metric variable and its conformity to the usual dispensation (Hair *et al.*, 2010). Hence, if the variation from the usual dispensation is adequately big, all consequent statistical tests are null and void (Hair *et al.*, 2010). This analysis used Kolmogorov-Smirnov Test and the Shapiro-Wilk Test to verify if the data is usually dispensed or not.

Table 6. 20: Tests of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
System acceptance	.269	408	.000	.782	408	.000
Effectiveness of business process	.244	408	.000	.804	408	.000
System usefulness	.250	408	.000	.807	408	.000
System use	.245	408	.000	.808	408	.000
Quality of report	.272	408	.000	.756	408	.000
Effectiveness of information	.290	408	.000	.755	408	.000
Information usefulness	.225	408	.000	.839	408	.000
Reliability	.301	408	.000	.729	408	.000
Empathy	.240	408	.000	.817	408	.000
Training Quality	.231	408	.000	.843	408	.000
Clinical measurements (Performance)	.254	408	.000	.823	408	.000
Operational measurements (Performance)	.258	408	.000	.806	408	.000
Financial measurements (Performance)	.252	408	.000	.821	408	.000

Table 6.20 presents the results from two well-known tests of normality, namely the Kolmogorov-Smirnov Test and the Shapiro-Wilk Test. The Shapiro-Wilks test for normality is one of three common normality tests designed to detect all departures from normality. It is comparable in power to the other two tests. The test rejects the hypothesis of normality when the p-value is less than or equal to 0.05. From the above outcomes indicates that p- values are more than 0.05. If the p-value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data is not a normal distribution. The study has 408 (greater than 30) sample sizes. Hence we can conclude that the data is a normal distribution.

6.10 Common Bias Method

Common method variance is described as “the variance that is attributable to the measurement method rather than to the constructs the measures represent” (Podsakoff et al. 2012, p. 879). Method biases are regarded as an issue because of its consequence in expanding the connection between variables assessed with the identical method (Sharma et al. 2009). Based on Podsakoff *et al.*, (2012), one of the important means of measurement error is bias method that threaten the validity of the presumption of connection between measures.

Table 6. 21: Common Bias Method for HIS_System Quality

KMO and Bartlett's Test			% of Variance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.984	
Bartlett's Test of Sphericity	Approx. Chi-Square	9303.310	50.066
	Df	703	
	Sig.	0.000	

Table 6.21 depicts the Common Bias Method for HIS_System Quality. The Common Bias Method was performed by using exploratory factors analysis. Common Bias Method exists when the factors values should be less than or equal to 50% variance, a single factor arises from the factor analysis or one-factor accounts for the majority of the covariance among the measures. From the above outcomes reveals that common bias method exists for HIS System quality.

Table 6. 22: Common Bias Method for HIS_Information Quality

KMO and Bartlett's Test			% of Variance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.986	
Bartlett's Test of Sphericity	Approx. Chi-Square	8588.621	50.860
	Df	595	
	Sig.	0.000	

Table 6.22 depicts the Common Bias Method for HIS_Information Quality. The Common Bias Method was performed by using exploratory factors analysis. Common Bias Method exists when the factors values should be less than or equal to 50% variance, a single factor arises from the factor analysis or one-factor accounts for the majority of the covariance among the measures. From the above outcomes reveals that common bias method exists for HIS Information quality.

Table 6. 23: Common Bias Method for HIS_Service Provider Quality

KMO and Bartlett's Test			% of Variance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.987	
Bartlett's Test of Sphericity	Approx. Chi-Square	11729.842	50.356
	df	1035	
	Sig.	0.000	

Table 6.23 depicts the Common Bias Method for HIS_Service provider Quality. The Common Bias Method was performed by using exploratory factors analysis. Common Bias Method exists when the factors values should be less than or equal to 50% variance, a single factor arises from

the factor analysis or one-factor accounts for the majority of the covariance among the measures. From the above outcomes reveals that common bias method exists for HIS service provider quality.

Table 6. 24: Common Bias Method for HIS_Training Quality

KMO and Bartlett's Test			% of Variance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.985	
Bartlett's Test of Sphericity	Approx. Chi-Square	7106.389	50.869
	df	435	
	Sig.	.000	

Table 6.24 depicts the Common Bias Method for HIS_Training Quality. The Common Bias Method was performed by using exploratory factors analysis. Common Bias Method exists when the factors values should be less than or equal to 50% variance, a single factor arises from the factor analysis or one-factor accounts for the majority of the covariance among the measures. From the above outcomes reveals that common bias method exists for HIS training quality.

Table 6. 25: Common Bias Method for Public Hospital Performance

KMO and Bartlett's Test			% of Variance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.985	
Bartlett's Test of Sphericity	Approx. Chi-Square	37201.769	49.370
	Df	7875	
	Sig.	.000	

Table 6.25 depicts the Common Bias Method for Public Hospital Performance. The Common Bias Method was performed by using exploratory factors analysis. Common Bias Method exists when the factors values should be less than or equal to 50% variance, a single factor arises from the factor analysis or one-factor accounts for the majority of the covariance among the measures. From the above outcomes reveals that the common bias method exists for the Public Hospital Performance.

6.11 Pearson's Coefficient of correlation:

The strength and direction of association between two variables are measured by Pearson correlation coefficient. The two variables must be measured on a continuous (interval) scale (Srmuniv 2018). The correlation coefficient (r) ranges from -1 to 1. Where r is a degree of correlation coefficient value and p indicates significance level value. Based on the sign of the correlation coefficient we may conclude the following manner (Gogtay & Thatte 2017):

- When r is –1, we say there is a perfect negative correlation.
- When r is a value between –1 and 0, we say that there is a negative correlation

- When r is 0, we say there is no correlation
- When r is a value between 0 and 1, we say there is a positive correlation
- When r is 1, we say there is a perfect positive correlation

6.11.1 (Correlation) Relationship between independent and dependent variables

Table 6.26 reveals that relationship between HIS system quality, information quality, service provider quality, training quality and public performance hospital by using correlation analysis. Where r is a degree of correlation and p indicates significance level. The correlation value ranged from 0.825-0.918. It is evident from the table that, System acceptance ($r=0.867$, $p<0.01$), Effectiveness of business process ($r=0.869$, $p<0.01$), System usefulness ($r=0.868$, $p<0.01$), System use ($r=0.865$, $p<0.01$), Quality of report ($r=0.874$, $p<0.01$), Effectiveness of information ($r=0.882$, $p<0.01$), Information usefulness ($r=0.849$, $p<0.01$), Reliability ($r=0.891$, $p<0.01$), Empathy ($r=0.857$, $p<0.01$), Training Quality ($r=0.854$, $p<0.01$) does showed a significant positive linear relationship with clinical measurements (performance). System acceptance ($r=0.884$, $p<0.01$), Effectiveness of business process ($r=0.876$, $p<0.01$), System usefulness ($r=0.872$, $p<0.01$), System use ($r=0.879$, $p<0.01$), Quality of report ($r=0.881$, $p<0.01$), Effectiveness of information ($r=0.895$, $p<0.01$), Information usefulness ($r=0.848$, $p<0.01$), Reliability ($r=0.903$, $p<0.01$), Empathy ($r=0.874$, $p<0.01$), Training Quality ($r=0.863$, $p<0.01$) and clinical measurements (performance) ($r=0.850$, $p<0.01$) does showed a significant positive linear relationship with operational measurements (performance). System acceptance ($r=0.875$, $p<0.01$), Effectiveness of business process ($r=0.874$, $p<0.01$), System usefulness ($r=0.861$, $p<0.01$), System use ($r=0.864$, $p<0.01$), Quality of report ($r=0.877$, $p<0.01$), Effectiveness of information ($r=0.877$, $p<0.01$), Information usefulness ($r=0.825$, $p<0.01$), Reliability ($r=0.886$, $p<0.01$), Empathy ($r=0.853$, $p<0.01$), Training Quality ($r=0.846$, $p<0.01$), clinical measurements (performance) ($r=0.846$, $p<0.01$) and operational measurements (performance) ($r=0.861$, $p<0.01$) does showed a significant positive linear relationship with financial measurements (performance).

Table 6. 26: (Correlation) Relationship between independent and dependent variables

	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**V10**	**V11**	**V12**	**V13**
V1	1												
V2	.874**	1											
V3	.876**	.858**	1										
V4	.881**	.865**	.868**	1									
V5	.899**	.887**	.887**	.892**	1								
V6	.892**	.881**	.889**	.900**	.908**	1							
V7	.868**	.830**	.855**	.852**	.867**	.868**	1						
V8	.902**	.905**	.893**	.903**	.918**	.914**	.869**	1					
V9	.885**	.870**	.866**	.869**	.877**	.892**	.835**	.880**	1				
V10	.865**	.853**	.864**	.847**	.870**	.873**	.836**	.886**	.853**	1			
V11	.867**	.869**	.868**	.865**	.874**	.882**	.849**	.891**	.857**	.854**	1		
V12	.884**	.876**	.872**	.879**	.881**	.895**	.848**	.903**	.875**	.863**	.850**	1	
V13	.875**	.874**	.861**	.864**	.877**	.877**	.825**	.886**	.853**	.846**	.846**	.861**	1

**P<0.01, *p<0.05

Where,
V1- System acceptance, **V2-** Effectiveness of business process, **V3-** System usefulness, **V4-** System use, **V5-** Quality of report, **V6-** Effectiveness of information, **V7-** Information usefulness, **V8-** Reliability, **V9-** Empathy, **V10-** Training Quality, **V11-** Clinical measurements (performance), **V12-** Operational measurements (Performance) and **V13 -** Financial measurements (Performance).

6.11.2 Relationship between HIS system quality, information quality, training quality and public hospital performance

Table 6.27 reveals that relationship between HIS system quality, information quality, training quality and public performance hospital by using correlation analysis. Where r is a degree of correlation and p indicates significance level. The correlation value ranged from 0.897-0.966. It is evident from the table that HIS System Quality ($r=0.966$, $p<0.01$), HIS information Quality ($r=0.952$, $p<0.01$), HIS Service Provider Quality ($r=0.953$, $p<0.01$) and HIS Training Quality ($r=0.900$, $p<0.01$) does show a significant positive linear relationship with Public Hospital Performance.

Table 6. 27: Relationship between HIS system quality, information quality, training quality and public hospital performance

	HIS System Quality	HIS Information Quality	HIS Service Provider Quality	HIS Training Quality	Public Hospital Performance
HIS System Quality	1				
HIS information Quality	.963**	1			
HIS Service Provider Quality	.962**	.950**	1		
HIS Training Quality	.902**	.896**	.897**	1	
Public Hospital Performance	.966**	.952**	.953**	.900**	1

**p<0.01, *p<0.05

6.12 Hypotheses Testing

Chapter three provided a detailed analysis of the theory and measures that were used to conceptualise the independent and dependent constructs of our research model. Following a detailed literature review in Chapter three, we framed four main propositions that expressed the relationship between our independent dimensions under the construct" *HIS System Effectiveness*" and our main dependent construct "*Public Hospital Performance".*

Following the construction of our dependent and independent factors, our research model changed to include our new factors under our main constructs. Figure 6.7 depicts the research model in more detail using the main dimensions and their respective factors as well as their proposed relationship with each factor under our dependent construct. The Health Information System Effectiveness dimensions were considered as the independent variables (IVs) and the (3) three factors that were attributed to public hospital performance were the dependent variables (DVs). In order to test and quantify the possible relations between the set of IVs and the Ds, multiple regression analysis (Coefficient of correlation) was performed. Chapter Six explored these relationships and discussed in detail the multiple regression analyses (Coefficient of correlation) that were performed for the exploration of these relationships, also this chapter tests the hypothes of our new framework.

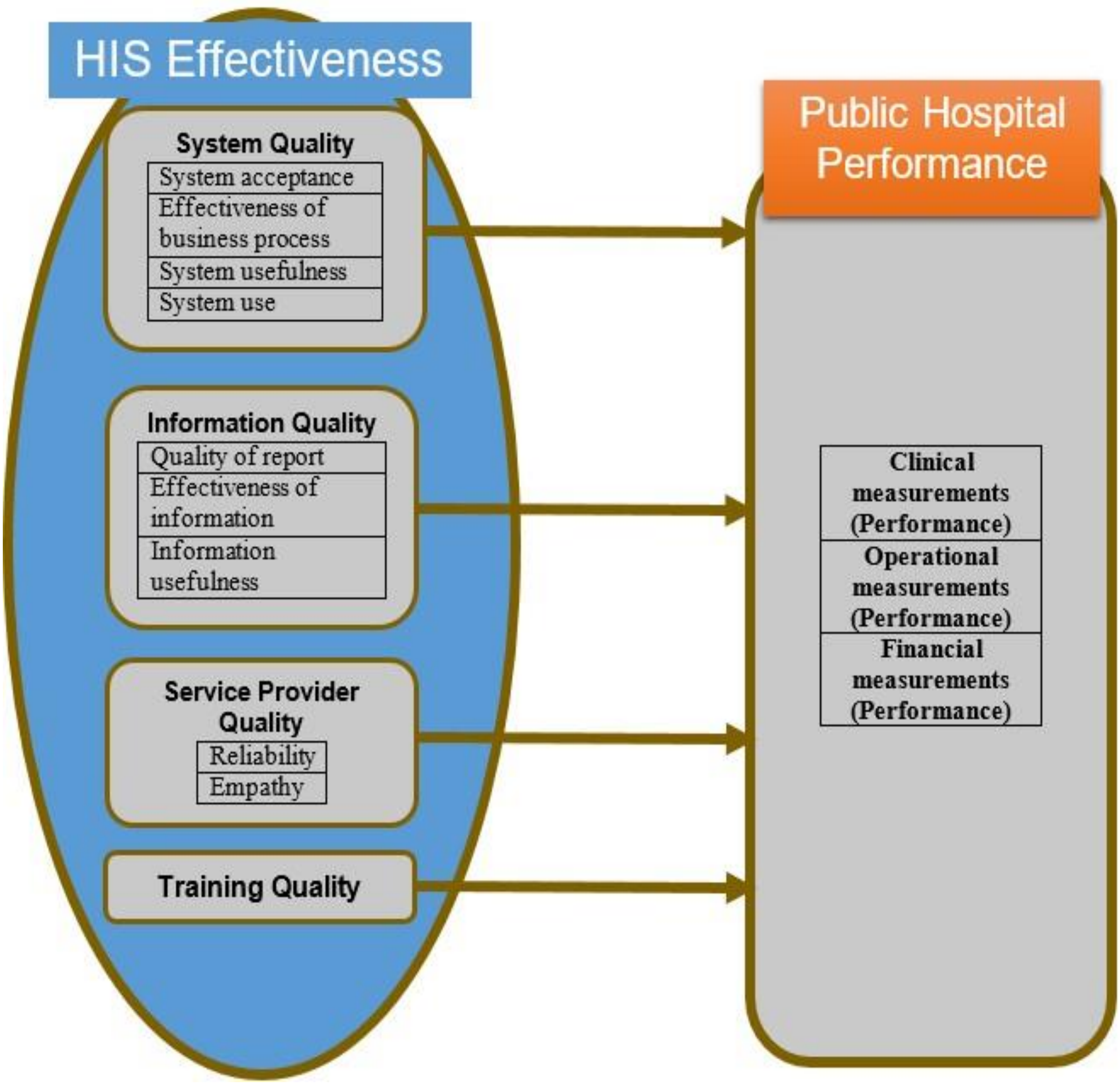


Figure 6. 7 The Conceptual Research framework - Health Information Systems' Effectiveness and Public Hospital Performance -

From figure 6.7, it is clear that this study explored the relationship between four dimensions of HIS effectiveness independent variables (IVs) (recognized from the literature review) with the three factors that were attributed to public hospital performance (clinical, operational and financial measurements) were the dependent variables (DVs). Consequently, the following major hypotheses were tested in the study:

H1: *HIS System quality is positively related to public hospital performance*

H1a: *HIS System quality impact positively on clinical hospital measurments*

H1b: *HIS System quality impact positively on opearatonal hospital measurments*

H1c: *HIS System quality impact positively on financial hospital measuremnts*

H2: *HIS Information quality is positively related to public hospital performance*

H2a: *HIS Information quality impact positively on clinical hospital measurments*

H2b: *HIS Information quality impact positively on opearatonal hospital measurments*

H2c: *HIS Information quality impact positively on financial hospital measuremnts*

H3: *HIS Service provider quality is positively related to public hospital performance*

H3a: *Service provider quality impact positively on clinical hospital measurement*

H3b: *Service provider quality impact positively on opearatonal hospital measurement*

H3c: *Service provider quality impact positively on financial hospital measurement*

H4: *HIS training quality is positively related to public hospital performance*

H4a: *HIS training quality impact positively on clinical hospital measurement*

H4b: *HIS training quality impact positively on opearatonal hospital measurement*

H4c: *HIS training quality impact positively on financial hospital measurement*

6.12.1 Regression Analysis

Regression is used to find the association between independent and dependent variables. It means that if there is a significant impact of independent variable on dependent variable. In the linear regression, we have to use only one independent variable and dependent variable. But in the multiple regressions, we can to use more than one independent variable and one dependent variable. Both regression analyses are used to predict the value of a dependent variable based on the value of independent variable. Dependent (Predictand) variable means the variable we want to predict and independent variable means the variable we are using to predict the value of the dependent variable.

- **Unstandardized Coefficient**

Unstandardized Coefficient is defined as the average change in the dependent variable associated with a one unit change in the dependent variable, statistically controlling for the other independent variables.

- **R-Square**

R square (R^2) value explains what percent of variance in the dependent variable that can be explained by the independent variable.

- **Beta Coefficient**

Estimated model coefficients table contains the following estimators: Through t-value and p-value for each independent variable, we can to know whether the each independent variable is significantly predicting the dependent variable. Beta (β) coefficients are the point estimator of independent variables. This table also contains the interval estimator of independent variable.

6.12.2 Hypotheses H1: System quality impacts positively on public hospital performance

H1: *HIS System quality is positively related to public hospital performance*

Table 6. 28: System quality impacts positively on public hospital performance

	Unstandardized Coefficients		**R Square**	**t value**	**p value**
	Beta	**SE**			
(Constant)	0.073	0.048	0.933	1.511	0.132
System acceptance	0.244	0.032		7.597	**0.000****
The effectiveness of business process	0.285	0.029		9.797	**0.000****
System usefulness	0.228	0.029		7.841	**0.000****
System use	0.226	0.030		7.410	**0.000****

Dependent Variable: Public hospital performance, **p<0.01

The hypotheses, H1: HIS System quality is positively related to public hospital performance is depicted in the table 6.28 (the association between system quality and public hospital performance is offered). In the regression model, system quality is considered as independent variable while public hospital performance is deemed as a dependent variable. Since the p value ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the System acceptance, Effectiveness of business process, System usefulness and System use are positively influences on public hospital performance. Also, the beta coefficient of System acceptance ($\beta=0.244$, $p<0.01$), Effectiveness of business process ($\beta=0.285$, $p<0.01$), System usefulness ($\beta=0.228$, $p<0.01$) and System use ($\beta=0.226$, $p<0.01$) are positive. It reveals that if System acceptance, Effectiveness of business process, System usefulness and System use are increase in value, then it will get to increase public hospital performance. Also system quality might be able to explain that 93% of the variance in Public hospital performance (R^2 value = 0.933). Hence there is a positive association between system quality and public hospital performance. Hence, we can conclude that the hypothese,

H1: HIS System quality is positively related to public hospital performance is accepted.

6.12.2.1 Hypotheses H1a: System quality impacts positively on clinical measurement (performance)

***H1a:** System quality is positively related to clinical hospital measurement (performance)*

Table 6. 29: System quality impacts positively on clinical measurement (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.210	0.078	0.834	2.697	0.007
System acceptance	0.197	0.052		3.806	**0.000****
The effectiveness of business process	0.277	0.047		5.901	**0.000****
System usefulness	0.260	0.047		5.533	**0.000****
System use	0.215	0.049		4.374	**0.000****

Dependent Variable: Clinical measurement (performance), **p<0.01

The hypotheses, H1a: System quality is positively related to clinical hospital performance is offered in table 6.29. In the regression model, system quality is considered as independent variable while clinical measurement (performance) is deemed as a dependent variable. Since the p value ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the System acceptance, Effectiveness of business process, System usefulness and System use are positively influences on clinical measurement (performance). Also, the beta coefficient of System acceptance ($\beta=0.197$, $p<0.01$), Effectiveness of business process ($\beta=0.277$, $p<0.01$), System usefulness ($\beta=0.260$, $p<0.01$) and System use ($\beta=0.215$, $p<0.01$) are positive. It reveals that if System acceptance, Effectiveness of business process, System usefulness and System use are increase in value, then it will get to increase clinical measurement (performance). Also, system quality might be able to explain that 83% of the variance in clinical measurement (performance) (R^2 value = 0.834). Hence there is a positive association between system quality and clinical measurement (performance). Hence, we can conclude with the hypothese,

H1a: System quality is positively related to clinical hospital performance is accepted.

6.12.2.2 Hypotheses H1b: System quality is positively related to operational hospital measurement (performance)

H1b: *System quality is positively related to operational hospital measurement (performance)*

Table 6. 30: System quality impacts positively on operational measurements (Performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.054	0.075	0.854	0.722	0.471
System acceptance	0.263	0.050		5.250	**0.000****
The effectiveness of business process	0.262	0.046		5.755	**0.000****
System usefulness	0.214	0.045		4.711	**0.000****
System use	0.254	0.048		5.336	**0.000****

Dependent Variable: Operational measurements (performance), **$p<0.01$

The hypotheses, H1b: System quality is positively related to operational measurements (performance) is presented in table 6.30. In the regression model, system quality is considered as independent variable while an operational measurement (performance) is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the System acceptance, effectiveness of business process, system usefulness and system use are positively influences on operational measurement (performance). Also, the beta coefficient of System acceptance (β=0.263, $p<0.01$), Effectiveness of business process (β=0.262, $p<0.01$), System usefulness (β=0.214, $p<0.01$) and System use (β=0.254, $p<0.01$) are positive. It reveals that if System acceptance, Effectiveness of business process, System usefulness and System use are increase in value, then it will get to increase operational measurement (performance). Also system quality might be able to explain that 85% of the variance in operational measurements (performance) (R^2 value = 0.854). Hence there is a positive association between system quality and operational measurements (performance). Hence, we conclude that hypotheses,

H1b: System quality is positively related to operational measurements (Performance) is accepted.

6.12.2.3 Hypotheses H1c: System quality is positively related to financial hospital measurement (performance).

H1c: *System quality is positively related to financial hospital measurement (performance).*

Table 6. 31: System quality impacts positively on financial measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	-0.046	0.081	0.837	-0.561	0.575
System acceptance	0.271	0.054		5.002	**0.000****
The effectiveness of business process	0.317	0.049		6.442	**0.000****
System usefulness	0.210	0.049		4.285	**0.000****
System use	0.208	0.051		4.048	**0.000****

Dependent Variable: Financial measurements (performance), **$p<0.01$

The hypotheses, H1c: System quality is positively related to financial measurements (performance) is offered in table 6.31. In the regression model, system quality is considered as independent variable while a financial measurement (performance) is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors is less than 0.01 significant level and it is reveals that System acceptance, effectiveness of business process, system usefulness and system use are positively influences on financial measurement (performance). Also, the beta coefficient of System acceptance (β= 0.197, $p<0.01$), Effectiveness of business process (β= 0.277, $p<0.01$), System usefulness (β= 0.260, $p<0.01$) and System use (β= 0.215, $p<0.01$) are positive. It reveals that if System acceptance, Effectiveness of business process, System usefulness and System use are increase in value, then it will get to increase financial measurement (performance). Also system quality might be able to explain that 84% of the variance in financial measurements (performance) (R^2 value = 0.837). Hence there is a positive association between system quality and public hospital performance. Therefore, we can conclude with the hypothese,

H1c: System quality is positively related to financial measurements (performance) is accepted.

6.12.3 Hypotheses H2: HIS Information quality is positively related to public hospital performance.

H2: *HIS Information quality is positively related to public hospital performance.*

Table 6. 32: Information quality impacts positively on public hospital performance

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.150	0.055	0.911	2.723	0.007
Quality of report	0.344	0.037		9.243	**0.000****
Effectiveness of information	0.430	0.037		11.485	**0.000****
Information usefulness	0.185	0.031		5.929	**0.000****

Dependent Variable: Public hospital performance, **p<0.01

The hypotheses, H2: HIS Information quality is positively related to public hospital performance is represented in table 6.32 (the association between information quality and public hospital performance). In the regression model, information quality is taken into account as an independent variable and public hospital performance is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors is less than 0.01 significant level and it is reveals that Quality of report, Effectiveness of information and Information usefulness are positively influences on Public hospital performance. Also, the beta coefficient of Quality of report (β=0.344, $p<0.01$), Effectiveness of information (β= 0.430, $p<0.01$) and Information usefulness (β= 0.185, $p<0.01$) are positive. It reveals that if Quality of report, Effectiveness of information and Information usefulness are increase in value, then it will get to increase public hospital performance. Also Information quality might be able to explain that 91% of the variance in Public hospital performance (R^2 value = 0.911). Hence there is a positive association between Information quality and public hospital performance. Hence, we conclude that the hypptheses

H2: HIS Information quality is positively related to public hospital performance is accepted.

6.12.3.1 Hypotheses H2a: Information quality is positively related to clinical hospital measurement (performance).

H2a: *Information quality is positively related to clinical hospital measurement (performance).*

Table 6. 33: Information quality impacts positively on clinical measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.264	0.080	0.820	3.285	0.001
Quality of report	0.303	0.054		5.608	**0.000****
Effectiveness of information	0.396	0.054		7.268	**0.000****
Information usefulness	0.233	0.045		5.129	**0.000****

Dependent Variable: clinical measurements (performance), **p<0.01

The hypotheses, H2a: Information quality is positively related to clinical measurements (performance) is shown in table 6.33. In the regression model, information quality is taken into account as an independent variable and clinical measurements (performance) is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the Quality of report, Effectiveness of information and Information usefulness positively influences on clinical measurements (performance). Also, the beta coefficient of Quality of report ($\beta= 0.303$, $p<0.01$), Effectiveness of information ($\beta= 0.396$, $p<0.01$) and Information usefulness ($\beta= 0.233$, $p<0.01$) are positive. It reveals that if the Quality of report, Effectiveness of information and Information usefulness are increase in value, then it will get to increase clinical measurements (performance). In addition, 82% of the variation in clinical measurements (performance) is dependent on information quality (R-square value=0.820). Hence there is a positive association between Information quality and clinical measurements (performance). Hence, we can conclude with the hypothese,

H2a: Information quality is positively related to clinical measurements (performance) is accepted.

6.12.3.2 Hypotheses H2b: Information quality is positively related to operational hospital measurement (performance).

H2b: *Information quality is positively related to operational hospital measurement (performance).*

Table 6. 34: Information quality impacts positively on operational measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.126	0.079	0.837	1.595	0.111
Quality of report	0.321	0.053		6.026	**0.000****
Effectiveness of information	0.462	0.054		8.631	**0.000****
Information usefulness	0.188	0.045		4.210	**0.000****

Dependent Variable: Operational measurements (performance), **p<0.01

The hypotheses, H2b: Information quality is positively related to operational measurements (performance) is represented in table 6.34. In the regression model, information quality is taken into account as an independent variable and operational measurements (performance) is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the Quality of report, Effectiveness of information and Information usefulness positively influences on operational measurements (performance). Also, the beta coefficient of Quality of report ($\beta= 0.321$, $p<0.01$), Effectiveness of information ($\beta= 0.462$, $p<0.01$) and Information usefulness ($\beta= 0.188$, $p<0.01$) are positive. It reveals that if the Quality of report, Effectiveness of information and Information usefulness are increase in value, then it will get to increase operational measurements (performance). Also Information quality might be able to explain that 84% of the variance in operational measurements (performance) (R^2 value = 0.837). Hence there is a positive association between Information quality and operational measurements (performance). Hence, we can conclude that the hypothese,

H2b: Information quality is positively related to operational measurements (performance) is accepted.

6.12.3.3 Hypotheses H2c: Information quality is positively related to financial hospital measurement (performance).

H2c: *Information quality is positively related to financial hospital measurement (performance).*

Table 6. 35: Information quality impacts positively on financial measurements (performance)

	Unstandardized Coefficients		**R Square**	**t value**	**p value**
	Beta	**SE**			
(Constant)	0.061	0.087	0.809	0.702	0.483
Quality of report	0.408	0.059		6.915	**0.000****
Effectiveness of information	0.432	0.059		7.286	**0.000****
Information usefulness	0.134	0.049		2.720	**0.007****

Dependent Variable: Financial measurements (performance), **p<0.01

The hypotheses, H2c: Information quality is positively related to financial measurements (performance) is represented in table 6.35. In the regression model, information quality is taken into account as an independent variable and financial measurements (performance) is deemed as a dependent variable. Since the p values (p<0.001) for all the factors are less than 0.01 significant level, it reveals that the Quality of report, Effectiveness of information and Information usefulness positively influences on financial measurements (performance). Also, the beta coefficient of Quality of report (β= 0.408, p<0.01), Effectiveness of information (β= 0.432, p<0.01) and Information usefulness (β= 0.134, p<0.01) are positive. It reveals that if the Quality of report, Effectiveness of information and Information usefulness are increase in value, then it will get to increase financial measurements (performance). Also Information quality might be able to explain that 81% of the variance in financial measurements (performance) (R^2 value = 0.809). Hence there is a positive association between Information quality and financial measurements (performance). Hence, we can conclude that the hypothese,

H2c: Information quality is positively related to financial measurements (performance) is accepted.

