



**ST. MARY UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**THE EFFECT OF INFORMATION TECHNOLOGY QUALITY ON  
HEALTH SERVICE DELIVERY: THE CASE OF PRIVATE  
GENERAL HOSPITALS IN ADDIS ABABA**

**BY**

**THOMAS ALEXANDER**

**JANUARY 2023**

**ADDIS ABABA**

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SERVICE DELIVERY: THE CASE OF PRIVATE GENERAL HOSPITALS  
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**THOMAS ALEXANDER**

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**APPROVAL SHEET**

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## DECLARATION

I, Thomas alexander , hereby declare that the thesis entitled “THE EFFECT OF INFORMATION TECHNOLOGY ON HEALTH SERVICE DELIVERY: THE CASE OF PRIVATE GENERAL HOSPITALS IN ADDIS ABABA” is my original work and submitted by me for the award of the Degree of Masters of business administration of St. Mary’s University in Addis Ababa and it hasn’t been presented for the award of any other Degree, Diploma, Fellowship or other similar titles of any other university or institution and that all sources of material used for the study have been appropriately acknowledged.

*Thomas Alexander*

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Student

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Signature, January 2023

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## **ACRONYMS**

HIT	Health Information Technology
WHO	World Health Organization
ICT	Information and communication technology
GNP	Gross National Product

## ABSTRACT

*The quality of information technologies implemented in Ethiopian private hospitals is far more modern and sophisticated than in public health facilities. The adoption of information and communication technology facilitate the provision of quality medical service but couldn't mitigate the extent of patient's complaints significantly. The study, thus, sought to investigate the effect of IT adoption on health service quality by taking private general hospitals in Addis Ababa as a case. The study targeted the population of medical staff (physician, nurses, lab technicians, and health officers at 10 private general hospitals. Convenient sampling technique was used for selecting the targets to collect primary data through self-administered questionnaires. The data were encoded and conducted both descriptive and inferential analyses with the help of SPSS 22.0. The findings showed that the five dimensions of health information technology had positive and significant effect on health care service quality. Specifically, information accuracy and relevance had relatively the highest contribution to the service quality. Whereas information integrity, physician-patient interactivity and information timeliness showed the least effect. It can be concluded that adoption of IT technologies facilitates provision of quality healthcare service in private general hospitals in Addis Ababa. It Is recommendable to implement user friendly software application, increase automation and telemedicine platform for easy access in a timely manner.*

**Keywords:** Information Technology, Service Quality, Healthcare Service

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background of the Study

Radical changes in lifestyle and nutrition had a profound impact on life duration and quality of life the fact that increased awareness of health-related problems results in escalating the demand for competent healthcare performance. The emphasis put on maintaining the high quality of services, the emergence of sophisticated technology, and the high incidence of chronic conditions in modern societies add to growing trends in healthcare expenditures. In this regard, new and innovative information technologies substantially transformed healthcare services to fit modern society (Bryman, 2014). However, the industry is characterized by considerable medication errors, poor communication, and disorganized/ inefficient delivery systems. To improve these situations, information technology has to be used to enable healthcare transformation, which involves replacing poorly coordinated acute-focused episodic care with coordinated management for preventive, acute, chronic, long-term, and end-of-life care (Long, 2013).

Information technology is the use of any computers, storage, networking, and other physical devices, infrastructure, and processes to create, process, store, secure, and exchange all forms of electronic data (Hughes, 2012). Typically, it is used in the context of business operations, as opposed to the technology used for personal or entertainment purposes. The commercial use of IT encompasses both computer technology and telecommunications.

Health information technology is information technology applied to health and medical care. It is compatible with the management of health information through computerized systems and the secure exchange of health information between consumers, suppliers, payers and quality monitors (Tate and Laura, 2013). Thus, technology adoption means the choice to acquire and use new ideas or innovation. The approach based on the irrational beliefs or individual experiences of practitioners was substituted by evidence-based clinical practice in modern society with the help of emerging communication technology. The adoption of information communication technology among general practitioners is to provide access to health services for the citizens (Gour and Srivastava, 2010). In the healthcare sector, information technology has played a crucial role in providing a central database to manage patient data in the form of electronic health records and modern software that helps to simplify

medical billing and coding and streamline the revenue cycle (Bryman, 2014). It has improved the level of patients' safety and outcome. Furthermore, the use of sophisticated equipment has improved the aspect of progressively updating the patients about their medical status (Gush, 2011).

Previous studies show that traditional codes of medicine practice put stress on direct contact between the physician and the patient (Caxton, 2015; Jelal, 2015; Kibe, 2014). The form of these contacts is frequently defined by appropriate legal regulations but there are many forms of services in which the traditional approach could be modified with the use of modern IT (Jelal, 2015). According to Lember (2017), the use of sophisticated equipment has improved the aspect of progressively updating the patients about their medical status including follow-up visits of chronic patients, monitoring of symptoms severity, and educating patients about their diseases. A patient with an established diagnosis remains under the long-term control of the physician, next visits do not require detailed history taken on every occasion. Instead, the physician should focus on issues that are the priority in the context of the individual patient and specific disease (Mwangi, 2015).

In this regard, information technology resources have improved the level of patients' safety and outcome by providing relevant, accurate, timely, and integrated information (Caxton, 2015). But consequently, the recent increasing burden of health care costs in developing economies has been regarded as the primary contemporary issue affecting the healthcare industry in several nations of the third-world countries. Through the application of information technology resources in the healthcare sector, private hospitals haven't been able to reduce their ever-escalating operational and other associated costs. For instance, the implementation of information technologies in private hospitals is far more modern and sophisticated than in public health facilities, but the medical costs as well as patient's complaints are incomparable. General hospitals in Ethiopia are also not far from this fact.

According to federal ministry of health (FMOH) report on 2021, there are a total of 144 hospitals in the country of which 54(37.5%) are owned by private investors but, in the vicinity of the capital city, only 44 private hospitals are licensed to provide the service up to the standard. Referring to Ethiopian health-tier, one of the criteria to level the healthcare institutes is their respective bed capacity. Based on minimum bed capacity requirement, those which have up to a minimum of 35, 50 and 110 beds are categorized under primary, secondary and tertiary level healthcare institutes respectively. There is a total of 37 primary hospitals, 10 general hospitals and 1 specialized hospital in the city currently (Addis Ababa Health Bureau, 2021). General hospital shall mean a health facility at secondary level

of healthcare tier which provides promoted, preventive, curative and rehabilitative service that requires diagnostic facilities and therapeutic intervention with a minimum capacity of 50 beds.

The emergence of private investments in the healthcare service sector escalates the intense competition in the hospitality industry in the country. Healthcare facilities have been known for accommodating patients far beyond their maximum capacities due to lack of sufficient medical professional and supplies to exceed the minimum standards (Dawit, 2019). The issue is more pronounced in the public health centers but the emergence of private investments in the sector mitigates their burden to a certain level. However serious legal requirements, increasing customers' awareness, demanding better medical services and complicated doctor-patient relation augmented the demand for adopting more sophisticated information and communication systems and tools to mitigate medical errors, exaggerated cost, extended delay, and bureaucratic procedures.

Undoubtedly, information and communication technology resource adoption contribute significantly to a better quality of care (Lember, 2017). The increased use of communication resources in hospitals has helped improve the knowledge level of the patients. I.e., through the use of computers or monitors, and digital communication tools, the patients have a chance of grasping the visual perspective of their health status. Moreover, the integrated information system is critical to patients' diagnosis and the reduction of medical errors has gone a long way in holistically improving the level and quality of healthcare outcomes and patients' safety (Mwangi, 2015). Other aspects of quality in the health sector are affordability, newer medical, and effective medication. According to Navathe and Conway (2019), improved health systems are fundamental in ensuring improved citizens' welfare.

Hence understanding the influence of information technology on the performance of medical service delivery is not overstated. The purpose of this study is, thus, to investigate the effect of information technology on medical service delivery in the case of private general hospitals in Addis Ababa, Ethiopia. The adoption of information technology opens the window for assuring appropriate healthcare quality to obtain the service in time within reasonable costs. Particularly, the rapid growth of the internet radically changes the mode of health services delivery.

## **1.2. Statement of the Problem**

Inaccuracy in medical care service has become common phenomenon in Ethiopia (MoH, 2020). Medical error complaints were filed by patients/ family of patients, police officers and regular courts to be reviewed by the committee against the incident. The escalation of the issue to the alarming rate in the private hospitals makes it more serious. According to Biruk (2019), among the files sued against medical doctors in eight years (2013– 2020), 125 incidents were investigated and case files closed. Despite, 22 cases at federal level are pending, 146 professionals from over 20 different types of health professions were involved. From all complaints, about 48% of them happened in governmental health facilities and 52% of them in private health facilities. This indicates the issue is more pronounced in the private health centers.

Medical error is a common encounter and represents an important public health problem posing a serious threat to patient safety. A study released in 2016 by Ranaei and Gorji (2020) found medical error is the third leading cause of death in the United States, after heart disease and cancer. Researchers looked at studies that analyzed the medical death rate data from 2000 to 2008 and extrapolated that over 250,000 deaths per year had stemmed from a medical error, which translates to 9.5% of all deaths annually in the United States of America, which makes the country lead in medical error worldwide. Even if there were a large number of medical errors in health-care settings, data in middle- and low-income countries are limited and varies widely since reporting error is still quite low. Thus, the requirement of adopting well-designed information technology is undeniable.

In Ethiopia, as part of health system reform, many healthcare quality improvement initiatives has been tried and one of them is reporting of safety events by implementing healthcare information technologies (Biruk, 2019). The emergence of private hospital investments in the sector were hoped to mitigate the burden of medical errors in hospitals to a certain level (MoH, 2020). However serious legal requirements, increasing customers' awareness, demanding better medical services and complicated doctor-patient relation augmented the demand for adopting more sophisticated information and communication systems and tools to mitigate medical errors, exaggerated cost, extended delay, and bureaucratic procedures.

Several studies in the field focused on the ethical issues of the medical professionals. Joseph (2017) argues that medical malpractice claims arise from health professionals' failures due to error or omission in diagnosis, treatment, aftercare or health management, cause an injury and/or death in a



patient. Peters (2018) also claims that error or omission is based upon the deviation of the health professional from a generally accepted standard of care. James (2017) posits that an injury or inadvertent complication that is the result of a medical treatment is not malpractice if the health professional administering the treatment properly advised the patient about the potential risks, obtained consent, and exercised appropriate/standard care in providing the treatment. In the healthcare process, there is a lot of literature on HIT pay off, but it overlooks the effect of actual IT usage on service delivery quality.

It reveals that undoubtedly information and communication technology resource adoption contribute significantly for the betterment of health care quality (Lember, 2017). As innovative methodologies enter into the healthcare industry, the tools' efficacy is critical resulting in positive change for the betterment of the industry (Simon, Keohane, and Amato, 2013). Moretto and Rebba (2009) argue that such practices are able to demonstrate if the resources should be devoted to keep information relevant, accurate, integrated and patient-centered in a timely manner. Long (2016) also posits staff competence and responsiveness are the determinant factors for the perceived quality of adopted technologies. While healthcare entities have integrated various forms of health information technology (HIT) into their systems, consideration of user's perception to deliver quality medical service in time with increased quality with fair prices (Kahn, 2014).

Investigating the effect of health information technology on the betterment of medical service quality helps to minimize the issue of medical error as well as complaints of patients due to misperception of the medical service complexity. More investment in HIT and the quality of health information can decrease medical errors, reduces operational costs, and enhances the quality of health care processes, and adopting HIT could save billions of dollars, reduces drug events, and lead to a better doctor-patient relationship (Lember, 2017). Moreover, the integrated information system is critical to patients' diagnosis; and the reduction of medical errors has gone a long way in improving the level and quality of healthcare outcomes and patients' safety holistically (Mwangi, 2015). This can be achieved by providing relevant, accurate and integrated information in a timely manner to enable ease of physician-patient interactivity.

The aim of this study was, thus, to investigate the effect of information technology adoption on service delivery in case of private hospitals in Addis Ababa. It focuses on the perception of medical staff at selected private general hospitals to understand the influence of information and communication system adoption on the perceived quality of the delivered medical service. This helps to fill the

aforementioned gap by examining the efficacy of the health information technologies in regards to contributing to the delivery of quality service.

### **1.3. Objectives of the Study**

#### **1.3.1. General Objective**

The general objective of the study was to investigate the effect of information technology on medical service delivery in the case of private general hospitals in Addis Ababa.

#### **1.3.2. Specific Objectives**

- i. To examine effect of information relevance on service delivery of private hospitals
- ii. To analyze the effect of information accuracy on service delivery of private hospitals
- iii. To understand the effect of timeliness on service delivery of private hospitals
- iv. To establish the effect of staff's integrity on service delivery of private hospitals
- v. To examine the effect of physician-patient interaction on service delivery of private hospitals

### **1.4. Hypotheses**

- H1. Information relevance has positive and significant effect on service delivery
- H2. Information accuracy has positive and significant effect on service delivery
- H3. Information timeliness has positive and significant effect on service delivery
- H4. Staff integrity has positive and significant effect on service delivery
- H5. Physician-patient interaction has positive and significant effect on service delivery

### **1.5. Significance of the Study**

The investigation of adopted health information technology practices of private hospitals has a number of significances to different stakeholders like the hospital managements, health information software developers, in- and out-patients, and serving as springboard for further study.

It provides well-organized, accurate and relevant information in timely manner to individual patients which may mitigate the complaints against medical errors. It might benefit the hospital managers and marketers to implement cost effective information technology strategy to attract and retain users/patients for longer period. It would also help them allocate appropriate budget based on

informed decision making. Information technology developers may get better understanding regarding the incompetence of the existing technologies to deliver quality service to the organization as well as the individual patients/ users. Managements of general hospitals redesign several health cares processes and systems across both inpatient and outpatient settings, with outcomes that include reducing missed appointments, medical errors, hospital length of stay, and costs. The customers (patients) would have better information regarding the overall activities of the hospitals what they have or have not. It also mitigates the hassle of accessing information and chasing known-physicians here and there in pursue of better medical services. It might also serve as a spring board for further study in the field by prospect fellow graduates.

### **1.6. Scope of the Study**

The researcher studies how private general hospitals use HIT, to ensure quality service delivery. The scope was geographically limited in Addis Ababa, the place where most private general hospitals are located. Other private hospitals in regional state will be excluded intentionally as they are out of the scope of this study. In particular this research looks in to the influence of IT in quality service delivery of healthcare facilities. It examines how the quality of the medical service is affected by competency of adopted HIT. The concept of IT adoption and service quality, in which the former is explained by providing relevant, accurate, and integrated information in time to enable easier physician-patient interaction. The study focuses on selected private general hospitals' operations from September to November 2022. The study involved medical staff at the selected ten private hospitals and considered only quantitative research approach to examine the relationship between HIT adoption and quality of medical services.

### **1.7. Limitations of the Study**

This study sought to examine the effect of technology adoption on quality of hospitals' health care service delivery only from the medical staff's perspective. Hence, it did not capture the views of the patients. It is therefore recommended that a study be done from patient's aspect. It focused only on private hospitals, labelled "General Hospitals" under the distinction of Ethiopian Federal Ministry of Health. Inclusion of other level of healthcare institutions like primary and secondary grade level institutes would give the bigger picture of this study. Moreover, only information technology quality factors were considered but there are several other factors like work environment, speciality area, institute's structure and size, etc. that could affect the success of the health service delivery.

