

Addis Ababa University
College of Natural Sciences
School of Information Sciences



A Thesis Submitted to the School of Information Science for the
Degree of Master of Science in Information Science

Readiness assessment of Zewditu Memorial Hospital to implement E-health

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Abstract

On this technology era information technology become the major tool for supporting of health sectors. The e-health technology enables cost-effective and secure use of information and communications technologies in support of health and health-related fields. At present there are information about how the e-health technologies improve the quality, the performance and the safety on the healthcare. But worldwide the readiness to adopt the technology is very stumpy. Moreover most of the e-health technologies either fail or fail to be properly utilized in the world therefore assessing the readiness level of hospital is very essential.

The aim of this study is to assess the technological, environmental, organizational, strategic, and people readiness to adopt and implement e-health in Zewditu memorial hospital. Due to the flexible nature, STOPE framework is used as an evaluation tool. Predominately, this study follows quantitative approach and supported by interview data gathered from key hospital management offices.

Survey questioner and interview is the major data collection tool. The interview was made for managements and medical directors in the hospital. Before direct distribution of the whole questioner the pilot test was made for 35 respondents of Black lion hospital. Based on the pilot study some modifications are made on the content. Smart PLS was used for reliability and validity test of the both the measurement and evaluation model. On other hand demographic statics data are calculated by SPSS version 16.

Relatively the result of the study shows that strategic, organizational and technology domains have good significant values with e-health readiness but the people domain needs more work before implementation of e-health technologies. The environmental constraint specifically the resource and economy domain also have lowest value than the others. Therefore serious attentions should be given for this domain.

Key words: E-health, E-health readiness, E-health adoption, E-health implementation

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List of Abbreviation

AAHB-----Addis Ababa health biro

BLH-----Black lion hospital

CSPP ----Computer system policy project

EMR----Electron medical record

E-health-----E-health

EBPC----Evidence-based patient choice

HIPA-----Health information privacy agency

ICT---- Information and Communications Technology

ICTs--- Information and Communications Technologies

IT----- Information Technology

M-Health-----Mobile based health

WHO-----World health organization

SPSS-----Statistical Package for Social Science

ZMH-----Zewditu Memorial Hospital

GP-----General practitioners

Chapter one

1.1.Introduction

These days information communication technology very significant tool for improving the quality of health centers (Adhikari, 2019). The world health organization defines the e-health as “the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, health education, knowledge and research” (WHO, 2012). E-health refers to the use of information and communication technologies to improve or enable health and healthcare. E-health widens the scope of healthcare delivery; citizens are in the center of services and services are offered by information systems often via the Internet. E-health is an emerging field in the intersection of medical informatics, public health, and business which refer to health service and information delivered or enhanced through the internet and related technology (Brocklehursts, 2010; Brocklehursts, 2010).

According to the report of world health organization (WHO, 2012) the three main core area of e-health are: delivery of health information for health professionals and health consumers through the Internet and telecommunications, using the power of IT and e-commerce to improve public health services, e.g. through the education and training of health workers, the use of e-commerce and e-business practices in health systems management (Adhikari, 2019).

The general objective of readiness assessment is to evaluate preparedness of organization component from different point of view; this process can lead to the correct decision making based on existing realities and constraints of the organization (Sima, Saeedeh, Sakineh, Asieh, & Heidari, 2011).

The definition of “e-readiness” can be varied from one e-readiness assessment study to the other based on their scope (Ajami, Ketabi, Isfahani, & Heidari, 2011).Even though there are understandings how e-health technologies improve the quality, the performance and the safety on the healthcare worldwide the readiness to adopt the technology is infant stage (Abera, Mengesha, & Musa, 2014).

According to (Kiberu, Scott, & Mars, 2019) the successful implementation and adoption of an e-health solution is dependent on the readiness of organizations, people and governments to adopt

ICT for health. In accordance, this research made an assessment from strategy, technology, organization, people and environmental perspectives.

Many scholars' shows that struggle and oppositions change from manual systems to electronic systems by some health providers create problems especially in developing countries (Braa J, 2004).According to (Sima et al., 2011) acceptance of any information system requires planning and good management to change the new system, as a part of the assessment before implementation, is regard as essential and prior to implementation.

Based to the study of (Kgasi & Kalema, 2014) ineffective implementation of any technological innovation is equivalent to great losses in terms of time, money and effort. Therefore such breakdown could be avoided by examining the readiness of organizations.

More than 50.0% of the e-health technologies either fail or fail to be properly utilized in the world (Senafekesh Biruk, 2014).Based on the study result, the cause for these failures is shortage of studies in the early implementation of the system. In line with this concern this study assessed the extent to which Zewditu memorial hospital is ready to adopt and implement of e-health technology.

From the earliest interview of the top level managements of AAHB, there are plenty of e-health technologies that are adopted for applying in Ethiopian governmental hospitals. Strategically Zewditu memorial hospital is selected for implementation of these technologies. But for the effective implementation of e-health studying the readiness level of Zewditu memorial hospital is very essential. This is highly helpful to know the characteristics of employs, so that the potential failures and less effective implementation of resources.

Scholars show that currently there are many readiness assessment frameworks, which are important for evaluating the readiness level. Specifically this paper used STOPE framework which is developed by (Bakry, 2004) for assessing e-health readiness in Zewditu memorial hospital. It evaluates certain organization from strategic, technology, organization, people and environment side. Many reasons can rise for the use of STOPE model widely, the flexible nature that enables to add new evaluation variables based on the context that are going to study. It also composes variables that address all dimensions i.e. the strategy, technology, organization, people and environmental issues that was meant to be addressed by this study.

Therefore based on the above mentioned research findings and concepts the aim of this study is to assess the technological, environmental, organizational, strategic, and people readiness to adopt e-health in Zewditu memorial hospital and to come up with helpful recommendations for successful implementation and effective use of the e-health technologies.

1.2.Statement of the problem

Information system adoption and implementation has vital merits over the health world (Boyapati, Dontula, & Nutalapati, 2011). Theoretically we know more about the values and the advantage of the e-health services in the hospital management systems. There are plenty of e-health technologies: the major ones are electronic health record, e-prescribing, Tele-dentistry, Tele-medicine and m-health systems. But the intention to involve in and use is very poor in developing countries like Ethiopia (Abera et al.,2014). Moreover (Belesti, 2016) help the concept by showing how the health information is in infant stage. According to (Beebeejaun, 2017) e-health is fundamental tool to improve the efficiency and effectiveness of health delivery system but the success of e-health implementations needs comparative e-health readiness assessment of different stockholders. Adopting and implementing of e-health technology help out a lot in increasing the value of the Ethiopian health sectors, as an initial it highly help the patients to schedule their appointment with healthcare professionals online through healthcare portals (Abera et al.,2014).This can save time, cost and extra effort of patient in effective manner. Additionally privacy of e-health record will be enhanced in an effective mode, and as in generally it helps providers to improve quality, productivity and work-life balances (Botha & Herselman, 2014).