6.12.4 Hypotheses H3: HIS Service provider quality is positively related to public hospital performance

***H3:** HIS Service provider quality is positively related to public hospital performance.*

Table 6. 36: Service Provider quality impacts positively on public hospital performance

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.154	0.053	0.917	2.915	0.004
Reliability	0.577	0.031		18.724	**0.000****
Empathy	0.378	0.031		12.329	**0.000****

Dependent Variable: Public hospital performance, **p<0.01

The hypotheses, H3: HIS Service provider quality is positively related to public hospital performance is reveals in the table 6.36 (the association between service provider quality and public hospital performance). In the regression model, service provider quality is taken into account as an independent variable and public hospital performance is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the reliability and empathy positively influences on public hospital performance. Also, the beta coefficient of reliability (β= 0.577, $p<0.01$) and empathy (β= 0.378, $p<0.01$) are positive. It reveals that if the reliability and empathy are increase in value, then it will get to increase public hospital performance. Also service provider quality might be able to explain that 92% of the variance in Public hospital performance (R^2 value = 0.917). Hence there is a positive association between service provider quality and public hospital performance. Hence, we can conclude with the hypothese

H3: HIS Service provider quality is positively related to public hospital performance is accepted.

6.12.4.1 Hypotheses H3a: Service provider quality is positively related to clinical hospital measurement (performance)

***H3a:** Service provider quality is positively related to clinical hospital measurement (performance).*

Table 6. 37: Service Provider quality impacts positively on clinical measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	SE			
(Constant)	0.288	0.080	0.819	3.603	0.000
Reliability	0.580	0.047		12.455	**0.000****
Empathy	0.343	0.046		7.412	**0.000****

Dependent Variable: Clinical measurements (performance), **p<0.01

The hypotheses, H3a: Service provider quality is positively related to clinical measurements (performance) is represented in table 6.37. In the regression model, service provider quality is taken into account as an independent variable and clinical measurmnt of hospital performance is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the reliability and empathy positively influences on clinical measurements (performance). Also, the beta coefficient of reliability ($\beta= 0.580$, $p<0.01$) and empathy ($\beta= 0.343$, $p<0.01$) are positive. It reveals that if the reliability and empathy are increase in value, then it will get to increase clinical measurements (performance). Also service provider quality might be able to explain that 82% of the variance in clinical measurements (performance) (R^2 value = 0.819). Hence there is a positive association between service provider quality and clinical measurements (performance). Hence, we conclude that the hypotheses,

H3a: Service provider quality is positively related to clinical measurement (performance) is accepted.

6.12.4.2 Hypotheses H3b: Service provider quality is positively related to operational measurement (performance).

H3b: *Service provider quality is positively related to operational measurement (performance).*

Table 6. 38: Service Provider quality impacts positively on operational measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	**SE**			
(Constant)	0.117	0.076	0.848	1.551	0.122
Reliability	0.566	0.044		12.853	**0.000****
Empathy	0.405	0.044		9.254	**0.000****

Dependent Variable: Operational measurements (performance), **$p<0.01$

The hypotheses, H3b: Service provider quality is positively related to operational measurements (performance) is represented in table 6.38. In the regression model, service provider quality is taken into account as an independent variable and operational measurmnt of hospital performance is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the reliability and empathy positively influences on operational measurements (performance). Also, the beta coefficient of reliability ($\beta= 0.566$, $p<0.01$) and empathy ($\beta= 0.405$, $p<0.01$) are positive. It reveals that if the reliability and empathy are increase in value, then it will get to increase operational measurements (performance). Also service provider quality might be able to explain that 85% of the variance in operational measurements (performance) (R^2 value = 0.848). Hence there is a positive association between service provider quality and operational measurements (performance). Therefore, the hypotheses,

H3b: Service provider quality is positively related to operational measurement (performance) is accepted.

6.12.4.3 Hypotheses H3c: Service provider quality is positively related to financial measurement (performance)

H3c: *Service provider quality is positively related to financial measurement (performance).*

Table 6. 39: Service Provider quality impacts positively on financial measurements (performance)

	Unstandardized Coefficients		**R Square**	**t value**	**p value**
	Beta	**SE**			
(Constant)	0.058	0.086	0.813	0.674	0.501
Reliability	0.587	0.050		11.742	**0.000****
Empathy	0.386	0.050		7.770	**0.000****

Dependent Variable: financial measurements (performance), **$p<0.01$

The hypotheses, H3c: Service provider quality is positively related to financial measurements (performance) is represented in table 6.39. In the regression model, service provider quality is taken into account as an independent variable and financial measurmnt of hospital performance is deemed as a dependent variable. Since the p values ($p<0.001$) for all the factors are less than 0.01 significant level, it reveals that the reliability and empathy positively influences on financial measurements (performance). Also, the beta coefficient of reliability (β= 0.587, $p<0.01$) and empathy (β= 0.386, $p<0.01$) are positive. It reveals that if the reliability and empathy are increase in value, then it will get to increase financial measurements (performance). Also service provider quality might be able to explain that 81% of the variance in financial measurements (performance) (R-square value =0.813). Hence there is a positive association between service provider quality and financial measurements (performance).

H3c: Service provider quality is positively related to financial measurements (performance) is accepted.

6.12.5 Hypotheses H4: HIS training quality is positively related to public hospital performance

H4: *HIS training quality is positively related to public hospital performance.*

Table 6. 40: Training quality impacts positively on public hospital performance

	Unstandardized Coefficients		R Square	t value	p value
	Beta	**SE**			
(Constant)	0.447	0.069	0.846	6.505	0.000
Training quality	0.877	0.019		47.201	**0.000****

Dependent Variable: Public hospital performance, **p<0.01

The hypotheses, H4: HIS training quality is positively related to public hospital performance is presented in table 6.40 (the association between training quality and public hospital performance). In the regression model, training quality is taken into account as an independent variable and public hospital performance is deemed as a dependent variable. Since the p value ($p<0.001$) for the factor training quality is less than 0.01 significant level, it reveals that the training quality positively influence on public hospital performance. Also, the beta coefficient of training quality (β=0.877, $p<0.01$) is positive. It reveals that if the training quality is increase in value, then it will get to increase public hospital performance. In addition, 85% of the variation in public hospital performance is dependent on training quality (R-square value=0.846). Hence there is a positive association between training quality and public hospital performance. Therefore, the hypotheses,

H4: HIS training quality is positively related to public hospital performance is accepted.

6.12.5.1 Hypotheses H4a: HIS training quality is positively related to Clinical measurements (performance).

H4a: *HIS training quality is positively related to Clinical measurements (performance).*

Table 6. 41: Training quality impacts positively on Clinical measurements (performance)

	Unstandardized Coefficients		R Square	t value	p value
	Beta	**SE**			
(Constant)	0.539	0.086	0.770	6.283	0.000
Training quality	0.855	0.023		36.893	**0.000****

Dependent Variable: Clinical measurements (performance), **p<0.01

The hypotheses, H4a: HIS training quality is positively related to Clinical measurements (performance) is presented in table 6.41. In the regression model, training quality is taken into account as an independent variable and clinical hospital performance is deemed as a dependent variable. Since the p value ($p<0.001$) for the factor training quality is less than 0.01 significant level, it reveals that the training quality positively influence on clinical measurements (performance). Also, the beta coefficient of training quality ($\beta=0.855$, $p<0.01$) is positive. It reveals that if the training quality is increase in value, then it will get to increase clinical measurements (performance). In addition, 77% of the variation in clinical measurements (performance) is dependent on training quality (R-square value=0.770). Hence there is a positive association between training quality and clinical measurements (performance). Hence, we can conclude with the hypothese,

H4a: HIS training quality is positively related to Clinical measurements (performance) is accepted.

6.12.5.2 Hypotheses H4b: HIS training quality is positively related to operational measurements (performance).

H4b: *HIS training quality is positively related to operational measurements (performance).*

Table 6. 42: Training quality impacts positively on operational measurements (performance)

	Unstandardized Coefficients		**R Square**	**t value**	**p value**
	Beta	**SE**			
(Constant)	0.421	0.087	0.780	4.854	0.000
Training quality	0.889	0.023		37.957	**0.000****

Dependent Variable: Operational measurements (performance), **$p<0.01$

The hypotheses, H4b: HIS training quality is positively related to Operational measurements (Performance) is presented in table 6.42. In the regression model, training quality is taken into account as an independent variable and operational hospital performance is deemed as a dependent variable. Since the p value ($p<0.001$) for the factor training quality is less than 0.01 significant level, it reveals that the training quality positively influence on operational measurements (performance). Also, the beta coefficient of training quality ($\beta= 0.889$, $p<0.01$) is positive. It reveals that if the training quality is increase in value, then it will get to increase operational measurements (performance). In addition, 78% of the variation in operational measurements (performance) is dependent on training quality (R-square value=0.780).Hence there is a positive association between training quality and operational measurements (performance). Hence, we can conclude that the hypothese,

H4b: HIS training quality is positively related to Operational measurements (Performance) is accepted.

6.12.5.3 H4c: HIS training quality is positively related to financial measurements (performance)

H4c: *HIS training quality is positively related to financial measurements (performance).*

Table 6. 43: Training quality impacts positively on financial measurements (performance)

	Unstandardized Coefficients		**R Square**	**t value**	**p value**
	Beta	**SE**			
(Constant)	0.381	0.097	0.738	3.940	0.000
Training quality	0.885	0.026		33.852	**0.000****

Dependent Variable: financial measurements (performance), **p<0.01

The hypotheses, H4c: HIS training quality is positively related to financial measurements (Performance) is presented in table 6.43. In the regression model, training quality is taken into account as an independent variable and financial hospital performance is deemed as a dependent variable Since the p value ($p<0.001$) for the factor training quality is less than 0.01 significant level, it reveals that the training quality positively influence on financial measurements (performance). Also, the beta coefficient of training quality ($\beta=0.885$, $p<0.01$) is positive. It reveals that if the training quality is increase in value, then it will get to increase financial measurements (performance). Also training quality might be able to explain that 74% of the variance in financial measurements (performance) (R^2 value value= 0.738). Hence there is a positive association between training quality and financial measurements (performance). Hence, we can conclude with the hypothese,

H4c: HIS training quality is positively related to financial measurements (Performance) is accepted.

CHAPTER SEVEN

ANALYSIS AND RESULTS OF THE MAIN STUDY BY USING AMOUS - SEM (ADVANCED SPSS SOFTWARE GRAPHIC)

Hypotheses Testing Using AMOUS Software - Structural Equation Model – SEM and CFA:

7.1 Structural Equation Modelling – SEM -

As it was debated in the earlier chapter, this analysis chose the SEM by the employment of Analysis of Moment Structures (AMOS) version 20 to authenticate the study hypotheses. As it is explained by (Hair et al. 2010) a structural equation modeling is a family of statistical exemplars that aim for clarifying the connection amongst lot of variables comprises two sorts of exemplars: Confirmatory factor analysis (CFA) also called the measurement model, and the structural model (Hair et al. 2006). The subsequent parts show the outcomes from both exemplars.

7.2 Confirmatory Factor Analysis – CFA -

In order to check the measurement exemplar, the present study carried out CFA employing AMOS 20.0 software. SEM is the latest method in carrying out CFA in social sciences (Worthington & Whittaker 2006). As per (Asparouhov & Muthén 2009), the CFA measurement exemplar indicates a number of factor loadings set at zero to study the hypothesis that some elements affect some factor indicators. After the proposal of Hair *et al*. (2006), for the purpose of evaluating the measurement exemplar, the below-mentioned chief methods were employed:

If the hypothesized model has a good fit, the statistical test values should be in the following manner.

- Chi-square value should be less than 5 (Hair et al. 2006)
- P value should be greater than 0.05 (Hair et al. 2006)
- GFI, AGFI and CFI values should be greater than 0.90 (Hooper et al. 2008; Hair et al. 2006; Hu & Bentler 1999)
- RMR & RMSEA values should be less than 0.08 (Hair et al. 2006)

7.3 Hypotheses testing by using SEM

7.3.1 Hypotheses H1: HIS System quality is positively related to public hospital performance

H1: HIS System quality is positively related to public hospital performance

Figure 7. 1: The relationship between the total effects of system quality on public hospital performance (as total effect)

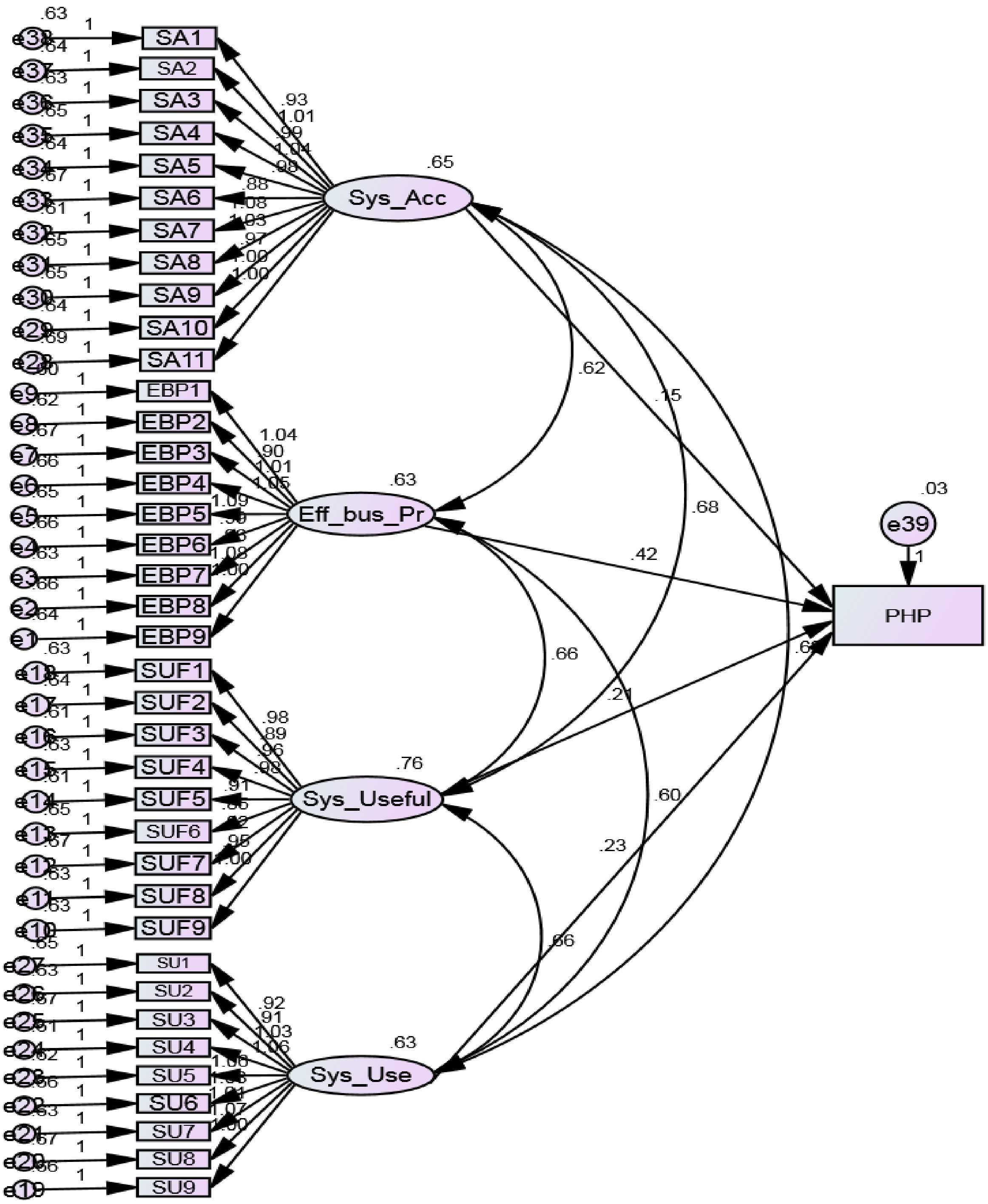


Table 7. 1: Relationship between total effects of system quality and total effect of public hospital performance

			Unstandardized coefficient	S.E	Standardized Coefficient	p-value
EBP9	<---	Eff_bus_Pr	1		0.703	
EBP8	<---	Eff_bus_Pr	1.077	0.076	0.724	<0.0001***
EBP7	<---	Eff_bus_Pr	0.964	0.071	0.692	<0.0001***
EBP6	<---	Eff_bus_Pr	0.994	0.072	0.697	<0.0001***
EBP5	<---	Eff_bus_Pr	1.091	0.076	0.731	<0.0001***
EBP4	<---	Eff_bus_Pr	1.051	0.075	0.717	<0.0001***
EBP3	<---	Eff_bus_Pr	1.01	0.073	0.7	<0.0001***
EBP2	<---	Eff_bus_Pr	0.899	0.068	0.67	<0.0001***
EBP1	<---	Eff_bus_Pr	1.037	0.073	0.727	<0.0001***
SUF9	<---	Sys_Useful	1		0.74	
SUF8	<---	Sys_Useful	0.952	0.064	0.722	<0.0001***
SUF7	<---	Sys_Useful	0.918	0.064	0.698	<0.0001***
SUF6	<---	Sys_Useful	0.847	0.061	0.675	<0.0001***
SUF5	<---	Sys_Useful	0.911	0.062	0.713	<0.0001***
SUF4	<---	Sys_Useful	0.977	0.064	0.732	<0.0001***
SUF3	<---	Sys_Useful	0.965	0.064	0.732	<0.0001***
SUF2	<---	Sys_Useful	0.885	0.062	0.695	<0.0001***
SUF1	<---	Sys_Useful	0.982	0.065	0.732	<0.0001***
SU9	<---	Sys_Use	1		0.697	
SU8	<---	Sys_Use	1.068	0.076	0.72	<0.0001***
SU7	<---	Sys_Use	1.014	0.073	0.711	<0.0001***
SU6	<---	Sys_Use	1.035	0.075	0.711	<0.0001***
SU5	<---	Sys_Use	1.064	0.075	0.731	<0.0001***
SU4	<---	Sys_Use	1.059	0.074	0.731	<0.0001***
SU3	<---	Sys_Use	1.029	0.075	0.706	<0.0001***
SU2	<---	Sys_Use	0.911	0.07	0.671	<0.0001***
SU1	<---	Sys_Use	0.92	0.07	0.671	<0.0001***
SA11	<---	Sys_Acc	1		0.697	
SA10	<---	Sys_Acc	1.004	0.072	0.712	<0.0001***
SA9	<---	Sys_Acc	0.969	0.071	0.696	<0.0001***
SA8	<---	Sys_Acc	1.032	0.074	0.719	<0.0001***
SA7	<---	Sys_Acc	1.081	0.074	0.746	<0.0001***
SA6	<---	Sys_Acc	0.882	0.069	0.656	<0.0001***
SA5	<---	Sys_Acc	0.983	0.071	0.705	<0.0001***
SA4	<---	Sys_Acc	1.043	0.074	0.724	<0.0001***
SA3	<---	Sys_Acc	0.99	0.072	0.709	<0.0001***
SA2	<---	Sys_Acc	1.014	0.073	0.715	<0.0001***
SA1	<---	Sys_Acc	0.928	0.069	0.686	<0.0001***
PHP	<---	Sys_Acc	0.147	0.134	0.145	0.274
PHP	<---	Eff_bus_Pr	0.423	0.11	0.41	<0.0001***

PHP	<---	Sys_Useful	0.208	0.095	0.221	**0.028***
PHP	<---	Sys_Use	0.226	0.141	0.218	0.110

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.960

Table 7.1 depicts the total effect of all items of system quality on the total effect of all items of public hospital performance. To inspect the theoretical interdependence between system quality as an independent variable with public hospital performance as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.2). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, Effectiveness of business process and System usefulness, system acceptance and system use are a positive influence on public hospital performance. System quality might be able to explain that 96% of the variance in public hospital performance (R-Square value = 0.960).

Table 7. 2: Model fit summary

Variable	Value	Suggested value
Chi-square value	705.892	
Degrees of freedom (df)	693	
P value	0.359	P-value >0.05 (Hair et al., 2006)
GFI	0.924	>0.90 (Hair et al., 2006)
AGFI	0.915	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.007	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.2). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (693)= 705.892, AGFI (Adjusted Goodness of Fit Index) = 0.915 and GFI (Goodness of Fit Index)=0.924 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.030 and RMSEA (Root Mean Square Error of Approximation) =0.007 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.2 Hypotheses H1a: System quality is positively related to Clinical measurement (performance)

H1a: System quality is positively related to Clinical measurement (performance)

Figure 7. 2: Relationship between total effect of system quality and total effect of Clinical measurement (performance)

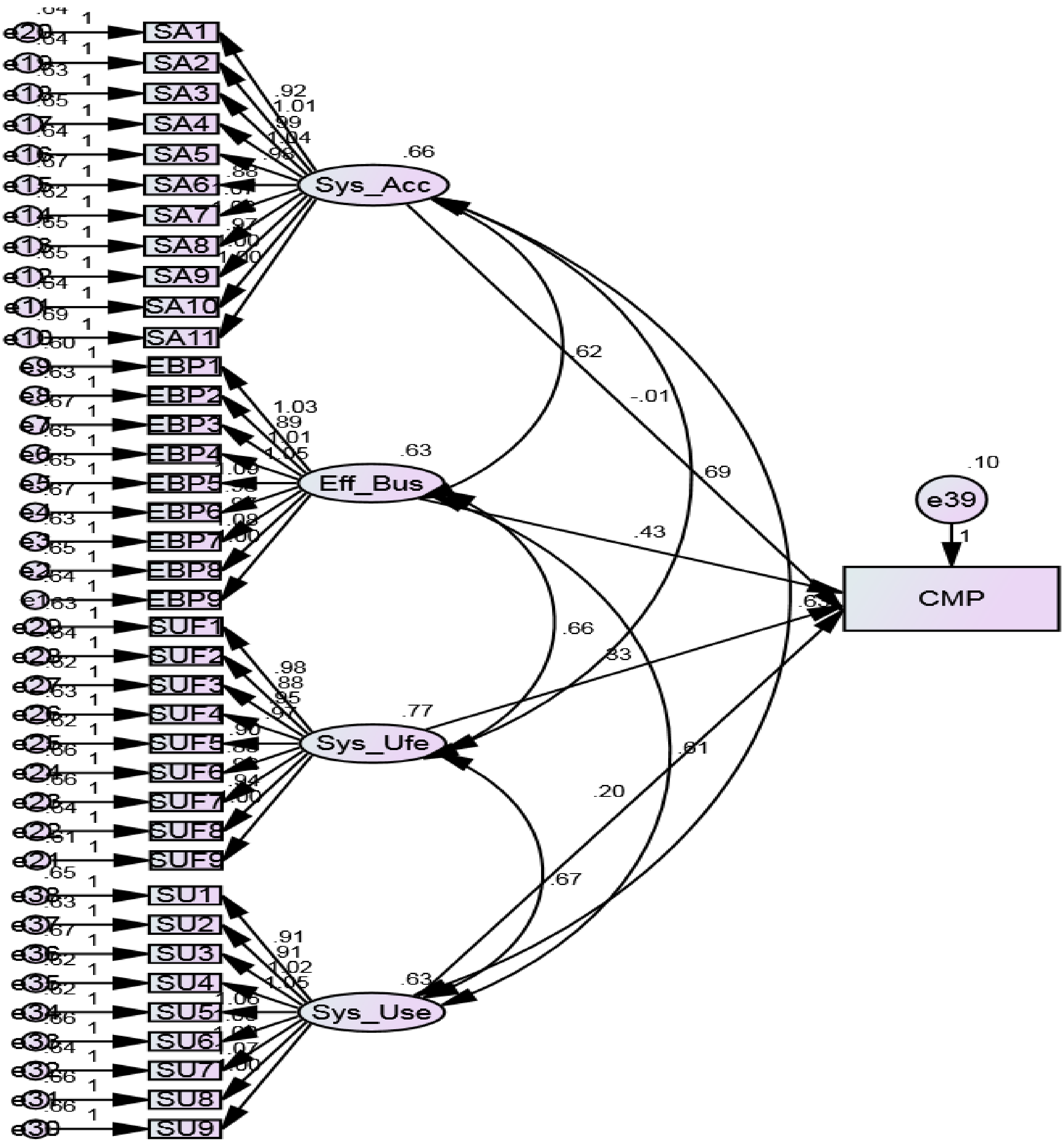


Table 7. 3: Relationship between total effect of system quality and total effect of Clinical measurement (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
EBP9	<---	Eff_Bus	1		0.704	
EBP8	<---	Eff_Bus	1.082	0.076	0.729	**<0.0001*** **
EBP7	<---	Eff_Bus	0.966	0.071	0.695	**<0.0001*** **
EBP6	<---	Eff_Bus	0.981	0.073	0.69	**<0.0001*** **
EBP5	<---	Eff_Bus	1.086	0.076	0.73	**<0.0001*** **
EBP4	<---	Eff_Bus	1.051	0.075	0.718	**<0.0001*** **
EBP3	<---	Eff_Bus	1.007	0.073	0.7	**<0.0001*** **
EBP2	<---	Eff_Bus	0.892	0.068	0.667	**<0.0001*** **
EBP1	<---	Eff_Bus	1.035	0.073	0.727	**<0.0001*** **
SA11	<---	Sys_Acc	1		0.7	
SA10	<---	Sys_Acc	0.997	0.072	0.71	**<0.0001*** **
SA9	<---	Sys_Acc	0.967	0.071	0.698	**<0.0001*** **
SA8	<---	Sys_Acc	1.03	0.073	0.721	**<0.0001*** **
SA7	<---	Sys_Acc	1.072	0.074	0.743	**<0.0001*** **
SA6	<---	Sys_Acc	0.88	0.068	0.658	**<0.0001*** **
SA5	<---	Sys_Acc	0.975	0.071	0.703	**<0.0001*** **
SA4	<---	Sys_Acc	1.039	0.073	0.724	**<0.0001*** **
SA3	<---	Sys_Acc	0.987	0.071	0.71	**<0.0001*** **
SA2	<---	Sys_Acc	1.008	0.072	0.714	**<0.0001*** **
SA1	<---	Sys_Acc	0.921	0.069	0.684	**<0.0001*** **
SUF9	<---	Sys_Ufe	1		0.747	
SUF8	<---	Sys_Ufe	0.94	0.063	0.719	**<0.0001*** **
SUF7	<---	Sys_Ufe	0.916	0.063	0.703	**<0.0001*** **
SUF6	<---	Sys_Ufe	0.834	0.06	0.67	**<0.0001*** **
SUF5	<---	Sys_Ufe	0.901	0.061	0.71	**<0.0001*** **
SUF4	<---	Sys_Ufe	0.968	0.063	0.732	**<0.0001*** **
SUF3	<---	Sys_Ufe	0.951	0.063	0.728	**<0.0001*** **
SUF2	<---	Sys_Ufe	0.877	0.061	0.694	**<0.0001*** **
SUF1	<---	Sys_Ufe	0.976	0.064	0.734	**<0.0001*** **
SU9	<---	Sys_Use	1		0.701	
SU8	<---	Sys_Use	1.065	0.076	0.722	**<0.0001*** **
SU7	<---	Sys_Use	1.003	0.073	0.707	**<0.0001*** **
SU6	<---	Sys_Use	1.03	0.074	0.711	**<0.0001*** **
SU5	<---	Sys_Use	1.056	0.074	0.729	**<0.0001*** **
SU4	<---	Sys_Use	1.05	0.074	0.729	**<0.0001*** **
SU3	<---	Sys_Use	1.023	0.074	0.706	**<0.0001*** **
SU2	<---	Sys_Use	0.905	0.069	0.671	**<0.0001*** **
SU1	<---	Sys_Use	0.914	0.07	0.671	**<0.0001*** **

CMP	<---	Sys_Acc	-0.011	0.216	-0.01	0.961
CMP	<---	Eff_Bus	0.427	0.171	0.405	**0.012***
CMP	<---	Sys_Ufe	0.334	0.152	0.351	**0.028***
CMP	<---	Sys_Use	0.204	0.223	0.194	0.361

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.859

Table 7.3 reveals that system quality is positively related to clinical measurements (performance). To inspect the theoretical interdependence between four factors namely system acceptance, the effectiveness of the business process, system usefulness, system use as an independent variable with clinical measurements (performance) as the dependent variable, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.4). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, the system quality is a positive influence on clinical measurements (performance). System quality could be able to explain that 86% of the variance in clinical measurements (performance) (R-Square value = 0.859).