Consideration of these issues in future studies might bring different results. Thus, future research on determinant factors of service delivery success in Ethiopian context are required.

## **1.8. Definitions of Key Terms**

**Information Technology** – Is defined as “a system that is both simple and complete, electronic hardware devices, and informal (word-of-mouth) communication chain net or computer-based information systems that use hardware and software, Internet and other telecommunications networks that transform data resources into an endless data of information products”. (Ranald, 2003).

**Information and Computer Technology (ICT)** - Is the convergence of computing, telecommunication and video techniques with computing providing capabilities for processing and storing information. (Horton, 1990).

**Service Delivery** - Service delivery is a component of business that defines the interaction between providers and clients where the provider offers a service, whether that be information or a task, and the client either finds value or loses value as a result. Good service delivery provides clients with an increase in value. (Idowu, 2010).

**Information Accuracy** – Information accuracy is one of the data quality characteristics that implies the information is correct (Jelal, 2015). In this research, the data accuracy is considered to be the reliability or free from error information delivered by the information system.

**Information Relevance** – Information relevance refers to the relatedness of the information be needed for decision-making (Lember, 2017). In this research, the information relevance is considered to be the information obtained and used for medical decision making.

**Information Timeliness** - Information needs to be timely if it is to be actioned. It refers to how up to date information is (Caxton, 2015). In this study, if the information was gathered in the past hour, then it's timely – unless new one has come in that renders previous medical information useless.

**Staff Integrity** - Data integrity is the measure of comprehensiveness (Kibe, 2014). For this study, information integrity refers to the requirement to ensure the information provided gives the complete picture of the medical reality of a patient.

**Physician-Patient Interaction** – It refers to effective communication between doctor and patient which is essential to achieve a high-quality healthcare (Caxton, 2015).

## **1.9. Organization of the Study**

This paper comprised five different chapters. The first chapter is an introduction which consists of background of the study, statement of the problem, research questions, objectives, significance, scope and limitation of the study. The second chapter presents review of related literature with respect to the theoretical perspective of HIT and empirical studies on IT and the third chapter is research methodology. Data collected from respondents were presented and analyzed in the fourth chapter, and the last chapter summarized of findings, conclusions and recommendations based on the findings.

## **CHAPTER TWO**

### **REVIEW OF THE RELATED LITERATURE**

#### **2.1. Theoretical Review**

##### **2.1.1. Concepts of Information System**

Concepts are the building blocks of theory and represent the points around which social research is conducted (Bryman, 2014). In a subtle way, they help to shape the boundaries within which a given object or phenomenon is examined, in this way forming the parameters within which to operate. For the purposes of this study, the following concepts were used as explained below.

##### **2.1.1.1. Information and Communication Technologies (ICTs)**

ICTs have been defined as any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form (Hughes, 2012). ICTs are divided into old/conventional and new ICTs. The old ones include radio, television, newspapers and magazines, while the new ones include computers, telefaxes, telephones, CD-ROMs, cable television and satellite systems. Literature identifies the conventional ICTs with the term media technology, and the new ones with IT.

The new ICTs focused on in this study are computers. Although they are ICTs in their own right, computers are integral parts of most modern telecommunication systems (Archangel, 2007). Some of the world's most sophisticated computers serve as 'switches' for major communications networks. Furthermore, miniaturised computer-like components enable the operation of most transmission and receiver technologies, ranging from telephones to television sets. There are different kinds of computers, and they include personal computers, laptops and handheld computers. It is the handheld computers that are the subject of this study.

##### **2.1.1.2. Continuing Medical Education**

Continuing Medical Education (CME) consists of educational activities that serve to maintain, develop, or increase the knowledge, skills and professional performance and relationships that a physician uses to provide services for patients, the public or the profession (American Academy of Paediatrics Grand Rounds Journal). The content of CME is that body of knowledge and skills generally recognised and accepted by the profession as within the basic medical sciences, the discipline of clinical medicine, and the provision of health care to the public. This definition of CME

recognises that all continuing educational activities which assist physicians in carrying out their professional responsibilities more effectively and efficiently are CME (Hughes, 2012).

### **2.1.1.3. The Modernization Theory of Development**

Discussions today about new ICTs having power to promote development, for example through facilitating the delivery of health services to hard-to-reach areas, areas with few health centres and/or few medical personnel, are a resurrection of the modernisation theory of development, also commonly known as the dominant paradigm. Melkote and Steeves define modernisation as a transition, or a series of transitions from primitive, subsistence economies to technology-intensive, industrialised economies; from subject to participant political cultures; from closed systems to open, achievement-oriented ones (2011).

Modernisation is the oldest and most deeply rooted view in Western development thinking (Servaes 2019). It came up during the late 1940s and 1950s, arising from the notion that international mass communication could be used to spread the message of modernity and transfer the economic and political modes of the West to the newly independent countries of the South (Thussu, 2010; White, 2014). The mass media were believed to have the potential to transform traditional societies by bringing images of ‘modernity’ to them.

Daniel Lerner was one of the earliest exponents of this theory. From research in the Middle East (*The Passing of Traditional Society*, 1958), he presented the Western path of ‘development’ as the most effective way to shake off traditional ‘backwardness’, arguing that Western society provided the most developed model of societal attributes (power, wealth, skill, rationality), and that from the West came the stimuli which undermined traditional society (Thussu, 2010; Servaes, 2019).

It is little wonder that today, most communication practice and scholarship in Third World development literature are consistent with the modernisation theory (Melkote and Steeves, 2011). Melkote and Steeves explain that at both the macro and micro levels, communication is viewed as a product and reinforcer of economic growth and development. At the macro level, the communication scholars who support this perspective back global and national policies that facilitate ‘free flows’ of media and information technology, content and hardware, for they view these products as crucial for Third World development and participation in the global economy. At the micro level, they support persuasive marketing campaigns (in areas like health, agriculture and population) as the most efficient means to transform traditional individuals and societies.

Viewing development as the bridging of gaps between traditional and modern by means of imitation processes, to the advantage of the latter (Servaes, 2019), the theory emphasised the massive transfer of capital-intensive, labour-saving technology, mainly from industrialised nations to underdeveloped countries. Echoes of these ideas are still present today. Computers, mobile telephones, telefaxes, CD-ROMS and a multitude of digital technology have been applied in the West, and now they are being seen as the solution to developing countries' problems, too. Schramm's explanation for this is that the transfer of communication media to the Third World automatically results in economic welfare (Schramm, 2014, in Avgerou and Walsham, 2010).

Such ideas have made the modernisation theorists receive criticism for seeking the explanation for countries' underdevelopment in chiefly internal causes that could be solved by technological (external) aid, rather than in their trade or external relationships with industrialised countries (Servaes, 2019). Dependency theorists have argued that the emphasis on technological transfer has led to greater technological dependence of developing countries on the more advanced ones (White, 2014).

The modernisation theory also believed in centralised planning, mainly by government economists and bankers, to guide and speed up the process of development. Because of this, development became the highest priority for most national governments in developing nations, once they obtained independence (Rogers, 2013). Today, institutions like the United Nations, World Bank and the International Monetary Fund make decisions on what nations should do, and even oversee the implementation of these decisions. Using ICTs as an example, Nulens and Audenhove say they do this because of the conviction that these tools can benefit their users. The authors note:

*“In recent years they (organisations) have introduced a multitude of programmes and initiatives in this field. Their impact is not confined to the implementation of specific programmes alone. By way of support in policy formulation processes, policy assessments, conditional loans and so forth, they can have considerable influence on policy formulation in developing countries” (Nulens and Audenhove, 2019).*

Modernisation's inherent features brought severe criticism against it. The theory assumed that the mass media were a neutral force in the development process, ignoring how they are themselves products of social, political, economic and cultural conditions. As Kranzberg argues (in Castells, 2010), technology is not neutral. Furthermore, since it supported the transfer of technology and the sociopolitical culture of developed societies to 'underdeveloped' societies, the theory is charged with



being a veiled synonym for Westernisation, described as the copying or implantation of Western mechanisms and institutions in a Third World context (Servaes, 2019). Servaes elaborates:

*I do not believe in the idea that Western technology can be borrowed without taking in Western culture at the same time. In my opinion, science and technology are much more than the mere instruments they were expected to be; they cannot be just borrowed or bought (Servaes, 2019).*

The modernisation theory also asserts that development is a linear process. Societies are believed to move from being traditional all the way to modernity in a sequence. This was propounded by Walter Rostow (2013), who asserted that a traditional society changes itself in successive phases into a modern society after a leap to self-sustaining growth based on a combination of industry-promoting, financial, and infrastructural measures (Servaes, 2019). Rostow outlined five stages through which, in his opinion, all societies have to pass – the traditional society, the pre-take-off stage, take-off, the road to maturity and the consumption society.

However, proponents of the multiplicity paradigm say there is no universal path to development. Instead, development must be conceived as an integral, multidimensional, and dialectic process that can differ from one country to another. This means every society should define development for itself and find its own strategy of achieving it. At the same time, this also implies that the problem of development is a relative one. Therefore, according to this paradigm, no part of the world can claim to be developed in all respects (Servaes, 2019; White, 2014).

By considering the mass media as ‘magic multipliers’, or major vehicles for disseminating information that motivated social change to a diverse public within a short period of time, modernisation perceived the role of communication in a linear, cause-effect-oriented way, ignoring the importance of two-way communication and the effect of feedback on the effectiveness of messages. The theory was also criticized for not paying attention to media content, for instance exposure to the mass media was misconstrued as an indicator of development, with no thought being given to the kind of content disseminated (Suriyasarn, 2018).

Rostow’s five stages of development assumed that the modern and the traditional lifestyles were mutually exclusive. The crux of the matter, Lerner argued, was ‘not whether, but how one should move from traditional ways toward modern lifestyles’ (Lerner, 2018, in Thussu, 2010). However, these modernisers failed to comprehend that the dichotomy of modern versus traditional was not

inevitable. Thus (2010) illustrates the futility of their case by quoting the example of the West's efforts at modernising the Arab world, despite which Islamic traditions continue to define it. He says these cultures can in fact also use modern communication methods to put their case across.

The fact that the theory was predicated on a definition of development that followed the model of Western industrialisation and modernisation, measured primarily by countries' Gross National Product (GNP), is another source of criticism. This is because by so doing, it failed to recognise that the creation of wealth on its own was insufficient; the improvement of life for the majority of the populations was dependent on the equitable distribution of that wealth and its use for the public good (Thus, 2010). The writer adds that the theory failed to ask questions like development for whom and who would gain or lose, ignoring any discussion of the political, social or cultural dimensions of development. This is why 'in many Southern Hemisphere countries, income disparities in fact increased over the succeeding years – despite a growth in GNP'.

The failure of the modernisation paradigm gave rise to the alternative or pluralist paradigm, in which scholars began to reconsider the role of communication in development. In this paradigm, development is defined as 'a widely participatory process of social change in a society, intended to bring about social and material advancement... for the majority of the people' (Rogers, 1976, in Suriyasarn, 2018). This paradigm rejects the notion of universality of development and economic-based perspectives. Instead, development problems are analysed at different levels, from international to local, and development is perceived to be need-oriented, endogenous, participatory, self-reliant and equitable.

Structuralists argued that social, economic and political structures enter into the formation of the problems of the poor (White, 2014). He believed that communication has a modest role to play in development, but the necessary condition of this role is some changes in the environment other than the addition of information. Other scholars, especially from the Third World, argued that the modernisation theory generally benefited Western media and communication companies, which had expanded into the Third World in the name of modernisation and development, but in actual fact in search of new consumers for their products. The theory was also considered too simplistic to solve world problems (Avgerou and Walsham, 2010).

With these developments, modernisation was supposed to have passed, but White (2014) note that 'the dominant paradigm of modernisation never really passed'. While communication and

development scholars turned their back on it, national governments, international aid agencies, the power blocs and transnationals continue to practice and propagate the old paradigms. This is reflected in the fact that catching up with the industrialised countries remains the ambition of developing countries' governments. Modernisation was simply revised, with a shift from support for the mass media to what Thussu (2010) calls 'an almost blind faith' in the potential of new information and communication technologies.

The revised version accepts a greater role for local elites in the modernisation process, but Western technology's importance remains crucial. This version says modernisation requires advanced telecommunication and computer infrastructure, preferably through the 'efficient' private corporations, thus integrating the South into a globalised information society. This explains the massive research and debate going on about the place of the new ICTs in society.

#### **2.1.1.4. The Information Society Theory**

The information society theory is more of a continuation of the modernisation theory of development. Like the modernisation paradigm, the theory of the information society believes strongly in the central place of (information) technology in society, and with this its resultant information and communication roles, which are regarded essential for development.

Enormous advances have been made in communication technologies, resulting in rapid increases in information flows globally. This is largely a result of the convergence of specific technologies into a highly integrated system, within which the old, separate technological trajectories become literally indistinguishable (Castells, 2010). The convergence involves computers, which provide information storage and data transfer capabilities previously unknown; satellites, which relay information over vast distances quickly; and digitisation, which converts any kind of communication data – pictures, sound, text – into a binary code that can be readily transmitted, decoded and delivered to the intended individual or audience (Melkote, 2011).

Although the new ICTs share many characteristics with the traditional media, they are also different. They are interactive, in that participants in a communication process (using the ICTs) have control over, and can exchange roles in their mutual discourse. To the extent that a special message can be obtained by each individual in a large audience, the new media are de-massifying. They are also asynchronous, meaning that they allow for the sending and receiving of messages at a time convenient for the individual user rather than requiring all participants to use the system at the same time

(Williams, 2018). It is because of such capabilities that the new ICTs are regarded as being better than the conventional. These capabilities are the reason why questions are raised about the ICTs' potential, how they are adopted and implemented, and the larger social questions concerning their benefits to humanity.

The technological breakthroughs that have given rise to, among other things, the new ICTs, are said to have led to an information society, a view supported by scholars such as Daniel Bell and Manuel Castells, and the WSIS, which states that:

*ICTs are today what industrial machines were during the industrial revolution; they have revolutionised the ways of working, transformed the economy, had an irreversible impact on the way people live, and have shaped a new society, the 'information society'.*

There is no agreed-upon definition of the information society, and most writers define it by its characteristics, especially information. Melody (2010) defines it as 'one that has become dependent upon complex electronic information and communication networks and which allocates a major portion of resources to information and communication activities. Martin (2015) says it is:

*"A society in which the quality of life, as well as prospects for social change and economic development, depend increasingly upon information and its exploitation... living standards, patterns of work and leisure, the education system and the marketplace are all influenced markedly by advances in information and knowledge."*

The idea of the information society has its roots in post-industrialism literature, a social science notion of the 1960s and 1970s. post-industrialism is said to have marked the end of the industrial capitalist era and the arrival of a service or leisure society. Bell, a post-industrialism proponent, held that just as the agrarian society was replaced by the industrial society as the dominant economic emphasis shifted from land to manufacturing, so does the post-industrial society develop as a result of the economic tilt towards the provision of services.