In spite of the potential gains that are obtained from the e-health services, there are several obstacles that limit the wider development and implementations of electronic health systems. Among these are the perceived threats to the security and privacy of patients' health data, and a widely held belief that these cannot be adequately protected (Sahama, Simpson, & Lane, 2013). Consequently this study addressed the privacy and security issues in terms of readiness in accordance with other domains (strategic, technology, organization, people and environment). Due to the flexible nature of the STOPE framework the privacy and security issues assed and addressed on this research paper.

Currently many studies are done on the area that identifies the readiness of specific e-health technologies (Telemedicine, electron medical system) the readiness of hospitals in adopting of electronic health technology James (2016). But the e-health technologies are much related to one another therefore it's better to make an exhaustive study of the e-health technology rather than studying specific e-health technology independently. This paper studies the existing status of Zewditu memorial hospital and their readiness level in comprehensive study rather than on specific manner. These will help to have more general idea than study conducted independently.

Moreover, since readiness differ from one organizational context to the other, the readiness level of Zewditu memorial hospital is not yet addressed with STOPE framework, therefore this research fill the gap by addressing the above listed issues.

Even though the advantage of e-health technology is embraced by research and organization on the readiness to adopt the e-health technology is in early stages. Readiness assessment is the very basic and important thing before applying the e-health technology (Al-Osaimi, Alheraish, & Bakry, 2006). Every success or failures of the application of e-health technology in hospitals be determined by the hospitals early stage of readiness to implement the technology (Senafekesh, Yilema, Andualem, & Tilahun, 2014). Especially in Ethiopian context there is limited literature and information related to this subject.

1.3. Research questions

1. What is the condition of Zewditu memorial hospital readiness for e-health implementation?
2. What are the major factors that determine E-health adoption and implementation of zewditu memorial hospital readiness (strategy, technological, Organization, people and environmental factors)?

1.4. Objective of the research

1.4.1. General objective

The general objective of the study is to assess the technological, environmental, organizational, strategic, and people readiness to adopt e-health in Zewditu memorial hospital and to arise with important recommendations for successful implementation and effective use of the e-health technology.

1.4.2. Specific objective

- To develop conceptual model for studying readiness of ZMH(in relative to other readiness assessment frameworks STOPE addressed and assessed mach more direction, specifically the strategy, technology, organization, people and environment).
- asses ZMH capability in E-health services
- Suggest some general recommendation for the hospital to use the system

1.5.Scope and Limitation

This research focuses on assessing and analyzing of ZMH readiness in implementing the E-health services. In addition to this it focuses on the affecting factors that influence the e-health technology. More assessing constraints are used to assess the readiness level but this research is done based on the STOPE framework. Geographically this study focuses only on Zewditu memorial hospital employers. For manageability, only ZMH have been selected for conducting the study. Since it need more resource (time and budget resource) this study concerns on certain organization specifically on ZMH.

1.6.Significance of the study

Assessments of Zewditu memorial hospitals readiness to adopt the e-health technology help a lot to identify the factors that affect the implementation of e-health. Therefore this research add new finding to the existing knowledge on the area. It will be very valuable in addressing the needs of patients, health professionals and taking measures to improve poor situations. In addition to this the study enables the researcher to get a better and broader understanding of e-health technology.

1.7.Ethical Considerations

As much as possible this research keeps secrets of the hospital that are obtained during the assessment. It also respects the interest of the participants and the organization. All basic principles of ethical considerations and standards are noted during all phases of the research process. In addition to this as much as possible all the materials and sources are properly acknowledged.

1.1.Organization of the thesis

Chapter 1: This is considered to be an introductory chapter, which provides a brief background to the study. This chapter includes the problem statement, the research significance of the study as

Well as scope of the study.

Chapter 2: This chapter explains on the literature review of the study and related work done by other researchers.

Chapter 3: This chapter presents the research Model which describes the frame work used for this study and the hypothesis developed to carry out the study.

Chapter 4: This chapter presents the research method used to collect and analyze data

Chapter 5: This chapter presents a detailed data analysis, as well as the finding of the study.

Chapter 6: concludes the entire study

CHAPTER TWO

2.1. Literature review

For having the comprehensible understanding about e-health services it's important to study and clarify the previous related works on the area. To visualize the current readiness level of professionals to implement the newly emerging e-health technology in Ethiopia; Zewditu memorial hospital is selected. On the other hand this section discusses the different readiness models and frameworks that help to study the readiness level of Zewditu memorial hospital. Finally this chapter will be generalized by studying and explaining the related works that have direct relation with the given title.

2.2. What is E-health?

The world health organization (2018) defines e-health as “e-Health is the use of information and communication technologies (ICT) for health. The e-Health unit works with partners at the global, regional and country level to promote and strengthen the use of ICT in health development, from applications in the field to global governance. The unit is based in the Department of service delivery and safety in the cluster of health systems and innovation.”

From the above definition we can notify that greater attention is given to the e-health technologies promotions. The main motive is that emergency of e-health technology facilitates not only the responsibilities of health professionals but also in improving the health status of human beings.

Moreover e-health is a newly emerging field in common of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies (Cruz-Cunha, 2013). In a broader sense, the term characterizes not only a technical development, but also an attitude and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology (Cruz-Cunha, 2013, p. 20).

Electronic technologies innovation in the health environment can be traced back to the introduction of Electronic health record system in 1968s. But later the contribution of internet brings a greater effect on the broader application of electronic health system in 1990. Currently

E-health have become nearly ubiquitous in medicine as well as [behavioral health settings](#) so that in 2015, the adoption rate for hospital and clinics reached 92 percent (sandy, 2019).

Authors	Definition
(eztalks, 2019)	E-health is the term characterizes the state of mind, a way of thought, an outlook and a commitment to a networked global thinking to enhance healthcare services globally by information and communication technology.
(World health organization, 2010)	E-Health is the use of information and communication technologies (ICT) for health.
(Health system group, 2004)	E-health is an emerging field focused on medical information and health care services delivered or enhanced through advanced Internet or related technologies
(Staudenmeir, 2004)	Any use of the Internet or related technology to improve: the health and wellness of the population; the quality of health care services and outcomes; efficiencies in health care services or administration
(Orlikoff & Totten, 2000)	The use of the Internet and related information systems and technology in all aspects of health care
(Cruz-Cunha, 2013)	E-health is newly emerging field in common of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies
(e-health technolgy, 2004)	The use of emerging information and communication technology, especially the

	Internet, to improve or enable health and health care thereby enabling stronger and more effective connections among patients, doctors, hospitals, payers, laboratories, pharmacies, and suppliers
(R.Pretlow, 2004)	E-health is the process of providing health care via electronic means, in particular over the internet. It can include teaching, monitoring (e.g. physiologic data), and interaction with health care providers, as well as interaction with other patients afflicted with the same conditions.
(Nuq & Aubert, 217–236)	E-Health as the use of information in electronic format and communication technologies in the health domain.