Table 7. 4: Model fit summary

Variable	Value	Suggested value
Chi-square value	706.083	
Degrees of freedom (df)	693	
P value	0.357	P-value >0.05 (Hair et al., 2006)
GFI	0.924	>0.90 (Hair et al., 2006)
AGFI	0.915	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.007	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.4). The structural model, the quality of good fit was acceptable representation of the sample data (χ^2 (693)= 706.083, GFI (Goodness of Fit Index)=0.924; AGFI (Adjusted Goodness of Fit Index) = 0.915 and CFI=0.999 which is larger than the 0.90 criteria as suggested by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMSEA (Root Mean Square Error of Approximation) =0.007 and RMR (Root Mean Square Residuals) =0.030, values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.3 Hypotheses H1b: System quality is positively related to Operational measurements (Performance)

H1b: System quality is positively related to Operational measurements (Performance)

Figure 7. 3: Relationsship between total effect of system quality and total effect of operational measurement (performance)

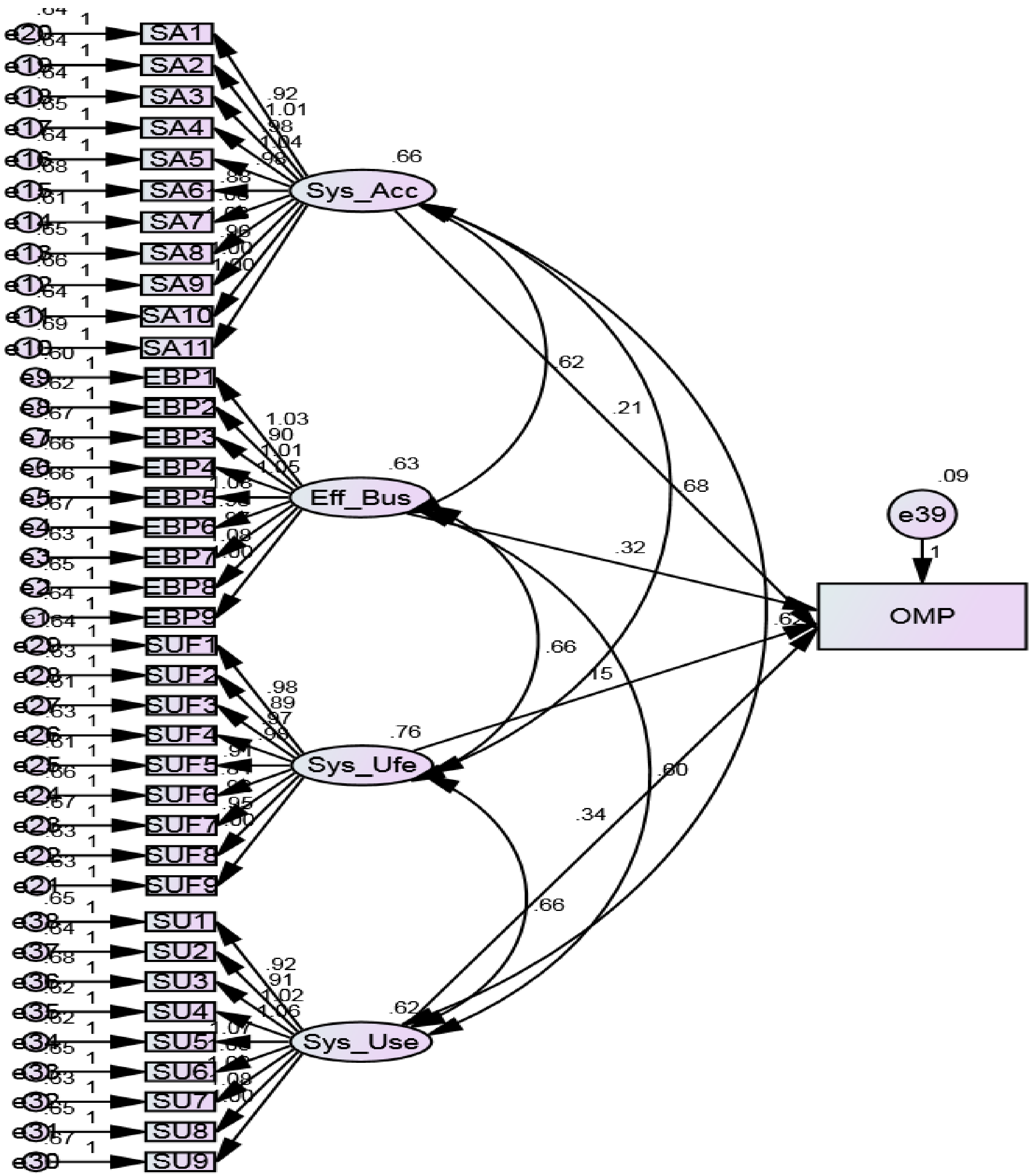


Table 7. 5: Relationsship between total effect of system quality and total effect of operational measurement (performance)

			Unstandardized coefficient	**S.E**	**Standardized coefficient**	**p-value**
EBP9	<---	Eff_Bus	1		0.704	
EBP8	<---	Eff_Bus	1.082	0.076	0.729	**<0.0001*** **
EBP7	<---	Eff_Bus	0.968	0.071	0.697	**<0.0001*** **
EBP6	<---	Eff_Bus	0.981	0.073	0.69	**<0.0001*** **
EBP5	<---	Eff_Bus	1.082	0.076	0.728	**<0.0001*** **
EBP4	<---	Eff_Bus	1.049	0.075	0.717	**<0.0001*** **
EBP3	<---	Eff_Bus	1.005	0.073	0.699	**<0.0001*** **
EBP2	<---	Eff_Bus	0.898	0.068	0.671	**<0.0001*** **
EBP1	<---	Eff_Bus	1.035	0.073	0.727	**<0.0001*** **
SA11	<---	Sys_Acc	1		0.741	
SA10	<---	Sys_Acc	0.952	0.064	0.723	**<0.0001*** **
SA9	<---	Sys_Acc	0.916	0.064	0.698	**<0.0001*** **
SA8	<---	Sys_Acc	0.843	0.061	0.673	**<0.0001*** **
SA7	<---	Sys_Acc	0.91	0.062	0.712	**<0.0001*** **
SA6	<---	Sys_Acc	0.975	0.064	0.732	**<0.0001*** **
SA5	<---	Sys_Acc	0.965	0.064	0.734	**<0.0001*** **
SA4	<---	Sys_Acc	0.888	0.062	0.698	**<0.0001*** **
SA3	<---	Sys_Acc	0.976	0.065	0.729	**<0.0001*** **
SA2	<---	Sys_Acc	1		0.694	
SA1	<---	Sys_Acc	1.084	0.077	0.727	**<0.0001*** **
SUF9	<---	Sys_Ufe	1.016	0.074	0.709	**<0.0001*** **
SUF8	<---	Sys_Ufe	1.047	0.076	0.716	**<0.0001*** **
SUF7	<---	Sys_Ufe	1.07	0.076	0.731	**<0.0001*** **
SUF6	<---	Sys_Ufe	1.059	0.075	0.728	**<0.0001*** **
SUF5	<---	Sys_Ufe	1.024	0.076	0.699	**<0.0001*** **
SUF4	<---	Sys_Ufe	0.913	0.07	0.67	**<0.0001*** **
SUF3	<---	Sys_Ufe	0.925	0.071	0.672	**<0.0001*** **
SUF2	<---	Sys_Ufe	1		0.699	
SUF1	<---	Sys_Ufe	1.002	0.072	0.713	**<0.0001*** **
SU9	<---	Sys_Use	0.963	0.071	0.694	**<0.0001*** **
SU8	<---	Sys_Use	1.032	0.073	0.721	**<0.0001*** **
SU7	<---	Sys_Use	1.079	0.074	0.746	**<0.0001*** **
SU6	<---	Sys_Use	0.877	0.068	0.655	**<0.0001*** **
SU5	<---	Sys_Use	0.98	0.071	0.705	**<0.0001*** **
SU4	<---	Sys_Use	1.04	0.074	0.724	**<0.0001*** **
SU3	<---	Sys_Use	0.985	0.071	0.707	**<0.0001*** **

SU2	<---	Sys_Use	1.01	0.072	0.714	**<0.0001*****
SU1	<---	Sys_Use	0.923	0.069	0.684	**<0.0001*****
OMP	<---	Sys_Acc	0.212	0.202	0.199	0.294
OMP	<---	Eff_Bus	0.317	0.159	0.291	**0.047***
OMP	<---	Sys_Ufe	0.145	0.144	0.147	0.313
OMP	<---	Sys_Use	0.344	0.216	0.314	0.111

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.878

Table 7.5 reveals that system quality is positively related to operational measurements (performance). To inspect the theoretical interdependence between four factors namely system acceptance, the effectiveness of the business process, system usefulness, system use as an independent variable with operational measurements (performance) as the dependent variable, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.6). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, the system quality is a positive influence on operational measurements (performance). System quality could be able to explain that 88% of the variance in operational measurements (performance) (R-Square value = 0.878).

Table 7. 6: Model fit summary

Variable	Value	Suggested value
Chi-square value	712.334	
Degrees of freedom (df)	693	
P value	0.297	P-value >0.05 (Hair et al., 2006)
GFI	0.923	>0.90 (Hair et al., 2006)
AGFI	0.914	> 0.90 (Hooper et al. 2008)
CFI	0.998	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.008	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.6). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (693)= 712.334, AGFI **(**Adjusted Goodness of Fit Index) = 0.914 and GFI (Goodness of Fit Index)=0.923 and CFI=0.998 which is greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMSEA **(**Root Mean Square Error of Approximation) =0.008 and RMR (Root Mean Square Residuals) =0.030, values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.4 Hypotheses H1c: System quality is positively related to financial measurements (Performance)

H1c: System quality is positively related to financial measurements (Performance)

Figure 7. 4: Relationsship between total effect of System Quality and total effect of hospital financial measurements (Performance)

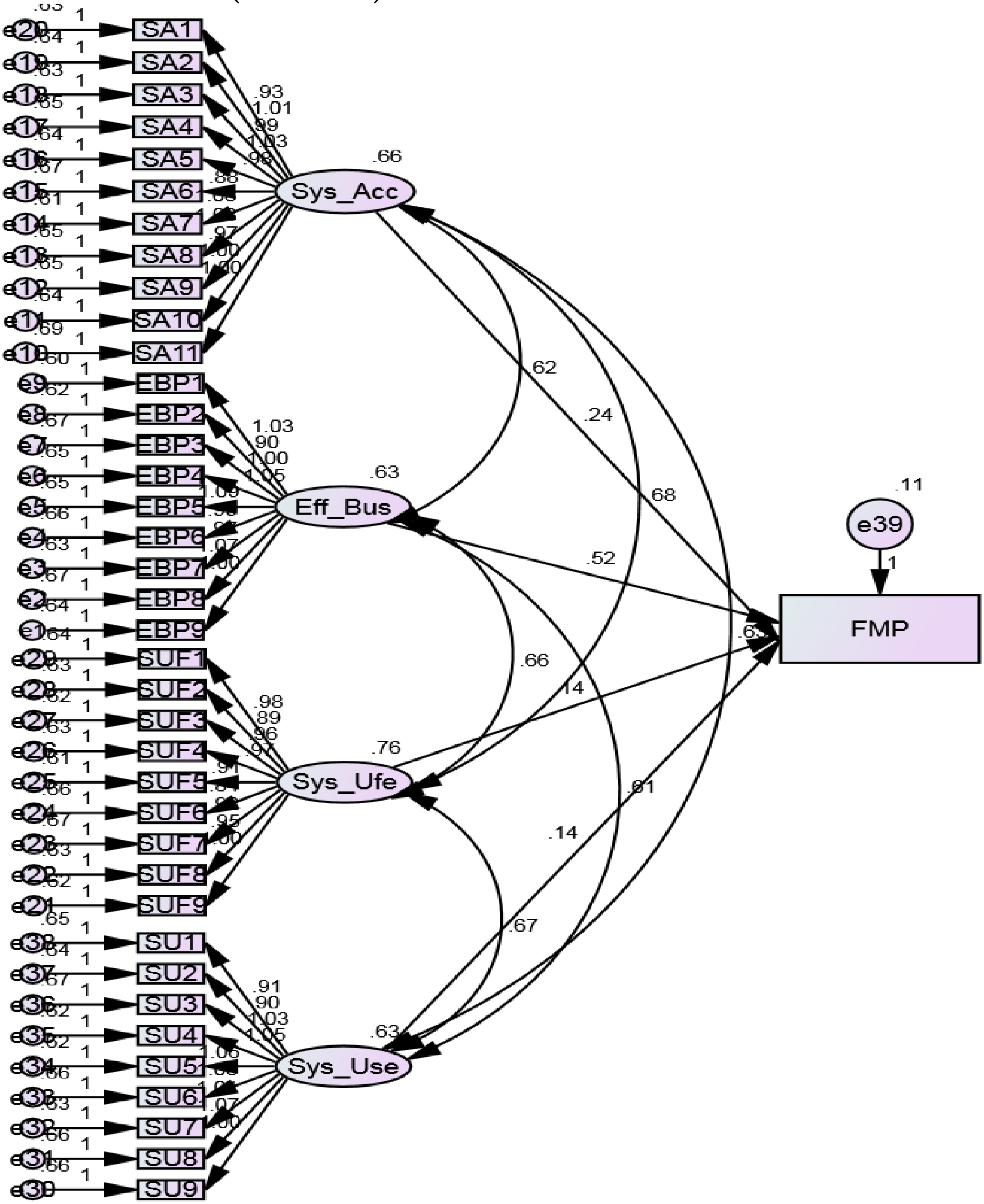


Table 7. 7: Relationsship between total effect of system quality and total effect of hospital financial measurement (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
EBP9	<---	Eff_Bus	1		0.704	
EBP8	<---	Eff_Bus	1.071	0.076	0.721	**<0.0001*** **
EBP7	<---	Eff_Bus	0.965	0.071	0.695	**<0.0001*** **
EBP6	<---	Eff_Bus	0.989	0.073	0.695	**<0.0001*** **
EBP5	<---	Eff_Bus	1.091	0.076	0.733	**<0.0001*** **
EBP4	<---	Eff_Bus	1.055	0.075	0.721	**<0.0001*** **
EBP3	<---	Eff_Bus	1.004	0.073	0.697	**<0.0001*** **
EBP2	<---	Eff_Bus	0.896	0.068	0.669	**<0.0001*** **
EBP1	<---	Eff_Bus	1.035	0.073	0.727	**<0.0001*** **
SA11	<---	Sys_Acc	1		0.741	
SA10	<---	Sys_Acc	0.951	0.064	0.722	**<0.0001*** **
SA9	<---	Sys_Acc	0.921	0.064	0.702	**<0.0001*** **
SA8	<---	Sys_Acc	0.842	0.061	0.671	**<0.0001*** **
SA7	<---	Sys_Acc	0.915	0.062	0.716	**<0.0001*** **
SA6	<---	Sys_Acc	0.975	0.064	0.732	**<0.0001*** **
SA5	<---	Sys_Acc	0.957	0.064	0.728	**<0.0001*** **
SA4	<---	Sys_Acc	0.886	0.062	0.697	**<0.0001*** **
SA3	<---	Sys_Acc	0.977	0.065	0.73	**<0.0001*** **
SA2	<---	Sys_Acc	1		0.699	
SA1	<---	Sys_Acc	1.068	0.076	0.723	**<0.0001*** **
SUF9	<---	Sys_Ufe	1.011	0.073	0.711	**<0.0001*** **
SUF8	<---	Sys_Ufe	1.029	0.074	0.71	**<0.0001*** **
SUF7	<---	Sys_Ufe	1.061	0.074	0.731	**<0.0001*** **
SUF6	<---	Sys_Ufe	1.052	0.074	0.729	**<0.0001*** **
SUF5	<---	Sys_Ufe	1.026	0.074	0.707	**<0.0001*** **
SUF4	<---	Sys_Ufe	0.901	0.069	0.667	**<0.0001*** **
SUF3	<---	Sys_Ufe	0.915	0.07	0.67	**<0.0001*** **
SUF2	<---	Sys_Ufe	1		0.699	
SUF1	<---	Sys_Ufe	1.005	0.072	0.714	**<0.0001*** **
SU9	<---	Sys_Use	0.966	0.071	0.696	**<0.0001*** **
SU8	<---	Sys_Use	1.031	0.073	0.721	**<0.0001*** **
SU7	<---	Sys_Use	1.076	0.074	0.744	**<0.0001*** **
SU6	<---	Sys_Use	0.88	0.069	0.656	**<0.0001*** **
SU5	<---	Sys_Use	0.977	0.071	0.703	**<0.0001*** **
SU4	<---	Sys_Use	1.034	0.074	0.72	**<0.0001*** **
SU3	<---	Sys_Use	0.988	0.071	0.709	**<0.0001*** **
SU2	<---	Sys_Use	1.013	0.073	0.716	**<0.0001*** **
SU1	<---	Sys_Use	0.927	0.069	0.688	**<0.0001*** **
FMP	<---	Sys_Acc	0.238	0.221	0.218	0.281
FMP	<---	Eff_Bus	0.518	0.179	0.465	**0.004** **
FMP	<---	Sys_Ufe	0.138	0.157	0.136	**0.38* **

FMP	<---	Sys_Use	0.136	0.232	0.122	0.558

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.862

Table 7.7 reveals that system quality is positively related to financial measurements (performance). To inspect the theoretical interdependence between four factors namely system acceptance, the effectiveness of the business process, system usefulness, system use as an independent variable with financial measurements (performance) as the dependent variable, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.8). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, the system quality is a positive influence on financial measurements (performance). System quality might be able to explain that 86% of the variance in financial measurements (performance) (R-Square value = 0.862).

Table 7. 8: Model fit summary

Variable	Value	Suggested value
Chi-square value	714.055	
Degrees of freedom (df)	693	
P value	0.282	P-value >0.05 (Hair et al., 2006)
GFI	0.923	>0.90 (Hair et al., 2006)
AGFI	0.914	> 0.90 (Hooper et al. 2008)
CFI	0.998	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.009	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.8). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (693)= 714.055, AGFI **(**Adjusted Goodness of Fit Index) = 0.914 and GFI (Goodness of Fit Index)=0.923 and CFI=0.998 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.030, CFI=0.998 and RMSEA **(**Root Mean Square Error of Approximation) =0.009 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.5 Hypotheses H2: Information quality is positively related to public hospital performance

H2: Information quality is positively related to public hospital performance

Figure 7. 5: Relationsship between total effect of Information Quality and total effect of public hospital performance

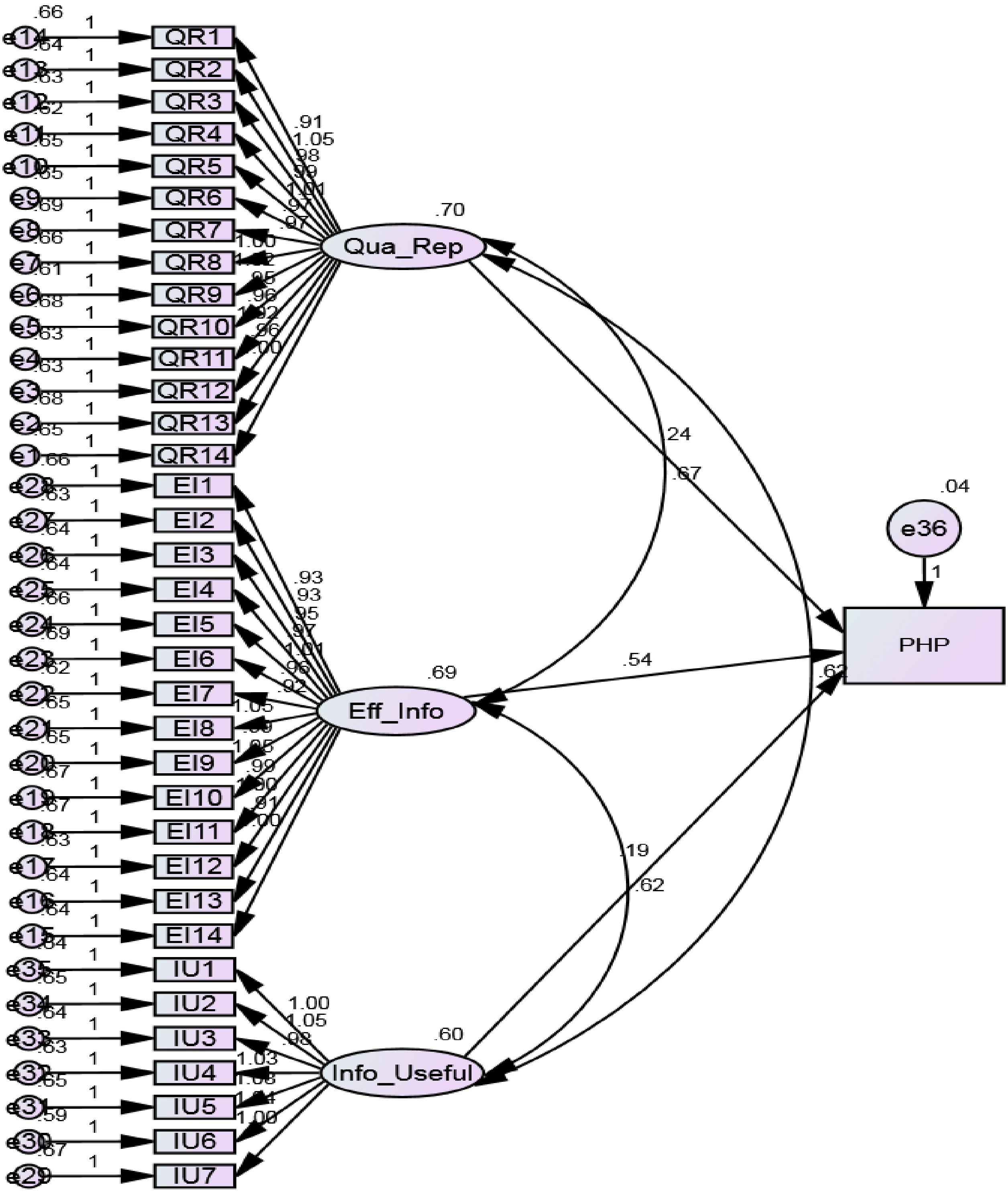


Table 7. 9: Relationsship between total effect of Information Quality and total effect of public hospital performance

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
QR14	<---	Qua_Rep	1.000		0.720	
QR13	<---	Qua_Rep	0.964	0.068	0.700	<0.0001***
QR12	<---	Qua_Rep	1.021	0.069	0.731	<0.0001***
QR11	<---	Qua_Rep	0.958	0.067	0.711	<0.0001***
QR10	<---	Qua_Rep	0.947	0.068	0.692	<0.0001***
QR9	<---	Qua_Rep	1.022	0.069	0.737	<0.0001***
QR8	<---	Qua_Rep	0.995	0.069	0.715	<0.0001***
QR7	<---	Qua_Rep	0.969	0.069	0.698	<0.0001***
QR6	<---	Qua_Rep	0.971	0.068	0.710	<0.0001***
QR5	<---	Qua_Rep	1.013	0.069	0.723	<0.0001***
QR4	<---	Qua_Rep	0.987	0.068	0.723	<0.0001***
QR3	<---	Qua_Rep	0.978	0.068	0.717	<0.0001***
QR2	<---	Qua_Rep	1.046	0.070	0.739	<0.0001***
QR1	<---	Qua_Rep	0.909	0.066	0.683	<0.0001***
EI14	<---	Eff_Info	1.000		0.720	
EI13	<---	Eff_Info	0.913	0.066	0.689	<0.0001***
EI12	<---	Eff_Info	1.003	0.068	0.724	<0.0001***
EI11	<---	Eff_Info	0.991	0.069	0.710	<0.0001***
EI10	<---	Eff_Info	1.049	0.071	0.729	<0.0001***
EI9	<---	Eff_Info	0.991	0.069	0.715	<0.0001***
EI8	<---	Eff_Info	1.049	0.070	0.735	<0.0001***
EI7	<---	Eff_Info	0.920	0.065	0.696	<0.0001***
EI6	<---	Eff_Info	0.965	0.069	0.695	<0.0001***
EI5	<---	Eff_Info	1.011	0.070	0.719	<0.0001***
EI4	<---	Eff_Info	0.970	0.068	0.711	<0.0001***
EI3	<---	Eff_Info	0.952	0.067	0.703	<0.0001***
EI2	<---	Eff_Info	0.927	0.066	0.696	<0.0001***
EI1	<---	Eff_Info	0.928	0.067	0.687	<0.0001***
IU7	<---	Info_Useful	1.000		0.687	
IU6	<---	Info_Useful	1.044	0.076	0.725	<0.0001***
IU5	<---	Info_Useful	1.085	0.079	0.721	<0.0001***
IU4	<---	Info_Useful	1.033	0.076	0.712	<0.0001***
IU3	<---	Info_Useful	0.983	0.075	0.690	<0.0001***
IU2	<---	Info_Useful	1.047	0.077	0.711	<0.0001***
IU1	<---	Info_Useful	0.998	0.075	0.696	<0.0001***
PHP	<---	Qua_Rep	0.245	0.133	0.250	0.065
PHP	<---	Eff_Info	0.545	0.134	0.553	<0.0001***
PHP	<---	Info_Useful	0.186	0.125	0.176	0.138

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.938

Table 7.9 depicts the total effect of all items of information quality on the total effect of all items of public hospital performance. To inspect the theoretical interdependence between information quality as an independent variable with public hospital performance as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.10). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, quality of report, Effectiveness of information and information usefulness has a positive influence on public hospital performance. Therefore, information quality has positive influence on public hospital performance. Information quality might be able to explain that 94% of the variance in public hospital performance (R-Square value = 0.938).