The information society is therefore developing in the context of post-industrialism (Lyon, 2018). Information, driven by information technology, is emerging as the dominant power factor in the information/post-industrial age, in the same way that land was in the agricultural period and capital in the industrial (Mowlana, 2017). The information society is therefore the 'third wave' (Lyon, 2018). Bell strengthens the argument for this when he says:

*“We are today on the rising slope of a worldwide third technological revolution. It is a rising slope, for we have passed from the stage of invention and innovation into the crucial period of diffusion... Yet the phenomenon cannot be reversed, and its consequences may be even greater than the previous two technological revolutions” (Bell, 2019).*

It is strongly believed that in this information society, information technology, the major index, has a broad potential social impact and will lead to development. Castells argues that because information is an integral part of all human activity, all processes of our individual and collective existence are directly shaped by the new technological medium (2010). According to Bell, ‘technology is the basis of increased productivity, and productivity has been the transforming fact of economic life’ (Bell, 2013). Just like the modernisation paradigm did, Webster says such a belief in technology implies that technology is neutral; that it is aloof from the social world. However, he rhetorically asks whether it can be seriously suggested that technologies are at once the motor of change and simultaneously untouched by social relations (ibid.), indicating that neutrality is far from a fact here.

Because information technology has the capacity to push the boundaries erected by geographical location, and with them the limitations once imposed by time, making it possible to link different places and continents (Webster, 2016), the information society is also said to be a networked society. Castells (2010) considers being networked very important because it enables one to access information from anywhere and interact with whomever one needs. This is not surprising, since back in 1981 Arthur C. Clarke prophesied that the new ICTs would unify a much-fragmented world into ‘one big gossiping family’ (Clarke, 2011). Castells concludes that inclusion on the network is a requisite of full participation in today’s society.

Information technology is criticized for widening the North-South divide instead of narrowing it as expected. The Southern Hemisphere countries are becoming more dependent on the North, instead of independent (Lyon, 2018). Apart from increasing inequalities among countries, the emphasis on information technology is also said to exacerbate inequalities within countries. The reason is that information is not steadily diffused in a general way through all social echelons, for instance intellectual and managerial skills, which are required to exploit information economically, are unevenly distributed in society. Furthermore, advanced hardware and software for information processing are expensive, so the few who can afford them are scarcely challenged by others using inferior machines (Lyon, 2018).

### **2.1.1.5. The Diffusion of Innovations Paradigm**

The other theory relevant to the study is the diffusion of innovations theory, one of the most conceptually useful models for understanding the relationship between technology, individuals and society (Hanson and Narula, 2010). The theory came out of the modernisation paradigm, evolving as the local-level framework to guide communications planning for modernisation (Melkote and Steeves, 2011). It was introduced into the context of development by Everett Rogers, who propagated it in developing countries, arguing that it had cross-cultural applications (White 2014).

The diffusion of innovations theory analyses and explains the adoption of a new product or a new way of doing a certain task (Singletary and Stone, 2018). Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2013). Rogers adds that diffusion is a kind of social change, because when new ideas are invented, diffused, and adopted or rejected, leading to certain consequences, social change occurs. On the other hand, an innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The perceived newness of the idea for the individual determines his/her reaction to it.

Just like the modernisation theory of development, a main theme in the diffusion of innovations theory is the suggestion that static societies are brought to life by outside influences, technical aid, knowledge and by the diffusion of ideas (Melkote and Steeves, 2011). Technology is crucial to this theory, and White (2014) claim that in later years Rogers began to use technology as a synonym for innovation. Modernisation is therefore a process of diffusion whereby individuals move from a traditional way of life to a more complex, more technically developed, and more rapidly changing way of life (Melkote and Steeves, 2011).

One of the shortcomings of those who subscribe to the notion of the post-industrial society is that they assume that the new society brought about by information technology is generally desirable (Lyon, 2018). To this end, Rogers cautions that it should not be assumed that the diffusion and adoption of all innovations is necessarily desirable, for studies reveal harmful and uneconomical innovations that are generally not desirable for either the individual or his/her social system. Furthermore, the same innovation may be desirable for one adopter in one situation but undesirable for another potential adopter in a different situation.

According to Rogers (2013), the characteristics of innovations, as perceived by individuals, help to explain their different rate of adoption. These characteristics are relative advantage, compatibility, complexity, trialability and observability.<sup>16</sup> Trialability explains why many new projects, including the one under study, are first introduced as pilot projects for a given period of time, and then, if the pilot is successful, they take off for a longer period of time. As Singletary and Stone (2018) say, most individuals will not adopt an innovation without trying it for a probationary period first. They add that those innovations that do not offer a small-scale trial will be adopted more slowly.

Bell states that apart from the five factors above, the rate of diffusion will also vary depending on the economic conditions and political stabilities of societies (2009). This means that the technology might be available, but as long as people cannot afford it, or as long as there is no political willingness towards adopting it, the technology's diffusion will not be successful.

The essence of the diffusion process is the information exchange by which a new idea is communicated to others (Rogers, 2013). Communication takes place through mass media and interpersonal channels. Mass media channels are usually more effective in creating awareness-knowledge of innovations, whereas interpersonal channels are more effective in forming, and in changing, attitudes towards a new idea (Williams, 2018). Interpersonal channels involve a face-to-face exchange between two or more individuals. Most individuals evaluate an innovation that they are considering adopting, not because of scientific research by experts, but through the subjective evaluations of near-peers who have previously adopted the innovation (*ibid.*). The handheld computer project under study here makes use of interpersonal channels of communication in exchanges between UHIN and the health practitioners using the technology.

As with several other models of communication, recent developments in the diffusion model have departed from a strictly one-way, downward directed communication approach (Windahl, 2012). Traditionally the model emphasised linearity of effect, hierarchy and social structure, but in recent times, horizontal exchanges of communication as well as communication from below in social systems have become more important. In the diffusion paradigm, an individual's decision about an innovation does not happen instantly; it is a process that occurs over time, with a series of actions and decisions. Rogers (2013) calls it the innovation-decision process, defined as the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, through implementation of the new idea and finally to confirmation of this decision.

Based on when they embrace an innovation, Rogers categorises adopters in the following way: the first category is that of the innovators (2.5%),<sup>18</sup> who are venturesome and anxious to try out new ideas; then the early adopters (13.5%), who are local opinion leaders. They are respected by others and maintain that respect by discreet use of innovations. The third category is the early majority (34%), who are characterised as deliberate. They have high interpersonal communication among peers but are not leaders. The late majority (34%) are skeptical and cautious, and they do not adopt until most others have done so. Last come the laggards (16%), who are traditional, socially isolated, locally oriented and without opinion leadership (Rogers, 1983; Singletary and Stone, 2018).

Explaining how an innovation ends up being adopted by a society, Singletary and Stone (2018) say it is because of the ‘diffusion effect’. This means that the more widely accepted the innovation is, the more pressure there is on others to accept it as well. However, the others could also accept the innovation on their own, having seen its benefits. Williams (2018) says most individuals do not adopt an innovation until they learn of their peers’ successful experience with it.

Related to the above is the fact that an innovation (which is interactive) is of little use to an individual unless others also adopt it. Therefore a ‘critical mass’ of adopters is necessary for the utility of the new idea to be sufficient for an individual to adopt. The usefulness of the new communication system increases for all adopters with each additional adopter. Prior to the formation of the critical mass, any given adopter is unlikely to have peers who will share about the benefits of the innovation.

To sum up the theory, consideration by an individual to adopt any innovation depends first on general attitude towards change and then on attitude towards the specific innovation (Singletary and Stone 2018). So, the innovation may be good, but as long as the individual has a problem with altering his/her actions, behaviour or ideas, efforts to make him/her adopt it might not be very successful.

The model is not without its weaknesses. Among these is a pro-innovation bias, which is the implication that an innovation should be diffused and adopted by all members of a social system. This shortcoming is common to all the theories selected for this study. Nelkin (2013) calls it the ‘technological fix’, meaning an overdependence on technological innovations to solve complicated social problems. Rogers observes that this bias is seldom straightforwardly stated in diffusion publications, but assumed and implied. The result is that it leads researchers to ignore the study of ignorance about innovations and to underemphasize the rejection or discontinuance of innovations.



Diffusion research has also been charged with often siding with the change agencies that promote innovations rather than with the audience of potential adopters. Rogers explains that this originates from the issue of ‘who sponsors diffusion research’, among other pro-source factors. He admits that it is likely that some of the factors underlying a particular social problem may be individual in nature, and that any effective solution to the problem may have to deal with changing these individual factors. But in many cases the causes of the social problem lie in the system of which the individual is a part. Such biasness can be an obstacle to finding relevant solutions to problems, because ‘how a social problem is defined is an important determinant of how we go about solving it, and therefore of the effectiveness of the attempted solution’ (Rogers, 2013).

In conclusion, the major themes running through the aforementioned three theories, such as their emphasis on economic development; technology and information as prime solutions for the problems of the less developed countries; the criticism that technology increases inequalities in societies and the fact that they advocate for a top-down/linear form of communication as opposed to two-way communication. These theories help to explain the increasing attention being given to the new ICTs today. The theories also explain how the adoption of new technology and ideas, for example the handheld computers and the new way of carrying out health management information reporting that came with them, takes place. The critique of the theories highlights the reasons why some people think that instead of bridging the digital divide, especially between the developed and developing nations, the new ICTs are simply widening it. The criticisms also point out hitherto ignored areas regarding technology and society, to which attention needs to be paid. The essence of these theories is that this study employs them as interpretive tools; they guide the analysis and interpretation of the data collected, enabling the successful evaluation of hospital projects.

### **2.1.2. Health Management Information System**

The term Health Management Information System (HMIS) refers to a system of generating health information, which information is primarily used to support management decisions, especially for resource allocation. It is used in determining how to prioritise resources for health services. According to Uganda’s Health Unit Procedures Manual (MoH, 2021), the health management information collected in the country is used to improve the ability of health units to provide optimal preventive and curative care. The information can be collected manually, using paper, or automatically, using computers. Computers are becoming indispensable in record keeping, inventory and other aspects of management information systems in hospitals and other organisations (Bell, 2015). The long-term

goal of the HMIS is to optimise health care delivery and achieve health for all. To achieve these goals, the HMIS process must provide accurate, timely and relevant information.

According to World Health Organization (2018) and Hodge (2012); HIS gathers data required from the health industry and similar industries, analyzes health data to ensure accuracy, time-bound, relevance, then turns the data into meaningful information to be used in decision making related to health. The effective functioning of the world's health systems depends on coordinated determinations to obtaining, reporting, using information to guide policy making, program intervention, and involve expertise on research.

Almunawar and Anshari, (2012) have defined HIS as the system used to describe the interaction between individuals, processes, and technologies in health sector in order to assist processes and administration in providing critical statistics that enhance services in the healthcare be of high quality. A health information system (HIS) is any type of standardized data that pertains to health. It involves the collection of data, information, or knowledge that can be used to aid the process of services delivery in health care or to encourage health development in a country (Panerai, 2010). The efficiency of health planning and policy, as well as the quality of health care delivery rely on the availability of reliable and timely data to help them make decisions.

#### **2.1.2.1. Types of Health Information System**

According to Dehnavieh (2019) there are numerous different types of HIS, however there is two main categories of HIS where most systems fit into one of the two categories; Electronic medical/health record (EMR), and, Clinical decision support system (CDSS).

**Electronic Medical/Health Record (EMR)** - EMR handles patient records or information where each patient's medical information is collected, processed and stored in electronic form (Tang and McDonald, 2006). These records include patient details, patient health history, test results, diagnosis, medications, and doctor appointments/special visits. EMR enables records to be shared by other health professionals and ensure the streamline of patient data to be accessed by various professionals and doctors in different health facility, clinic or hospital to ensure easy access of information, better treatment as well as time saving.

**Clinical Decision Support System (CDSS)** - CDSS manages information, clinical data sharing, and helps clinicians make better clinical decisions. According to Addo and Agyepong, (2020) “the clinical decision support in facilitating clinical work flow integration among nurses and other medical

professionals”. CDSS analyzes data using the system, the availability of analyzed data assist professionals and health providers in improving care to patients and decisions making.

**Information Collected by HIS** - The kind of information collected in health information systems includes patient information, laboratory test results, diagnosis report, treatment, and medical history (Brook, 2020). HIS collects information from health industry; in clinics, dispensaries, health facilities and hospitals (WHO, 2008). The information collected is needed and used by health providers, nurses, doctors, health planners, decision makers and policy makers; used to improve patient safety, service delivery, make plan and decisions on health matters and enact effective health policy.

### **2.1.2.2. Dimensions of Health Information System**

The health information system is concerned with data quality and is characterized by the relevance, accuracy, timeliness and integrity of the data, while the health system's performance focuses on decision-makers who consider explicitly informing the formulation of policies, planning, management and supply (Brook, 2020). His study established that the hospital information management system in hospitals provide accurate and pertinent patient information and other useful information needed to effectively manage patient care and to manage the health facility well. The study also established that modern and sufficient communications equipment and information is required for the system to deliver the desired results. The training of health professionals and continuous support are also of the utmost importance according to the results of the study. This study is relevant to the current study in that it seeks to address the issues of process automation and online record keeping and how they affect the performance of hospitals.

#### **2.1.2.2.1. Information Relevance**

Information should be relevant to the purpose for which it is required. It must be suitable. What is relevant for one manager may not be relevant for another. Relevance means how pertinent is the information to the question. According to Lee (2013) measures of relevance are this information is useful to our work, this information is relevant to our work, this information appropriate for our work, and this information is applicable to our work.

If one has information to understand and interpret, it is needed to be relevant based on user-specified criteria for the domain of interest and timely to our purpose within that domain. Of course, the user-specified criteria depend on the domain and purpose in mind. For example, if a surgeon performing a surgery wants to know about the patient’s potential allergic reactions to anesthesia, a database

providing all the information on the patient except that would be of no use. The information may be ‘Accessible’ and ‘Interpretable’ but not relevant in terms of user-specified criteria (Belle, 2001).

Relevance has many possible domain- and purpose-related criteria, but if the information is outdated it is useless. Thus, timeliness is an important element of ‘Relevance’ as discussed below. Wang, Reddy and Kon (2015) subsume relevance under the dimension of usefulness and treat timeliness as a separate usefulness criterion. However, it seems unlikely that information could be inaccessible or unintelligible, but still useful. Also, fitness for use is the global quality evaluation being made and decomposed by the model into specific criteria. Therefore, usefulness is an inappropriate label, or is placed at the wrong level in the model. Also, while information could certainly be timely but irrelevant, the reverse seems unlikely, thus the criteria are not separable.

Timeliness has two components: age and volatility of the information. Age, or ‘currency’ of information is simply a measure of how old the information is based on how long ago it was recorded. All other things being equal, the more recently the information was collected, the more likely it is to be relevant. For example, a medical report containing a patient’s blood pressure values measured at their annual physical can be considered a current measurement for purposes of evaluating long-term health status. However, if a physician were to want to know the patient’s blood pressure now, a more recent measurement is preferable. Volatility of information is a measure of information instability – the frequency of change of the value for an entity attribute of interest (the ‘source value’). The more volatile information is the more rapidly any recorded values<sup>4</sup> become outdated. Non-volatile information is stable; it does not change nor become outdated. Again, for annual physical exams the information remains valid for one year, and for routine check-ups such periodic measures of blood pressure are satisfactory. But, during surgery, blood pressure values are much more briefly valid, more volatile, and must be monitored continuously to provide information on the patient’s moment-to-moment status. Annual values are, of course, irrelevant in this context.

The datedness of information varies directly with its age and inversely with its volatility. Information must be updated as frequently as the source value changes or else become outdated. But, information that is updated as frequently as the source value changes may not be necessary for the user’s purpose, nor practical, feasible or cost-effective. Thus, a relative measure of outdatedness – timeliness – becomes an important IQ sub-element. Timeliness is a judgment by the user of whether information is recent enough to be relevant, given the rate of change of the source value, and the domain and purpose of interest.