Table2.1 Different definition of e-health

According to (Rezai-Rad, Vaezi, & Nattagh, 2012) generally E-health includes 3 main core areas:

- 1) Using internet and telecommunication to deliver health information to health professionals and clients,
- 2) Utilizing the power of IT and e-commerce to improve the quality of public health services, and
- 3) Utilizing e-commerce and e-business for management of health systems. It also provides a new method for using health resources (information, money, and medicines), and will improve efficient use of the resources.

2.3. Components of e-health

According to Regional Office for the Americas of the World Health Organization (PHAO) e-health contain diverse category and components on it. The chief ones are described below.

Electronic medical records (or electronic health record)

It's a technology in which health information of individuals is recorded electronically and assists health professionals with decision making and treatment."Electronic Medical Records (EMR) emerged as a result of the rapid development of Internet technology and the advancement of medical information, gradually replacing the complicated handwritten medical records, which has become an indispensable part of the hospital" (Zhou, Ma, Huang, Cai, & He, 2019).

Tele Health or telemedicine

Sometimes desistance become a major barrier or problem in health care services, as a result of this the telecommunication services and the electronic information world provides new technology called Tele health. Tele health will support far distance clinical health-care, patient and professional health-related education, public health, and health administration body's (Tsai, Cheng, Tsai, Hung, & Chen, 2019).

"The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" (World health organization, 2010).

M-Health (or health through the use of mobile devices)

Currently the wireless devices such as mobile phone and patient monitoring devices are used widely in world wide. Thus an increased use of mobile technology led to the emergency of using wireless devices for accessing health related information (Alam, 2018). **It increases the effectiveness and capacity of the delivery of health information for individuals** (Sadegh, Khakshour, Sepehri, & Assadi, 2018).

Tele dentistry

Now days the information technology improved the quality and performance of management of dental patients, in addition to this it made possible their partial or complete management at distance of very far kilometers away from the health care or the effective and qualified dentist with aim of minimizing resources (Boyapati, Dontula, & Nutalapati, 2011). This is generally known as “Tele dentistry” (Boyapati, Dontula, & Nutalapati, 2011).

The concept of Tele dentistry is explained by the conference funded by the Westinghouse Electronics Systems Group in Baltimore at on 1984 with the aim of introducing how to apply dental informatics in dental practice to directly affect the delivery of oral healthcare (Chen, Hobdell, Dunn, & Johnson, 2003).

According to the definition of (Yoshinaga, 2001) “Tele dentistry is a combination of telecommunications and dentistry, involving the exchange of clinical information and images over remote distances for dental consultation and treatment planning”

Tele pathology

In medicine there is field concern in the study of the nature of disease and its causes, processes, development and consequences this is called Pathology (Weinstein, Graham, & Richter, 2009). The Tele pathology is all about the practice of pathology at a distance by pathologists. It uses [telecommunications](#) technology to facilitate the transfer of image-rich pathology data between distant locations for different purpose (purposes of [diagnosis](#), [education](#), and [research](#)) (Weinstein, Graham, & Richter, 2009).

Tele robotic systems

It’s a system that allows procedures such as surgeries, treatments, and diagnoses to be conducted across short or long distances while utilizing wired and/or wireless communication networks, Tele robotics is considered to be an integral part of the wider field of telemedicine (Avgousti, et al., 2016). In Tele robotic systems, the remote manipulator is controlled from the operator’s site by sending position commands while receiving visual and other sensory feedback information. The local and remote systems are typically referred to as “master” and “slave” systems,

respectively, and the overall system is referred to as a “master–slave system” (Avgousti, et al., 2016).

2.4. Benefits and drawbacks of the e-health technology

The above listed e-health technologies have their own pros and cons (Nandi, 2012). All of the above listed e-health technologies have common characteristics that helps the individuals (patients) and health professionals to carry out their tasks in effective manner. The most common characteristics that have benefit over the health world are described on the next session.

Efficiency and quality of care

According to the explanation of Nandi (2012) the promises of e-health is to increase efficiency in health care, thereby decreasing costs. One possible way of decreasing costs would be by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement. The aim of health technology is not only developing the system that is increase efficiency but also improving quality (Ball, 2004).

Additionally it wills encouragement of a new relationship between the patient and health professional, towards a true partnership, where decisions are made in a shared manner. This situation helps a lot in increasing the quality of health services (Nandi, 2012).

Empowerment of consumers and patients

Electronic record system is one of the major types of e-health technology. It enables the personal data (patients’ data) to be record and access through the internet. It will also open new avenues for patient-centered medicine, and enables evidence-based patient choice (sandy, 2019). A personal digital healthcare environment gives people more insight into their health. If they wish, they can share all or part of their data with a healthcare provider or informal career, so that they do not have to repeatedly relate their entire medical history. This allows the healthcare provider to work more effectively, determine the right treatment more quickly, and avoid mistakes. Patients gain more control over their own health thanks to a greater understanding of their health situation (Nictiz, 2015).

Privacy and confidentiality

health information) are those who are the least likely to benefit from advances in information technology, unless political measures ensure equitable access for all. The digital divide currently runs between rural versus urban populations, rich against poor, young opposed to old, male in opposition to female people, and between neglected/ rare vs. common diseases (Nandi, 2012).

Additionally the greater challenges of e-health technology are it primarily serves those who are advanced in technological aspects. It is evident that communication inequalities exist when web-based services are utilized by higher-income, highly educated, younger, and employed groups (Baur & Kanaan, 2006).

Most common challenges are;

- **Financial barrier:** This is the most common challenge especially in developing countries like Ethiopia. The Ethiopian healthcare system is straining to deal with several issues and struggles to achieve the maximum impact on the health care service (Federal Ministry of Health, 2014). As general the cost for the hardware and software is very expansive. This will be the most barriers for health centers.
- **Difficulty learning and using the software:** The software and the necessary programs which are important for implementation needs detail and deep understanding, therefore in order to help this it needs more training sessions (Botha, Botha, & Herselman, 2014).
- Time also one of the grater complications in the implementation process. It might be time consuming to update the E-health thoroughly (Botha, Botha, & Herselman, 2014).

2.5. Privacy and E-health technology

Office of the Federal Privacy Commissioner (2001) Define privacy in the context of health sectors as “the right of the individual client or patient to be let alone and to make decisions about how personal information is shared”. Privacy rights with respect to individual healthcare decisions and health information have been outlined in court decisions, in federal and state statutes, accrediting organization guidelines and professional codes of ethics.