Table 7. 10: Model fit summary

Variable	Value	Suggested value
Chi-square value	581.327	
Degrees of freedom (df)	589	
P value	0.581	P-value >0.05 (Hair et al., 2006)
GFI	0.930	>0.90 (Hair et al., 2006)
AGFI	0.921	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.10). The structural model, the quality of fit was suitable representation of the sample data χ^2 (589)= 581.327, AGFI **(**Adjusted Goodness of Fit Index) = 0.921 and GFI (Goodness of Fit Index)=0.930 and CFI (Comparative Fit Index)=1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.6 Hpotheses H2a: Information quality is positively related to Clinical measurements (performance)

H2a: Information quality is positively related to Clinical measurements (performance)

Figure 7. 6: Relationsship between total effect of Information Quality and total effect of Clinical measurements (performance)

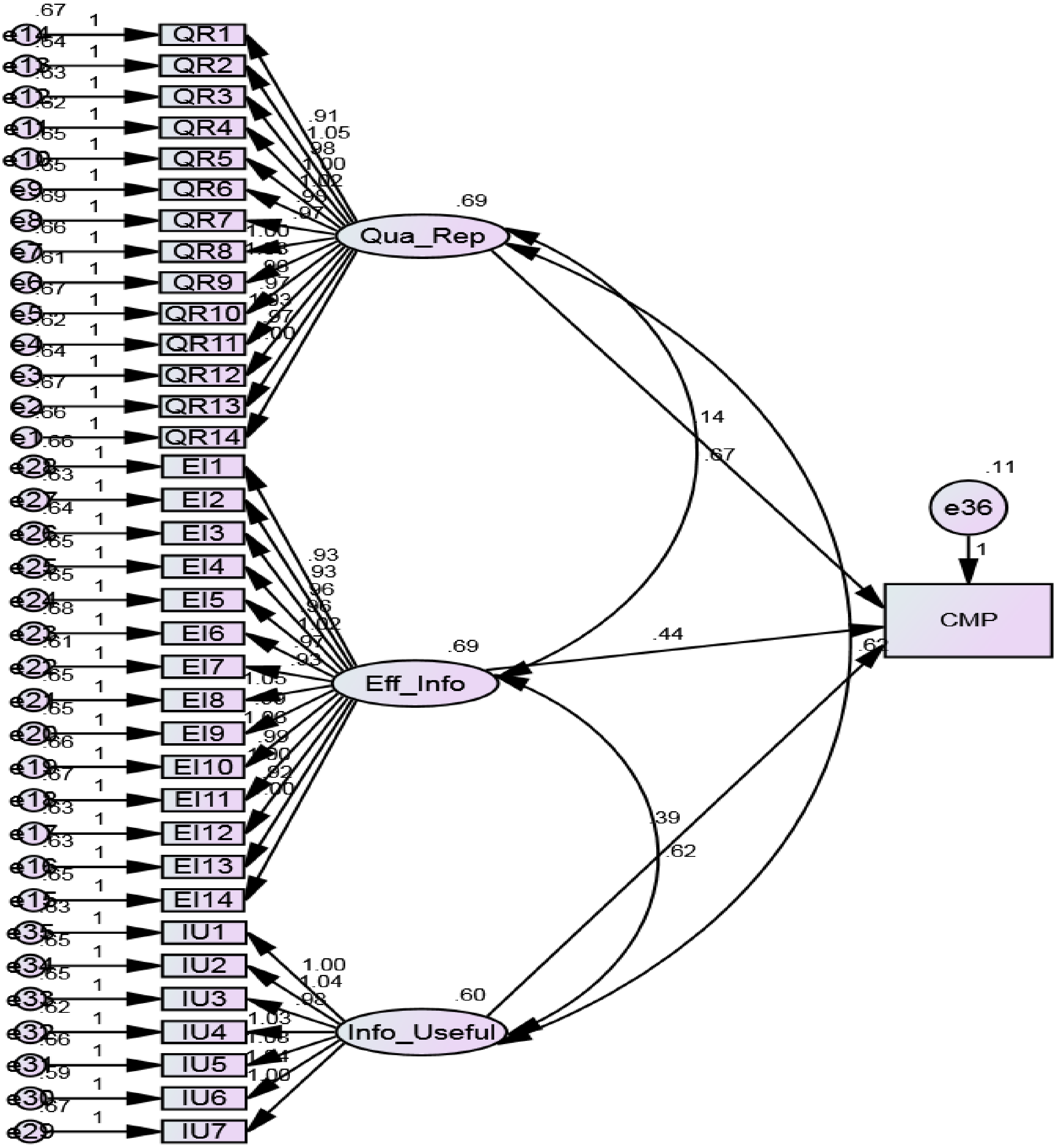


Table 7. 11: Relationsship between total effect of Information Quality and total effect of Clinical measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
QR14	<---	Qua_Rep	1		0.715	
QR13	<---	Qua_Rep	0.973	0.069	0.702	**<0.0001*** **
QR12	<---	Qua_Rep	1.025	0.07	0.73	**<0.0001*** **
QR11	<---	Qua_Rep	0.968	0.068	0.714	**<0.0001*** **
QR10	<---	Qua_Rep	0.959	0.069	0.696	**<0.0001*** **
QR9	<---	Qua_Rep	1.03	0.07	0.737	**<0.0001*** **
QR8	<---	Qua_Rep	1.002	0.07	0.716	**<0.0001*** **
QR7	<---	Qua_Rep	0.974	0.07	0.697	**<0.0001*** **
QR6	<---	Qua_Rep	0.978	0.069	0.71	**<0.0001*** **
QR5	<---	Qua_Rep	1.02	0.07	0.724	**<0.0001*** **
QR4	<---	Qua_Rep	0.995	0.069	0.724	**<0.0001*** **
QR3	<---	Qua_Rep	0.984	0.069	0.717	**<0.0001*** **
QR2	<---	Qua_Rep	1.05	0.071	0.736	**<0.0001*** **
QR1	<---	Qua_Rep	0.909	0.067	0.679	**<0.0001*** **
EI14	<---	Eff_Info	1		0.717	
EI13	<---	Eff_Info	0.919	0.066	0.692	**<0.0001*** **
EI12	<---	Eff_Info	1	0.069	0.721	**<0.0001*** **
EI11	<---	Eff_Info	0.99	0.07	0.707	**<0.0001*** **
EI10	<---	Eff_Info	1.06	0.072	0.735	**<0.0001*** **
EI9	<---	Eff_Info	0.991	0.069	0.712	**<0.0001*** **
EI8	<---	Eff_Info	1.05	0.071	0.734	**<0.0001*** **
EI7	<---	Eff_Info	0.929	0.066	0.701	**<0.0001*** **
EI6	<---	Eff_Info	0.975	0.069	0.7	**<0.0001*** **
EI5	<---	Eff_Info	1.017	0.07	0.721	**<0.0001*** **
EI4	<---	Eff_Info	0.964	0.068	0.705	**<0.0001*** **
EI3	<---	Eff_Info	0.956	0.068	0.704	**<0.0001*** **
EI2	<---	Eff_Info	0.926	0.067	0.694	**<0.0001*** **
EI1	<---	Eff_Info	0.933	0.067	0.689	**<0.0001*** **
IU7	<---	Info_Useful	1		0.688	
IU6	<---	Info_Useful	1.043	0.075	0.726	**<0.0001*** **
IU5	<---	Info_Useful	1.08	0.079	0.719	**<0.0001*** **
IU4	<---	Info_Useful	1.033	0.076	0.713	**<0.0001*** **
IU3	<---	Info_Useful	0.977	0.074	0.687	**<0.0001*** **
IU2	<---	Info_Useful	1.044	0.077	0.71	**<0.0001*** **
IU1	<---	Info_Useful	1	0.075	0.698	**<0.0001*** **
CMP	<---	Qua_Rep	0.136	0.195	0.135	0.484
CMP	<---	Eff_Info	0.438	0.191	0.433	**0.022***
CMP	<---	Info_Useful	0.39	0.186	0.362	**0.036***

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.846

Table 7.11 reveals that information quality is positively related to clinical measurements (performance). To inspect the theoretical interdependence between three factors namely Quality of report, Effectiveness of information and Information usefulness as an independent variable with clinical measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.12). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, Effectiveness of information, Quality of report and Information usefulness are a positive influence on clinical measurements (performance). Therefore, information quality has positive influence on clinical measurements (performance). Information quality could be able to explain that 85% of the variance in clinical measurements (performance) (R-Square value = 0.846).

Table 7. 12: Model fit summary

Variable	Value	Suggested value
Chi-square value	577.657	
Degrees of freedom (df)	589	
P value	0.623	P-value >0.05 (Hair et al., 2006)
GFI	0.930	>0.90 (Hair et al., 2006)
AGFI	0.921	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.12). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (589)= 577.657, AGFI **(**Adjusted Goodness of Fit Index) = 0.921 and GFI (Goodness of Fit Index)=0.930 and CFI (Comparative Fit Index)= 1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.7 Hpotheses H2b: Information quality is positively related to Operational measurements (Performance)

H2b: Information quality is positively related to Operational measurements (Performance)

Figure 7. 7: Relationsship between total effect of Information Quality and total effect of operational measurements (performance)

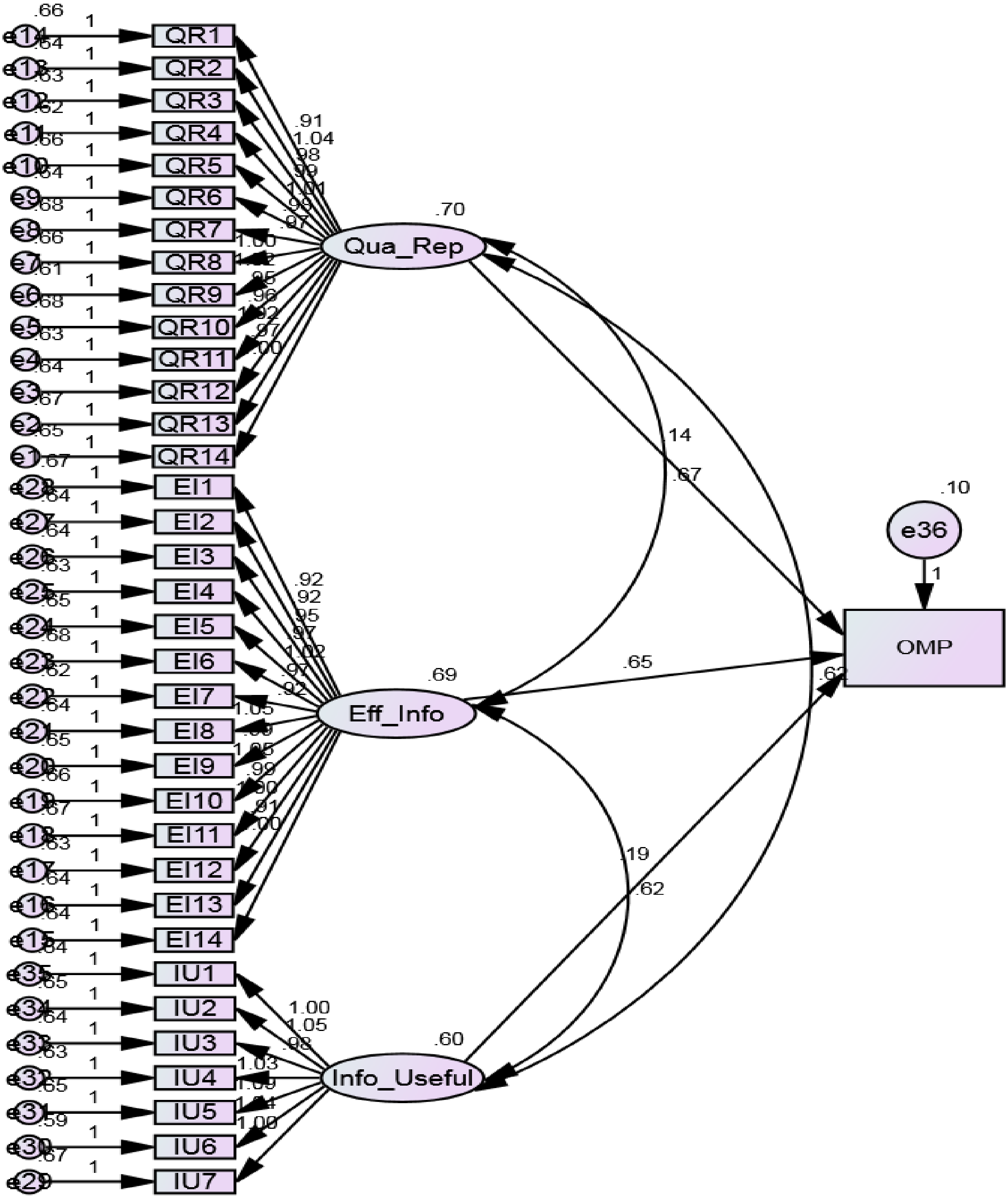


Table 7. 13: Relationsship between total effect of Information Quality and total effect of operational measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
QR14	<---	Qua_Rep	1		0.719	
QR13	<---	Qua_Rep	0.972	0.069	0.705	**<0.0001*** **
QR12	<---	Qua_Rep	1.015	0.069	0.726	**<0.0001*** **
QR11	<---	Qua_Rep	0.956	0.067	0.709	**<0.0001*** **
QR10	<---	Qua_Rep	0.949	0.068	0.692	**<0.0001*** **
QR9	<---	Qua_Rep	1.024	0.069	0.737	**<0.0001*** **
QR8	<---	Qua_Rep	1	0.069	0.718	**<0.0001*** **
QR7	<---	Qua_Rep	0.974	0.069	0.701	**<0.0001*** **
QR6	<---	Qua_Rep	0.978	0.068	0.714	**<0.0001*** **
QR5	<---	Qua_Rep	1.012	0.07	0.722	**<0.0001*** **
QR4	<---	Qua_Rep	0.988	0.068	0.723	**<0.0001*** **
QR3	<---	Qua_Rep	0.98	0.068	0.717	**<0.0001*** **
QR2	<---	Qua_Rep	1.042	0.07	0.735	**<0.0001*** **
QR1	<---	Qua_Rep	0.907	0.066	0.681	**<0.0001*** **
EI14	<---	Eff_Info	1		0.72	
EI13	<---	Eff_Info	0.912	0.066	0.689	**<0.0001*** **
EI12	<---	Eff_Info	0.997	0.069	0.721	**<0.0001*** **
EI11	<---	Eff_Info	0.988	0.069	0.708	**<0.0001*** **
EI10	<---	Eff_Info	1.054	0.071	0.734	**<0.0001*** **
EI9	<---	Eff_Info	0.99	0.069	0.714	**<0.0001*** **
EI8	<---	Eff_Info	1.049	0.071	0.736	**<0.0001*** **
EI7	<---	Eff_Info	0.919	0.066	0.695	**<0.0001*** **
EI6	<---	Eff_Info	0.97	0.069	0.699	**<0.0001*** **
EI5	<---	Eff_Info	1.017	0.07	0.724	**<0.0001*** **
EI4	<---	Eff_Info	0.971	0.068	0.712	**<0.0001*** **
EI3	<---	Eff_Info	0.954	0.067	0.705	**<0.0001*** **
EI2	<---	Eff_Info	0.919	0.066	0.691	**<0.0001*** **
EI1	<---	Eff_Info	0.923	0.067	0.684	**<0.0001*** **
IU7	<---	Info_Useful	1		0.687	
IU6	<---	Info_Useful	1.042	0.076	0.724	**<0.0001*** **
IU5	<---	Info_Useful	1.086	0.079	0.722	**<0.0001*** **
IU4	<---	Info_Useful	1.033	0.076	0.712	**<0.0001*** **
IU3	<---	Info_Useful	0.985	0.075	0.691	**<0.0001*** **
IU2	<---	Info_Useful	1.046	0.077	0.711	**<0.0001*** **
IU1	<---	Info_Useful	0.995	0.075	0.694	**<0.0001*** **
OMP	<---	Qua_Rep	0.144	0.191	0.139	0.451
OMP	<---	Eff_Info	0.65	0.192	0.625	**<0.0001*** **
OMP	<---	Info_Useful	0.194	0.179	0.174	0.279

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.864

Table 7.13 depicts that information quality is positively related to operational measurements (performance). To inspect the theoretical interdependence between three factors namely Quality of report, Effectiveness of information and Information usefulness as an independent variable with operational measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.14). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, Effectiveness of information, Quality of report and Information usefulness are a positive influence on operational measurements (performance). Therefore, Information Quality is a positive influence on operational measurements (performance). Information quality could be able to explain that 86% of the variance in clinical measurements (performance) (R-Square value = 0.864).

Table 7. 14: Model fit summary

Variable	Value	Suggested value
Chi-square value	583.860	
Degrees of freedom (df)	589	
P value	0.552	P-value >0.05 (Hair et al., 2006)
GFI	0.930	>0.90 (Hair et al., 2006)
AGFI	0.921	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.14). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (589)= 583.860, AGFI **(**Adjusted Goodness of Fit Index) = 0.921 and GFI (Goodness of Fit Index)=0.930 and CFI (Comparative Fit Index)= 1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.8 Hypotheses H2c: Information quality is positively related to financial measurements (Performance)

H2c: Information quality is positively related to financial measurements (Performance)

Figure 7. 8: Relationsship between total effect of Information Quality and total effect of financial measurements (performance)

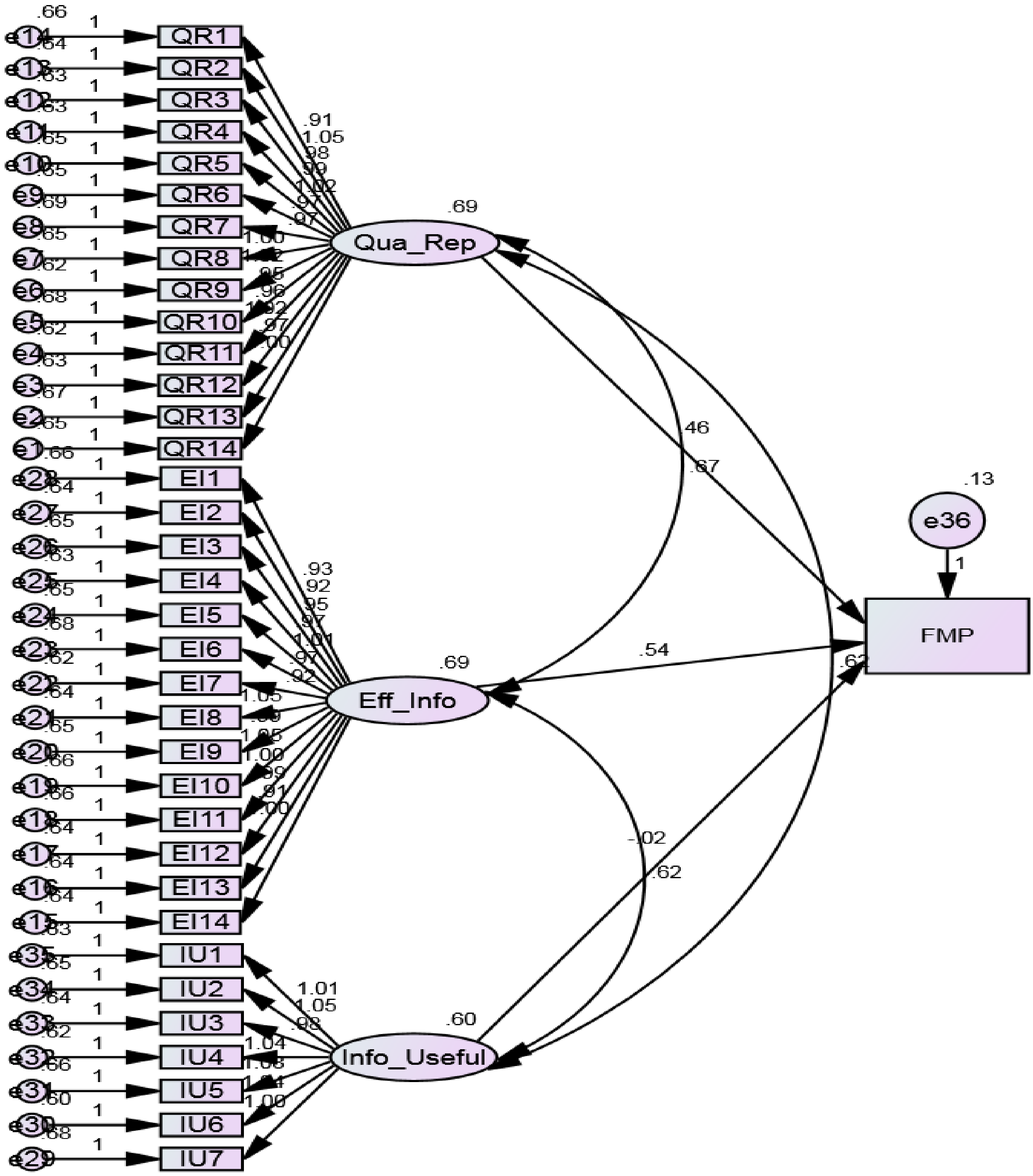


Table 7. 15: Relationsship between total effect of Information Quality and total effect of financial measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
QR14	<---	Qua_Rep	1		0.718	
QR13	<---	Qua_Rep	0.967	0.069	0.700	<0.0001***
QR12	<---	Qua_Rep	1.023	0.070	0.731	<0.0001***
QR11	<---	Qua_Rep	0.962	0.067	0.712	<0.0001***
QR10	<---	Qua_Rep	0.950	0.068	0.692	<0.0001***
QR9	<---	Qua_Rep	1.022	0.069	0.734	<0.0001***
QR8	<---	Qua_Rep	1.003	0.069	0.719	<0.0001***
QR7	<---	Qua_Rep	0.969	0.069	0.696	<0.0001***
QR6	<---	Qua_Rep	0.973	0.068	0.709	<0.0001***
QR5	<---	Qua_Rep	1.019	0.070	0.725	<0.0001***
QR4	<---	Qua_Rep	0.986	0.068	0.720	<0.0001***
QR3	<---	Qua_Rep	0.984	0.068	0.719	<0.0001***
QR2	<---	Qua_Rep	1.048	0.071	0.738	<0.0001***
QR1	<---	Qua_Rep	0.914	0.067	0.685	<0.0001***
EI14	<---	Eff_Info	1		0.719	
EI13	<---	Eff_Info	0.912	0.066	0.688	<0.0001***
EI12	<---	Eff_Info	0.993	0.069	0.717	<0.0001***
EI11	<---	Eff_Info	0.996	0.069	0.713	<0.0001***
EI10	<---	Eff_Info	1.052	0.071	0.731	<0.0001***
EI9	<---	Eff_Info	0.993	0.069	0.716	<0.0001***
EI8	<---	Eff_Info	1.051	0.071	0.737	<0.0001***
EI7	<---	Eff_Info	0.920	0.066	0.696	<0.0001***
EI6	<---	Eff_Info	0.968	0.069	0.697	<0.0001***
EI5	<---	Eff_Info	1.015	0.07	0.722	<0.0001***
EI4	<---	Eff_Info	0.972	0.068	0.712	<0.0001***
EI3	<---	Eff_Info	0.948	0.067	0.700	<0.0001***
EI2	<---	Eff_Info	0.920	0.066	0.691	<0.0001***
EI1	<---	Eff_Info	0.932	0.067	0.691	<0.0001***
IU7	<---	Info_Useful	1		0.686	
IU6	<---	Info_Useful	1.043	0.076	0.723	<0.0001***
IU5	<---	Info_Useful	1.082	0.08	0.718	<0.0001***
IU4	<---	Info_Useful	1.040	0.077	0.715	<0.0001***
IU3	<---	Info_Useful	0.982	0.075	0.688	<0.0001***
IU2	<---	Info_Useful	1.049	0.078	0.711	<0.0001***
IU1	<---	Info_Useful	1.006	0.076	0.700	<0.0001***
FMP	<---	Qua_Rep	0.461	0.209	0.434	0.027*
FMP	<---	Eff_Info	0.540	0.207	0.507	0.009**
FMP	<---	Info_Useful	-0.025	0.199	-0.022	0.901

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.834

Table 7.15 depicts that information quality is positively related to financial measurements (performance). To inspect the theoretical interdependence between three factors namely Quality of report, Effectiveness of information and Information usefulness as an independent variable with financial measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.16). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, quality of report and the effectiveness of information and information usefulness are a positive influence on financial measurements (performance). Hence, Information quality has a positive impact on financial measurements (performance). Information quality could be able to explain that 83% of the variance in financial measurements (performance) (R-Square value = 0.834).

Table 7. 16: Model fit summary

Variable	Value	Suggested value
Chi-square value	584.495	
Degrees of freedom (df)	589	
P value	0.545	P-value >0.05 (Hair et al., 2006)
GFI	0.930	>0.90 (Hair et al., 2006)
AGFI	0.921	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.16). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (589)= 584.495, AGFI **(**Adjusted Goodness of Fit Index) = 0.921 and GFI (Goodness of Fit Index)=0.930 and CFI (Comparative Fit Index)= 1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.9 Hypotheses H3: HIS Service provider quality is positively related to public hospital performance

H3: HIS Service provider quality is positively related to public hospital performance

Figure 7. 9: Relationsship between total effect of service provider quality and total effect of public hospital performance

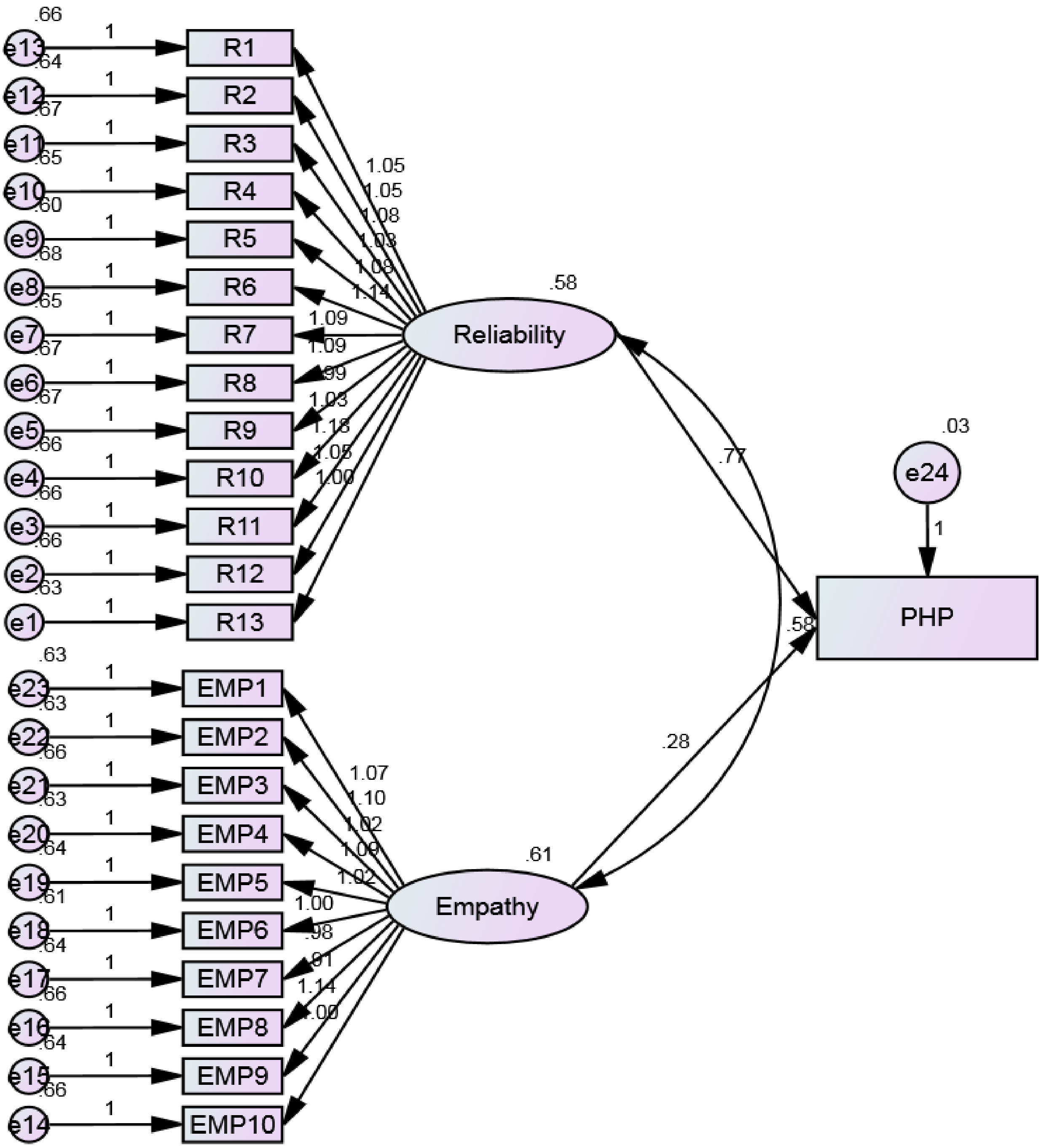


Table 7. 17: Relationsship between total effect of service provider quality and total effect of public hospital performance

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
R13	<---	Reliability	1		0.691	**<0.0001*** **
R12	<---	Reliability	1.046	0.077	0.699	**<0.0001*** **
R11	<---	Reliability	1.181	0.082	0.742	**<0.0001*** **
R10	<---	Reliability	1.031	0.076	0.693	**<0.0001*** **
R9	<---	Reliability	0.986	0.075	0.676	**<0.0001*** **
R8	<---	Reliability	1.089	0.079	0.712	**<0.0001*** **
R7	<---	Reliability	1.085	0.078	0.715	**<0.0001*** **
R6	<---	Reliability	1.145	0.081	0.725	**<0.0001*** **
R5	<---	Reliability	1.085	0.077	0.728	**<0.0001*** **
R4	<---	Reliability	1.03	0.076	0.697	**<0.0001*** **
R3	<---	Reliability	1.08	0.079	0.707	**<0.0001*** **
R2	<---	Reliability	1.045	0.076	0.704	**<0.0001*** **
R1	<---	Reliability	1.047	0.077	0.699	**<0.0001*** **
EMP10	<---	Empathy	1		0.694	
EMP9	<---	Empathy	1.139	0.079	0.743	**<0.0001*** **
EMP8	<---	Empathy	0.911	0.071	0.66	**<0.0001*** **
EMP7	<---	Empathy	0.984	0.073	0.694	**<0.0001*** **
EMP6	<---	Empathy	0.997	0.073	0.707	**<0.0001*** **
EMP5	<---	Empathy	1.016	0.074	0.704	**<0.0001*** **
EMP4	<---	Empathy	1.089	0.077	0.731	**<0.0001*** **
EMP3	<---	Empathy	1.024	0.075	0.703	**<0.0001*** **
EMP2	<---	Empathy	1.097	0.077	0.734	**<0.0001*** **
EMP1	<---	Empathy	1.071	0.076	0.725	**<0.0001*** **
PHP	<---	Reliability	0.77	0.136	0.715	**<0.0001*** **
PHP	<---	Empathy	0.282	0.128	0.269	**0.027***

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.958

Table 7.17 depicts the total effect of all items of service provider quality on the total effect of all items of public hospital performance. To inspect the theoretical interdependence between service provider quality as an independent variable with public hospital performance as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.18). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, reliability and empathy has a positive influence on public hospital performance. Hence service provider quality has a positive impact on public hospital performance.

Service provider quality might be able to explain that 96% of the variance in public hospital performance (R-Square value = 0.958).