If information is updated frequently enough for the user's purposes, then it is timely. If not, it may be irrelevant. The less timely information is, the less likely it is to be relevant to the user. For example, a doctor may require their recovering surgery patient to only have twice-daily blood pressure measurement, even though the underlying value varies continuously. Every twelve hours, the prior blood pressure measurement becomes outdated information and becomes less timely. If the next measurement is not made on time, the most recent (i.e., least outdated) may suffice. Measurements from a week ago, however, are certainly no longer timely at all and therefore of unacceptable quality.

Users of historical information may need information from a specific point or period in time; this is different from timeliness. One can require relevant blood pressure information to include measurements from surgeries during a specific week last year and that were timely when recorded. Since information may be relevant, but inaccessible or unintelligible, we use relevance as the dimensional label, and timeliness as one specific user-determined criterion among the many possible. This matches the loading of relevance and timeliness as factors important to Contextual Quality in the empirical model by Wang & Strong (1996). Information that does not match the domain or purpose of the user is presumed useless, and information that does but is outdated is similarly useless.

#### **2.1.2.2.2. Information Accuracy/Reliability**

In operational terms, improving safety means designing and implementing health care processes to avoid, prevent, and ameliorate adverse outcomes or injuries that stem from the processes of health care itself (Iezzoni, 2005). Safety is best understood in terms of injuries that occur to patients and the errors or latent failures that lead to these injuries or harm. Although both perspectives are essential in building a safer health care system, the overriding priority in the short term is the reduction of injuries or harm to patients. Assessing errors that lead to patient injuries or harm is one method for organizing a framework of measures that will define the safety of the health care system.

An error of execution is the failure of a planned action to be completed as intended, while an error of planning is the use of a wrong plan to achieve an aim (Reason, 2016). Errors have also been classified into errors of commission (doing unnecessary things or doing them wrongly) and errors of omission (failing to do necessary things). As a component of quality health care, safety problems or patient injuries have been found to occur along the continuum of clinical care functions and in the general environment of care. Errors in diagnosis, including misdiagnosis (wrong diagnosis) and missed diagnosis (failure to diagnose), are relatively common. Their prevalence is estimated at 10 percent

among hospital populations based on autopsy studies (Bordage, 2019) and even higher for patients in intensive care units. Treatment errors are problems related to planning, technical proficiency, or prescription practices. Lack of technical proficiency or competence in procedures such as colonoscopy can lead to complications or nosocomial infections (Leape, 2011).

#### **2.1.2.2.3. Information Integrity**

Completeness deals with information having all required parts of an entity's information present (Wang, Reddy and Kon, 2015; Wang, Storey and Firth, 2017). A patient examination report example typically requires descriptive patient information such as name, age, sex, treatment and payment details, plus the results of various visit-specific tests and any pertinent diagnoses. Absence of any of these renders the report incomplete, unless there is tolerance for missing values for some attributes. In a database environment, completeness can be in violation if a patient or patients' records are missing or certain field values are missing.

One must be able to get information for it to be of use. Information quality models that focus on information as a by-product of the system rarely cite information integrity as a quality criterion (Wang, Storey and Firth, 2015), yet it is obviously critical to the user (Wang, Strong and Lee, 2017; Wang, Reddy and Kon, 2015; Wang and Strong, 2016). Information retrieval may require a certain amount of time or have an associated measure of cost to the user. If information is inaccessible, all other qualities of it are irrelevant.

A hospital medical report on the outcome of patient surgery may not be needed any sooner than the end of the month for statistical purposes, or it may be needed immediately for reference and review during an examination. Off-site clinical access to such information may be free, available as for-pay products or services, or part of a private intranet. To access even different inhouse information sources within a hospital intranet may also require widely different times, and have associated costs. Depending on their setting, a physician might conceivably have to decide between results only on hand, available by mail, by fax, or by electronic transfer, and the delays and costs associated with each choice.

#### **2.1.2.2.4. Physician-Patient Interactivity**

Patient centeredness refers to health care that establishes a partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients' wants, needs, and preferences and that patients have the education and support they need to make decisions and participate in their own care (Bindman, 2011).

Patient centeredness is a characteristic of the relationship between clinician and patient (Charles, 2012) and can be contrasted to disease- centered and clinician-centered care (Byrne and Long, 2017). Patients of different races, cultures, genders, and ages have different preferences and beliefs that providers must take into account in order to achieve patient-centered care (Stewart, 2018). Patients vary in the degree of autonomy and involvement they want in health care decision making. Some prefer active self-management, while others prefer to rely completely on the clinician's recommendations (Arora and McHorney, 2012).

Creating effective partnerships means encouraging the kind of shared decision making and patient skills and knowledge needed for self-management of health conditions. The degree of shared decision making is partly dependent on the clinician's participatory decision-making style, the degree of trust established, the patient's desire to have a role in decisions (Charles, 2018).

#### **2.1.2.2.5. Information Timeliness**

Timeliness combines being able to obtain care and getting it promptly. It includes both access to care (people can get care when needed) (Aday and Anderson, 2015) and coordination of care (once under care, the system facilitates moving people across providers and through the stages of care. Timeliness, as applied to general access to the health care system, is defined by the ability to obtain primary and specialty care (Kassirer, 2014) when needed. Timeliness may also require access to special services, such as being able to obtain physical therapy for a disability or chronic condition and being able to obtain home health care when needed (Phillips, 2013; Thomas and Payne, 2018). For example, access to home health care can affect the quality of end-of-life care since it influences the place of death and access to palliative home care.

The timeliness also includes measures of whether people are actually able to obtain care for a specific problem once they have entered the system and how long it takes them to do so. It includes aspects such as delays and difficulties in getting a checkup, obtaining routine care, or obtaining urgent care (Bindman, 2011). Delays in obtaining care can directly affect the effectiveness of care and health

outcomes. In some cases, delays in care can endanger the life of the patient, for example, delays in receiving antibiotics for pneumonia or delays in reperfusion therapy after a heart attack.

### **2.1.3. Quality Service Delivery**

If one is to understand how IT might enhance the quality service delivery, it is necessary to investigate the concept of quality service delivery. The construct of quality as conceptualized in the services literature centers on perceived quality. Perceived service quality is defined as the consumers' judgment about an entity's overall excellence or superiority (Parasuraman, 1988). Perceived quality results from a comparison of customer expectations with customer perceptions of performance. In the context of health care service, health care quality is defined as having the following attributes: effectiveness, safety, people-centredness, timeliness, equity, integration of care and efficiency. Health care needs are divided into health promotion and disease prevention, diagnosis and treatment, rehabilitation and palliative care. The foundations of quality imply a workforce, facility, medications and medical products, as well as data. To help deepen understanding, policy was also added as one of the components.

Service quality stems from a comparison of what customers feel an organization should offer (their expectations) with their perceptions of the performance of the organization in providing the service. It is important to acknowledge that the debate concerning the different formulations of service quality remains to be settled. Specifically, Cronin and Taylor (2004) propose a scale based on perceptions only measurements. Perhaps the most significant aspect of this debate in the present context is that both expectations and perceptions may be influenced by information provided to the customer. An example that provides very clear evidence of the impact of information on the service delivery is shown by the example of waiting, which confirms that if customers know that they will have to wait, they wait more patiently (Dawes and Rowley, 2016).

The measurement of service quality rests upon an understanding of those attributes which contribute to consumer expectations and perceptions of service quality. These attributes are decided by the customer and contribute significantly to a quality assessment of the service provided. Knowledge of the dimensions of these attributes and possibly the ability to measure them can yield an insight into more effective ways of improving service quality. Such dimensions may be identified through the use of focus groups for specific industry sectors and types of service encounters. Some authors, most notably Parasuraman (1988) with their work on SERVQUAL have sought to identify some generic



dimensions of service quality, such as - reliability, assurance, tangibles, empathy and responsiveness (RATER). There has, however, been an extensive and continuing debate about the generic dimensions of service quality and the RATER factors have been found unstable across contexts (Buttle, 2016). Nevertheless, there is a central need to identify those factors that are most important in the delivery of specific services and any strategies that facilitate communication with customers leading to the identification of such dimensions.

When consumers purchase a service, they undergo an experience which centres on the simultaneous delivery and receipt of the service. Services are viewed as being 16 unique from goods due to their inherent characteristics generally agreed to be intangibility, inseparability (of production and consumption), perishability and heterogeneity (Dibb, 2014). During this dyadic interaction (Solomon, 2015) the employee or service provider and the customer are physically and psychologically drawn together (Schneider, 2014). It is at this point that customer perceptions are formed and judgments made on the nature of the experience enhanced. Services incorporate a degree of interactivity as consumers are involved in the production process and can take responsibility for the service which they receive (Hoffman and Bateson, 2017). Advantage can be accrued by the service provider if they increase the participation of customers in the service experience so that costs can be lowered.

Aijo (2016) suggests that customers will be drawn ever closer into the production process to the point of ultimate integration and that the customer's greater involvement will provide precious inputs into decision-making. One is likely to see a blurring of boundaries between employee and customer occurring in many service organizations in the future. Since the dimensions time and control are important to customers when receiving service (Berkely and Gupta, 2005) this increases willingness on the part of the customer to participate or even execute certain aspects of the service.

The increasing role of technology in the service delivery and the growing participation of the consumer in the production and delivery of the service may suggest a reconsideration of the "servuction" system developed by Langeard (1981). This model draws a distinct line between back and front-office activities; however, we would propose that the development of automated services, for example through ATMs, has eroded this clear distinction. The adoption of IT in the quality service delivery means that the customer is drawn even closer into the production of the service, which corresponds emphatically with the service characteristic of inseparability.

Bateson (1995) recognizes that non-face-to-face interactions as well as the physical environment form part of the service. The interface between customer and service provider may be best driven by customer needs. The needs could be based on whether the customer is seeking a high or low involvement purchase (East, 2017). Undoubtedly the interaction between provider and customer is important, but the whole context of the interaction, including the physical environment needs to be considered (Morgan et al., 1995). It is also important to remember that face to face encounters remain the primary mechanism for service delivery and the customer's relationship with personnel may be stronger than with the organization itself. In particular, complex services require trust and confidence on the part of the consumer in the organization providing the service (Ennew, 2013).

Much of the services literature presupposes that a personal interaction is central to an assessment of service quality (Lewis, 2013). However, the increasing role of IT in the service experience again calls for a reconsideration of existing models. Gabbott (2015) has argued that the nature of the service experience has dramatically altered towards a displacement of personal interaction. Some guidelines may be provided here by Lovelock's (2016) reminder that services can be categorized into three levels of contact; high, medium and low. He suggests that low contact services take place through an electronic or physical distribution channel. What may, in fact, be happening is that services are continually being categorized by both consumers and service providers and a service which may formerly have been deemed medium contact category can be now classified as low contact. Elements of high contact services may also be considered suitable for the further embedding of IT, in cases where the consumer characteristics of a chosen segment are suitable, and they display a willingness to interact electronically.

According to Christopher (2011), quality of service is a degree to which a service meets its specification, with emphasis on meeting customers' needs. In other words, it is the degree to which a service satisfies the needs and the expectations of the user. 18 Where as according to Juran as quoted by Dale (2019) quality of service is fitness of that service for use.

According to Clark and Johnson (2010), consumers view quality service delivery in terms of certain dimensions. The determinants of quality service delivery include: ability of service to fulfil a consumer's needs or problem, ability to use the service without any dangers, risk or doubt, ability of a service to be easily accessible to the service users, and the ability of the service to be offered today and thereafter whenever a consumer needs it. Where as according to Roland (2009), some times

service delivery is just perception, in which the consumer assumes an impression about brand names, advertisement to mention but a few.

#### **2.1.4. Relationship between ICT and Quality Service Delivery**

According to Efraim et al, (2003), customers sophistication and expectations increase as customers become more knowledgeable about the availability and quality of products and services. They are also more knowledgeable about competing products. These expectations translate into the need for organisations to demonstrate a customer orientation. Customers are demanding ever-more detailed information about products and services. They want to know what features are available, what warranties they will receive, what financing is available, and so on, and they want to know immediately. Companies must be able to deliver information quickly to satisfy their customers or risk losing them. Advances in the use of internet and electronic commerce (e commerce) bring customers information about thousands of products, including cost and quality comparisons. Customers also want customized products, with high quality and low prices. Information technology enables vendors to respond through mass customization.

In health sector, information systems play a vital role to deliver quality health services (Sayyadi, 2021). Different studies have described the HIS impact on quality of the services delivered in health facilities. Manzar, (2017) asserts that most countries have rapidly adopted HIS, and the use of such systems increased due to its impact on improving patient safety as well as delivering high quality services at less cost, and efficient management of patient data.

According to Nguyen, (2015) HIS have positive impact such as to improve healthcare quality and cost saving. For quality services delivery in hospitals or health facility, HIS integration support communication between health professionals and practitioners. Through this, better flow of information and sharing of clinical data is influenced. This is simply that HIS ensures mainstreaming of patients' data that can be used by different professionals and practitioners in different contexts (Orang'i, 2019).

Health information system (HIS) is used to manage patient data; effective patient data management leads to effective health services delivery, and quality of care can be realized (Sani et al., 2017). According to Gesulga (2017); AbouZahr and Boerma, (2005) health information systems lead to quality health services improvement through the accessibility of health information, the ease access

of data allows health providers to deliver service at ease. These systems support the process of recording patient information for its availability and reliability as well as accuracy.

Moreover, HIS improves patient safety. The system can save all the patient information and can be shared in multiple databases to improve the patient's safety through the ease of access of patient data with the help of the system (Alotaibi and Federico, 2017). Addo and Agyepong (2020) claim that "the applications of ICT provide the access to the health services for the citizens and increase the level of patients' safety, also provide the quicker medical diagnoses, reduced workload among users, improvement in patients' waiting time and information accessibility" Furthermore, HIS helps on record keeping and management which influence the service delivery (Ondieki, 2017). However, on the contrary, problems with HIS can affect the delivery of services and patient outcome (Kim, Coiera, and Magrabi, 2017). This is a caution that HIS has its own limits in terms of usefulness.

## **2.2. Empirical Literature Review**

Not much has been written about the ITs and their contribution to health in particular. Most of the available literature has explored the conventional media and their role in improving health and promoting good governance. In this review, literature is looked at regarding the IT adoption and quality health service, as each of these aspects has a bearing on the study.

### *The Effect of Information Relevance*

Cudworth and Hobden (2013) studied the determinants of technological innovation and its effect on hospital health service quality. The objective of the study was to investigate the impact of information technology on the healthcare service quality. It was conducted on 255 physicians at 12 selected general hospitals in Nigeria. The study found that the provision of relevant information by the adopted IT technologies positively affects the level of health service quality at private hospitals, which is higher than that of public hospitals.

Giesler and Markus (2012) examined the use of hospital management information systems among health workers at Mater Hospital and Kenyatta National Hospital. The objectives of the study were: to evaluate the use of the ICT system in both hospitals, to establish to what extent the software system provides accurate and relevant patient information. The health information system is concerned with data quality and is characterized by the relevance, accuracy, timeliness and integrity of the data, while the health system's performance focuses on decision-makers who consider explicitly informing the formulation of policies, planning, management and supply. The findings of the study established that

the hospital information management system in both hospitals provide accurate and pertinent patient information and other useful information needed to effectively manage patient care and to manage the health facility well. The study also established that modern and sufficient communications equipment and information is required for the system to deliver the desired results.