Security and privacy are two different variables that are different components as associate divisions. Therefore as defined by the HIPAA the major requirements of privacy are,

1. **Patients understand:** this implies patients have an exclusive right to know and understand how their sensitive and private health information are kept and utilized by any healthcare provider.
2. **Patient's control:** this allows patients to be given permission to determine who can access his/her health data the major ones.

In addition to this (Federal privacy commissioner, 2001) state that the major privacy information that the Privacy Act apply to are; Health information which contain the personal information such as about an individual's health or disability at any time, collected in connection with the donation or intended donate on of body parts and substances, information about physical or biological samples where it can be linked to an individual, personal details, such as a name, address, admission and discharge dates, billing information and Medicare number and other related ideas.

Why is it important to study the privacy and security issue in related to e-health technology adoption and implementation readiness?

It's impossible to think effective implementation of the e-health technology without the protection of privacy achieving, privacy in e-Health is extremely vital in achieving the objectives of using this modern technology (Azeez & Vyver, 2018).

Health professionals have much more complain in privacy issues in implementing e-health technology in health sectors.

2.6. E-Health in Ethiopia

An Ethiopian researcher (Belesti, 2016) shows that, Ethiopia is among the poorest in implementation of health technologies within the countries (Belesti, 2016). The world health organization report shows that there is stumpy ratio of professionals to the population, due to the shortage of healthcare providers such as nurses and general practitioners (GP), patients often suffer from limited or nonexistent access to specialized care services (Abera et al., 2014). Many scholars agreed that in order to improve the quality and efficiency of the health care status it's important to introduce and implement electron health systems within the country.

Belest (2016) in his studies shows that not only E-health technology but also Health information as a whole is in junior level of development. He put Health resource, Management, information product, dissemination and use, indicators and data source as standard to evaluate e-health status in Ethiopia. Based on his studies he have acquire the following result

Components to evaluate	Statius
Data management	Poor
Resources	Poor
dissemination and use	Poor
Indicators	Good
Information product	Good
Dissemination and use	Not adequate

Table2.2 Statutes of E-health in Ethiopia (based on Belstis study)

In general we can understand that the most of the variable components in the evaluating list are awfully low.

2.7. What is Readiness in the context of E-health?

Different scholars study the readiness level of individuals from different perspectives in different field of study (Adams, 2003).

“Readiness is the measure of the degree to which an organization, a society, or a country may be ready, willing or prepared to obtain benefits which arise from information and communication technology” (Farlex, 2014).Appelbaum *et al.*(2000) also defined readiness as “the extent to which people in the organization are ready to adopt and use the new technology and will determine the magnitude of the change efforts needed”. As explained in the above paragraph it’s possible to define readiness based on the area we focus on. Therefore the definition that used for health sectors can be taken as defines e-health as “the use of information and communication technologies (ICT) for health” (World health organization, 2010).It’s also possible to define readiness as “The technology-readiness construct refers to people’s propensity to embrace and use new technologies for accomplishing goals in home life and at work” (Parasuraman A. , 2000).

2.8. Readiness assessment theories and Models

Currently the IT becomes the best solution for effective achievement of the business goals (Aziz, 2010). Now a days the IT applications are fail due to the soft or hard issues (such as speed, quality and profit in return) (Aziz, 2010). Thus for avoiding or minimize this failure it's important to study the pre implementation or e-readiness through different models.

According to (Beig, 2015) there are number of e-readiness models some of them are Technology readiness index (TRI) Technological achievement index (TAI), McConnell International (MI), STOPE model, computer system policy project (cspp), Networked Readiness Index (NRI), UNCTAD ICT Development Index, The Economist Intelligence Unit (EIU) E-Readiness Ranking Tool. In the following paragraphs, some of the most widely used theories and models will be discussed.

Technology Acceptance Model (TAM)

Most of known researchers use TAM model to know the acceptance of technology within an organization. The TAM model was introduced by Fred Davis in 1986, it also known that Original TAM model by Davis (Yemserach, 2018). Two important variables are discussed in this model.

- **Perceived usefulness** it's "the degree to which a person believes that using a particular system would enhance his or her job performance". And the other variable is
- **Perceived ease of use** it's "the degree to which a person believes that using a particular system would be free of effort".

But due to the reasons not addressing an individual level not organization level and the other one is that the factors identified in this research are not covered by the TAM model the improved TAM was introduced in 1989 (Yemserach, 2018).

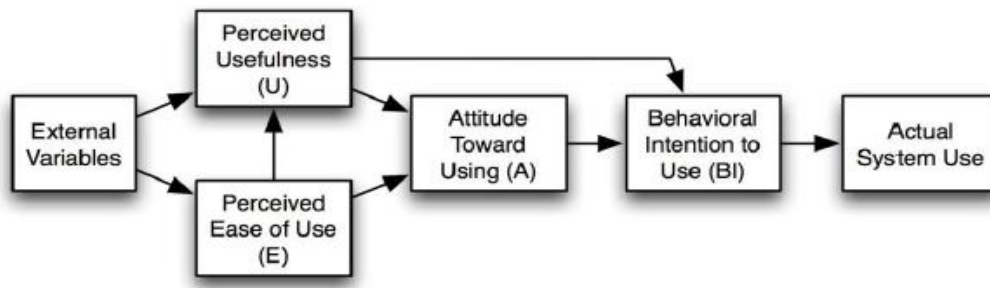


Figure 2.2 TAM model

The Technology readiness index (TRI index)

The technology readiness index was developed by the Parasuraman in 2000. The Technology Readiness Index has been validated as being a predictor of adoption of innovative technologies, and the findings it provides in a certain context equate to different strategies that would apply to a cutting-edge product or service. It is frequently used in research to identify the general innovativeness of a population and/or as moderating variable in a more complete model that explains acceptance of a technology (Parasuraman A. , 2000). As general there four dimension of the TRI model (Parasuraman & Charles, 2001).

- *optimism*, a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency
- *innovativeness*, the tendency to be a technology pioneer and thought leader
- *discomfort*, perceived lack of control over technology and a feeling of being overwhelmed by it
- *Insecurity*, distrust of technology and skepticism about its ability to work properly.

This is the good framework in working with classifying and identifying the positive and negative factors that affect the readiness of individuals to adopt and implement the new technological merits.

Technology organization and environment (ToE)

The technology, organization, environment (TOE) framework is described in Tornatzky and Fleischer’s through the Processes of Technological Innovation in 1990. The TOE framework is

an organization level theory that contains three main elements that is technology, organization and environment (Baker, 2011). All three are posited to influence technological innovation.