Table 7. 18: Model fit summary

Variable	Value	Suggested value
Chi-square value	253.516	
Degrees of freedom (df)	250	
P value	0.426	P-value >0.05 (Hair et al., 2006)
GFI	0.952	>0.90 (Hair et al., 2006)
AGFI	0.943	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.006	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.18). The structural model, the quality of fit was suitable representation of the sample data χ^2 (250)= 253.516, AGFI (Adjusted Goodness of Fit Index) = 0.943 and GFI (Goodness of Fit Index)=0.952 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA (Root Mean Square Error of Approximation) =0.006 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.10 Hypotheses H3a: Service provider quality is positively related to Clinical measurements (performance)

H3a: Service provider quality is positively related to Clinical measurements (performance)

Figure 7. 10: Relationsship between total effect of service provider quality and total effect of Clinical measurements (performance)

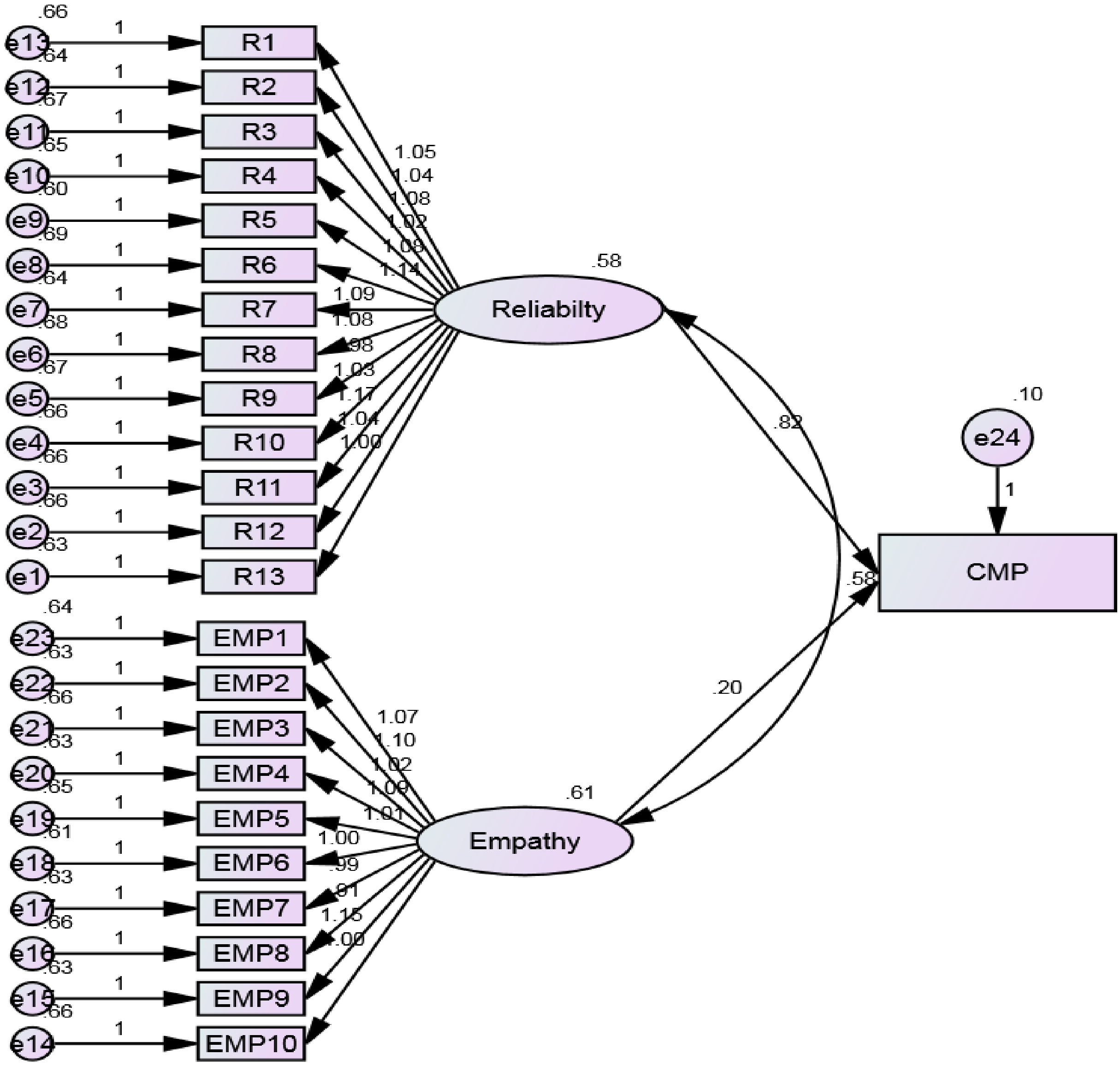


Table 7. 19: Relationsship between total effect of service provider quality and total effect of Clinical measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
R13	<---	Reliability	1		0.693	
R12	<---	Reliability	1.043	0.077	0.699	**<0.0001*** **
R11	<---	Reliability	1.173	0.082	0.739	**<0.0001*** **
R10	<---	Reliability	1.03	0.077	0.695	**<0.0001*** **
R9	<---	Reliability	0.984	0.075	0.676	**<0.0001*** **
R8	<---	Reliability	1.078	0.079	0.707	**<0.0001*** **
R7	<---	Reliability	1.087	0.078	0.718	**<0.0001*** **
R6	<---	Reliability	1.137	0.081	0.722	**<0.0001*** **
R5	<---	Reliability	1.084	0.077	0.729	**<0.0001*** **
R4	<---	Reliability	1.024	0.076	0.694	**<0.0001*** **
R3	<---	Reliability	1.081	0.079	0.71	**<0.0001*** **
R2	<---	Reliability	1.042	0.077	0.704	**<0.0001*** **
R1	<---	Reliability	1.051	0.077	0.703	**<0.0001*** **
EMP10	<---	Empathy	1		0.694	
EMP9	<---	Empathy	1.147	0.080	0.747	**<0.0001*** **
EMP8	<---	Empathy	0.911	0.072	0.659	**<0.0001*** **
EMP7	<---	Empathy	0.989	0.074	0.697	**<0.0001*** **
EMP6	<---	Empathy	0.998	0.073	0.707	**<0.0001*** **
EMP5	<---	Empathy	1.012	0.075	0.701	**<0.0001*** **
EMP4	<---	Empathy	1.092	0.078	0.732	**<0.0001*** **
EMP3	<---	Empathy	1.025	0.076	0.702	**<0.0001*** **
EMP2	<---	Empathy	1.098	0.078	0.733	**<0.0001*** **
EMP1	<---	Empathy	1.067	0.077	0.722	**<0.0001*** **
CMP	<---	Reliability	0.821	0.198	0.748	**<0.0001*** **
CMP	<---	Empathy	0.196	0.190	0.182	0.302

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.864

Table 7.19 depicts that service provider quality is positively related to clinical measurements (performance). To inspect the theoretical interdependence between two factors namely reliability and empathy as an independent variable with clinical measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.20). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, empathy and reliability has a positive influence on hospital clinical measurements (performance). Hence service provider quality has a positive impact on clinical measurements (performance). Service provider quality might be able to explain that 86% of the variance in clinical measurements (performance) (R-Square value = 0.864).

Table 7. 20: Model fit summary

Variable	Value	Suggested value
Chi-square value	266.953	
Degrees of freedom (df)	250	
P value	0.220	P-value >0.05 (Hair et al., 2006)
GFI	0.950	>0.90 (Hair et al., 2006)
AGFI	0.940	> 0.90 (Hooper et al. 2008)
CFI	0.997	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.013	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.20). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (250)= 266.953, AGFI **(**Adjusted Goodness of Fit Index) = 0.940 and GFI (Goodness of Fit Index)=0.950 and CFI (Comparative Fit Index)=0.997 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.013 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.11 Hypotheses H3b: Service provider quality is positively related to Operational measurements (Performance)

H3b: Service provider quality is positively related to Operational measurements (Performance)

Figure 7. 11: Relationsship between total effect of service provider quality and total effect of operational measurements (performance)

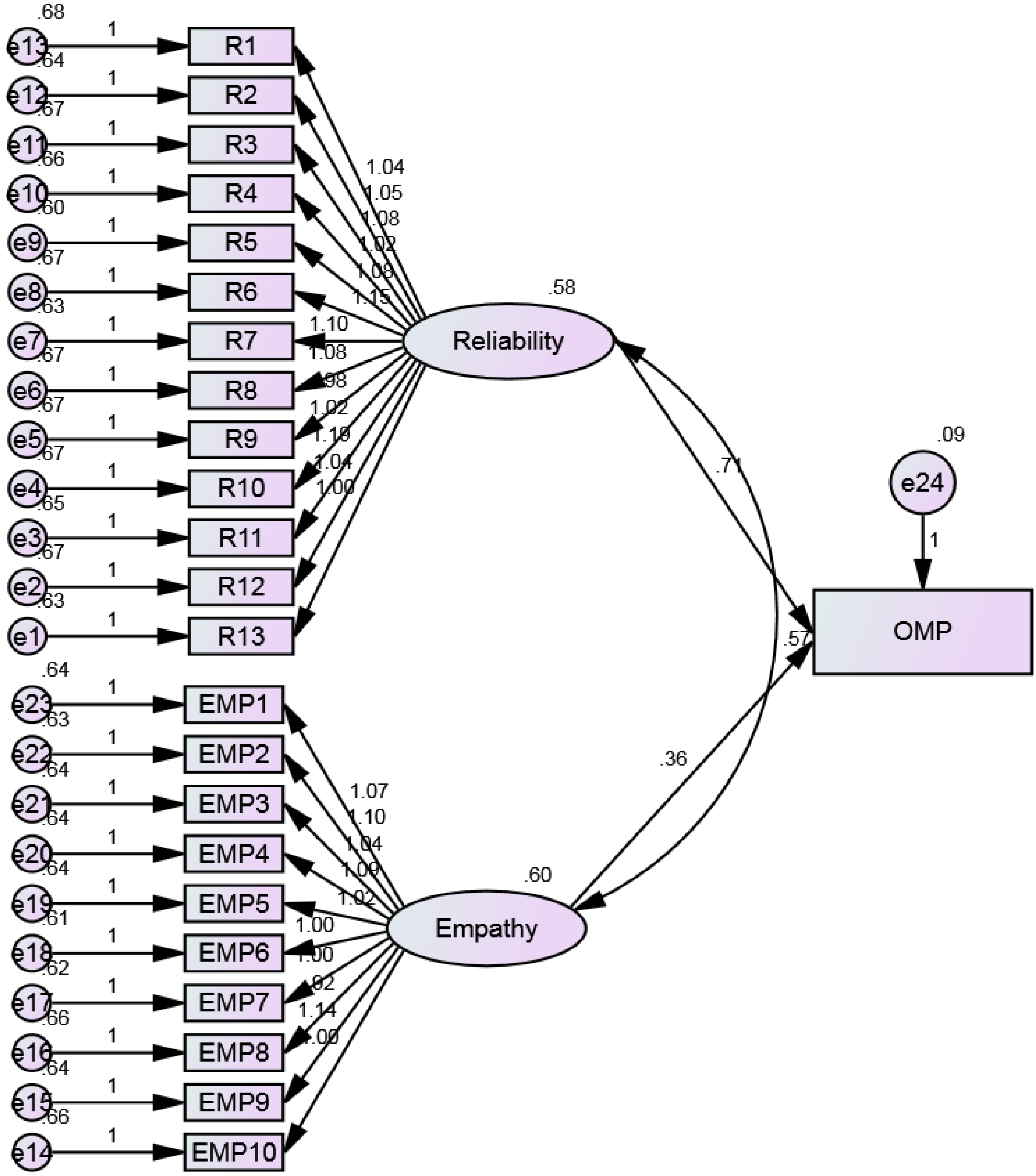


Table 7. 21: Relationsship between total effect of service provider quality and total effect of operational measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
R13	<---	Reliability	1		0.692	
R12	<---	Reliability	1.038	0.077	0.695	**<0.0001*** **
R11	<---	Reliability	1.186	0.082	0.746	**<0.0001*** **
R10	<---	Reliability	1.024	0.077	0.689	**<0.0001*** **
R9	<---	Reliability	0.981	0.075	0.673	**<0.0001*** **
R8	<---	Reliability	1.083	0.079	0.709	**<0.0001*** **
R7	<---	Reliability	1.098	0.079	0.724	**<0.0001*** **
R6	<---	Reliability	1.153	0.082	0.731	**<0.0001*** **
R5	<---	Reliability	1.082	0.077	0.727	**<0.0001*** **
R4	<---	Reliability	1.02	0.076	0.691	**<0.0001*** **
R3	<---	Reliability	1.084	0.079	0.711	**<0.0001*** **
R2	<---	Reliability	1.046	0.077	0.705	**<0.0001*** **
R1	<---	Reliability	1.036	0.077	0.692	**<0.0001*** **
EMP10	<---	Empathy	1		0.690	
EMP9	<---	Empathy	1.144	0.081	0.742	**<0.0001*** **
EMP8	<---	Empathy	0.917	0.072	0.661	**<0.0001*** **
EMP7	<---	Empathy	1	0.074	0.702	**<0.0001*** **
EMP6	<---	Empathy	0.997	0.074	0.703	**<0.0001*** **
EMP5	<---	Empathy	1.021	0.076	0.703	**<0.0001*** **
EMP4	<---	Empathy	1.093	0.078	0.729	**<0.0001*** **
EMP3	<---	Empathy	1.042	0.076	0.711	**<0.0001*** **
EMP2	<---	Empathy	1.102	0.078	0.733	**<0.0001*** **
EMP1	<---	Empathy	1.071	0.077	0.721	**<0.0001*** **
OMP	<---	Reliability	0.713	0.182	0.628	**<0.0001*** **
OMP	<---	Empathy	0.356	0.176	0.320	**0.043***

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.886

Table 7.21 depicts that service provider quality is positively related operational measurements (performance). To inspect the theoretical interdependence between two factors namely reliability and empathy as an independent variable with operational measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.22). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, empathy and reliability has a positive influence on operational measurements (performance). Hence, Service provider quality has a positive impact on operational measurements (performance). Service provider quality might be able to explain that 89% of the variance in operational measurements (performance) (R-Square value = 0.886).

Table 7. 22: Model fit summary

Variable	Value	Suggested value
Chi-square value	252.883	
Degrees of freedom (df)	250	
P value	0.437	P-value >0.05 (Hair et al., 2006)
GFI	0.952	>0.90 (Hair et al., 2006)
AGFI	0.943	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.005	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.22). The structural model, the quality of good fit was suitable representation of the sample data (χ^2 (250)= 252.883, AGFI **(**Adjusted Goodness of Fit Index) = 0.943 and GFI (Goodness of Fit Index)=0.952 and CFI (Comparative Fit Index)=1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.005 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.12 Hypotheses H3c: Service provider quality is positively related to financial measurements (Performance)

H3c: Service provider quality is positively related to financial measurements (Performance)

Figure 7. 12: Relationsship between total effect of service provider quality and total effect of financial measurements (performance)

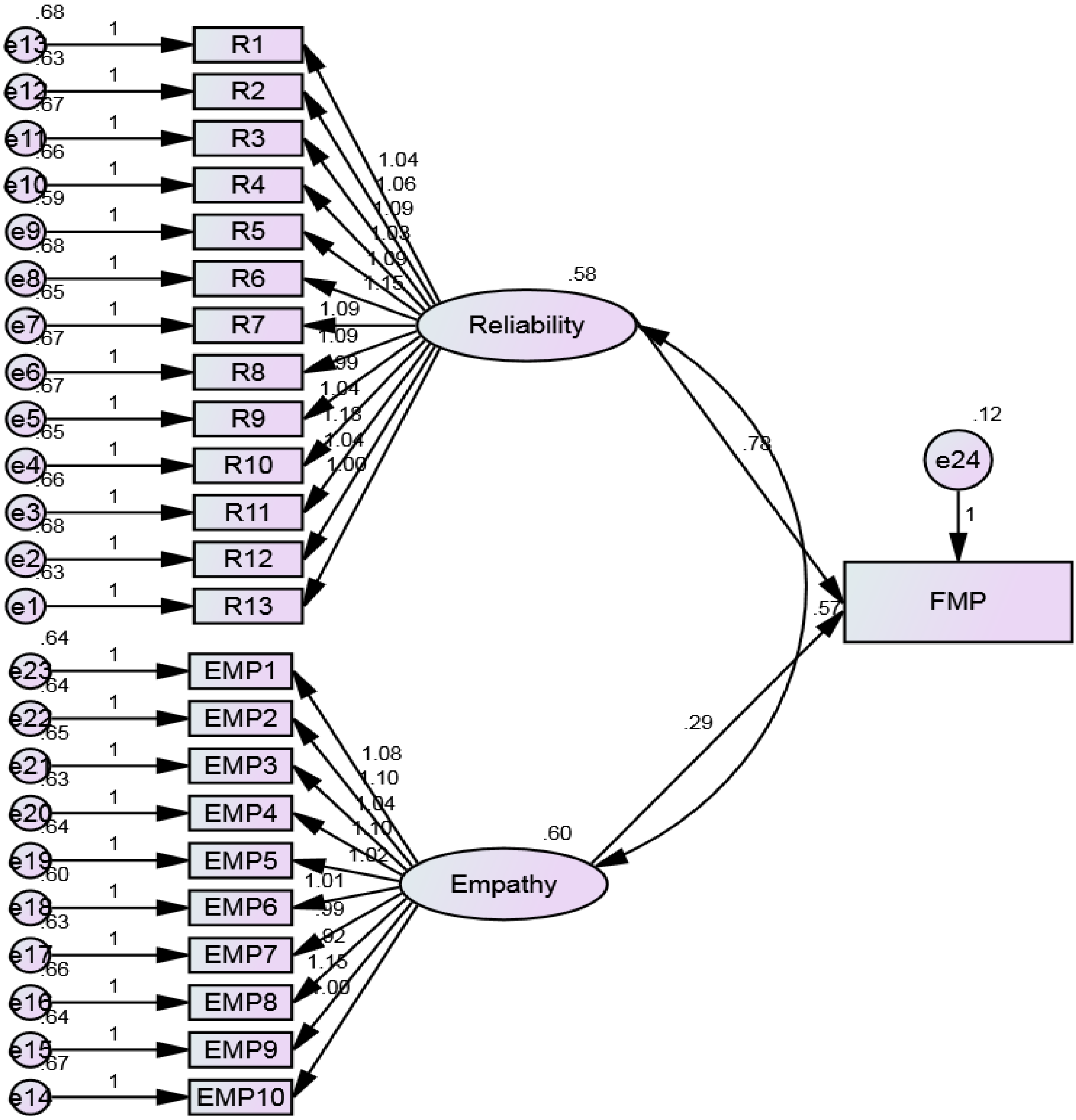


Table 7. 23: Relationsship between totla effect of HIS Service Provider Quality and total effect of Financial measurements (Performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
R13	<---	Reliability	1		0.69	**<0.0001*** **
R12	<---	Reliability	1.037	0.078	0.691	**<0.0001*** **
R11	<---	Reliability	1.181	0.083	0.74	**<0.0001*** **
R10	<---	Reliability	1.042	0.077	0.699	**<0.0001*** **
R9	<---	Reliability	0.991	0.076	0.677	**<0.0001*** **
R8	<---	Reliability	1.091	0.08	0.711	**<0.0001*** **
R7	<---	Reliability	1.086	0.079	0.714	**<0.0001*** **
R6	<---	Reliability	1.151	0.082	0.727	**<0.0001*** **
R5	<---	Reliability	1.095	0.078	0.733	**<0.0001*** **
R4	<---	Reliability	1.028	0.077	0.693	**<0.0001*** **
R3	<---	Reliability	1.087	0.08	0.71	**<0.0001*** **
R2	<---	Reliability	1.06	0.077	0.712	**<0.0001*** **
R1	<---	Reliability	1.037	0.078	0.69	**<0.0001*** **
EMP10	<---	Empathy	1		0.688	
EMP9	<---	Empathy	1.151	0.081	0.744	**<0.0001*** **
EMP8	<---	Empathy	0.92	0.073	0.661	**<0.0001*** **
EMP7	<---	Empathy	0.993	0.075	0.695	**<0.0001*** **
EMP6	<---	Empathy	1.012	0.074	0.711	**<0.0001*** **
EMP5	<---	Empathy	1.025	0.076	0.704	**<0.0001*** **
EMP4	<---	Empathy	1.1	0.079	0.732	**<0.0001*** **
EMP3	<---	Empathy	1.037	0.077	0.706	**<0.0001*** **
EMP2	<---	Empathy	1.101	0.079	0.73	**<0.0001*** **
EMP1	<---	Empathy	1.076	0.078	0.723	**<0.0001*** **
FMP	<---	Reliability	0.782	0.208	0.67	**<0.0001*** **
FMP	<---	Empathy	0.294	0.201	0.257	0.143

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.850

Table 7.23 depicts that service provider quality is positively related to financial measurements (performance). To inspect the theoretical interdependence between two factors namely reliability and empathy as an independent variable with financial measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.24). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, empathy and reliability has a positive influence on financial measurements (performance). Hence, Service provider quality has a positive impact on financial measurements (performance). Service provider quality might be able to explain that 85% of the variance in financial measurements (performance) (R-Square value = 0.850).

Table 7. 24: Model fit summary

Variable	Value	Suggested value
Chi-square value	254.862	
Degrees of freedom (df)	250	
P value	0.403	P-value >0.05 (Hair et al., 2006)
GFI	0.952	>0.90 (Hair et al., 2006)
AGFI	0.943	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.029	< 0.08 (Hair et al., 2006)
RMSEA	0.007	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.24). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (250)= 254.862, AGFI **(**Adjusted Goodness of Fit Index) = 0.943 and GFI (Goodness of Fit Index)=0.952 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.029 and RMSEA **(**Root Mean Square Error of Approximation) =0.007 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.13 Hypoltheses H4: HIS training quality is positively related to public hodpsital performance

H4: HIS training quality is positively related to Clinical measurements (performance)

Figure 7. 13: Relationsship between total effect of Training Quality and total effect of public hospital performance

Table 7. 25: Relationsship between total effect of Training Quality and total effect of public hospital performance

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
TQ7	<---	HIS_Training_Quality	1		0.682	
TQ6	<---	HIS_Training_Quality	0.972	0.075	0.676	**<0.0001*** **
TQ5	<---	HIS_Training_Quality	1.067	0.078	0.709	**<0.0001*** **
TQ4	<---	HIS_Training_Quality	1.118	0.079	0.734	**<0.0001*** **
TQ3	<---	HIS_Training_Quality	1.064	0.079	0.699	**<0.0001*** **
TQ2	<---	HIS_Training_Quality	0.959	0.076	0.655	**<0.0001*** **
TQ1	<---	HIS_Training_Quality	1.159	0.083	0.73	**<0.0001*** **
PHP	<---	HIS_Training_Quality	1.056	0.059	0.986	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.972

Table 7.25 depicts the total effect of all items of training quality on the total effect of all items of public hospital performance. To inspect the theoretical interdependence between training quality as an independent variable with public hospital performance as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.26). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, training quality is a positive influence on public hospital performance. Training quality might be able to explain that 97% of the variance in public hospital performance (R-Square value = 0.972).

Table 7. 26: Model fit summary

Variable	Value	Suggested value
Chi-square value	20.654	
Degrees of freedom (df)	20	
P value	0.418	P-value >0.05 (Hair et al., 2006)
GFI	0.988	>0.90 (Hair et al., 2006)
AGFI	0.978	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.025	< 0.08 (Hair et al., 2006)
RMSEA	0.009	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.26). The structural model, the quality of fit was suitable representation of the sample data χ^2 (20)= 20.654, AGFI **(**Adjusted Goodness of Fit Index) = 0.978 and GFI (Goodness of Fit

Index)=0.988 and CFI (Comparative Fit Index)=1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.025 and RMSEA **(**Root Mean Square Error of Approximation) =0.009 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.14 Hypottheses H4a: HIS training quality is positively related to Clinical measurements (performance)

H4a: HIS training quality is positively related to Clinical measurements (performance)

Figure 7. 14: Relationsship between total effect of Training Quality and total effect of Clinical measurements (performance)

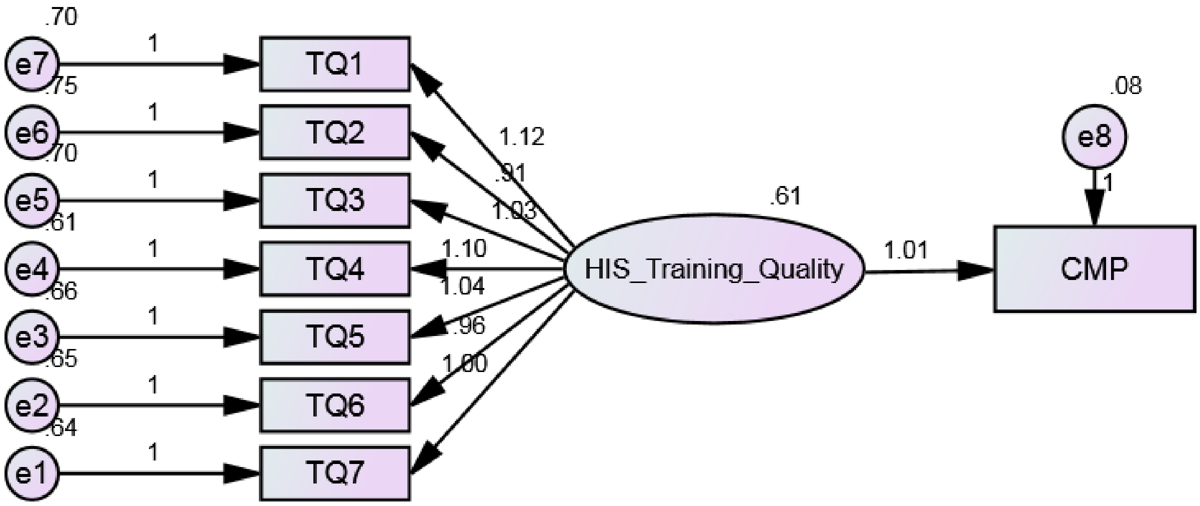


Table 7. 27: Relationsship between total effect of Training Quality and total effect of Clinical measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
TQ7	<---	HIS_Training_Quality	1		0.699	
TQ6	<---	HIS_Training_Quality	0.956	0.073	0.68	**<0.0001*** **
TQ5	<---	HIS_Training_Quality	1.04	0.077	0.708	**<0.0001*** **
TQ4	<---	HIS_Training_Quality	1.102	0.078	0.741	**<0.0001*** **
TQ3	<---	HIS_Training_Quality	1.033	0.077	0.695	**<0.0001*** **
TQ2	<---	HIS_Training_Quality	0.909	0.074	0.636	**<0.0001*** **
TQ1	<---	HIS_Training_Quality	1.119	0.081	0.722	**<0.0001*** **
CMP	<---	HIS_Training_Quality	1.007	0.057	0.942	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.887

Table 7.27 shows that training quality is positively related to clinical measurements (performance). To inspect the theoretical interdependence between training quality as an independent variable with clinical measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.28). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, training quality is a positive influence on clinical measurements (performance). Training quality might be able to explain that 89% of the variance in clinical measurements (performance) (R-Square value = 0.887).