Hahn & Powers (2010) conducted a study to determine the effect of IT innovation strategies on the competitiveness of the Aga Khan University Hospital, in Nairobi, Kenya. The survey was conducted on 210 medical practitioners in public hospitals. The results supported there is a strong relationship between information relevance and health service quality. They conclude that the hospital supports innovation of ICT technologies to enhance provision of relevant and reliable information through the continuous acquisition of updated equipment. The study recommends the successful adoption and use of ICT in hospitals contribute positively to the performance of these hospitals. Based on these explanations, the following hypothesis is proposed:

*H1 – Information relevance has positive and significant effect on health service quality.*

#### ***The Effect of Information Accuracy/Reliability***

Gesulga (2017) conducted a survey on the impact of health information systems on health service quality in the case of public hospitals in Jeddah, Saudi Arabia. A population of 385 physician were participated in the survey. The results revealed that adoption of ICT leads to quality health services improvement through the accessibility of accurate health information. The ease access of reliable data allows health providers to deliver quality service at ease. It concludes that HIS system supports the process of recording patient information for its availability and reliability/accuracy.

Draleaga's (2012) thesis on ICTs and Rural Women Empowerment examines the role the technology plays in uplifting the healthcare service quality of the Ugandan rural woman. The survey targeted 188 healthcare professionals in Kampala, Uganda. The findings argue that ICT adoption in the healthcare facilities improves the quality of healthcare services significantly. She suggests that healthcare facilities should be equipped with modern ICT technologies to facilitate the provision of quality and reliable health services. The system can save all the patient information and can be shared in multiple databases to improve the patient's safety though the ease access of patient data with the help of the system. Based on this description, the following hypothesis is proposed:

*H2 – Information integrity has positive and significant effect on healthcare service quality.*

### *The Effect of Information Integrity*

Hahn and Powers (2010) analyzed the effect of technological automation and the maturity of integration in hospital quality scores in US hospitals. The objective of this study was to assess whether the level of Picture Archiving Communication System maturity, conceptualized as the level of automation and integration attained, is related to broader hospital service delivery quality measures. The study was conducted on 55 selected private hospitals in USA. The study found that the level of information integration had a significant effect on hospital service quality. The finding supports the level of information integration had a significant effect on patient experience and patient outcome scores. The results suggest that high levels of automation and information integration with other functions or other hospital information systems have a positive effect on hospital quality.

John's (2010) study on HIS adoption on Medical Service quality of Tertiary hospitals in Abu Dhabi, UAE. The study targeted expat medical practitioners accounted 512 physicians at 5 tertiary hospitals. The objective of the study was to investigate the influence of potential usage of ICTs at District and Provincial Levels in Abu Dhabi. The findings assured ICT can strengthen the integrity of the health information and management systems in the hospitals. It recommends that ICT adoption for healthcare centers, health workers and managers should be developed continuously. The author also adds that a strategy should be developed to integrate all districts and provinces in the country, so that those with poor ICT capacities can benefit from those that are better off.

Leander (2013) sought to establish the factors influencing the adoption of mHealth by focusing on maternal health at the Nakuru Provincial General Hospital. The study objectives were: to determine the influence of knowledge and awareness on the adoption of mHealth in maternal health care at Nakuru Provincial General Hospital (PGH), to establish the influence of the government policies on the adoption of mHealth in maternal health care at Nakuru PGH, to establish the effects of ICT infrastructure on the adoption of mHealth in maternal health care at Nakuru PGH and to identify the cost aspects affecting the adoption of mHealth in maternal health care at Nakuru PGH. The results indicated that knowledge and awareness influence the adoption of mHealth in maternal health care. There was understanding of mHealth among hospital employees. Government policies influence the adoption of mHealth in maternal health care. The hospital did not have a policy to improve the integration of ICT in the provision of health services. Based on this explanation, the following hypothesis is proposed:

*H3 – Information Integration has positive and significant effect on health care service quality.*

#### ***The Effect of Physician-Patient Interaction***

Nguyen, (2015) studied the effect of health information system on health service quality of general hospitals in Nigeria. The survey conducted on 416 medical and admin staff of the targeted hospitals. The findings revealed that health information system have positive impact such as to improve healthcare quality and cost saving. For quality services delivery in hospitals or health facility, HIS integration support communication between health professionals and patients. Through this, better flow of information and sharing of clinical data is influenced. This is simply that HIS ensures mainstreaming of patients' data that can be used by different professionals and practitioners in different contexts. HIS is used to manage patient data; effective patient data management leads to effective health services delivery, and quality of care can be realized (Sani, 2017).

Hochbaum and Dorit (2011) studied the development of telemedicine systems in the health system of Kenya. The study objectives were: to identify the issues that affect the adoption of telemedicine technology in developing countries, to develop a conceptual framework for telemedicine deployment through organisation collaboration to promote a guideline framework for the Kenyan healthcare sector and policy makers, to demonstrate that the framework on the adoption of telemedicine devised during these research can support the analysis of healthcare collaborative innovation performance, to validate the conceptual framework developed by evaluating it in the context of the deployment of telemedicine deployment by conducting interviews. Based on this finding, the following hypothesis is proposed:

*H4 – Patient-physician interactivity has positive and significant effect on health service quality.*

#### ***The Effect of Information Timeliness***

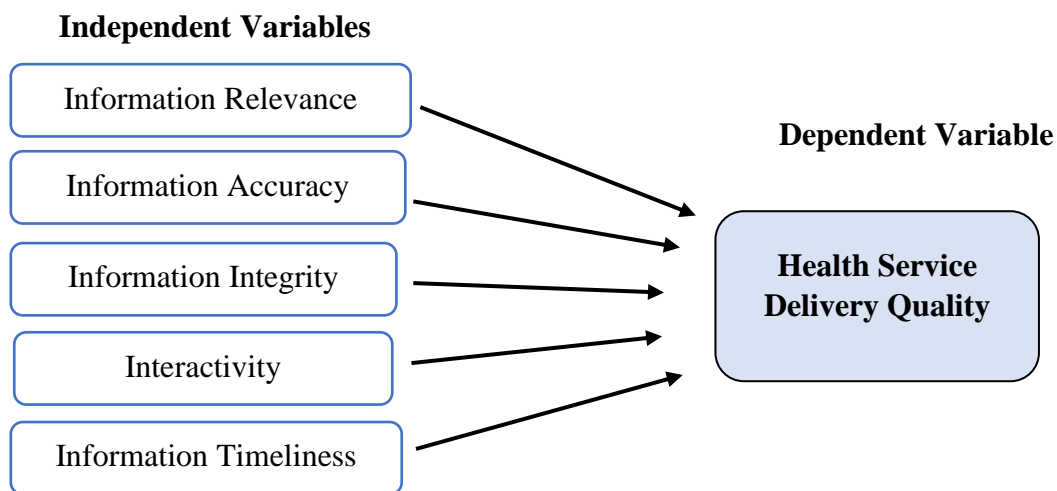
Zahra and George (2012) conducted a study to determine the effect of ICT adoption on health care performance in Kenya. The objective was to investigate the influence of information relevance, accuracy, interactivity and timeliness on the quality of healthcare service delivery. A total of 337 medical and admin staff participated in the survey. The results of this research revealed that Kenya's hospitals collaborate with other organizations primarily to provide timely information regarding the patients who were in need of emergency and immediate medical attention improves the quality of the health care service the hospitals provided.

Addo and Agyepong, (2020:2) studied the applications of ICT on the improvement of the healthcare service of private hospitals in India. The study focused on the healthcare professionals at selected 20 general hospitals in Delhi. The results of the findings revealed that providing accurate and timely medical information to both the physicians and the patients played a significant role in the improvement of delivering quality health case service. They also asserted most healthcare facilities have rapidly adopted HIS, and the use of such systems increased due to its impact on improving patient safety as well as delivering high quality services at less cost, and efficient management of patient data. Based on this description, the following hypothesis is proposed:

*H5 – Information timeliness has positive and significant effect on health service quality.*

### 2.3. Conceptual Framework

The framework was created based on Information & Communication Technology and Service Delivery Quality. ICT dimensions namely information relevance, accuracy, timeliness, integrity, and physician-patient interaction are considered as independent variables. While service delivery is taken as dependent variable of the study. The model is adopted from Brook’s study (2020). The following diagram shows the conceptual connections between the independent variables and the dependent variable. The arrows show information relevance, accuracy, integrity, timeliness and physician-patient interaction have direct relationship with service delivery quality.



(Source: Brook, 2020)

Figure 1. Conceptual Framework of the Study



# **CHAPTER THREE**

## **RESEARCH METHODOLOGY**

### **3.1 Research Approach**

Research approach is a strategy of inquiry that provide specific direction for procedure in a research design. Bhattacharjee (2012) classifies scientific research approaches into three namely quantitative, qualitative and mixed research. Among them, for this study, a quantitative research approach was adopted to address the research question raised and test hypotheses posited. Quantitative research is the systematic and scientific investigation of quantitative properties and phenomena and their relationships and where the investigator primarily uses the post-positivist paradigm to knowledge formation. The objective of quantitative research is to develop and employ mathematical models, theories and hypotheses pertaining to natural phenomena (Creswell, 2003). Hence, quantitative research approach was used in this study for involving generation of data in quantitative analysis. Thus, the data were quantified and statistical methods were applied in the analysis to seek evidence about a characteristic or a relationship between IT and service quality variables.

### **3.2 Research Design**

There are three types of research design namely exploratory, descriptive and explanatory research. The goal of exploratory research is to discover ideas and in-sights while descriptive research is usually concerned with describing a population with respect to important variables. Explanatory research is used to establish cause-and-effect relationships between variables and causal analysis is concerned with the study of how one or more variables affect changes in another variable. It is thus a study of functional relationships existing between two or more variables (Kothari, 2004). This study applied explanatory research design as it evaluates the variables of interest in the ICT and service quality variables and determine the relationship between the constructs.

### **3.3 Population, Sample Size and Sampling Technique**

#### **3.3.1 Targeted Population**

A population can be defined as the complete set of subjects that can be studied: people, objects, organizations from which a sample may be obtained (Shao, 1999). According to the federal ministry of health (FMoH) report on 2019, there are a total of 144 hospitals in the country of which 90 are run by both federal and state governments while the rest are owned by private investors.

Among 58 registered active hospitals in the vicinity of the capital city, only 14 are public owned whereas the rest 44 private hospitals are licensed to provide the service up to the standard. According to Ethiopian health tier, one of the criteria to level the healthcare institutes is their respective bed capacity. Based on minimum bed capacity requirement, those which have a minimum of 35, 50 and 110 beds are categorized under primary, secondary and tertiary level healthcare. There are a total of 37 primary hospitals, 10 general hospitals and 1 specialized hospital in the city currently (Addis Ababa Health Bureau, 2019). General hospital shall mean a health facility at secondary level of healthcare tier which provides promoted, preventive, curative and rehabilitative service that requires diagnostic facilities and therapeutic intervention with a minimum capacity of 50 beds.

A population of medical staff (general practitioners, residentials, specialists, nurses, lab technicians and health officers at different managerial levels) in private general hospitals were targeted. For the reason that the medical staff are more exposure to use the health information technology and are believed to have better understanding regarding their influence on the delivery of quality service than other staff. The study population, thus, constitutes the medical staff, working for 10 private general hospitals namely Hayat, Yordanos, Korean (MCM), Kadisco, St. Yared, Bethezata, Bethel Teaching, Yearrer, Halelujah and St. Gebriel general hospital in the period of Aug. – Sept., 2022.

#### **3.3.2 Sample Size**

Sampling is the process of selecting a number of study units from a defined study population (Carvalho, 1984). Determining sample size is a very important issue because samples that are too large are uneconomical while too small samples may lead to inaccurate results. When the size of the population is known, the sample size is calculated based on Yemane's (1967) formula for proportionality of sample for the known population. Since the exact total population is known, the sample size determination formula is used to estimate the sample size. The formula is:

$$n = \frac{N}{1 + Ne^2} = \frac{960}{1 + (960 * 0.5^2)} = 282$$

Where: n = required sample size; N = Total Population; e = Tolerable error (0.05).

A representative sample size of 282 respondents were taken from 10 private general hospitals with a capacity of accommodating 50 and more beds. Accordingly, a sample proportion per stratum is illustrated in Table 1. Below.

Table 1: Sample Proportion per Stratum

Industry	Company	No. of Staff	Proportion	Sample Proportion
General Private Hospitals	Bethel Teaching	100	0.104	29
	Bethezata	60	0.063	18
	Halelujah	115	0.120	34
	Hayat	150	0.156	44
	Kadisco	63	0.066	19
	Korean (MCM)	248	0.258	73
	St. Gabriel	50	0.052	15
	St. Yared	51	0.053	15
	Yerrer	73	0.076	21
	Yordanos	50	0.052	15
<b>Total</b>		<b>960</b>		<b>282</b>

(Source: FMHACA, 2022)

### 3.3.3 Sampling Techniques

Sampling is the process of selecting a number of study units from a defined study population (Abiy, 2009). It is economical to take representative sample for the intended investigation when conducting census is unrealistic. Even though hospitals are obliged to have their own records of patients, the ethics doesn't allow them to transfer patients' medical history for third parties. As both the health institutes and concerned authorities are hesitant to provide the patients' list and their respective addresses, it is impractical to select samples from the sample frame randomly. According to Zikmud (2000), there are two main sampling methods, probability and non-probability sample. In this study, the lack of access to a list of the population under study makes fully randomized samples (probability sampling) difficult to obtain. Thus, convenience non-probabilistic sampling will be applied to select the targeted sample size from the sampling frame.

### **3.4 Source of Data**

According to Catherine (2017), data may be collected as primary, secondary or both. Primary data are originated by the researcher for the specific purpose of addressing the problem at hand. On the other hand, secondary data contains relevant data that has been collected for a different purpose, but from which the conclusion is valuable for the purpose. In this study basically the primary source, i.e., data collected from medical staff at the selected 10 private hospitals were used for analysis.

### **3.5 Data Collection Instrument**

Questionnaire to be used must be prepared very carefully so that it may prove to be effective in collecting the relevant information. Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions (Kothari, 2004). The questions are presented with exactly the same wording and in the same order to all respondents. Resort is taken to this sort of standardization to ensure that all respondents reply to the same set of questions.

A structured questionnaire, based a 5- point Likert –scale, was used as a major instrument of data collection tool. The questionnaire consisted of three sections. The first section elicits information on the demographic characteristics of the respondents, the second section constitutes of items that request information on the independent variables of the study i.e., IT in terms of information relevance, accuracy, integrity, interactivity, and timeliness; while the third section is all about the dependent variable – service delivery quality. The attributes were measured using 5-point Likert scale ranging from 1- for "Strongly disagreed" to 5- for "strongly agreed". The questions regarding IT dimensions and service delivery quality are adopted from Brook (2020), then it was adjusted to fit for the context of the study.

### **3.6 Data Collection Procedure**

A pilot survey was conducted on 10 respondents at Landmark hospital, excluded from the sample frame, prior to administrating the questionnaire to the targeted sample respondents so as to check whether the questioner is clear, easy to understand and straightforward to ensure that the respondents able to answer the questions with no difficulty. In addition to these, the pilot study was administered to test the appropriateness, validity and reliability of the questioner, and then based on their feedbacks; some changes were made on the questionnaire before distributing to the selected sample elements. Based on the sample size proportion, as computed on the above formula, proportionate self-

administered questionnaires will be distributed to willing participants at each general hospital to collect a total of 282 responses. Medical staff those who were not in an emergency or surgery room were intentionally excluded as they situation wouldn't be comfortable to fill the questionnaire without bias as much as possible.