Based on the idea of Baker (2011) the technology context describe that all the technological aspect in the firm and technology is which are external to the firm that are available but not used in the firm. The technological aspect is very vital in the adoption process because they set a bored limit on the scope and peace technological change that the firm that undertake. The organizational context also deals about all the resources within the firm. This resource can be the link structure between the employs of the organization, the firm size and the amount of slack resources. . The environmental context includes the size and structure of the industry, the firm’s competitors, the macroeconomic context and the regulatory environment.

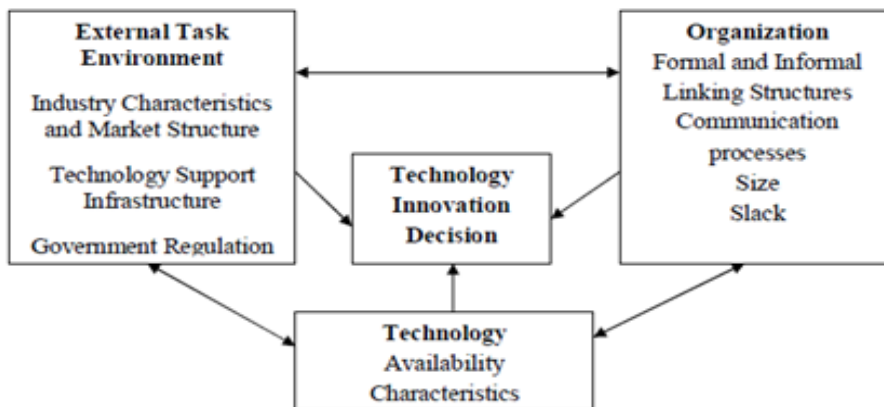


Figure2.3 Technology- Organization –Environment (TOE) framework Source; (Baker, 2011)

STOPE framework

Bakery was the one who develop the STOPE framework. His aim was to introduce the new framework that evaluates the readiness level in terms of Strategy, Technology, organization, people and environment (Bakry, 2004). According to (Al-Osaimi, Alheraish, & Bakry, 2006) integration of e-readiness assessment factors is considered to be of three levels and sublevels, the first domain is considered as the major STOPE domain which are Strategy, Technology, organization, people and environment. The other sub domains are derived and branching from the major ones, and on last sub level is includes the issues associated with each of sub-domains of main domains.

Due to its flexible nature currently many researchers are using this assessment model (Abera, Mengesha, & Musa, 2014). It allows allowing modifications of the factors under STOPE to match with the requirements of the case-study considered, whether a country or an organization associated with a specific field, such as health sectors banking, education or other different fields (Leulsegd, 2017).

The “Strategy” construct integrates the factors concerned with “future directions, commitments and plans toward ICT development and utilization.” Two sub-domains are associated with this domain: “leadership” and “future development plans” (Abera et al., 2014)

The “Technology” domain integrates the factors concerned with the “current state of issues dealing with ICT facilities.” The four sub-domains associated with technology are: “ICT basic information infrastructure,” “ICT e-services infrastructure,” “ICT provisioning,” and “ICT support.

The “Organization” domain integrates the factors related to ICT regulations and management. Three sub-domains are associated with this domain: “ICT government regulations,” “ICT cooperation among organizations,” and “ICT management.

The “People” domain integrates the factors associated with the “current state of issues concerned with ICT users and skills.” The domain has four sub-domains: “ICT awareness,” “ICT education and training,” “ICT qualifications and jobs,” and “management of ICT skills.

The “Environment” domain integrates the factors associated with the “current state of the basic non-ICT issues surrounding and affecting the current state of ICT”

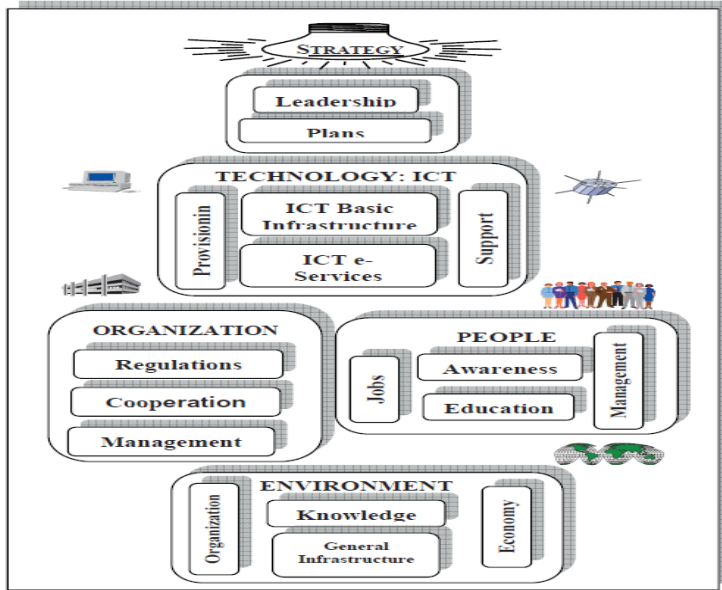


Figure 2.4 The STOPE framework for e-readiness assessment (source: Al-osaimi, Alheraish and Bakry, 2006)

2.9. Related works

Technology readiness in different organizations and in different companies is one of the dominant research area studied by many researchers. It may have different variations based on the sector we use for. In relation to this many researchers done on the area to get the internal and external factors that affect adoption of e-health, the challenges affecting readiness and other related things are done on this area. Even very closely related works are done both in Ethiopia and other countries.

(Abera et al., 2014) make an assessment of Ethiopian Health Facilities Readiness for adoption of Telemedicine. The main goal of the paper was to conduct readiness assessment based on the STOPE framework. The technological, environmental, organizational, strategic, and people readiness was studied in this research. The main reason for the study is to adopt telemedicine in public health facilities in Addis Ababa and to come up with recommendations for successful implementation and effective use of the telemedicine technologies

First the researcher presents the readiness theoretical framework in which a brief description of each component of the research model and hypotheses are indicated. Due to the relations and similarities between e-government and e-health measurement items and constructs and the context of the study (the Ethiopian healthcare system), the research describe that the STOPE

model is a preferable framework for assessing e-health readiness in Ethiopia. Cross sectional survey and key informant interviews was done to get qualitative and quantitative data. On the other hand simple random sampling was used to select fifteen health centers out of the thirty-four public health facilities in Addis Ababa. This study finally have got that the selected health facilities have better readiness level on some variable (strategy, organization, people and environment) and low level of readiness level on others (Technology readiness score). For instance the organizational variable has better result in compared to technology (Abera et al., 2014) recommended that further studies focusing on behavioral, psychological, and social aspects to provide a clearer picture of telemedicine readiness and to enhance the usability of the systems once it is put in place.