Table 7. 28: Model fit summary

Variable	Value	Suggested value
Chi-square value	24.795	
Degrees of freedom (df)	20	
P value	0.209	P-value >0.05 (Hair et al., 2006)
GFI	0.985	>0.90 (Hair et al., 2006)
AGFI	0.973	> 0.90 (Hooper et al. 2008)
CFI	0.997	>0.90 (Hu and Bentler, 1999)
RMR	0.027	< 0.08 (Hair et al., 2006)
RMSEA	0.024	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.28). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (20)= 24.795, AGFI **(**Adjusted Goodness of Fit Index) = 0.973 and GFI (Goodness of Fit Index)=0.985 and CFI (Comparative Fit Index)=0.997 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.027 and RMSEA **(**Root Mean Square Error of Approximation) =0.024 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.15 Hypotheses H4b: HIS training quality is positively related to Operational measurements (Performance)

H4b: HIS training quality is positively related to Operational measurements (Performance)

Figure 7. 15: Relationsship between total effect of Training Quality and total effect of operational measurements (performance)

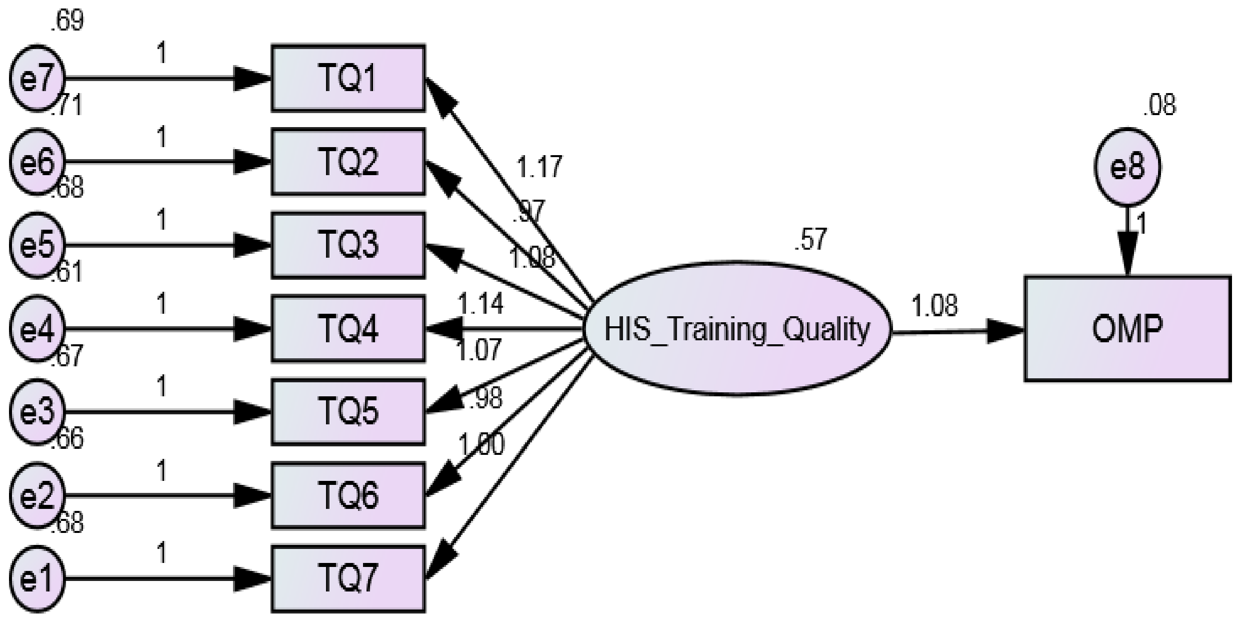


Table 7. 29: Relationsship between total effects of Training Quality and total effect of operational measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
TQ7	<---	HIS_Training_Quality	1		0.676	
TQ6	<---	HIS_Training_Quality	0.976	0.078	0.672	**<0.0001*** **
TQ5	<---	HIS_Training_Quality	1.068	0.082	0.703	**<0.0001*** **
TQ4	<---	HIS_Training_Quality	1.138	0.083	0.74	**<0.0001*** **
TQ3	<---	HIS_Training_Quality	1.083	0.082	0.705	**<0.0001*** **
TQ2	<---	HIS_Training_Quality	0.97	0.079	0.656	**<0.0001*** **
TQ1	<---	HIS_Training_Quality	1.17	0.086	0.731	**<0.0001*** **
OMP	<---	HIS_Training_Quality	1.081	0.064	0.947	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.896

Table 7.29 shows that training quality is positively related to operational measurements (performance). To inspect the theoretical interdependence between training quality as an independent variable with operational measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.30). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, training quality is a positive influence on operational measurements (performance). Training quality might be able to explain that 89% of the variance in operational measurements (performance) (R-Square value = 0.896).

Table 7. 30: Model fit summary

Variable	Value	Suggested value
Chi-square value	21.316	
Degrees of freedom (df)	20	
P value	0.379	P-value >0.05 (Hair et al., 2006)
GFI	0.987	>0.90 (Hair et al., 2006)
AGFI	0.977	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.025	< 0.08 (Hair et al., 2006)
RMSEA	0.013	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.30). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (20)= 21.316, AGFI **(**Adjusted Goodness of Fit Index) = 0.977 and GFI (Goodness of Fit Index)=0.987 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.025 and RMSEA **(**Root Mean Square Error of Approximation) =0.013 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.3.16 Hypotheses H4c: HIS training quality is positively related to financial measurements (Performance)

H4c: HIS training quality is positively related to financial measurements (Performance)

Figure 7. 16 : Relationsship between total effect of Training Quality and total effect of financial measurements (performance)

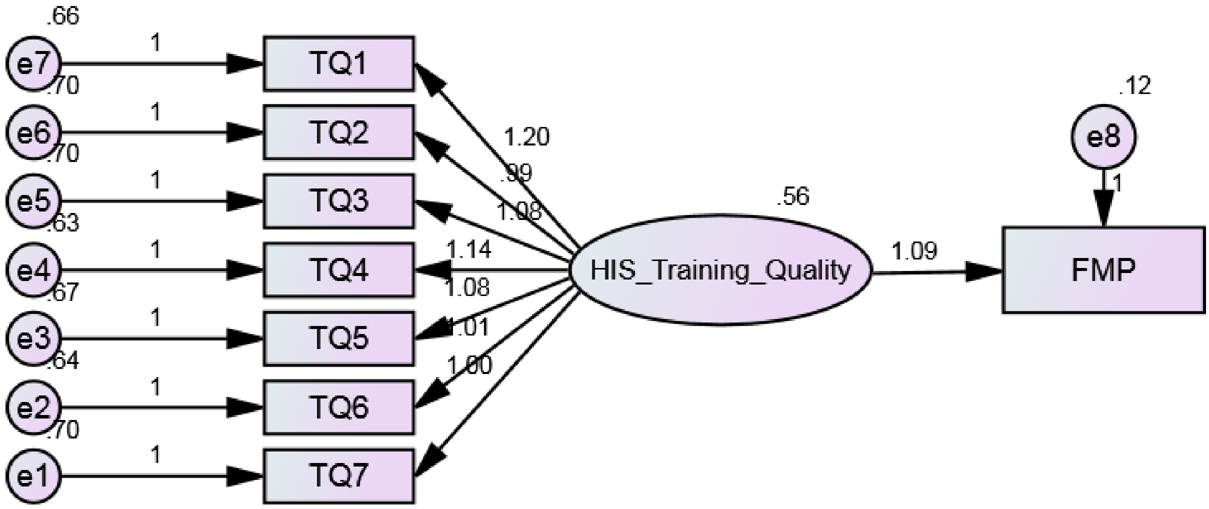


Table 7. 31: Relationsship between total effect of Training Quality and total effect of financial measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
TQ7	<---	HIS_Training_Quality	1		0.668	
TQ6	<---	HIS_Training_Quality	1.009	0.08	0.687	**<0.0001*** **
TQ5	<---	HIS_Training_Quality	1.076	0.084	0.7	**<0.0001*** **
TQ4	<---	HIS_Training_Quality	1.137	0.086	0.73	**<0.0001*** **
TQ3	<---	HIS_Training_Quality	1.082	0.085	0.696	**<0.0001*** **
TQ2	<---	HIS_Training_Quality	0.991	0.082	0.663	**<0.0001*** **
TQ1	<---	HIS_Training_Quality	1.203	0.09	0.742	**<0.0001*** **
FMP	<---	HIS_Training_Quality	1.089	0.068	0.921	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square- 0.896

Table 7.31 shows that training quality is positively related to financial measurements (performance). To inspect the theoretical interdependence between training quality as an independent variable with financial measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.32). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, training quality is a positive influence on financial measurements (performance). Training quality might be able to explain that 89% of the variance in financial measurements (performance) (R-Square value = 0.896).

Table 7. 32: Model fit summary

Variable	Value	Suggested value
Chi-square value	21.498	
Degrees of freedom (df)	20	
P value	0.368	P-value >0.05 (Hair et al., 2006)
GFI	0.987	>0.90 (Hair et al., 2006)
AGFI	0.977	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.025	< 0.08 (Hair et al., 2006)
RMSEA	0.014	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.32). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (20)= 21.498, AGFI **(**Adjusted Goodness of Fit Index) = 0.977 and GFI (Goodness of Fit Index)=0.987 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.025 and RMSEA **(**Root Mean Square Error of Approximation) =0.014 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.4 The Confirmatory Factor Analysis - CFA - for the contructs of framework

7.4.1 CFA for the construct of HIS System Qulity

Figure 7. 17: Confirmatory Factor analysis (CFA) of HIS System Quality

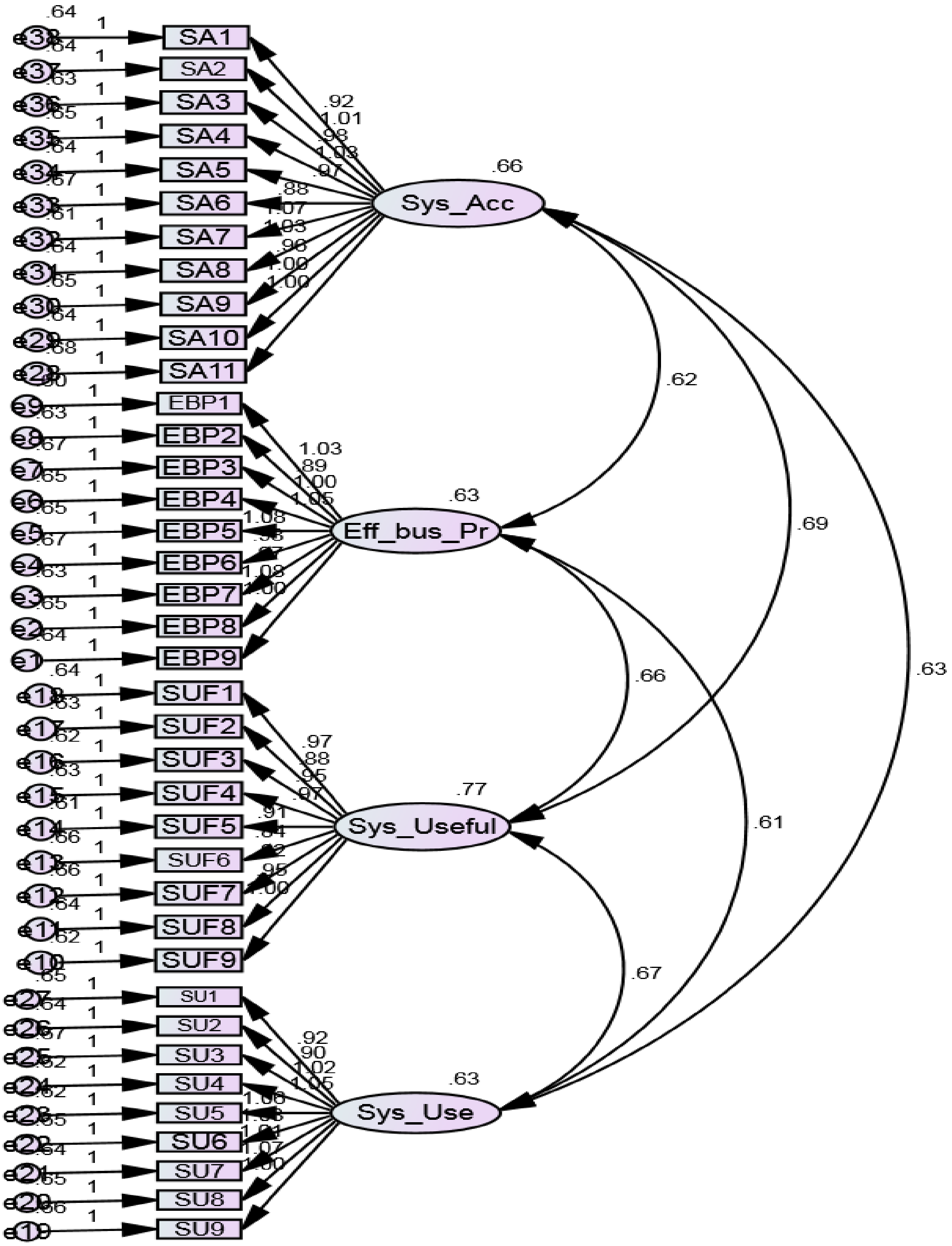


Table 7. 33: Confirmatory Factor analysis (CFA) of HIS System Quality

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
EBP9	<---	Eff_bus_Pr	1		0.705	
EBP8	<---	Eff_bus_Pr	1.079	0.076	0.728	<0.0001***
EBP7	<---	Eff_bus_Pr	0.968	0.071	0.698	<0.0001***
EBP6	<---	Eff_bus_Pr	0.977	0.073	0.688	<0.0001***
EBP5	<---	Eff_bus_Pr	1.084	0.076	0.729	<0.0001***
EBP4	<---	Eff_bus_Pr	1.052	0.075	0.72	<0.0001***
EBP3	<---	Eff_bus_Pr	1.003	0.073	0.698	<0.0001***
EBP2	<---	Eff_bus_Pr	0.893	0.068	0.668	<0.0001***
EBP1	<---	Eff_bus_Pr	1.033	0.073	0.727	<0.0001***
SUF9	<---	Sys_Useful	1		0.744	
SUF8	<---	Sys_Useful	0.946	0.063	0.721	<0.0001***
SUF7	<---	Sys_Useful	0.918	0.063	0.703	<0.0001***
SUF6	<---	Sys_Useful	0.836	0.061	0.669	<0.0001***
SUF5	<---	Sys_Useful	0.907	0.062	0.714	<0.0001***
SUF4	<---	Sys_Useful	0.97	0.064	0.731	<0.0001***
SUF3	<---	Sys_Useful	0.954	0.063	0.728	<0.0001***
SUF2	<---	Sys_Useful	0.883	0.061	0.698	<0.0001***
SUF1	<---	Sys_Useful	0.973	0.064	0.730	<0.0001***
SU9	<---	Sys_Use	1		0.699	
SU8	<---	Sys_Use	1.073	0.076	0.726	<0.0001***
SU7	<---	Sys_Use	1.007	0.073	0.708	<0.0001***
SU6	<---	Sys_Use	1.034	0.075	0.713	<0.0001***
SU5	<---	Sys_Use	1.06	0.075	0.731	<0.0001***
SU4	<---	Sys_Use	1.05	0.074	0.728	<0.0001***
SU3	<---	Sys_Use	1.021	0.075	0.704	<0.0001***
SU2	<---	Sys_Use	0.903	0.069	0.668	<0.0001***
SU1	<---	Sys_Use	0.915	0.07	0.671	<0.0001***
SA11	<---	Sys_Acc	1		0.701	
SA10	<---	Sys_Acc	0.999	0.072	0.713	<0.0001***
SA9	<---	Sys_Acc	0.964	0.071	0.696	<0.0001***
SA8	<---	Sys_Acc	1.03	0.073	0.722	<0.0001***
SA7	<---	Sys_Acc	1.072	0.074	0.743	<0.0001***
SA6	<---	Sys_Acc	0.878	0.068	0.657	<0.0001***
SA5	<---	Sys_Acc	0.974	0.071	0.703	<0.0001***
SA4	<---	Sys_Acc	1.034	0.073	0.722	<0.0001***
SA3	<---	Sys_Acc	0.985	0.071	0.709	<0.0001***
SA2	<---	Sys_Acc	1.008	0.072	0.715	<0.0001***
SA1	<---	Sys_Acc	0.921	0.069	0.685	<0.0001***

*p<0.05, **p<0.01, ***p<0.001

Table 7.33 reveals the confirmatory factor analysis for HIS system quality. To review the theoretical interdependence between system acceptances, the effectiveness of the business process, system usefulness and system use, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.34). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above results reveals that system acceptance, the effectiveness of the business process, system usefulness and system use are a positive significant relationship with each other.

Table 7. 34: Model fit summary

Variable	Value	Suggested value
Chi-square value	680.019	
Degrees of freedom (df)	659	
P value	0.277	P-value >0.05 (Hair et al., 2006)
GFI	0.925	>0.90 (Hair et al., 2006)
AGFI	0.916	> 0.90 (Hooper et al. 2008)
CFI	0.998	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.009	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.34). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (659)= 680.019, AGFI **(**Adjusted Goodness of Fit Index) = 0.916 and GFI (Goodness of Fit Index)=0.925 and CFI (Comparative Fit Index)=0.998 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.030 and RMSEA **(**Root Mean Square Error of Approximation) =0.009 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.4.2 CFA for the construct of HIS Information Quality

Figure 7. 18: Confirmatory Factor analysis (CFA) of HIS Information Quality

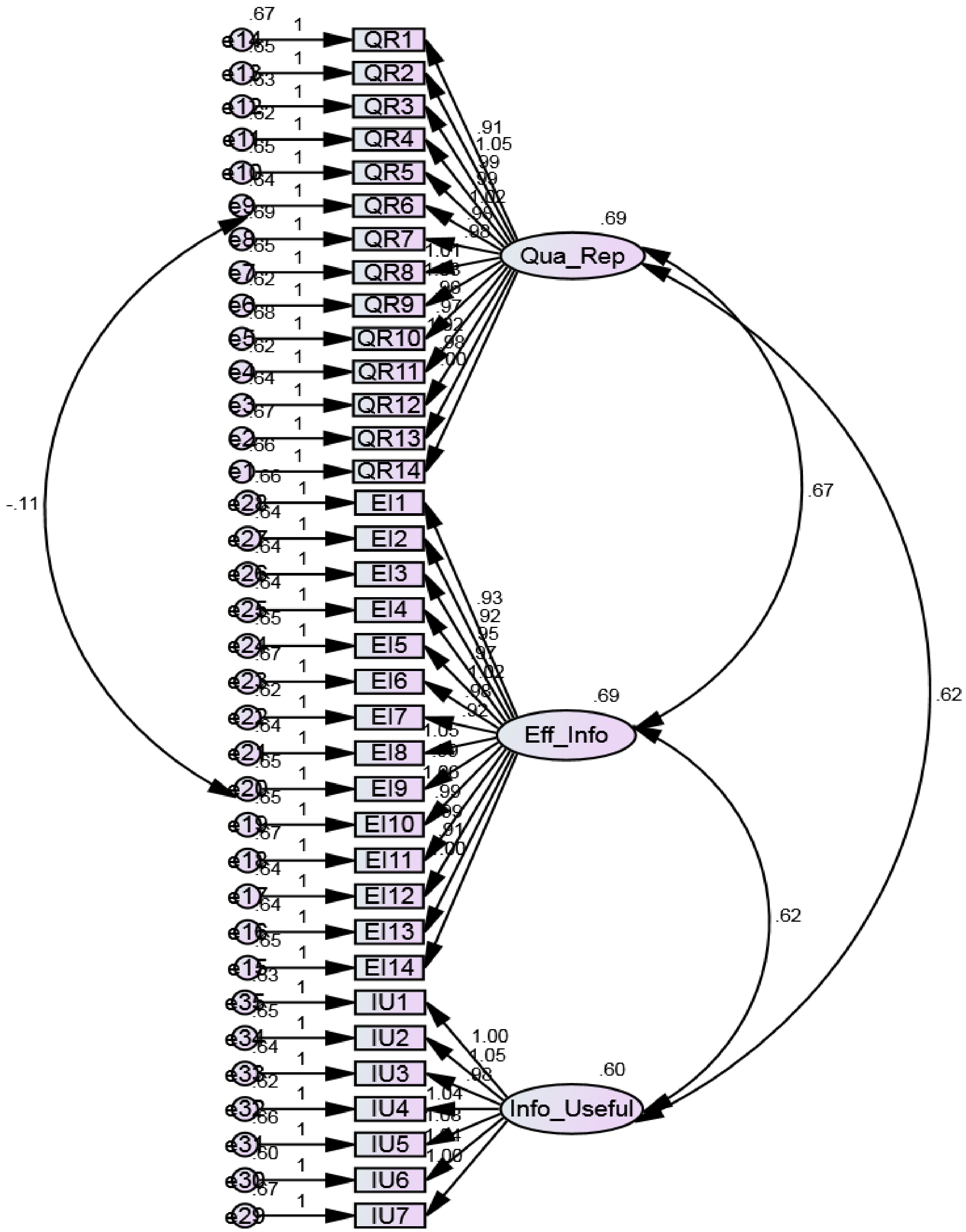


Table 7. 35: Confirmatory Factor analysis (CFA) of HIS Information Quality

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
QR14	<---	Qua_Rep	1		0.715	
QR13	<---	Qua_Rep	0.976	0.069	0.704	**<0.0001*** **
QR12	<---	Qua_Rep	1.021	0.07	0.727	**<0.0001*** **
QR11	<---	Qua_Rep	0.965	0.068	0.712	**<0.0001*** **
QR10	<---	Qua_Rep	0.957	0.069	0.695	**<0.0001*** **
QR9	<---	Qua_Rep	1.027	0.07	0.736	**<0.0001*** **
QR8	<---	Qua_Rep	1.007	0.07	0.719	**<0.0001*** **
QR7	<---	Qua_Rep	0.975	0.07	0.698	**<0.0001*** **
QR6	<---	Qua_Rep	0.985	0.069	0.715	**<0.0001*** **
QR5	<---	Qua_Rep	1.02	0.071	0.723	**<0.0001*** **
QR4	<---	Qua_Rep	0.992	0.069	0.722	**<0.0001*** **
QR3	<---	Qua_Rep	0.987	0.069	0.719	**<0.0001*** **
QR2	<---	Qua_Rep	1.047	0.071	0.734	**<0.0001*** **
QR1	<---	Qua_Rep	0.91	0.067	0.68	**<0.0001*** **
EI14	<---	Eff_Info	1		0.718	
EI13	<---	Eff_Info	0.915	0.066	0.689	**<0.0001*** **
EI12	<---	Eff_Info	0.992	0.069	0.715	**<0.0001*** **
EI11	<---	Eff_Info	0.993	0.07	0.71	**<0.0001*** **
EI10	<---	Eff_Info	1.06	0.072	0.736	**<0.0001*** **
EI9	<---	Eff_Info	0.994	0.069	0.715	**<0.0001*** **
EI8	<---	Eff_Info	1.051	0.071	0.735	**<0.0001*** **
EI7	<---	Eff_Info	0.925	0.066	0.698	**<0.0001*** **
EI6	<---	Eff_Info	0.975	0.069	0.701	**<0.0001*** **
EI5	<---	Eff_Info	1.021	0.07	0.725	**<0.0001*** **
EI4	<---	Eff_Info	0.968	0.068	0.708	**<0.0001*** **
EI3	<---	Eff_Info	0.952	0.068	0.702	**<0.0001*** **
EI2	<---	Eff_Info	0.917	0.067	0.687	**<0.0001*** **
EI1	<---	Eff_Info	0.932	0.067	0.689	**<0.0001*** **
IU7	<---	Info_Useful	1		0.687	
IU6	<---	Info_Useful	1.042	0.076	0.723	**<0.0001*** **
IU5	<---	Info_Useful	1.081	0.079	0.718	**<0.0001*** **
IU4	<---	Info_Useful	1.039	0.077	0.716	**<0.0001*** **
IU3	<---	Info_Useful	0.98	0.075	0.687	**<0.0001*** **
IU2	<---	Info_Useful	1.047	0.078	0.711	**<0.0001*** **
IU1	<---	Info_Useful	1.004	0.076	0.700	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001

Table 7.35 reveals the confirmatory factor analysis for HIS information quality. To review the theoretical interdependence between Quality of report, Effectiveness of information and Information usefulness, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.36). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above results reveals that Quality of report, Effectiveness of information and Information usefulness are a positive significant relationship with each other.

Table 7. 36: Model fit summary

Variable	Value	Suggested value
Chi-square value	534.296	
Degrees of freedom (df)	556	
P value	0.739	P-value >0.05 (Hair et al., 2006)
GFI	0.934	>0.90 (Hair et al., 2006)
AGFI	0.925	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.36). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (556)= 534.296, AGFI (Adjusted Goodness of Fit Index) = 0.925 and GFI (Goodness of Fit Index)=0.934 and CFI (Comparative Fit Index)=1.000 which are greater than the 0.90 criteria as suggested by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.030 and RMSEA (Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.4.3 CFA for the construct of HIS Service Provider Quality

Figure 7. 19: Confirmatory Factor analysis (CFA) of HIS Service Provider Quality

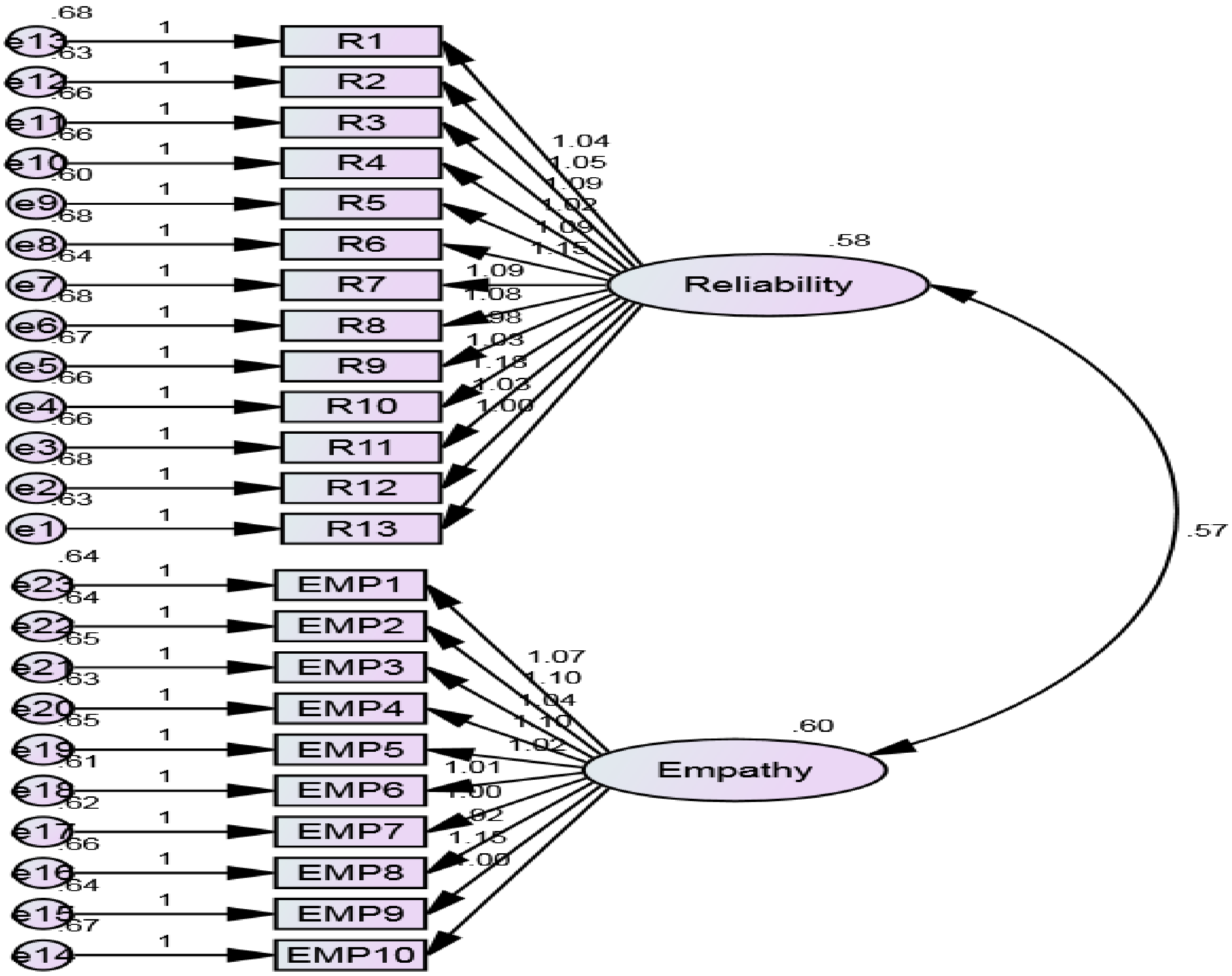


Table 7. 37: Confirmatory Factor analysis (CFA) of HIS Service Provider Quality

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
R13	<---	Reliability	1		0.692	
R12	<---	Reliability	1.033	0.078	0.691	**<0.0001*** **
R11	<---	Reliability	1.178	0.083	0.741	**<0.0001*** **
R10	<---	Reliability	1.034	0.077	0.696	**<0.0001*** **
R9	<---	Reliability	0.985	0.076	0.675	**<0.0001*** **
R8	<---	Reliability	1.080	0.08	0.707	**<0.0001*** **
R7	<---	Reliability	1.094	0.079	0.721	**<0.0001*** **
R6	<---	Reliability	1.148	0.082	0.728	**<0.0001*** **
R5	<---	Reliability	1.090	0.078	0.732	**<0.0001*** **
R4	<---	Reliability	1.019	0.077	0.69	**<0.0001*** **
R3	<---	Reliability	1.088	0.08	0.713	**<0.0001*** **
R2	<---	Reliability	1.054	0.077	0.71	**<0.0001*** **

R1	<---	Reliability	1.036	0.078	0.692	**<0.0001*** **
EMP10	<---	Empathy	1		0.688	
EMP9	<---	Empathy	1.155	0.082	0.746	**<0.0001*** **
EMP8	<---	Empathy	0.920	0.073	0.66	**<0.0001*** **
EMP7	<---	Empathy	1.001	0.075	0.700	**<0.0001*** **
EMP6	<---	Empathy	1.008	0.075	0.708	**<0.0001*** **
EMP5	<---	Empathy	1.021	0.077	0.701	**<0.0001*** **
EMP4	<---	Empathy	1.101	0.079	0.731	**<0.0001*** **
EMP3	<---	Empathy	1.042	0.077	0.708	**<0.0001*** **
EMP2	<---	Empathy	1.103	0.08	0.731	**<0.0001*** **
EMP1	<---	Empathy	1.072	0.078	0.720	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001

Table 7.37 reveals the confirmatory factor analysis for HIS service provider quality. To review the theoretical interdependence between reliability and empathy, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.38). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above results reveals that reliability and empathy are a positive significant relationship with each other.