### 3.7 Data Analysis and Presentation

The data in this study were analyzed using both descriptive and inferential statistics. Descriptive statistics is used to interpret data in general and for testing hypothesis and investigating research objectives inferential method is used using statistical package for social science (SPSS) version 20. Descriptive statistics is applied to interpret demographic variables of the respondents and to discover the frequencies of each dimension whereas inferential statistics is used for hypothesis testing such as correlation and multi-regression. Tables and graphs are used to present analysis results pictorially.

**Model Specification** - Multiple linear regression analysis is a statistical method to deal with the formulation of a mathematical model depicting relationships amongst variables which can be used to predict the value of a dependent variable, given the value of the independent (Kothari, 2004).

The study sought to see the extent to which the ICT practice affects service delivery quality. Thus, it considers:

**Independent Variables** – Health Information Technology dimensions in terms of information Relevance (5 statements), Accuracy (5), Integrity (5), Physician-Patient Centered (5), Interactivity (5) and Timeliness (5).

**Dependent Variable** – Health Service Quality (5 statements) to be measured by Health care quality indicators namely effectiveness, safety, people-centredness, timeliness, equity, integration of care and efficiency. The foundations of quality imply a workforce, facilities, medications and medical products, as well as data.

To do so, the relationship between information technology and service delivery quality variables is formulated as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + e$$

Where: Y = Service Delivery; x<sub>1</sub> = Information Relevance; x<sub>2</sub> = Information Accuracy; x<sub>3</sub> = Information Integrity; x<sub>4</sub> = Physician Centered Interactivity; x<sub>5</sub> = Information Timeliness; e = error term; β<sub>0</sub> = constant, term; β<sub>1,2,3,4, & 5</sub> = coefficient terms.

### 3.8 Scale Validity

Whiston (2012) defined validity as obtaining data that is appropriate for the intended use of the measuring instruments. In this case, validity tests, which determine whether the expressions in the scale make suitable measurements according to the purpose of the research. Although it is possible to list several scale validities, three types of validity are generally accepted to have particular importance in the literature, namely content validity, construct validity, and face validity. Based on this, the items in the questionnaire are rigorously refined to make sure they measure what they intend to measure. To reduce subjectivity, the questionnaires were revised after repeated discussion with different research professionals. After carrying out a pilot survey, revisions were also made to questions that are not clear to solve all ambiguities. Since the student researcher did not develop a new scale and used one that has been previously created and tested for validity in the local language of the country in which the original research was conducted, it is sufficient to test the validity.

### 3.9 Reliability

The scale reliability was computed using Cronbach's alpha coefficient for the entire set of IT adoption and healthcare service quality. The use of Cronbach Coefficient to measure reliability of instrument enabled to identify the strength of items included in the questionnaire such that measure between 0.7 and 1.0 signifies a strong consistency of item used in questionnaire (Mugenda, 2003). However, the acceptable Alpha value that meets the statistical prerequisite for the instrument to be characterized as reliable should be between 0.70 and 0.9 as the value more than 0.9 could be an implication of redundant variables measuring same subject (Travakol, 2011).

Table 2: Reliability Test - Cronbach Alpha's Coefficient

	N	Cronbach's Alpha
Relevance	5	.776
Accuracy	5	.703
Integrity	5	.731
Interactivity	5	.819
Timeliness	5	.742
Healthcare Service Quality	6	.792
Overall Reliability	<b>31</b>	<b>.735</b>

Source: Own SPSS Output, 2022.

As seen in Table 2, the reliability test measured by Cronbach's alpha was found an aggregate value of .735, which is within the acceptable range (above  $\alpha = .70$ ). Thus, the scale was considered a reliable measurement of the study variables.

### **3.10 Ethical Considerations**

It is important to consider ethical principles when conducting business research. Ethical issues are categorized into four different types: harm to participants, lack of informed consent, invasion of privacy, and deception (Bryman, 2011). In this study, there are descriptive questions about the respondent's age and gender but this information is not enough to identify the person. The second ethical principle to consider is the lack of informed consent. The third ethical principle concerns the invasion of privacy. In this study, the respondent has the opportunity to skip a question if it is judged sensitive. Furthermore, this study is not of a sensitive nature which enhances the respondents' willingness to answer. The fourth ethical principle refers to deception which occurs if respondents are led to believe that research is about something else than what it is. After considering these ethical principles and fully living up to the requirements, it can be classified as ethical.

## **CHAPTER FOUR**

### **DATA ANALYSIS AND INTERPRETATIONS**

#### **4.1 Response Rate**

After distributing 282 questionnaires to the targeted respondents, medical staff of the hospitals under study, a total of 247 questionnaires were collected which accounted for 87.6% of the total distributed questionnaires. Then, further screened for missing data and other inconsistency and was found 228 valid and usable questionnaires for statistical analysis. The responses further screened for error correction and then encoded accordingly to make them suitable for data analysis. SPSS 22.0 application software was used to organize and prepare the collected data and analyzed using the multiple linear regression model for testing a set of factors simultaneously. After carried out all the required data preparation, then analyzed, interpreted and then findings are presented as follows.

#### **4.2 General Information about the Respondents**

The first part of the questionnaire consists of the demographic characteristics of the respondents. It requested a limited amount of information related to their personal and socio-demographic status. Accordingly, the following variables such as sex, age, education, specialty, employment status, and work experience were summarized and described in the Table 3 below.

Referring the results in Table 3, their sex orientation, female respondents constituted relatively the highest percentage 137(60.1%) while their male counterparts shared the rest 91(39.9%). This implies that majority of the respondents were female medical staff who have been currently working at the ten private general hospitals in Addis Ababa. The predominance of females at healthcare facilities is a common phenomenon, but given the small sample size and limited scope of the study, it would be premature to draw any conclusions regarding the significance of this sex gap far beyond sampling variety. Future studies with a gender-specific focus might look into this issue further.

Regarding the age group, the staff within 21-30 years represented 90(39.5%) followed by 73(32.0%) within 31-40 years, 30(13.2%) within 41-50 years, 22(9.6%) with 51-60 years but those staff above 60 years constituted only 13(5.7%). This also implies that respondents from each age group were participated in this survey. This could be taken as a good opportunity for gathering data from different age group (adolescents to seniors) regarding their perception towards the influence of IT adoption on the overall quality of healthcare service delivery.



Table 3: Demographic Characteristics of Respondents

Category		Frequency	Percent
Sex	Male	91	39.9%
	Female	137	60.1%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>
Age	21-30	90	39.5%
	31-40	73	32.0%
	41-50	30	13.2%
	51-60	22	9.6%
	>60	13	5.7%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>
Education	First Degree	171	75.0%
	Second Degree	47	20.6%
	Others	10	4.4%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>
Speciality	Physician	96	42.1%
	Nurse	112	49.1%
	Health Officer	10	4.4%
	Lab Technician	10	4.4%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>
Employment Status	Permanent	135	59.2%
	Part-timer	53	23.2%
	Internship	36	15.8%
	Others	4	1.8%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>
Experience	<5 years	87	38.2%
	5 - 9 years	70	30.7%
	10 - 14 years	43	18.9%
	>14 years	28	12.3%
	<b>Total</b>	<b>228</b>	<b>100.0%</b>

Source: Own SPSS Output, 2022.

As far as their academic achievement, first degree holders accounted 171(75.0%) while second degree and others qualification holders did 47(20.6%) and 10(4.4%) respectively. This indicates that above 90 percent of the respondents were well-educated. The student researcher believes that it's because of the nature of the healthcare industry that requires high caliber medical workforce for the sensitivity public health and the wellbeing of the society at large. This could also be taken as an opportunity to collect data from the participants who were believed to have better understanding of the subject.

Same token, nurses accounted 112(49.1%) of the respondents, followed by 96(42.1%) physicians 10(4.4%) health officer, 10(4.4%) lab technician, 7(3.1%) radiologist and the rest 4(1.8%) were from other specialities. This implies that nurses and physicians were large in number in hospitals as their role is so important in the healthcare.

Their employment status also indicates that 135(59.2%) of the respondents were permanent staff in their respective hospitals, while 53(23.2%) part-timer, 36(15.8%) internship and 4(1.8%) had other contractual agreement. Regarding their work experience, those respondents who have served in their current position for less than <5 years accounted 87(38.2%) while 70(30.7%) from 5 - 9 years, 43(18.9%) from 10 - 14 years and the rest 28(12.3%) served their organization more than 14 years. This implies that majority of the respondents had relatively less stay in their respective workplace. However, having staff from both short and long service years would be taken as a good opportunity to get different perspective regarding the adoption of information technologies for the betterment of the healthcare service in private general hospitals.

### **4.3 Description of Study Variables**

The description of the study variables namely information relevance, accuracy, integrity, physician-patient interactivity, timeliness and healthcare service delivery quality are presented with mean and standard deviation (descriptive) statistics to compare the respondents' perception of the variables. The mean indicates to what extent the sample group averagely agrees or disagrees with the different statements. The scale is set in such a way that respondents strongly disagreed if the mean scored value is in the range of 1.00 – 1.80; disagreed within 1.81 – 2.60; neither agreed nor disagreed within 2.61 - 3.40; agreed if it is in the range of 3.41 – 4.20; while strongly agreed when it falls within 4.21 – 5.00. In addition, standard deviation shows the variability of an observed response. Similarly, the standard deviation indicates the level of variation in the respondent's perception. That means, if the deviation is less than 1.000, it implies they had similar stand. If higher than the threshold value (Std. 1.000), they would have different stand on that specific issue/idea/statement.

Table 4: Description of Information Relevance Perception

Relevance	N	Mean	Std.
The system facilitates access to information in a user-friendly manner	228	3.57	1.846
The system often provides important medical-related information to the users	228	3.68	1.628
The system provides evidence-based clinical decision making for the end users.	228	3.75	1.665
Every user department/ medical unit receives appropriate/ filtered-out information	228	3.71	1.701
The system is capable to maintain patient’s confidential information	228	3.42	1.853
<b>RLV</b>	<b>228</b>	<b>3.63</b>	<b>1.372</b>

Source: Own Survey, 2022

Referring the results in Table 4, the respondents agreed with the idea that the system often provided important medical-related information to the users (Mean = 3.68, Std. 1.628) and evidence-based clinical guidelines/decision making for the concerned users (Mean = 3.75, Std. 1.665), with appropriate/ filtered-out information (Mean = 3.71, Std. 1.701). However, they had weak perception towards the facilitation of the system to access information in a user-friendly manner (Mean = 3.57, Std. 1.846) and its capability to secured patient’s confidential information (Mean = 3.42, Std. 1.853). Overall, the relevance of information provided the IT systems of the private general hospitals was perceived relatively weak (Mean = 3.63, Std. 1.372) which emanated from either high variability of the respondents’ perception (Std. > 1.000) or lack of medical staff’s awareness regarding the relevance/validity of the medical-related information to the end-users as necessary. This implies that, in the private general hospitals, lack of managing, analyzing and optimizing patient treatment histories and other key medical products’ data is evidenced. I.e., often patients need treatments from different medical unit, for instance, a patient might receive preliminary diagnosis and treatment from a general practitioner (aka GP) before being referred to a specialist.

Table 5: Description of Information Accuracy/Reliability Perception

Information Accuracy/Reliability	N	Mean	Std.
The system complies with the requirements of the health authorities	228	4.21	1.518
The system minimizes human-induced errors	228	4.02	1.674
The system always provides error free information	228	2.79	1.552
The system sends accurate reminder to the physician for notifying critical cases	228	2.77	1.771
They system is dependable to reach on decisions in the case of critical situations	228	3.92	1.732
<b>REL</b>	<b>228</b>	<b>3.54</b>	<b>1.258</b>

Source: Own Survey, 2022

As far as information accuracy/reliability is concerned, the results in Table 5 also show that the respondents acknowledged the system complied with the requirements of the health authorities (Mean = 4.21, Std. 1.518), and system minimized human-induced errors (Mean = 4.02, Std. 1.674), and is dependable to reach on decisions in the case of critical situations (Mean = 3.92, Std. 1.732). However, they had doubts about the system is free from error (Mean = 2.79, Std. 1.552) and capable of sending accurate reminder to the physician for notifying critical cases (Mean = 2.77, Std. 1.771). Overall, the majority of the respondents had weak perception towards the reliability/accuracy of the medical information generated from the adopted IT technologies as the average mean value scored 3.54, despite they had varied stand regarding the dependability of the system (std. 1.258). This implies that the accuracy or dependability of the information processed through the IT system of the hospitals is in question. In other words, the staff had doubts about the quality of the medical information results in poor performance of the health facilities as quality data are needed to deliver safe/ reliable service.

Table 6: Description of Information Integrity Perception

Information Integrity	N	Mean	Std.
The IT system coordinates all required information from different medical units	228	3.73	1.732
The physician can access every (current + historic) data of the patient collectively	228	3.79	1.688
The system coordinates the staff (medical + admin) to have a good communication	228	3.84	1.657
The system grants access for the patient to get their medical results as demanded	228	3.21	1.776
The system provides detailed information for the concerned users/managements	228	4.07	1.502
<b>INT</b>	<b>228</b>	<b>3.73</b>	<b>1.333</b>

Source: Own Survey, 2022

Regarding the perception of information integrity, the results in Table 6 show that the respondents agreed with the idea that the system provided detailed information for the concerned users, both medical and admin management (Mean = 4.07, Std. 1.502). Similarly, they also acknowledged the IT system coordinated all the required information from different functional/medical units (Mean = 3.73, Std. 1.732) that enabled them to access both current and historic data of the patients collectively (Mean = 3.79, Std. 1.688) to establish a good communication (Mean = 3.84, Std. 1.657). However, they were indifferent regarding the system's provision of access to the patient to get their medical results as demanded (Mean = 3.21, Std. 1.776). Overall, the majority of the respondents had positive perception towards the integrity of the healthcare information systems of the private general hospitals in Addis Ababa (Mean = 3.73) despite they didn't have similar stand on the issue (Std. 1.333). This

has an implication that an information integration in health care system enables the secure flow of data to concerned and authorized users to strengthen better health care delivery service.

Table 7: Description of Information Physician-Patient Interaction Perception

Interaction	N	Mean	Std.
The system helps patients to involve in decision making before their treatment	228	3.61	1.774
The system offers patients choice of treatment before they are admitted	228	3.54	1.772
The system provides frequent self-monitoring of their treatment/results if demanded	228	3.51	1.819
The system provides health-related information with their preferred language	228	3.43	1.743
The medical system is user friendly for both patients and medical staff	228	3.57	1.519
<b>ACT</b>	<b>228</b>	<b>3.53</b>	<b>1.386</b>

Source: Own Survey, 2022

Table 7 also illustrates that the respondents had weak perception towards the support of the adopted IT system (Mean = 3.53, Std. 1.386) the fact that they slightly agreed with the idea that states the system helped patients to involve in decision making before their treatment (Mean = 3.61, Std. 1.774), offered patients choice of treatment before they are admitted (Mean = 3.54, Std. 1.772). They also claimed that the system provided them with health-related information with their preferred language (Mean = 3.43, Std. 1.743) and frequent self-monitoring of their treatment/results (Mean = 3.51, Std. 1.819). They had also doubt about the medical system is user friendly for both patients and medical staff (Mean = 3.57, Std. 1.519). This implies that the IT system mainly has limitation to promote the interaction between physicians and patients in the process of clinical treatment and the decision-making of sharing, so as to improve the compliance of patients with medical guidance, which is the embodiment of patients' trust in doctors in the long run.