Additionally (Senafekesh et al., 2014) made readiness assesment on selected three hospitals which is found in Northern Gonder Zone. The major objective is to asses health professionals readiness to identify factors that affect the acceptance and use of electronic medical recoreding system in pre implemnation phases. An instution based cross sectional quantitative study was made on 606 study paricipants. A pretested selfe help questioners are used for collecting the necessary data. On this study SPSS version 16 was used for data analysis. Descriptive statatistics, bi variante , multi-variante logistic regration where used to describe the study oboective and asses the determinates health professionals readiness for the system. The result prove that the Gender, knowledge, attitude, and computer related skills were the core determinant factors of the presence of a relatively low readiness and utilization of the system. The core and engagement readiness of the study participants were 67.8% and 60.9%, respectively which is low since professionals are the main actor of the EMR system. They measured the readiness of health professional in terms of their three perspectives. Those are;

- Fear or concern about the potentially negative impacts.
- their recognition of the benefits of EMR,
- Their willingness to accept EMR training.

The researchers suggested that it need more studies to promote EMR systems to the potential primary users to increase its adaption and success rate. Mainly the current study follows the cross sectional quantitative study approches additionally the spss version 16 also used for data analysis.

This is the major similarity with what (Senafekesh et al., 2014) did. Unlike that of the previous work, the objective of this study not to explore the factors that affect e-health readiness rather assessing the readiness of ZMH by putting STOPE framework as an evaluation eyeglass.

A readiness assessment of electronic health records implementation was also conducted by (Isfahani, Heidari, Ajami, & Ketabi, 2011) with the aim of showing the situation of readiness assessment in EHR implementation roadmap, then to recognize requirements associated with electronic readiness assessment and main areas of EHR readiness assessment. From library and electronic resources deep literature review was made in order to know the requirements (Requirements for process readiness, infrastructure readiness) associated with electronic readiness assessment. On this research not only the requirements are studied but also the four main areas of the EHR readiness assessment are organized and studied in well defined manner. Those variables are Organizational culture, Management and leadership, Operational readiness and Technical readiness.

Furthermore Iran researchers Rezai-Rad, Vaezi, & Nattagh develop conceptual framework that used evaluating readiness. This was done by reviewing different literature on e-readiness assessment models and opinions of ICT and health experts (Rezai-Rad, Vaezi, & Nattagh, 2012). The founder of this model was made deeper study on different readiness models which are done by various institutions, universities and individuals. The presented framework consists of technological, engagement, societal, and core readiness components.

Elements	Components
<i>Technological Readiness</i>	<ul style="list-style-type: none"> - Availability and affordability of hardware and software - Telephone mainlines per employee, computers per personnel, Internet connection bandwidth, ICT quality support (This are generally known as Infrastructure Quality) - ICT support personnel
<i>Engagement Readiness</i>	<ul style="list-style-type: none"> - Strategies and Legal and Financial

	<ul style="list-style-type: none"> - Support of ICT form the government side. - E-Health Education(it include adequate hours for ICT learning, Comprehensive need assessment and suitable context for ICT educational programs)
<i>Societal Readiness</i>	<ul style="list-style-type: none"> - Different kind of communications between healthcare the external environment such as administrative body's, clients and communities. - Internal communication among healthcare providers through email, phones and other communication methods.
<i>Core Readiness</i>	<ul style="list-style-type: none"> - Realization of Problems related to patient's documentation(it include brake of patient privacy, Inefficient documentation, Providers' Satisfaction with paper-based health records (PHR))

Table2.3 Readiness framework component

Element and components of EHRAF framework (Source: (Rezai-Rad, Vaezi, & Nattagh, 2012))

Delphi method was used to develop and test the designed framework. The Delphi Technique is a method used to estimate the likelihood and outcome of future events, most of the time it use the for creating Work Breakdown Structures, identifying risks and opportunities, compiling lessons learned and anytime you would usually conduct a brainstorming session (Cantrill, Sibbald, & Buetow, 1996).This framework was done by the tree phase of Delphi and the final result of the framework was organize and presented as follows.Kiberu, Scott, & Mars (2019) propose the e-health readiness assessment framework. What make this study differ from other is that they first made the readiness assessment in rural and urban hospitals in North West province of South

Africa and the result leads to the e-health architecture framework as solution. Need, technological, engagement and social acceptance readiness were assessed. The following table summarizes all the related works in short and clear manner.

Author, year and Title	Aim/objective	Approach and model used	Result/key finding
(Abera, Mengesha, & Musa, 2014) Assessment of Ethiopian Health Facilities Readiness for Implementation of Telemedicine	The general objective of the research was to conduct readiness assessment on selected Ethiopian hospitals	Quantitative research approach. Based on the STOPE model	-The output shows that the strategy, organization, people and environment domain have strong result in readiness level. -Technology readiness score is the lowest of all the domains of the research model.
(Senafekesh, Yilema, Andualem, & Tilahun, 2014) Health Professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study	The aim of this study is to assess health professionals' readiness and to identify factors that affect the acceptance and use of electronic medical recording system in the pre implementation phase at hospitals of North Gondar Zone, Ethiopia.	cross-sectional quantitative approach	The result shows that the 54.1% of the respondent are ready to use the technology. Gender, attitude, knowledge and computer literacy are the major significant factors for acceptance of EHR.
Isfahani, Heidari, Ajami, & Ketabi (2011) Readiness Assessment of Electronic Health Records Implementation	The general objective of the study was showing the situation of readiness assessment in HER implementation roadmap and finding the factors associated with readiness.	Cross sectional study	Organizational culture, Management and leadership, Operational readiness and Technical readiness are the main factors that are related with readiness to adopt e-health.
(Rezai-Rad, Vaezi, & Nattagh, 2012) E-Health Readiness Assessment Framework in Iran	To conducted and designing E-health Readiness Assessment Framework (EHRAF) in Iran.	Quantities approach used, deep literature are used. Delphi method was used to develop and test the framework	E-health readiness assessment framework and an expert system developed.

(Kiberu, Scott, & Mars, 2019)	To assess health provider readiness for implementation and integration of telemedicine services at three levels of Uganda's health facilities.	cross-sectional quantitative approach	Along with the factors examine the level of health facility and title or role of healthcare worker were found to have a significant statistical association with being ready to integrate telemedicine into the healthcare system.
(Beebeejaun, 2017) An assessment of e-health readiness in public health sector of Mauritania.	-The major aim was to provide an assessment of e-health readiness in public health sectors of Mauritania. -To find the critical factors of e-health implementation.	Cross sectional study was made from different participant that are selected through random selection.	The stuffs that are found in Mauritania are highly ready to adopt e-health for a significant improvement of health system.