Table 7. 38: Model fit summary

Variable	Value	Suggested value
Chi-square value	237.451	
Degrees of freedom (df)	229	
P value	0.337	P-value >0.05 (Hair et al., 2006)
GFI	0.953	>0.90 (Hair et al., 2006)
AGFI	0.944	> 0.90 (Hooper et al. 2008)
CFI	0.998	>0.90 (Hu and Bentler, 1999)
RMR	0.030	< 0.08 (Hair et al., 2006)
RMSEA	0.010	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.38). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (229)= 237.451, AGFI **(**Adjusted Goodness of Fit Index) = 0.944 and GFI (Goodness of Fit Index)=0.953 and CFI (Comparative Fit Index)=0.998 which are greater than the 0.90 criteria as suggested by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.030 and RMSEA **(**Root Mean Square Error of Approximation) =0.010 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.4.4 Confirmatory Factor analysis (CFA) of HIS Training Quality

Figure 7. 20: CFA for the construct of HIS Training Quality

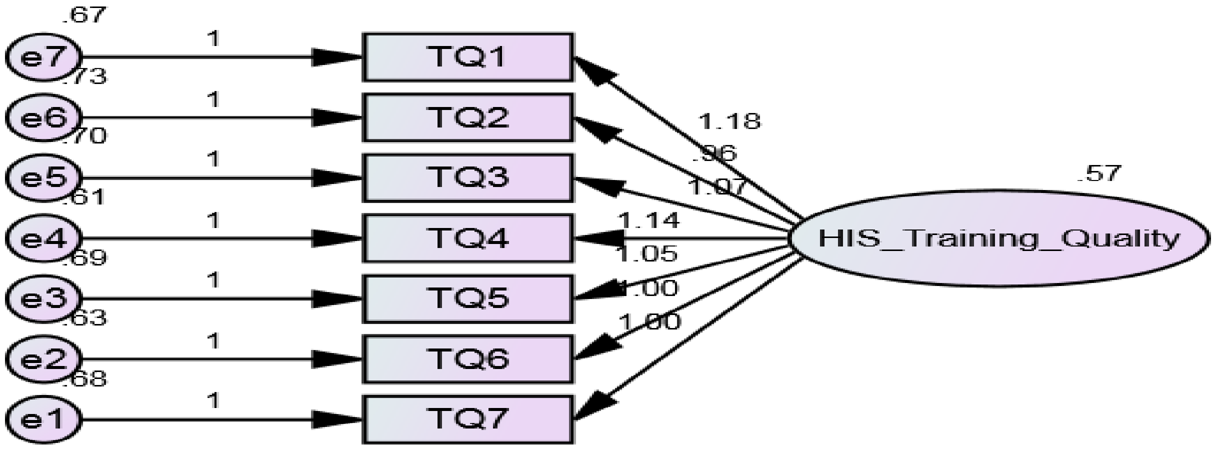


Table 7. 39: Confirmatory Factor analysis (CFA) of HIS Training Quality

			Unstandardized coefficient	**S.E**	**Standardized coefficient**	**p-value**
TQ7	<---	HIS_Training_Quality	1		0.676	
TQ6	<---	HIS_Training_Quality	1.002	0.082	0.690	**<0.0001*** **
TQ5	<---	HIS_Training_Quality	1.051	0.086	0.692	**<0.0001*** **
TQ4	<---	HIS_Training_Quality	1.144	0.088	0.744	**<0.0001*** **
TQ3	<---	HIS_Training_Quality	1.071	0.087	0.697	**<0.0001*** **
TQ2	<---	HIS_Training_Quality	0.958	0.083	0.648	**<0.0001*** **
TQ1	<---	HIS_Training_Quality	1.179	0.092	0.736	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001

Table 7.39 reveals the confirmatory factor analysis for HIS training quality. To review the theoretical interdependence between training quality statements, structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.40). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above results reveals that training quality is a positive significant relationship with each other statements.

Table 7. 40: Model fit summary

Variable	Value	Suggested value
Chi-square value	17.423	
Degrees of freedom (df)	14	
P value	0.234	P-value >0.05 (Hair et al., 2006)
GFI	0.988	>0.90 (Hair et al., 2006)
AGFI	0.976	> 0.90 (Hooper et al. 2008)
CFI	0.997	>0.90 (Hu and Bentler, 1999)
RMR	0.027	< 0.08 (Hair et al., 2006)
RMSEA	0.025	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.40). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (14)= 17.423, AGFI **(**Adjusted Goodness of Fit Index) = 0.976 and GFI (Goodness of Fit Index)=0.988 and CFI (Comparative Fit Index)=0.997 which are greater than the 0.90 criteria as suggested by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.027 and RMSEA **(**Root Mean Square Error of Approximation) =0.025 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.5 CFA of testing the relationships between the independent and dependent constructs

7.5.1 CFA for HIS System with Clinical measurements (performance)

Figure 7. 21: Confirmatory Factor analysis (CFA) of HIS System relationship and Clinical measurements (performance)

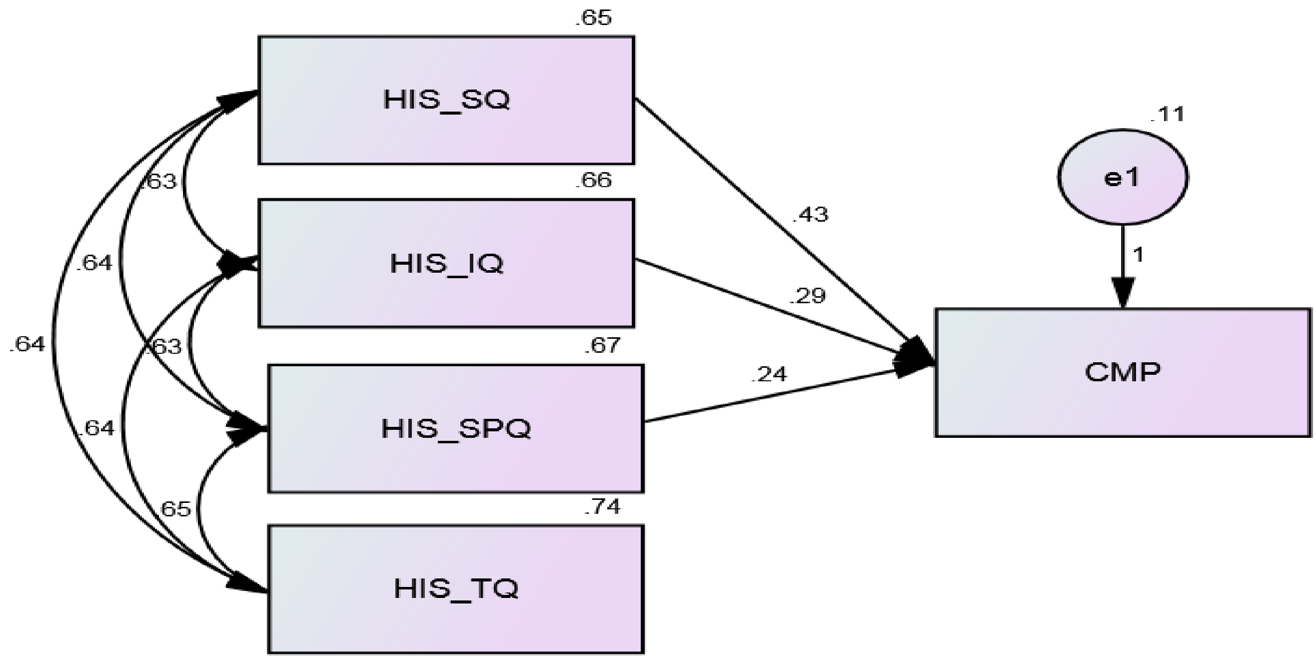


Table 7. 41: Confirmatory Factor analysis (CFA) of HIS System relationship and Clinical measurements (performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
CMP	<-->	HIS_SQ	0.429	0.092	0.413	**<0.0001*** **
CMP	<-->	HIS_IQ	0.288	0.078	0.279	**<0.0001*** **
CMP	<-->	HIS_SPQ	0.245	0.079	0.240	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.846

Table 7.41 shows that CFA Second Order for HIS System Quality relationship with Clinical measurements (performance). To inspect the theoretical interdependence between System quality, Information quality, Service provider Quality and Training Quality as an independent variable with clinical measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.42). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989).

From the above findings, System quality, Information quality and Service provider Quality are a positive influence on clinical measurements (performance). Hospital information system might be able to explain that 85% of the variance in operational measurements (performance) (R-Square value = 0.846). Therefore, we canconclude that,

Hospital Information system has a positive influence on clinical hospital measurements

Table 7. 42: Model fit summary

Variable	Value	Suggested value
Chi-square value	8.378	
Degrees of freedom (df)	1	
P value	0.004	P-value >0.05 (Hair et al., 2006)
GFI	0.992	>0.90 (Hair et al., 2006)
AGFI	0.879	> 0.90 (Hooper et al. 2008)
CFI	0.998	>0.90 (Hu and Bentler, 1999)
RMR	0.004	< 0.08 (Hair et al., 2006)
RMSEA	0.021	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.42). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (1)= 8.378, AGFI **(**Adjusted Goodness of Fit Index) = 0.879 and GFI (Goodness of Fit Index)=0.992 and CFI (Comparative Fit Index)=0.998 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.004 and RMSEA (Root Mean Square Error of Approximation) =0.021 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.5.2 CFA of HIS system with Operational hospital measurements (Performance)

Figure 7. 22: Confirmatory Factor Analysis (CFA) of HIS system relationship and Operational measurements (Performance)

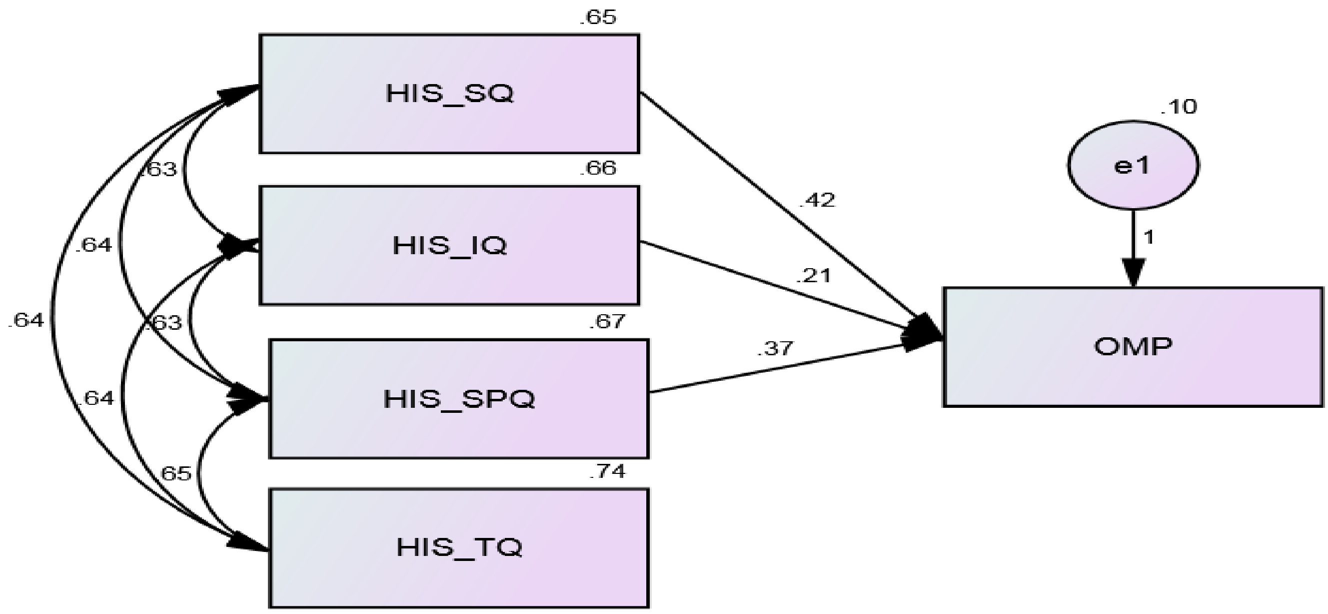


Table 7. 43: Confirmatory Factor Analysis (CFA) of HIS system relationship and Operational measurements (Performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
OMP	<---	HIS_SQ	0.418	0.088	0.389	**<0.0001*** **
OMP	<---	HIS_IQ	0.215	0.074	0.202	**0.005** **
OMP	<---	HIS_SPQ	0.373	0.075	0.353	**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.869

Table 7.43 shows that CFA Second Order for HIS System relationship with operational measurements (performance). To inspect the theoretical interdependence between System quality, Information quality, Service provider Quality and Training Quality as an independent variable with operational measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.44). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above findings, System quality, Information quality and Service provider Quality are a positive influence on operational measurements (performance). Hospital information system might be able to explain that 87% of the variance in operational measurements (performance) (R-Square value = 0.869). Therefore, can concludue that:

Hospital Information system has a positive influence on operational hospital measurements

Table 7. 44: Model fit summary

Variable	Value	Suggested value
Chi-square value	5.177	
Degrees of freedom (df)	1	
P value	0.023	P-value >0.05 (Hair et al., 2006)
GFI	0.995	>0.90 (Hair et al., 2006)
AGFI	0.925	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.003	< 0.08 (Hair et al., 2006)
RMSEA	0.001	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 7.44). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (1)= 5.177, AGFI (Adjusted Goodness of Fit Index) = 0.925 and GFI (Goodness of Fit Index)=0.995 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.003 and RMSEA (Root Mean Square Error of Approximation) =0.001 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.5.3 CFA for HIS System with financial measurements (Performance)

Figure 7. 23: Confirmatory Factor Analysis (CFA) of HIS System relationship and financial measurements (Performance)

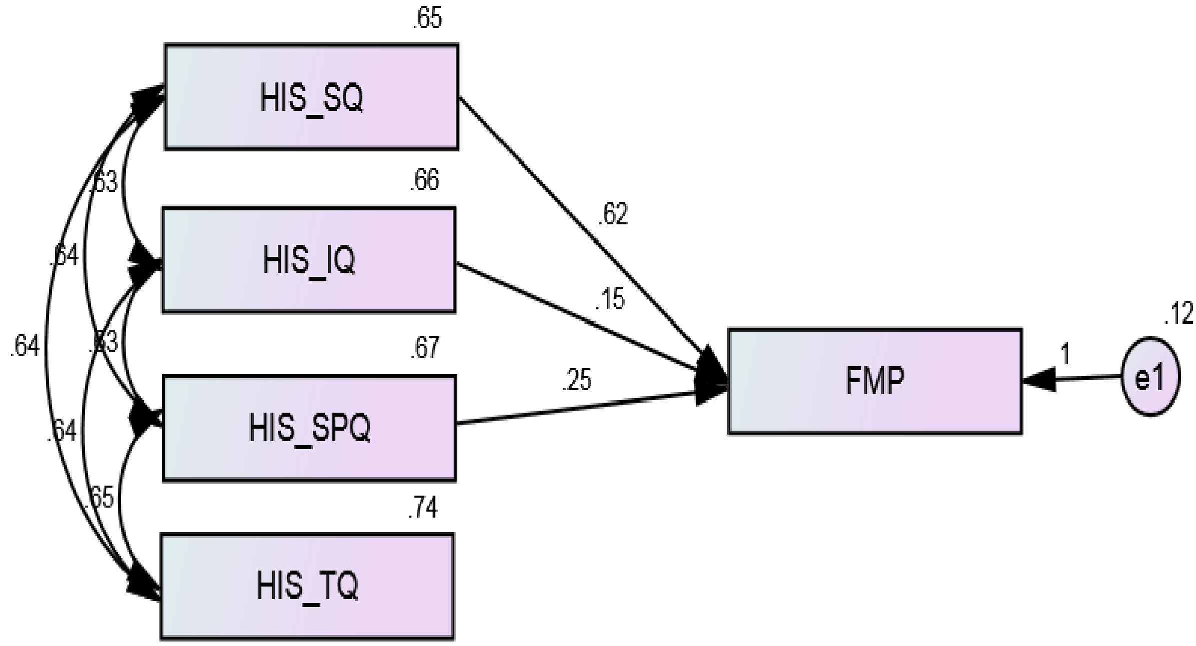


Table 7. 45: Confirmatory Factor Analysis (CFA) of HIS System relationship and financial measurements (Performance)

			Unstandardized coefficient	S.E	Standardized coefficient	p-value
FMP	<---	HIS_SQ1	0.619	0.098	0.563	**<0.0001*** **
FMP	<---	HIS_IQ1	0.148	0.083	0.136	**0.043***
FMP	<---	HIS_SPQ1	0.247	0.084	0.228	**<0.003***

*p<0.05, **p<0.01, ***p<0.001, R-Square-0.843

Table 7.45 shows that CFA Second Order for HIS System relationship with financial measurements (performance). To inspect the theoretical interdependence between System quality, Information quality, Service provider Quality and Training Quality as an independent variable with financial measurements (performance) as the dependent variable and structural equation modelling was used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.46). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above findings, System quality, Information quality and Service provider Quality are a positive influence on financial measurements (performance). Hospital information system might be able to explain that 84% of the variance in financial measurements (performance) (R-Square value = 0.843). Therefore, can concludue that:

Hospital Information system has a positive influence on operational hospital measurements

Table 7. 46: Model fit summary

Variable	Value	Suggested value
Chi-square value	2.108	
Degrees of freedom (df)	1	
P value	0.147	P-value >0.05 (Hair et al., 2006)
GFI	0.998	>0.90 (Hair et al., 2006)
AGFI	0.969	> 0.90 (Hooper et al. 2008)
CFI	1.000	>0.90 (Hu and Bentler, 1999)
RMR	0.002	< 0.08 (Hair et al., 2006)
RMSEA	0.005	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 6.46). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (1)= 2.108, AGFI **(**Adjusted Goodness of Fit Index) = 0.969 and GFI (Goodness of Fit Index)=0.998 and CFI (Comparative Fit Index)=1.000 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.002 and RMSEA **(**Root Mean Square Error of Approximation) =0.005 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

7.6 Testing the SEM for HIS System with public hospital performance (clinical, operational and financial)

Figure 7. 24: Structural Equation Model (SEM) of HIS System relationship and public hospital performance (clinical, operational and financial)

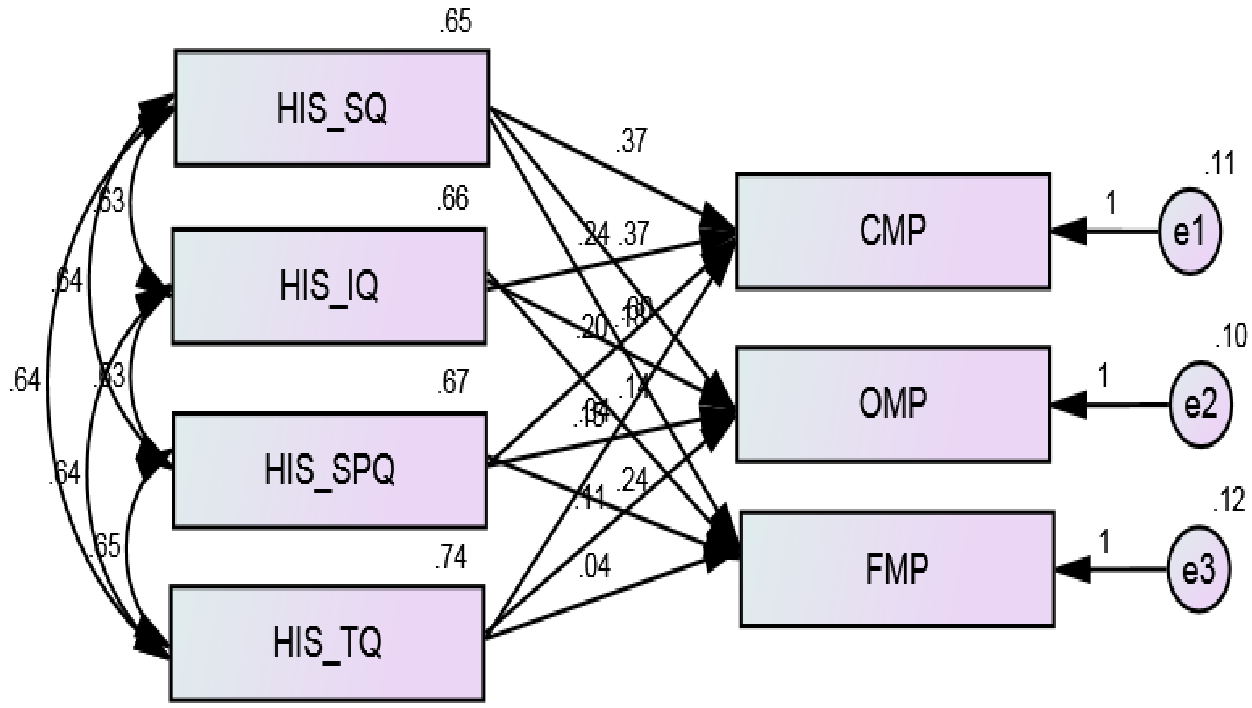


Table 7. 47: Structural Equation Model (SEM) of HIS System relationship and Public hospital performance (Clinical, operational and financial)

			Unstandardized coefficient	**S.E**	**Standardized coefficient**	**R-Square**	**p-value**
CMP	<---	HIS_SQ	0.369	0.093	0.355	0.849	**<0.0001*** **
CMP	<---	HIS_IQ	0.242	0.079	0.235		**0.002** **
CMP	<---	HIS_SPQ	0.201	0.079	0.196		**0.011***
CMP	<---	HIS_TQ	0.151	0.052	0.155		**0.004** **
OMP	<---	HIS_IQ	0.18	0.075	0.17	0.870	**0.017***
OMP	<---	HIS_SPQ	0.339	0.076	0.322		**<0.0001*** **
OMP	<---	HIS_SQ	0.372	0.089	0.347		**<0.0001*** **
OMP	<---	HIS_TQ	0.113	0.05	0.113		**0.022***
FMP	<---	HIS_TQ	0.037	0.056	0.036	0.843	0.509
FMP	<---	HIS_SPQ	0.236	0.086	0.218		**0.006** **
FMP	<---	HIS_IQ	0.137	0.085	0.126		0.107
FMP	<---	HIS_SQ	0.604	0.101	0.55		**<0.0001*** **

*p<0.05, **p<0.01, ***p<0.001

Table 7.47 shows that SEM analysis for HIS System relationship with Public hospital performance. To inspect the theoretical interdependence between System quality, Information quality, Service provider Quality and Training Quality as an independent variable with clinical, operational and financial measurements (performance) are dependent variable and structural equation modelling were used. This analysis allows to test all the relevant paths and measurements errors and feedbacks are included directly into the model. The fit indices show a good fit as the factors are found to be significant at p>0.05 (Table 7.48). The model fit, which was assessed using global fit (seven different fit indices). In other words, the degree to which the implicit matrix of co variances, (based on the hypothesized model), and the sample covariance matrix, based on data it seems to fit (Bollen 1989). From the above findings, System quality, Information quality, Service provider Quality and training quality are a positive influence on clinical, operational and financial measurements (performance). Hospital information system might be able to explain that 85%, 87% and 84% of the variance in clinical measurements (performance) (R-Square value = 0.849), operational measurements (performance) (R-Square value = 0.870) and financial measurements (performance) (R-Square value = 0.843).

Table 7. 48: Model fit summary

Variable	Value	Suggested value
Chi-square value	2.382	
Degrees of freedom (df)	3	
P value	0.497	P-value >0.05 (Hair et al., 2006)
GFI	0.998	>0.90 (Hair et al., 2006)
AGFI	0.985	> 0.90 (Hooper et al. 2008)
CFI	0.999	>0.90 (Hu and Bentler, 1999)
RMR	0.001	< 0.08 (Hair et al., 2006)
RMSEA	0.000	< 0.08 (Hair et al., 2006)

The fit indices show a model is a good fit as the factors are found to be significant at the p>0.05 (Table 6.48). The structural model, the quality of fit was suitable representation of the sample data (χ^2 (3)= 2.382, AGFI **(**Adjusted Goodness of Fit Index) = 0.985 and GFI (Goodness of Fit Index)=0.998 and CFI (Comparative Fit Index)=0.999 which are greater than the 0.90 criteria as recommended by Hu and Bentler (1999) and Joreskog and Sorbom (1981). Similarly, RMR (Root Mean Square Residuals) =0.001 and RMSEA **(**Root Mean Square Error of Approximation) =0.000 values are lower than 0.08 critical value (Steiger H 1989; Hair et al. 2006).

CHAPTER EIGHT

DISCUSSION

8.1 Introduction

This chapter presents a discussion of the findings presented in the previous chapter. The focus of the chapter is interpreting the findings to determine their consequences on the research questions and the research objectives. Additionally, the chapter covers the limitations and contributions of the findings to the study and practice areas. It is important to recall that the main aim of the study is to investigate the impact of HIS effectiveness on the performance of public hospitals.

8.2 Overview of the Results

The study involved 408 participants with comparable proportions of male (46.8%) and female (53.2%) participants. Staff members (85.3%) dominated the sample while managers made up only 14.7% of the sample. The proportions of staff and managers in the sample match their respective representations in public healthcare facilities. Over half of the participants (51.7%) had three or more years of experience. Furthermore, over half of the facilities that were included in the sample (53.4%) had implemented HIS for at least five years whereas 36.5% had implemented HIS for three to five years.

8.3 Measuring HIS Effectiveness (Answering Research Question 1, RQ1)

The conceptual framework of this study drew from the Delone and McLean's (D&M) Information success model (DeLone & McLean 1992;2003) which is widely adopted in the IS research. Following a comprehensive literature review on the older and more recent studies (e.g. Li and Ye 1999; Rai et al. 2002; Chang & King 2005; Bernoider 2008; Gorla et al. 2010) and Input-Output Performance Model (Change and King, 2005). This thesis identified all items used by researchers for the measurement of the D&M dimensions. The findings of this study serve to validate these models by providing psychometric measures that support their validity and reliability. The commendable performance of the instrument used in measuring HIS effectiveness (overall performance and for individual performance) is evidence of the relevance and validity of the frameworks that form their basis. Since few studies have focused explicitly on measuring HIS effectiveness, the performance of this instrument cannot be matched up against the existing instrument; instead, the assessment focuses on its metrics which are excellent. Exploratory Factor Analysis was employed as there was no theoretical basis to specify a priori the number and patterns of common factors (Hurley et al. 1997).

In this concern, it would be logical to infer that the study contributed to the IS field as we used older and recent variables in a single coherent model. We can now argue that we have the appropriate items to measure HIS and Hospital Performance concepts as the exploratory factor analysis resulted in the formation of 13 factors which satisfied the statistical and conceptual criteria for acceptance.

HIS effectiveness was measured across four dimensions: system quality, information quality, training quality, and service provider quality. Each of these dimensions was measured using multiple items: system quality (38 items), information quality (35 items) service provider quality (23 items) and training quality (7 items). Public hospital performance was measured using 23 items.

HIS system quality included system acceptance, system usefulness, system use and effectiveness of the business process. HIS information quality dimension encompassed quality of the report, information usefulness, and effectiveness of information. The service provider quality dimension included empathy and reliability. Lastly, HIS training quality had only one item, training quality. Convergent and discriminant validity has been established on all the four dimensions (independent variables) and the dependent measure of public hospital performance.

The results show that information quality, system quality, training quality and service provider quality are all important in the assessment of HIS effectiveness. By using expalantory factor analysos EFA each of theses constructs has items grouped under difffrent factors. Each of these factors contributes to understanding the perspective of the performance and usefulness of HIS to healthcare facilities. Their individual contribution to HIS effectiveness has been captured and analyzed in previous studies. In this regard, the findings of the study converge with those from previous studies.

System quality measures focus on the acceptances, usefulness, and effectivness of process and use of HIS system. It provides insights into the usability, utility, acceptances and perceived gains associated with the use of HIS. They capture the functionality of the system, ease of use, the capacity to recover from errors, the feedback that users receive and its capacity to perform the intended function. A system that scores high on system quality measures is likely to score high in HIS effectiveness.

Information quality dimension focuses on the data. It includes metrics that target the usefulness and effectiveness of information and reports generated by HIS. Integrated information management is the heart of HIS. It is unlikely that a comprehensive assessment of an information system including HIS would exclude items covered in the system quality and information quality as they focus on the elemental value of implementing the systems. A system that scores high in information quality is likely to score high in HIS effectiveness.

Training quality is tied to the perception that users develop on the usability, relevance, and utility of an information system. Importantly, the actual use and performance of an information system are influenced by the quality of training that the users get. Thus, the findings are in line with studies linking training quality to HIS acceptance, use and performance.

Service provider quality included the empathy and reliability of the third parties that provide services that are essential to the functioning on an HIS system. Some of these entities may include the developer or vendor of the system and internet service provider. The reliability of such providers influences the speed with which errors and technical problems are addressed. Absentee and unreliable providers can affect the usability of HIS and its overall performance. Analysis of IS and HIS effectiveness rarely consider service provider quality which the results have revealed to be an important dimension of HIS effectiveness.