Table 8: Description of Information Timeliness Perception

Timeliness	N	Mean	Std.
To visit a physician, the waiting time of patients at clinician's office is fair enough	228	3.45	1.685
Duration of wait for laboratory test results is boringly extended	228	3.48	1.659
Laboratory diagnosis results are updated to the concerned physician immediately	228	3.63	1.665
The system gives priority for critical/ urgent care issues	228	3.43	1.626
The system provides on time information to the patient/family as necessary	228	3.58	1.556
<b>TIM</b>	<b>228</b>	<b>3.51</b>	<b>1.107</b>

Source: Own Survey, 2022

As far as the timeliness of the IT system in the private general hospitals is concerned, the respondents slightly agreed with the waiting time of patients to visit a physician is fair enough (Mean = 3.45, Std. 1.685), duration of wait for laboratory test results is boringly extended (Mean = 3.48, Std. 1.659), the diagnosis results are updated to the physician immediately (Mean = 3.63, Std. 1.665). They had also weak perception towards the system ability to give priority for critical/ urgent care issues (Mean = 3.43, Std. 1.626) and the system provides on time information to the patient/family as necessary (Mean = 3.58, Std. 1.556). The overall information timeliness of the hospitals is perceived weak with varied stand as the average mean value scored 3.51 and std. 1.107. This also implies that timeliness of care provides the practitioner’s ability to quickly provide care after recognizing a need, meaning the timelier a health provider, the better their patients' health outcomes.

Table 9: Description of Health Service Quality Perception

Health Service Quality	N	Mean	Std.
The hospital is known for providing in time service as expected by the patients	228	3.46	1.514
I believe that the medical service of the hospital is safe for patients	228	3.64	1.543
The hospital strives for patients to have a fair opportunity to attain their full health potential (none should be disadvantaged).	228	3.53	1.088
The system facilitates coordination of patient care with medical service.	228	3.58	1.137
The hospital provides higher level of service compared to its service charge.	228	3.56	1.131
The hospital gives due consideration for the needs of individual patient to provide a highly customized type of support.	228	3.60	1.100
<b>HSQ</b>	<b>228</b>	<b>3.56</b>	<b>1.003</b>

Source: Own Survey, 2022

Referring the health care service quality of the private general hospitals, the results in Table 9 illustrates that the respondents believed the medical service of the hospital is safe for patients (Mean = 3.64, Std. 1.543) and provided patients to have a fair opportunity to attain their full health potential/ no discrimination (Mean = 3.53, Std. 1.088). Similarly, they also had weak perception towards the hospitals gave due consideration for the needs of individual patient to provide a highly customized type of support. (Mean = 3.60, Std. 1.100) as well as the system facilitates coordination of patient care with medical service to exceed the patients’ expectation (Mean = 3.58, Std. 1.137). However, they slightly agreed that the hospitals provided higher level of service compared to their service charge (Mean = 3.56, Std. 1.131) and they are known for providing in time service as expected by the patients (Mean = 3.46, Std. 1.514). The overall health service delivery quality of the hospitals was also perceived weak implying that the managements couldn’t exceed the expectation of their patients

in terms of providing safe, effective, fair and patient-centered medical service in timely manner that results in weak perception of the respondents towards the quality of the service delivery.

#### 4.4 Inferential Analysis

Inferential statistics can help to provide explanations for a situation or phenomenon. It allows researchers to draw conclusions based on extrapolations and is thus fundamentally different from descriptive statistics, which simply summarize the data that has been measured (Hair, 2010). In this study, inferential statistics are adopted to examine the relationship between IT adoption and health service quality. To do so, correlation tests, the assumption for regression model tests, and finally multi-regression analysis are performed in terms of model summary, ANOVA test, and beta coefficient determination to address the study's objectives.

##### 4.3.1. Correlation Test

A correlation coefficient is a useful tool for summarizing the relationship between two variables with a single number ranging from -1.0 to 1.0. (Field, 2005). Pearson's correlation coefficient was calculated on the independent and dependent variables to determine the relationship between them. Field's (2005) recommendations relied on correlation to assess the strength of the relationship between variables. If the correlation coefficient falls between 0.1 and 1.0, the coefficient (r) is weak at 0.29; moderate at 0.3 to 0.49; and strong at >0.5 relationship between variables. In this study, Pearson correlation was used to examine the relationship between each of the independent variables and the dependent variable using a two-tailed test of statistical significance at the level of 95% confidence and significance <0.05.

Table 10. Pearson Correlation Matrix

	<b>RLV</b>	<b>REL</b>	<b>INT</b>	<b>ACT</b>	<b>TIM</b>	<b>HSQ</b>
Relevance - RLV	1					
Accuracy - REL	.437**	1				
Integrity - INT	.304**	.301**	1			
Interactivity - ACT	.155*	.424**	.507**	1		
Timeliness - TIM	.160*	.243**	.211**	.182**	1	
Healthcare Service Quality - HSQ	.605**	.675**	.478**	.487**	.313**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Source, Own Survey, 2022

The results of the correlation test in Table 10 illustrates information relevance ( $r = .605$ ) and accuracy ( $r = .675$ ) had positive and relatively strongest significant relation with overall health service quality. But information integrity ( $r = .478$ ), patient-physician interaction ( $r = .487$ ), and timeliness ( $r = .313$ ) had positive and moderate significant relationship. In summary, the relationship between IT adoption and health service quality was found to be positive and statistically significant. This implies that any change in the five dimensions of IT adoption dimensions ends up with direct and proportionate changes in health service quality.

#### 4.3.2. Assumptions of Regression Test

Multiple regression is an analysis that assesses whether one or more predictive variables explain the dependent (criterion) variable. The regression assumptions are linear relationship, multicollinearity, multivariate normality, and homoscedasticity.

**Multicollinearity** – Multicollinearity assumes that there are no highly related predictor variables. Having such a problem or violating an assumption may result in the linear regression model producing inconsistent results. Thus, before performing the linear regression (Ordinary Least Square Method), one should look for the problem of multicollinearity, which is characterized by a high correlation between some of the independent variables. The Variance Inflation Factor (VIF) is used in the study to calculate the effect of correlation among independent variables on the precision of regression estimates. The VIF should not be greater than 10. If the Tolerance ( $1/VIF$ ) value is less than 0.1, it also indicates the possibility of multicollinearity, but if it is greater than 0.1, it indicates that the model is free of multicollinearity (Hair, 2004).

Table 11. Collinearity Assumption Test

	N	Tolerance	VIF
Relevance	228	.760	1.317
Reliability/Accuracy	228	.665	1.503
Integrity	228	.683	1.465
Interactivity	228	.648	1.543
Timeliness	228	.918	1.089

(Source: Own Survey, 2021)

The collinearity statistics analysis of VIF values in Table 11 ranges from 1.089 to 1.503 and Tolerance values ranges from 0.665 to 0.918 in this study indicates that there was no collinearity problem. This could be interpreted as confirmation that the independent variables are not strongly



related to one another. I.e., if the independent variables in this model were highly related to one another, they would have primarily measured or conveyed the same information.

**Homoscedasticity** - Before running multiple regression analysis, there should be homoscedasticity, which means that the residuals (the differences between the observed and predicted values of the dependent variable) are normally distributed and have constant variance (Burns & Burns 2008). If the assumption of homoscedasticity is violated (i.e., there is heteroscedasticity).

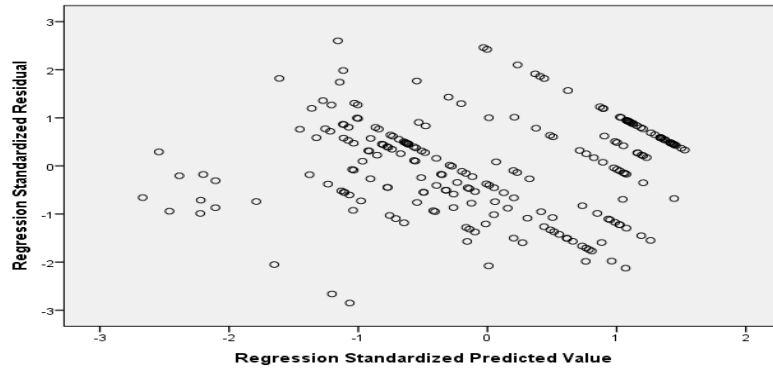


Figure 2. Scattered Plot for Homoscedasticity Test

The graph, Figure 2, demonstrates the study's homoscedasticity. Using ZRESID versus ZPRED plots, the researcher attempted to determine whether the graph resembled a random array of dots evenly distributed around zero because Testing for Homoscedasticity is based on the assumption in regression analysis that the residuals at each level of the predictor variable(s) have similar variances. This means that the spread of residuals should be fairly constant at each point along with any predictor variable. Thus, as seen in the figure, the annexed dots are randomly distributed along the reference line. It can be concluded that the homoscedasticity assumption has been met.

**Linearity Test** - Linear regression needs the relationship between the independent and dependent variables to be linear. It is also important to check for outliers since linear regression is sensitive to outlier effects. The linearity assumption can best be tested with scatter plots.

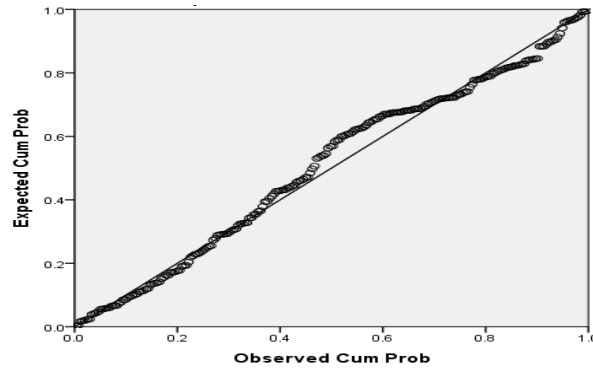


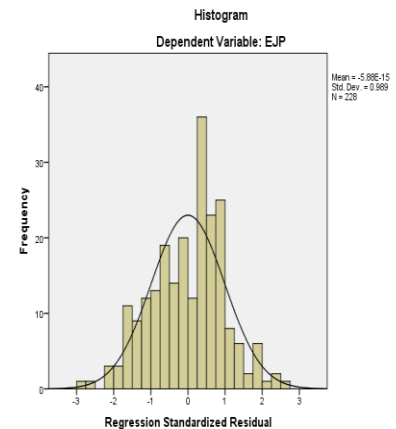
Figure 3. Scattered Plot for Linearity Test

Figure -6 depicts the expected value for each of the IT adoption dimensions (the predictor variables) (straight line). The plot in the same figure as the annexed plot shows how the points are distributed randomly and evenly across the plot. And, these patterns are indicative of a situation in which the linearity assumptions have been met in all the five IT adoption variables against health service quality.

**Multivariate Normality** - To ensure that the distribution of scores is normal, the values of Kurtosis and Skewness must be examined. Both of which have a standard error associated with them. Skewness and kurtosis should be zero in a normal distribution. Positive skewness values indicate a pile-up of scores on the left side of the distribution, whereas negative values indicate a flat distribution. The further the value is from zero, the more likely the data are not normally distributed. Both of which have a standard error associated with them. However, the actual values of skewness and kurtosis are not informative in and of themselves. It must instead take the value and convert it to a z-score. The z-score is simply a normalized score from a distribution with a mean of 0.0 and a standard deviation of 1.0.

Table 12. Normality Assumption Test

	N	Skewness		Kurtosis	
	Stat	Stat	Std. Error	Stat	Std. Error
Relevance	228	-.487	.161	-1.288	.321
Reliability/Accuracy	228	-.752	.161	-.725	.321
Integrity	228	-.794	.161	-.813	.321
Interactivity	228	-.543	.161	-1.222	.321
Timeliness	228	-.490	.161	-.702	.321
Health Service Quality	228	-.185	.161	-.267	.321
Valid N (listwise)	228				



As illustrated in Table 4.10, all the IT adoption dimensions' z-scores skewed to the right side but were found to be within an acceptable range (skewness within -2.0 to 2.0; and Kurtosis within -2.0 to 2.0). Therefore, it is pretty clear then that the numeracy scores are negatively skewed, indicating a pile-up of scores on the right of the distribution.

#### 4.4.3. Multiple Linear Regression Analysis

Multiple linear regression analysis in this study was used to model the value of health service quality based on its linear relationship with the five IT adoption variables (predictors namely information relevance, accuracy, interaction, integrity and timeliness). This means the overall health service quality is an aggregation of the IT adoption dimensions. To indicate the impact that each predictor had on the constructed variable, the unstandardized coefficients are checked. The output of the multiple linear regression model shows a model summary, ANOVA test, and Beta Coefficients.

Table 13. Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810 <sup>a</sup>	.657	.649	.5945

a. Dependent Variable: HSQ

b. Predictors: (Constant), TIM, ACT, INT, REL, RLV

As indicated in the model summary of the analysis in Table 13, the value of R (.810) indicated the overall correlation of IT adoption variables with health service quality. It indicates that the IT adoption variables have positive strong relationship with the health service quality of private general hospitals in Addis Ababa. While the goodness-of-fit of the model ( $R^2 = .657$ ) illustrates the variation of IT adoption is accounted for a 65.7% variation in health service quality. That means, the IT adoption explains about 65.7% of the variation in health service quality of the private general hospitals in Addis Ababa.

Table 14. ANOVA Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	150.111	5	30.022	84.931	.000 <sup>b</sup>
	Residual	78.474	222	.353		
	Total	228.585	227			

a. Dependent Variable: HSQ

b. Predictors: (Constant), TIM, ACT, INT, REL, RLV

Referring to the ANOVA test results in Table 14, the F-value of 84.931 is significant at  $p < .05$ . Therefore, it can be inferred that with 65.7% of the variance ( $R^2$ ), IT adoption dimensions are significant and the model appropriately measured the dependent variables – health service quality. In short, the regression model predicts overall health service quality, and has been significantly explained by the five independent variables. This implies that the fitness of model shows to what extent the hypothetical model is consistent with data. Goodness-of-fit measures, used in the context of latent construct modeling, describe how well the observed data represents/explains the latent constructs of interest. Inferences related to the latent construct are drawn from these observable occurrences; therefore, assessing the goodness-of-fit for a model is one of the most important aspects.

Table 15. Coefficients

<b>Coefficients<sup>a</sup></b>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.370	.177		2.090	.038
1 Relevance	.258	.033	.353	7.830	.000
Reliability/Accuracy	.299	.038	.375	7.785	.000
Integrity	.108	.036	.144	3.015	.003
Interactivity	.132	.035	.182	3.735	.000
Timeliness	.092	.037	.102	2.484	.014

a. Dependent Variable: HSQ

Referring the regression coefficients, the results in Table 15 illustrates that beta coefficients of each IT adoption dimension represents the last output in the analysis of the multiple regression models. The results of the multiple linear regression analysis revealed that each dimension of IT adoption had a positive and significant effect on overall health service quality. Information accuracy/reliability ( $B = .375$ ,  $p < .05$ ) had relatively the highest effect on health service quality followed by relevance ( $B = .353$ ,  $P < .05$ ) and physician-patient interaction ( $B = .182$ ,  $P < .05$ ). However, integrity ( $B = .144$ ,  $P < .05$ ) and timeliness ( $B = .102$ ,  $P < .05$ ) had relatively lower contributions to the prediction model. This implies that the predicted change in the health service quality for every unit change in that specific predictor variable, i.e., keeping other factors constant, a unit change in relevance, for instance, is accounted for a .353 unit change in health service quality.