Table 2.4 Revision on related works

The above research use different method and different approaches to come up with valuable findings. The main difference between others contribution and the current study is the methodology and the way that it passes in order to achieve the major objective. For instance as we can see from Table 2.4 (Abera et al.,2014) made quantiatative study on assesing the the rediness level of Ethiopian health sectors to adopt telemedicin by using STOPE framework.Unlike that of the current study it foesnt adressed the additional two variables (security and privacy). Secondely its obviuse that the rediness level by itselfes differ from one organization to the other. Therefore due to the reson that the rediness level of ZMH did not addressed by using the mentioned framwork this reserch address the gap.

On the other hand, due to the flexable nature(to add additional variables) of STOPE framework this reserch use the mentiond framwork in as an evaluation eyeglass. Additionaly it address all diamantions that are important to address the rediness level of ceratin organization or firm.

Chapter three

3.1. Research Model and hypothesis Development

The focal goal of readiness assessment is to help an organization achieve its aims without any sudden disclosure that could possibly affect the organization. Since it's suitable for assessing readiness level of health sectors this study uses the comparison and hypothesis of (Abera et al., 2014) based on STOPE framework. The brief explanations of main latent variables and associated hypothesis are presented as follows.

Strategy Domain

The strategy domain contains the “leadership” and “future development plans” as the main components. “Strategy” construct integrates the factors concerned with future directions, commitments and plans toward ICT development and utilization for e-health implementation (Al-Osaimi, Alheraish, & Bakr, 2006). The leadership sub-domain integrates the commitment and responsibilities of IT managers as well as vision and support of government toward e-health implementation and utilization. Strategy of the organization directly determines the readiness of the organization to accept new technology implementation or even to upgrade the current technology (Gaym, 2008). E-Government is a major factor in attainment of successful e-Government adoption (Reffat, 2003). According to Michael (2015) the Strategy is a comprehensive view of the collectively identified ICT investment priorities across the health system. The Strategy has been developed to ensure a more equitable distribution of ICT funding across the state, leveraging collective solutions to better address the varying levels of capability and enable a more consistent standard of care, in rural and urban health services. From the above findings and strategy domain the following hypothesis is developed.

H1: Strategy determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

Technology domain

ICT Basic Communication & Information Infrastructure sub domain

ICT Basic Communication & Information Infrastructure is defined as the “ICT infrastructure is an overall name used to describe all the computer and communications hardware and software used to manage clerical, administrative, and management tasks in organizations” (willie, 2003).

If novel technology can improve the quality, effectiveness, productivity and performance of the company as well as it founds to be quicker, easier, and more efficient to perform tasks, the probability of adopting that technology will be increased (Lai, 2017). Availability and performance of the necessary equipments and infrastructure are the major factors that have direct association with ICT basic information infrastructure (Al-Osaimi, Alheraish, & Bakr, 2006). Scholars (Al-Osaimi et al., 2006) describe that availability and affordability of the hardware and software infrastructure are not only basic objects in ICT adoption but also have a significant positive influence on technology usage. According to Bakry (2004) Installation delay (Failures), Speed rate and Congestion/delay measures are the major determinate factors IT performance in a certain organization, for the adoption process of the new technologies. This domain will be evaluated based on the following hypothesis.

H2: ICT Basic Communication & Information Infrastructure determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

ICT Support sub domain

The other sub domain of the technology domain is ICT Support constraint, dealing with the ICT support covers not only the support personals but also the business or the organizational services that are related with Information communication technology (Rezai-Rad, Vaezi, & Nattagh, 2012). The present of ICT experts with relevant degrees, experience to ICT expert consultant’s and with the high extent of motivation to help and train the newly adopted e-health technologies throughout ZMH have high impact on the adoption of the new technology (Sachs, 2000).

On the other hand the ICT support describe about the standards that are applied in international, national or local level. It is virtually impossible to determine the compliance with any particular ICT standards (Evans, 2014). Based on the above concepts this study formulate hypothesis in order to verify the ICT support actually determine the E-health readiness of Zewditu memorial hospital.

H3: ICT support determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

Security sub domain

Security is all about the protection of resource, information or system of the organization resilience against unauthorized access or any other security attacks (Al-Issa, Ottom, & Tamrawi, 2019). Confidentiality, integrity and availability should be considered for each possible information state when we deal with the security issues (Sahama, Simpson, & Lane, 2013). Be deficient in effective security is one of the biggest hinder factor for many organizations to not to take up new technology.

In the case of e-health, health care professionals have numerous reasons not to trust the e-health technology, for example, they cannot give away control over their patient's medical record. Weak security is one of the prominent problems that are hindering the full diffusion of e-health in healthcare industry (Sahama, Simpson, & Lane, 2013). Security issue even if cloud providers believe that they can protect companies' data more securely than the companies themselves (Alam, 2018). Furthermore the deficient in security is one of the biggest challenges for many organizations not to adopt and implement newly emerging technology (Salleh & Janczewski, 2016). It also empirically proven fact that security concerns have weak positive correlation with intention to use e-health in developing countries, (Zayyad & Toycan, 2018) on their studies show that the correlation coefficient analysis of security domain is nearly 0.09 which is below the reference range. This result proves that hypothesis which states that "Security concerns have negative influence intention to use e-health". From this research it's possible to see how security is the prominent factor in determining of the e-health.

Therefore it's very basic to deal with the security issue when we concern about the technological adoption concept. Thus, based on the above studies this study developed hypothesis to investigate if security determines e-health adoption readiness.

H4: Security determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

Organization domain

Based on the STOPE framework ICT government regulation, ICT Corporation and ICT management is the basic sub domain for the organizational domain.

There are many factors that affect the adoption and diffusion of e-health within the organization. (Bamahros, Rahim, & Sami, 2018), argued that the top level management support, the unfamiliarity with the technology, and ineffective management, as well as organizational culture and medical norms (Abera et al., 2014) are the important determinants of technology acceptance, adoption and implementation factors that have greater influence on the readiness of implementation of e-health technology. The commitment of e-health managers and technical resources as well as the human resources support from the organization also the determinate factor in success of e-health implantation (Adams, 2003).The effective implementation of e-health also depends on the engagement factors such as Strategies, Legal and Financial Support of ICT (Rezai-Rad, Vaezi, & Nattagh, 2012). The impact of top level management is one of consistence factor in influencing IT implementation (Papagiannidis & Gangwar, 2015).

Moreover top level managements deep acceptance on the importance and value of adoption of new technologies is the key factors for successful implementations of new technology. According to (Mutula & Brakel, 2006) the management with the high level of understanding about the merits of technology leads to higher financial supports that are provided for implementation of adopted technologies.. Based on the above studies the following hypothesis is generated.

H5: Management readiness determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

People domain

Based on the STOPE framework the people domain integrates factors associated with the ICT Awareness, ICT Education & Training, ICT Qualifications & Jobs as well as the Management of ICT skills.