8.4 The relationship between HIS effectiveness and Hospital Performance (Answering Research Question 2, RQ2)

The study targeted three measures of hospital performance: clinical, operational and financial. HIS effectiveness measures focus on system acceptance, business process, usefulness, and system use, quality of reports, training quality, reliability, empathy, information usefulness and effectiveness of information. The study findings reveal that the clinical performance had significant positive correlations with each measure of HIS effectiveness. The findings suggest that an increase in the measures of HIS effectiveness is associated with a positive change in hospital performance. Next, the results show that operational performance had significant positive correlations with each measure of HIS effectiveness. The finding implies that an increase in any measure of HIS effectiveness is associated with improvements in hospital performance. The same trend is observed in financial performance. Overall, the findings reveal that each measure of HIS effectiveness has a significant positive correlation with each of the three measures of hospital performance. Additionally, the findings revealed the existence of significant positive correlations between HIS system quality, information quality, service provider quality, training quality, and public hospital performance.

8.4.1 HIS system quality is positively related to public hospital performance

Anema et al. (2013) asserted that performance measures are a means of benchmarking and carrying out assessments. A comprehensive literature search led to insights into the relationship between HIS effectiveness and hospital performance. The results of this study add to these insights. From the findings, the overall clinical, financial and operational performance is positively impacted by HIS effectiveness. Previous studies (Halawi et al. 2008; Po-An Hsieh & Wang 2007; Iivari 2005; Rai et al. 2002; Hong et al. 2001/2002; Venkatesh & Davis 2000; Venkatesh & Morris 2000; Igbaria et al. 1997; Suh et al. 1994) had highlighted the existence of significant positive relationships between system quality and system use at the individual level. The research hypothesis that was tested and accepted is:

(H1): HIS system quality is positively related to public hospital performance.

8.4.2 HIS information quality is positively related to public hospital performance

The findings reveal the existence of a significant positive relationship between information quality and all three performance outcomes. Previous studies (Chiu et al. 2007; Halawi et al. 2008; Leclercq 2007; Kulkarni et al. 2006; Wu & Wang 2006; Almutairi & Subramanian 2005; Iivari 2005; Wixom & Todd 2005; McGill et al. 2003; Bharati 2003; Kim et al. 2002; Palmer 2002; Rai et al. 2002; Seddon & Kiew 1996; Seddon & Yip 1992) highlighted the existence of a significant positive relationship between information quality and user satisfaction. Thus, it is plausible that the observed positive association between information quality and the three measures of public hospital performance is a result of greater user satisfaction. Importantly, the findings reveal that HIS effectiveness can lead to better information and data utilization to improve clinical, financial and operational processes in the hospital. Additionally, it could be a result of the perceived usefulness. Generally, users interact with information systems that they perceive as more useful than they do with systems that they perceive as less beneficial. Previous studies have highlighted the positive relationship between information quality and the net benefits (Bharati & Chaudhary 2006; Kositanurit et al. 2006; Wu & Wang 2006; Shih 2004; Rai et al. 2002; D'Ambra & Rice 2001; Seddon & Kiew 1996; Gatian 1994; Kraemer et al. 1993).

Information quality is positively associated with IS use, user satisfaction, and net benefits at the organizational level (Peter et al. 2008; Scheepers et al. 2006; Coombs et al. 2001; Teo & Wong 1998; Wixom & Watson 2001). The findings of this study reveal that there is a positive association between information and each of the three performance outcomes. From the previous studies, it is possible that the positive association is a result of greater HIS use, and user satisfaction. Users are likely to be appreciative of information that is laden with knowledge, presented in a format that they readily understand and that they can readily apply to their daily activities. HIS system that scores high in information quality meets these requirements. Importantly, there is a clear convergence between the current findings and the previous studies regarding the positive association between information quality and performance. The current study adds to the existing knowledge by breaking down the association into clinical, financial and operational components. The research hypothesis that was tested and accepted is:

(H2): HIS information quality is positively related to public hospital performance.

8.4.3 HIS service provider quality is positively related to public hospital performance

The quality of the service provider is positively related to the clinical, operational and financial performance of public hospitals. The finding could be a result of the influence of the provider quality on the availability of service and support. A quality service provider ensures that HIS services are always running, technical problems are addressed with minimal disruption and can be relied upon to provide support services. These positives improve the overall usability of HIS and the perceptions that the user develop regarding the system, also the empathy and the reliable peapole who provide the health servics to the patients. Previous studies highlighted the value of high-quality HIS in aiding the administration (Rahimi et al. 2016), it improves the process of integrated decision-making (Lau et al., 2010) and the evaluation of performance (Goddard et al., 2012). The research hypothesis that was tested and accepted is:

(H3): HIS service provider quality is positively related to public hospital performance.

8.4.4 HIS training quality is positively related to public hospital performance.

The concept of use is tied to training and the availability of support. Users can use systems if they have been sufficiently trained in its different functionalities. The current study provides support for these assertions as they show that training quality is positively related to clinical, financial and operational performance of public hospitals. Thus, like previous studies that show a significant positive relationship between use and the net benefits of IS (Chiu et al. 2007; Halawi et al. 2008; Bharati & Chaudhary 2006; Kulkarni et al. 2006; Wu & Wang 2006; Iivari 2005; Wixom & Todd 2005; McGill et al. 2003; Kim et al. 2002; Rai et al. 2002; Torkzadeh & Doll 1999), the current findings highlight the value of investing in elements that improve the overall use of the system such as training quality. The research hypothesis that was tested and accepted is:

(H4): HIS training quality is positively related to public hospital performance.

8.5 The leading Indicators of Hospital Performance (Answering Research Question RQ3)

The table below provided a summary of the hypotheses that were tested to determine the relationship between HIS effectiveness and hospital performance. It is clear that the findings supported all twelve hypotheses.

Table 8. 1 Summary of the hypotheses that were tested and the outcomes of the tests

No.	Description	Results
H1	HIS System quality is positively related to public hospital performance is accepted	Supported
H1a	System quality is positively related to clinical hospital performance is accepted	Supported
H1b	System quality is positively related to operational measurements (Performance) is accepted.	Supported
H1c	System quality is positively related to financial measurements (performance) is accepted.	Supported
H2	HIS Information quality is positively related to public hospital performance is accepted.	Supported
H2a	Information quality is positively related to clinical measurements (performance) is accepted.	Supported
H2b	Information quality is positively related to operational measurements (performance) is accepted.	Supported
H2c	Information quality is positively related to financial measurements (performance) is accepted.	Supported
H3	HIS Service provider quality is positively related to public hospital performance is accepted.	Supported
H3a	Service provider quality is positively related to clinical measurement (performance) is accepted.	Supported
H3b	Service provider quality is positively related to operational measurement (performance) is accepted	Supported
H3c	Service provider quality is positively related to financial measurements (performance) is accepted.	Supported
H4	HIS training quality is positively related to public hospital performance is accepted	Supported
H4a	HIS training quality is positively related to Clinical measurements (performance) is accepted.	Supported

H4b	HIS training quality is positively related to Operational measurements (Performance) is accepted.	Supported
H4c	HIS training quality is positively related to financial measurements (Performance) is accepted.	Supported

8.5.1 System quality is positively related to clinical hospital performance

Devaraj and Kohli (2003) asserted that the use of HIS provides healthcare providers the opportunity to maximize the quality of the services that they offer. The system quality is equally important in ensuring that the hospitals harness the power of information technologies (Cho et al., 2003). The current study supports these previous studies as it shows that HIS system quality has a positive relationship with clinical performance. It is possible that the system quality influences the caregiving process by automating the process, reducing the input in redundant tasks and preventing the occurrences of errors such as misdiagnosis of diseases and erroneous prescription of drugs. The research hypothesis that was tested and accepted is:

(H1a): HIS system quality is positively related to clinical public hospital performance.

The hypothesis is supported by several previous studies (Devaraj & Kohli 2003; Cho et al., 2003).

8.5.2 System quality is positively related to operational performance

High-quality information system gives hospitals the chance to offer the best services (Urbach & Müller 2012), allows care teams to deal effectively with complex problems (Sligo et al., 2017), and documenting pertinent information relating to the patient (Nguyen et al. 2014). The findings of this study converge with those of previous studies in that it suggests that the system quality influences the operational performance of the public hospital. It is probable that the system quality is tied to the degree to which HIS implementation can improve the time required to complete most of the processes involved in caring for patients and other non-clinical processes. The research hypothesis that was tested and accepted is:

(H1b): HIS system quality is positively related to operational public hospital performance.

The hypothesis is supported by several previous studies (Urbach & Müller 2012; Nguyen et al. 2014; Sligo et al. 2017).

8.5.3 System quality is positively related to financial performance

The use of HIS in public hospitals improves evaluation (Rahimi et al., 2016) which in turn cuts down financial wastage, improves the administration of the staff (Ibrahim et al., 2016) which lowers the operational costs (Sligo et al., 2017). The current study supports these findings by highlight the existence of a significant positive relationship between financial performances. It is possible that the HIS system quality influences the degree to which its use curbs loopholes that cause financial wastage. Additionally, insights from its application to operational processes can result in new, more efficient approaches that reduce the resource demands. The research hypothesis that was tested and accepted is:

(H1c): HIS system quality is positively related to financial public hospital performance.

The hypothesis is supported by several previous studies (Rahimi et al., 2016; Sligo et al., 2017; Ibrahim et al., 2016).

8.5.4 Information quality is positively related to clinical performance

Information quality enables the staff to implement the required changes (Urbach & Muller 2012) and highlight the weak areas in hospitals (McCone 2017; Rezaian et al., 2018). The current study supports these findings by showing a significant positive relationship between information quality and clinical performance. It is plausible that the information quality influences the utility and value of HIS to the care of patients. For instance, the use of HIS can ease the process of accessing and noting information that improves the accuracy of medical diagnoses. The research hypothesis that was tested and accepted is:

(H2a): HIS information quality is positively related to clinical public hospital performance.

The hypothesis is supported by several previous studies (Urbach & Muller, 2012; McCone, 2017; Rezaian et al., 2018).

8.5.5 Information quality is positively related to operational performance

Goddard et al. (2012) revealed that the information quality influences the use of teams for the advancement of health. Similar studies showed that information quality improves the knowledge levels of the hospital staff (Lau et al., 2010) and administration (Rahimi et al., 2016). The current study is on concordance with these findings. Information quality may influence operational performance by easing the process of teamwork, enabling the employees to perform at higher levels, and creating room for innovation. Quality information for the management team can help reduce wastages and improve process flow. Several mechanisms underline this outcome including reduction in miscommunication, improvements in communication accuracy and timeliness, and the availability of information that can be used for innovative process reengineering to improve efficiency. The research hypothesis that was tested and accepted is:

(H2b): HIS information quality is positively related to operational public hospital performance.

Goddard et al. (2012), Lau et al. (2010) and Rahimi et al., (2016) arrived at similar conclusions.

8.5.6 Information quality is positively related to financial performance

The positive relationship between information quality and financial performance of public hospital noted in this study is in line with findings from previous studies. McCone (2017) linked information quality to a reduction in the cost of running hospitals, whereas Goddard et al. (2002) opined that it could nurture cost-saving innovations. However, the findings differ from those by Nguyen et al. (2014) who asserted that the information quality of HIS was linked to the increased workflow in the short-term. Overall, information quality can influence financial performance by influencing the implementation of cost-saving changes and innovations. The research hypothesis that was tested and accepted is:

(H2c): HIS information quality is positively related to financial public hospital performance.

Goddard et al. (2002) and McCone (2017) came to similar conclusions.

8.5.7 Service provider quality is positively related to clinical performance

Service provider quality can influence clinical performance in a number of ways. First, the service provider quality can affect the availability and reliability of clinical services such as diagnosis and prescription. The speed and reliability of the HIS are partly dependent on the service provider quality. Previous studies have tied provider quality to the ease of managing hospitals (Rahimi et al., 2016), integrated decision making (Lau et al., 2010) and the evaluation process (Goddard et al., 2002). The nature of support services and even extra services such as hosting and cloud storage can determine the room that a hospital has for the innovative use of the data that it generates from its HIS. The research hypothesis that was tested and accepted is:

(H3a): HIS service provider quality is positively related to clinical public hospital performance.

Several previous studies supported this hypothesis (Rahimi et al., 2016; Goddard et al., 2002; Lau et al., 2010).

8.5.8 Service provider quality is positively related to operational performance

Service provider quality can influence operational performance via several avenues. First, the applicability and use of the output of HIS to operational process depends on their quality. A service provider that designs a system that is unable to provide highly relevant and customized output is unlikely to contribute to improved operational performance (Sligo et al., 2017; Ibrahim et al., 2016). The research hypothesis that was tested and accepted is:

(H3b): HIS service provider quality is positively related to operational public hospital performance.

Sligo et al., (2017) and Ibrahim et al. (2016) arrived at the same conclusion.

8.5.9 Service provider quality is positively related to financial performance

The service provider quality influences the overall cost of implementing and running HIS (Sligo et al., 2017). A quality provider reduces the risk of a future surge in the costs of maintaining and running a HIS (Urbach & Muller, 2012). McCone (2017) opines that it is linked to the cost of input. Overall, the services provider quality affects the initial and ongoing investment in HIS and its contributions to cutting downs costs and wastage in hospitals. The research hypothesis that was tested and accepted is:

(H3c): HIS service provider quality is positively related to financial public hospital performance.

Previous studies have arrived at similar conclusions (McCone, 2017; Sligo et al., 2017; Urbach & Muller, 2012).

8.5.10 Training quality is positively related to clinical performance

Lau et al. (2010) revealed that having the appropriate skills related to the use of HIS improves care providers capacity to offer quality and timely services. Goddard et al. (2002) linked training quality to the innovation capabilities whereas Urbach and Muller (2012) link it to caregiving competencies. The current study converges with these previous studies. It is plausible that the training quality influences the overall usability of the HIS system and the perceived and actual clinical gains. The research hypothesis that was tested and accepted is:

(H4a): HIS training quality is positively related to clinical public hospital performance.

Goddard et al. (2002) and Urbach and Muller (2012) arrived at similar findings.

8.5.11 Training quality is positively related to operational performance

Previous studies outlined the operational benefits associated with training quality (Sligo et al., 2017; Ibrahim et al., 2016; Rahimi et al., 2016). The current study is in the same vein. It is plausible that the training quality influences the degree to which the end users can use HIS to improve operations and the data generated by this system to innovate. The research hypothesis that was tested and accepted is:

(H4b): HIS training quality is positively related to operational public hospital performance.

Studies that have come to similar conclusion include Sligo et al., 2017, Ibrahim et al., 2016, and Rahimi et al., 2016.

8.5.12 Training quality is positively related to financial performance

Training quality eventually leads to a reduction in the cost of operations (Lau et al., 2010), increase the cost of operations in the short term (Nguyen et al., 2014) and improves innovation (Rahimi et al., 2016). The current study converges with the findings by Lau et al. (2010) and Rahimi et al. (2016). It is possible that the quality of training influences the utility of HIS system reduced errors that can affect the system performance, and provide more opportunities to use HIS to enhance operations. The research hypothesis that was tested and accepted is:

(H4c): HIS training quality is positively related to financial public hospital performance. The studies that support this view include Lau et al. (2010) and Rahimi et al. (2016).

8.6 Contributions

The study has been a resounding success. All three objectives that the study sets out to address, including their associated research hypotheses and questions, were amicably addressed. The study shows that it is possible to assess HIS effectiveness and use multiple measures for hospital performance.

The study and its findings make several remarkable contributions to research and practice. First, the study confirms that HIS implementation is associated with improvement in hospital performance as some earlier studies had reported. Unlike previous studies, it shows that this relationship exists in the Jordanian health system and drills down the performance to clinical, financial and operational components. Thus, the study was successful in addressing the research gap that had been identified.

The study contributes to the existing understanding of best practices in the effective implementation and measurement of HIS. HIS measurements used in this study can be employed by future studies and in practice settings to assess HIS effectiveness. Unlike existing tools for assessing IS implementation, the new tools will include training and service provider quality; this is likely to change the approach used in assessing the existing information systems.

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The study sought to address the low update of HIS in Jordan public health by developing an understanding of HIS effectiveness and its relationship with hospital performance. Specifically, the study aimed to investigate the impact of HIS effectiveness on the financial, operational and clinical performance of public hospitals. The study led to the identification and validation of measurements of HIS effectiveness in public hospitals. Additionally, the study revealed that each of the four dimensions of HIS effectiveness has a significant positive relationship with the clinical, operational and financial performance of public hospitals in Jordan. The findings also reveal that training quality is a reliable indicator of overall hospital performance and for clinical, financial and operational performance. System quality is the leading indicator of clinical performance. Even though the study achieved its mandate, some limitations must be considered when interpreting these findings. First, the research design is not enough to make cause-and-effect inferences. As such, the study findings cannot be used to claim that HIS implementation leads or causes better performance. Secondly, the generalization of the findings should be limited to public hospitals in Jordan. There is no basis for inferring the findings beyond this target population.

9.2 Recommendations

The following recommendations have been made based on the findings:

9.2.1 Research

a) The first research implication is the need to consider going beyond system and information quality in the assessment of HIS effectiveness. The current study reveals that training and HIS Information Quality are equally important in assessing this construct. Future research should involve the exploration of more constructs that should be included in assessing HIS effectiveness to improve their accuracy and reliability.
b) The current study had some methodological limitations that limited cause-and-effect inferences. Future studies should seek to use better designs that involve randomization and blocking and control groups to develop a better understanding of the nature of the relationship between HIS effectiveness and public hospital performance.
c) Qualitative techniques can be used to develop an understanding of why training quality is the strongest predictors of hospital performance out of the four dimensions of HIS effectiveness.

Such studies will help enhance the existing understanding of the value of training quality of HIS implementation and use.

d) Actually the researcger didn’t measure the performance but she has relyed on a validated questionnaire that listed some questions related to performance (appendix A: questionnaire part six), based on that this questionnaire was distributed to end user who used the HIS in the hospital research method of this research study is purely quantitative and the researcher didn’t use secondary data. just the researcher in this research study tested the relation between the quality of HIS and training quality and their significant effectiveness on net benefit one of these benefit is the performance, but the researcher didn’t measure the performance and this is out of the scope of my thesis.

9.2.2 Practice and Policy

a) Public hospitals should endeavor to increase their uptake of HIS as its use is associated with improved financial, operational and clinical performance. The government as the foremost stakeholder in the Jordan public healthcare service provision should allocate budgets for the acquisition and implementation of HIS in all key public healthcare facilities.

b) The implementation of HIS in public hospitals in general and in Jordan’s public hospitals must involve due considerations of the information, system, training and service provider quality. The findings show that each of these factors is important to the effectiveness of HIS implementation and possibly influences the contributions of HIS effectiveness to hospital performance.

c) The assessment of information systems and HIS in public hospitals should involve consideration of the system and information aspects as well as the training and service provider dimensions. Most existing assessment tools tend to focus on the former while ignoring the latter.

d) Policy level changes are required to encourage the uptake of HIS by Jordan’s public hospitals. The findings of this study reveal that effective HIS implementation may contribute to improving operational, financial and clinical performance in public healthcare facilities. Examples of policies that may be considered include providing free training for workers from healthcare facilities that are implementing HIS and subsidizing IT tools and software meant for healthcare use.

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APPENDIXES

Appendix A: ASurvey Questionnaire

Survey Questionnaire

Dear Sir/Madam

You are invited to participate in a research study survey for doctoral degree purposes titled “The impact of Health Information System (HIS) effectiveness on public hospital performance, case of Jordan".

Taking part in this study will take you approximately 10 minutes to fill the questionnaire. All of your responses will be recorded anonymously and kept confidential. There is no any kind of risks and possible disadvantages associated with participating in this research study.

If you are able to help me to fill in the survey, I will highly appreciate it.

Many thanks for your cooperation.

Note: This research questionnaire has ethical approval by the research ethics committee of the university.

Part 1: Demographic information:

Please answer the following questions by tick the relevant answer:

1. What is your gender?

   1. Male
   2. Female

2. What is your age?
   1. 18 to 25
   2. 26 to 39
   3. 40 or above

3. What is your position in the hospital?

1. Managers
2. Staff

4. How long have you been employed in this hospital?
   1. Less than 12 months
   2. Between 1 to 3 years
   3. More than 3 years

5. What is the percentage for the employees who are using the Health Information system in this hospital?
   1. 9% or less
   2. Between 10% and 29%
   3. Between 30% and 49%
   4. 50% or more

6. How long the health information system have implemented in this hospital?
   1. One year or less
   2. One year to three years
   3. Three years to five years
   4. More than five years

Please specify to what extent you agree or disagree with the following statements as a result of measuring the items of health information system effectiveness in the hospital:

P art Two: HIS System Quality

The following statements ask you to assess the general characteristics of the Health information system. Please click the answer that best represents your evaluation of each statement.

7. **The extent that:**

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
7.1 HIS system is reliable					
7.2 HIS system is flexible					
7.3 HIS System is responsive to meet your changing needs					
7.4 HIS system meet					

your expectation					
7.5 HIS System is easily upgraded					
7.6 HIS System is well integrated					
7.7 System provides benefits for the entire hospital					
7.8 HIS System is useful for problem identification					
7.9 HIS System is helpful for decisions making					
7.10 HIS system coverages of medical knowledge bases					
7.11 HIS System is ease to use					
7.12 HIS System is easy to learn					
7.13 HIS System is cost effective					
7.14 HIS Make easier to do your work					
7.15 HIS have fast response time					
7.16 HIS System is accessible in timely manner (ease with which information can be retrieved from the system)					
7.17 HIS system is easily maintained					
7.18 It is easy to become skilful in using systems					

The following statements ask you to assess the extent that HIS system produce various outcomes for you and your work. Please click the answer that best represents your evaluation of each statement.

8. The extent that Health Information system (HIS):

	Strongly disagree 1	**Disagree 2**	**Neutral 3**	**Agree 4**	**Strongly agree 5**
8.1 Improve your decisions					
8.2 Give you confidence to accomplish your					

job					
8.3 Increase participation in decision making					
8.4 Improve work quality					
8.5 Enhance the ability of problem solving					
8.6 Facilitate collective group decision making					
8.7 Facilitate collaborative problem solving					
8.8 Facilitate your learning					
8.9 Facilitate knowledge transfer					
8.10 Facilitate internal relationships					
8.11Enhance information sharing with internal departments					
8.12 Reduce process cost					
8.13 Reduce cycle times					
8.14 Increase your work productivity					
815 Contribute to achieve the strategic goals of the medical, nursing and administrative management					
8.16 Increase your awareness of job-related information					
8.17 Improve your job performance					
8.18 Improve patient satisfaction					
8.19 Speed service delivery					
8.20 Help you manage relationships with other departments					

Part three: Information Quality of HIS

The following statements ask you to assess the general characteristics of the information that HIS provide to you. Please click the answer that best represents your evaluation of each statement.

9. The extent that:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
9.1 Information is easily updated					
9.2 Information is easily integrated					
9.3 Information is easily changed					
9.4 Information is easily maintained					
9.5 Information is reliable					
9.6 Information is verifiable					
9.7 Information is interpretable					
9.8 Information is understandable					
9.9 Information is concise					
9.10 Information is important					
9.11 Information is relevant					
9.12 Information is well organised					
9.13 Information is well defined					
9.14 Information is available					
9.15 Information is up-to-date					
9.16 Information is received in timely manner					
9.17 Information is accessible					
9.18 Information is complete					
9.19 Information is accurate					
9.20 Information is clear					
9.21 Information is usable					
9.22 Information is believable					
9.23 Information					

is unbiased					
9.24 Information is secure (data protection)					

The following statements ask you to assess the outcomes of using the information that HIS provided to you. Please click the answer that best represents your evaluation of each statement.

10. The extent that:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
10.1 Information is useful for defining problems					
10.2 Information is useful for making decision					
10.3 Information is identifying problems					
10.4 Information is useful for problem solving					
10.5 Information meets your requirements					
10.6 Information improve your efficiency					
10.7 Information improve your functional productivity					
10.8 Information improve decision effectiveness					
10.9 Information can be used for multiple purpose					
10.10 It is easy to identify errors in information					
10.11 Information can be easily compared to past information					

Part four: service provider quality of HIS

The following statements ask you to assess the IS provider people. Please click the answer that best represents your evaluation of each statement.

11. The extent that IS provider people:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
11.1 are polite					
11.2 Are reliable people					
11.3 Has your best interest at heart					
11.4 Are sincere					
11.5 Are helpful to you					
11.6 Solve your problem as if they were their own					
11.7 Show respect to you					
11.8 Are pleasant to work with					
11.9 Are willing to help you					
11.10 Have a knowledge and skills to do their job well					
11.11 Are dependable people					
11.12 Instil confidence in you					
11.13 Understand your specific needs					
11.14 Are efficient in performing their services3					
11.15 Help to make you a more knowledgeable computer user					
11.16 Gives you individual attention					

The following statements ask you to assess the service provider (SP) by the function. Please click the answer that best represents your evaluation of each statement.

12. The extent that the IS function:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
12.1 Responds in timely manner					
12.2 Complete its services in a timely manner					
12.3 dependent in providing services					
12.4 Can provide emergency					

services					
12.5 Has a sufficient people to provide services					
12.6 Provides a sufficient variety of services					
12.7 Has sufficient capacity to serve all its users					

Part Five: Training quality

The following statements ask you to assess the training programs provided by the IT department. Please click the answer that best represents your evaluation of each statement.

13. The extent that:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
16.1 Training programs ae useful					
16.2 Have a variety of training programs					
16.3 The current training programs are cost effective					
16.4 Training programs cover your needs					
16.5 Training programs are instructive					
16.6 Training programs are sufficient					
16.7 Training programs help you to learn the numerous uses of HIS system					

Part six: Hospital performance

The following statement ask you to assess the public hospital performance after the Health information system HIS implantation. Please click the answer that best represents your evaluation of each statement.

14. The impact of HIS system on public hospital performance:

	Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
14.1 HIS reducing avoidable incidents by contributions to improvements in the quality of care offered to the patients					
14.2 HIS Reducing Medical errors					
14.3 HIS aid in the reduction of death rates by aiding the timely acquisition of information on the patient that minimize the risk of medical errors					
14.4 HIS Increased patient satisfaction by contributions to improvements in the quality of care offered to the them					
14.5 HIS increased the quality of care by creation of high quality systemic information sharing					
14.6 HIS increase hospital service effectiveness					
14.7 The computerized system enables the medics to serve their patients with a smile and to meet the corporate objective					
14.8 HIS makes the admission process score more seamless.					
14.9 HIS facilitates the sharing of patient data among hospitals in a secure manner					
14.10 HIS facilitates retrieval processes					

associated with patient admission					
14.11 HIS reduction in medication errors (by support various technologies that help avoid miscommunication of patient data and prescriptions)					
14.12 HIS reduce the patient wait time while waiting for the provision of services					
14.13 HIS reduce the average length of stay ALOS (ascertaining the time it takes a hospital to restore patients into a functioning state)					
14.14 HIS helps in scheduling of maintenance tasks and monitoring trends in service and resource utilization					
14.15 implementation of a HIS end in better (balanced) resource utilization (not too high nor too low)					
14.16 HIS make it easier to collect and visualize data on different payers.					
14.7 HIS facilitate the scheduling of physicians to ensure that there is a proper balancing of their workload					
14.18 HIS ensure a uniformity and improvements in physicians' performance (revenue per physician and reimbursements per physician).					
14.19 Implementation of a HIS minimizing recurrent					

expenditures such as the money used in procuring stationery and communicating.					
14.20 HIS facilitate in capturing the financial state of a hospital in real time					
14.21 HIS Facilitate administrators and other members of the administrative staff to report their finances and remain accountable.					
14.22 HIS reduction the expenses incurred by the hospital (by reduction in overtime and test errors)					
14.23 HIS reduce the number of referrals made by a hospital to outside centres					

Thank you

Appendix B: Letter of Ethical Approval

College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London
Kingston Lane
Uxbridge
UB8 3PH
United Kingdom

www.brunel.ac.uk

3 April 2017

LETTER OF APPROVAL

Applicant: Mis Heba Hatamlah

Project Title: Health Information system effectiveness (HIS) and public hospital performance

Reference: 6392-LR-Apr/2017- 6987-1

Dear Mis Heba Hatamlah

The Research Ethics Committee has considered the above application recently submitted by you.

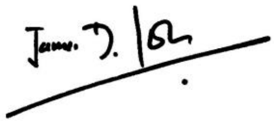
The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.

Approval to proceed with the study is granted subject to receipt by the Committee of satisfactory responses to any conditions that may appear above, in addition to any subsequent changes to the protocol.
The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.
You may not undertake any research activity if you are not a registered student of Brunel University or if you cease to become registered, including abeyance or temporary withdrawal. As a deregistered student you would not be insured to undertake research activity. Research activity includes the recruitment of participants, undertaking consent procedures and collection of data. Breach of this requirement constitutes research misconduct and is a disciplinary offence.



Professor James Knowles

Chair

College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London