Specifically, Information relevance has relatively higher positive significant effect on health service quality ( $B = .353$ ,  $p < .05$ ). Providing important medical-related information and evidence-based clinical guidelines/decision making for the medical practitioners with appropriate/ filtered-out information in a user-friendly manner affect the health service quality. This finding is in line with study of Cudworth and Hobden (2013). They investigated the determinants of technological innovation and its effect on hospital health service quality and concluded the provision of relevant information by the adopted IT technologies positively affects the level of health service quality at private hospitals, which is higher than that of public hospitals. Similarly, Hahn and Powers (2010) supported there is a strong relationship between information relevance and health service quality. They conclude that the hospital supports innovation of ICT technologies to enhance provision of relevant and reliable information through the continuous acquisition of updated equipment.

Similarly, the accuracy of information processed by the health information system showed the highest contribution to the quality of the healthcare service ( $B = .375$ ,  $p < .05$ ). System compliance with the requirements of the health authorities, reduction of human-induced error, its dependability to make decisions and its capability of sending accurate reminder to the physician for notifying critical cases affect the perception of the medical and admin staff towards the quality of the health service. This finding is also in support of Gesulga (2017) who posits the adoption of ICT leads to quality health services improvement through the accessibility of accurate information. The ease access of reliable data allows health providers to deliver quality service. It concludes that HIS system supports the process of recording patient information for its availability and reliability/accuracy. However, Dralega's (2012) study argues that ICT adoption in the healthcare facilities improves the quality of healthcare services significantly if it implements properly. Otherwise, it adversely affects the patient's life if erroneous data in the system exists.

It was also found that information integrity had positive significant effect on health service quality ( $B = .144$ ,  $p < .05$ ). System's provision of detailed information for the concerned users, coordination of all the required information and establishing a good communication among different functional/medical units affected the perception of the medical practitioners towards the quality of health service delivery. Information integration in health care system enables the secure flow of data to concerned and authorized users to strengthen better health care delivery service (John, 2010). He also concluded that adoption of ICT can strengthen the integrity of the health information and management systems in the hospitals. Sani (2017) also recommends that ICT adoption for healthcare

centers, health workers and managers should be developed continuously. The author also adds that a strategy should be developed to integrate all districts and provinces in the country, so that those with poor ICT capacities can benefit from those that are better off.

Physician-patient interactivity had positive and significant contribution to health service quality ( $B = .183$ ,  $p < .05$ ). The IT system adoption helped patients to involve in decision making before their treatment, offered patients choice of treatment before they are admitted and provided them with health-related information with their preferred language in a user-friendly manner also affected their perception of health service quality improvement. Nguyen (2015) also supported the importance of health information system's capability to create interactive communication between medical staff and patients. He argues that that HIS ensures mainstreaming of patients' data that can be used by different professionals and practitioners in different contexts. HIS is used to manage patient data; effective patient data management leads to effective health services delivery, and quality of care can be realized (Sani, 2017). However, on the contrary, Hochbaum and Dorit (2011) found out the telemedicine system could be easily manipulated by the patients to take unprescribed medicines without experiencing the actual illness which could cause adverse effect on the users.

Nonetheless, Information timeliness show relatively the least effect on health service quality ( $B = 0.104$ ). Fairness of waiting time of patients to visit a physician, waiting laboratory test and diagnosis results and the system's ability to give priority for critical/ urgent care issues had less influence on medical and admin staff of the hospitals. This finding is against the findings of Zahra and George (2012). They argued that timely information regarding the patients who were in need of emergency and immediate medical attention improves the quality of the health care service the hospitals provided. In this case, its less influence might be justified by the presences of less due consideration for time value in developing countries' context but it requires further investigation to have a clear picture regarding the influence of delivery time on quality of medical service. On the other hand, Addo and Agyepong, (2020) argue that providing accurate and timely medical information to both the physicians and the patients played a significant role in the improvement of delivering quality health case service. Thus, these days, most healthcare facilities have rapidly adopted HIS, and the use of such systems increased due to its impact on improving patient safety as well as delivering high quality services at less cost, and efficient management of patient data.

Based on the results of the multiple linear regression analysis, substituting the standardized coefficients in the model yields:

$$HSQ = .370 + .353RLV + .375REL + .144INT + .182ACT + .102TIM$$

From the Multiple Linear Regression equation, the interpretation as follows:

- The constant 0.370 shows the effect of information relevance, accuracy, integrity, physician-patient interaction, and timeliness on service delivery. It means that, in a condition where all independent variables are constant (zero), health service delivery as dependent variable is predicted to be 0. 370.
- In condition where other variables are constant, if information relevance increases by one unit health service quality is predicted to be increased by 0.353 units.
- In condition where other variables are constant if information accuracy increases by one unit, health service quality is predicted to be increased by 0.375 units.
- In condition where other variables are constant if information integrity increases by one unit, health service quality is predicted to be increased by 0.144 units.
- In condition where other variables are constant if physician-patient interaction increases by one unit, health service quality is predicted to be increased by 0.182 units.
- In condition where other variables are constant if information timeliness increases by one unit, health service quality is predicted to be increased by 0.102 units.

The results in Table 16 illustrates that all the five dimensions of IT adoption had statistically significant influences on overall health service quality at a 95% confidence level ( $p < .05$ ), indicating that, for the private general hospitals in Addis Ababa, these factors are important in assessing or predicting the level of their health service quality. Therefore, based on these findings, all the five proposed null hypotheses are refuted but alternate hypotheses are supported accordingly.

*Table 16.* Estimated Regression Coefficients

Code	Hypothesis	Beta, Sig.	Decision
H1	Relevance has positive significant effect on health service quality	B= .353, p= .000	Supported
H2	Accuracy has positive significant effect on health service quality	B= .375, p= .000	Supported
H3	Integrity has positive significant effect on health service quality	B= .144, p= .003	Supported
H4	Interactivity has positive significant effect on health service quality	B= .182, p= .000	Supported
H5	Timeliness has positive significant effect on health service quality	B= .102, p= .004	Supported

Source, Own Survey, 2022

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1. Summary of Major Findings

The major findings of the analyses are summarized and presented below.

##### *Descriptive and Inferential Analysis*

- There is a positive and statistically significant relationship between the five variables of IT adoption and health service quality dimension.
  - Specifically, information relevance ( $r = .605$ ) and accuracy ( $r = .675$ ) had positive and relatively strongest significant relation with overall health service quality.
  - But information integrity ( $r = .478$ ), patient-physician interaction ( $r = .487$ ), and timeliness ( $r = .313$ ) had positive and moderate significant relationship.
- As per the regression analysis results of the model summary, IT adoption dimensions are accounted for 65.7% variation in health service delivery quality, significant at  $p < .05$ .

##### *Specific Objective -1. The Effect of Information Relevance on Health Service Quality*

- The system often provided important evidence-based clinical guidelines/decision making for the concerned users (Mean = 3.75). However, facilitation of the system to access information was not as such user-friendly and capable of securing patient's confidentiality.
- Information accuracy had relatively the highest positive significant effect on health service quality ( $B = .375, p < .05$ ).

##### *Specific Objective -2. The Effect of Information Accuracy on Health Service Quality*

- The system complied with the requirements of the health authorities (Mean = 4.21). However, the respondents had doubts about the system is free from error (Mean = 2.79) and capable of sending accurate reminder to the physician for notifying critical cases (Mean = 2.77).
- Information relevance, next to information accuracy, had also relatively stronger positive significant effect on health service quality ( $B = .353, P < .05$ ).

##### *Specific Objective -3. The Effect of Information Integrity on Health Service Quality*



- The health information system provided detailed information for the concerned users (Mean = 4.07), and coordinated all the required information from different functional/medical units (Mean = 3.73). However, the respondents were indifferent regarding the system's provision of access to the patient to get their medical results as demanded (Mean = 3.21).
- Information integrity also showed positive and significant effect on health service quality (B = .182, P<.05).

*Specific Objective - 4. The Effect of Physician-Patient Interaction on Health Service Quality*

- The system helped patients to involve in decision making before their treatment (Mean = 3.61) and offered patients choice of treatment before they are admitted (Mean = 3.54). But they had doubt that the system provided them with health-related information with their preferred language (Mean = 3.43).
- Physician-Patient interaction had the least effect on health service quality (B = .144, P<.05).

*Specific Objective -5. The Effect of Information Timeliness on Health Service Quality*

- The respondents had weak perception towards the system's ability to give priority for critical/urgent care issues (Mean = 3.43) and provision of on time information to the patient/family as necessary (Mean = 3.58, Std. 1.556).
- Information timeliness had the least contribution to health service quality (B = .102, P<.05).

## 5.2. Conclusion

The recent increasing burden of health care costs in developing economies has been regarded as the primary contemporary issue affecting the healthcare industry in several nations of the third-world countries. Through the application of information technology resources in the healthcare sector, private hospitals haven't been able to reduce their ever-escalating operational and other associated costs results in improving the overall health service quality. That means, the implementation of information technologies in private hospitals is far more modern and sophisticated than in public health facilities, but the medical costs as well as patient's complaints are incomparable. Private general hospitals in Ethiopia are also not far from this facet. The study, thus, sought to investigate the effect of IT adoption on health service delivery quality in the case of private general hospitals in Addis Ababa.

The results of the findings revealed that relevant and important information is required to provide accurate medical and administrative decisions. Meanwhile, information integration in health care system enables secured flow of data to concerned and authorized users to strengthen better health care delivery service in time. That means, timeliness of care provision assures the practitioner's ability to quickly provide care after recognizing the requirement of medical attention. However, lack of managing, analyzing and optimizing patient treatment histories and other key medical products data are still evidenced in private general hospitals. The accuracy/dependability of the information processed through the IT system of the hospitals is still in question as the staff had doubts about the quality of the medical decisions results in poor image of the health facilities regarding the delivery of safe and quality medical service. The health information system has also limitation to promote the interaction between physicians and patients in the process of clinical treatment and the decision-making of sharing, so as to improve the compliance of patients with medical guidance, which is the embodiment of patients' trust in doctors in the long run.

It can, thus, be concluded that information relevance, accuracy, integrity, physician-patient interaction and timeliness of medical service delivery affect the overall health service quality of the private general hospitals in Addis Ababa. That means, health information technology supports and secures information management and exchange across all computerized systems in the functional facilities of the private general hospitals. These technological resources have improved the level of patients' safety and outcome by providing relevant and accurate information to integrate the medical operation through creating patient-physician interaction in a timely and user-friendly manner.

### **5.3. Recommendations**

Based on the major findings and conclusions, the following suggestions are forwarded as follows:

- It is recommendable to amend the existing health information system of the general hospital to provide all the required/ relevant/information for physician and managerial decisions. This can be achieved by filtering out the unnecessary information or enable the system to deliver utterly valuable information by eliminating information overload.
- It is suggested to the management of the general hospitals to continuously monitor the recording and processing of the medical activities by adapting high performance computers and medical software so as to avoid man-made and machine errors as well.
- It would be more important if the management of the hospitals incorporate additional application software (portal) in the existing system to easily communicate with different functional departments as well as the hospitals' health information system.
- It is also advisable to increase system automation and make use of telemedicine application software to promote physician-patient interaction. This can be improved by providing patients with choice of treatment and prescription.
- It is recommendable to install audio-visual portal system to contact physicians with their personal digital equipment in case of emergency so as to improve the health information system's ability to give priority for critical/ urgent care issues in a timely manner.
- This study sought to examine the effect of technology adoption on quality of hospitals' health care service delivery only from the medical staff's perspective. Hence, it did not capture the views of the patients. It is therefore recommended that a study be done from patient's aspect.

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## Appendix



**ST. MARY UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**

### **Survey Questionnaire**

Questionnaire to be filled by Medical Staff

**Dear participant,**

My name is *Thomas alexander* and I am currently a prospective MBA graduates at St. Mary's University, School of Graduate Studies, department of business administration. I am conducting my research entitled "The effect of information technology on service delivery quality in the case of selected private general hospital in Addis Ababa" as a partial fulfillment of masters of business administration. This study is intended to investigate how the quality of the medical service is affected by the adoption of information technology to modernize and facilitate the communication between the medical staff and the admitted patients. Your honest and sincere responses for this questionnaire will play a great role in making the research successful. I assure you that all the responses will be treated confidentially and only be used for academic purpose. Participation is purely voluntary and no need to write your name.

***Many thanks for your kind cooperation in advance!!***

***Thomas alexander***

***Telephone: 0900484496***

***Email – alexanderthomas786@gmail.com***

**Part I. General Information**

- 1. Gender       Female                       Male
- 2. Age             21 - 30 years       31 - 40 years       41 – 50 years       > 60
- 3. Education     First Degree       2<sup>nd</sup> Degree       Other, please specify\_\_\_\_\_
- 4. Profession     Physician             Nurse               Health Officer  
                           Admin Staff             Others, please specify \_\_\_\_\_
- 5. Employment    Permanent             Part-timer             Internship  
                           Others, please specify \_\_\_\_\_
- 6. Experience     < 5 Years             5 – 9 years             10 – 14 years  
                           > 14 years

**Part II. Questions related with Information Technology and Service Delivery Quality**

Please read each statement carefully and show your level of agreement on the statements by putting “X” mark in the boxes using the following 5-scale Likert scales: Strongly agreed (SA)=5, Agreed (A)=4, Neutral (N)=3, Disagreed (DA)=2, and strongly disagreed (SDA)=1

1. Health Information Technology	Likert Scale				
1.1 Information Relevance	1	2	3	4	5
The system provides only valid information to the users					
The system facilitates to access information in a user-friendly manner					
Every user department/ medical unit receives appropriate (filtered-out) information					
The system is capable to maintain patient’s confidential information					
The system provides evidence-based clinical guidelines/decision making for the concerned users					
1.2 Information Reliability	1	2	3	4	5
The system is error free					
The system minimizes human-induced errors					
The system complies with the requirements of the health authorities					
They system is dependable to reach on decisions in the case of critical situations					
The system sends accurate reminder to the physician for notifying critical follow up cases					
1.3 Information Integrity	1	2	3	4	5
The information system coordinates all required information from different medical units					

The physician can access every (current + historic) information of the patient collectively

The system coordinates the medical and other admin staff to have access for communication

The system grants ease of access for the patient to get their medical results when demanded

The system provides detailed/summarized information for the concerned managements


**1.4 Physician-Patient (Centered) Interaction**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
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The system helps patients to involve in decision making before their treatment

Patients are offered choice of treatment via their cell-phone before admitted to the hospital

The system provides frequent self-monitoring of their treatment/results if demanded

The system provides health-related information to the users with their preferred language

The medical system is user friendly for users


**1.5 Information Timeliness**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
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To visit a physician, the waiting time of patients at clinician’s office is fair enough

Duration of wait for laboratory test results is boringly extended

Other diagnosis results are updated to the concerned physician immediately

The system gives priority for critical/ urgent care issues

The system provides on time information to the patient/family as necessary


**2. Health Service Quality**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
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I believe that the medical service of the hospital is safe for patients

The adoption of health information technology improves the efficient of the medical service

The system facilitates coordination of patient care

The system minimizes the data/medical history tracking of patients

Overall, they health information technology improves clinical outcomes




**Many Thanks for Your Valued Time!!!**