ICT Awareness sub domain

In this fast-growing and fast-changing digital era information communication and technology has influenced all aspects of life. Awareness can be described as a situation where a subject is aware of some information when that information is directly obtainable to bring to put up with in the direction of a wide range of [behavioral actions](#) (Philomina & Amutha, 2016). According to Mahmud Akhter Shareef, [Vinod Kumar](#), Uma Kumar and Ahsan Akhter Hasin (2009) ICT awareness is the gaining of knowledge, education, and consciousness as much as a user perceived to be sufficient to learn and use ICT and realizes its overall characteristics, strategic functionality, and competitive advantage. The ICT awareness of individuals in an organization has superior impact on the adoption of new technology (Oye, Aiahad, & Abraham., 2016). Shortage of understanding about importance of E-health and the low level of understanding about the importance of E-health technology are great hindrances to E-health adoption (Kesse-Tachi, Asmah, & Agbozo, 2019). Research shows that the stumpy qualified use of healthcare professional readiness is a major barrier for e-health technology in developing countries (Abera et al., 2014).

Furthermore, if individuals are highly involved in their community they may identify e-Health as a public responsibility and start to maintain the e-Health service and through this maintenance usage will increase, this category emphasizes the need for e-Health (Hage, Roo, & Boonstra, 2013). Based on the above studies the following hypothesis is generated.

H6: ICT awareness determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

ICT education and training sub domain

Different studies show that how information communication technology is very basic in organizational success but the way how to use and implement within the firm is one of the biggest challenge and barrier (Kilbridge, 1998). Therefore for successful adoption of technologies trainings have full-size values, employees who attend training and pioneering programs of the organization are more likely to accept changes within organization (Glaser, John, & Hsu, 1998). If an organization is aware of a technology, it will be able to make the required preparations before adoption and this will increase the success of their implementation

(Carroll, Van der Merwe, & Kotzé, 2011). Health informatics training programs at all level will ensure that health care professionals and management have considerate the role of ICTs in health and that qualified personnel are available to manage and operate E-health services (Abera et al., 2014).Therefore the following hypothesis is generated if training and education determines adoption and implementation of e-health.

H7: ICT training and education determines the readiness to implement e-health at Zewditu memorial hospital.

Skills and knowledge of employees

Employees skill and knowledge are playing an important role in determining level and quality of performance of services in the service organizations (Hanafi & Ibrahim, 2018).According to (Rosenberg, 1972) the skill level and knowledge of workers are two of the important determinants of diffusion of a technology to individual firms, because both constraints are crucial for successful implementation and operation of a new invention. If a successful implementation of a technology requires complex new skills, then adoption might be slow. As a consequence, the overall levels of skills available to the enterprise as well as the manner in which the necessary skills are acquired are important determinants of adoption. In case of e-health the Nigerian researcher (Zayyad & Toycan, 2018) empirically shows that the IT literacy, skill and experience of healthcare professionals have significant influence on their willingness, perception, attitude, and intention to use health technology applications. Hence, attention should be given to the recruitment and training of supposed e-health capacity (Alam, 2018). Based on the above studies hypothesis was formulated as:

H8: Skills and knowledge of employees determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

Environment Domain

The environment domain integrates the factors and the variables “current state of the basic non-ICT issues surrounding and affecting the current state of ICT” (Al-Osaimi, Alheraish, & Bakry, 2006).The four major sub domain of environmental readiness are “knowledge,” “resources and

the economy,” “organization” including general regulations, cooperation, and management, and the basic “non-ICT infrastructure.”

Knowledge sub domain

According to (Al-Osaimi, Alheraish, & Bakr, 2006), the context of knowledge deals about cultural and educational factors that have direct relation with the adoption of new technology. This factor has greater impact on the adoption and implementation of new technology especially in health care centers. Abera (2014) states that Socio-cultural factors can affect a physician’s readiness to adopt e-health technologies. The culture of communication links of healthcare organizations with other institutions (i.e. hospitals and administrative centers), the communication between clients and communities have high impact on the adoption of e-health technology (Li & Chattopadhyaya, 2010). Not only the external communication but also the internal communications (e.g. telephone, e-mail, etc.) among healthcare providers have greater influence on the e-health adoption.

Moreover according to (Al-Osaimi, Alheraish, & Bakr, 2006) the culture domain not only concern about the communication culture but also the literacy on ICT and the knowledge of English which are the necessary element for implementing new technology. In addition to the cultural sub domain the support and hold up of the science and technology have larger impact on the e-health adoption .The following hypothesis shows the relationship.

H9: Knowledge determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

Resource and economy sub-domain

According to the study of (Hameed, Swif, & Counsell, 2012) the resource and economic can be defined as the quantity of financial and technical resources found in the association for the acceptance process of new technology. This domain deals about the resources that are available, the income per capita (Income relative to cost of living or Standard of living) have much more effect on the adoption and implementation of new technology. Adoption of new technology may also be affected by an abundance of financial resources that are important for IT investment Moreover the availability of finance may also play an important role, as firms may abandon the

implantation of new technology if the requisite funding cannot be obtained (Gelebo, Plekhanov, & Silve, 2015). More researches are done how the e-health is affected by the resource and capacity of the firm with the result of high impact of resource and economic domain in e-health adoption (Hage, Roo, & Boonstra, 2013). Based on the above statements the following hypothesis is generated.

H10: The resource and economy verify the readiness to adopt and implement e-health in Zewditu memorial hospital

Privacy sub domain

Privacy is the critical factor that has different definitions in different area of study. In the context of E-health, the primary concern is with the aspect of privacy referred to as 'information privacy' a term which refers to the ability of an individual to exercise control over their personal data held by others (Sahama, Simpson, & Lane, 2013). Information privacy concerns the collection, maintenance, use and disclosure of 'personal information'. Due to various reasons information privacy become legislated in different countries. For example the Australian privacy Act defines principles governing data collection, use and disclosure, as well as data quality and data security by public and most private sector organizations, including health service providers (Office of the Australian information commissioner, 1998). Economically advanced countries are spending much more financial resources on the technical aspect of e-health implementation but the privacy issue is one of the major challenges on the implementations process, the main reason for not resolving the problem is the cultural related issues (Sahama, Simpson, & Lane, 2013).

As per (Tornatzky & Eveland, 1990) privacy context is in which a firm conducts its business its industry, competitors, access to resources supplied by others, and dealing with the government. Essentially, it suggests that there will be privacy influences coming from the environment in which the organization operates whenever the organization is planning for new technology adoption. It also suggests that the privacy issue should be considered on the environment domain. On the bases of the above studies, this research makes privacy as one of environmental construct to measure e-health readiness of ZMH. As such, it is hypothesized that:

H11: privacy issues decide the readiness to adopt and implement e-health in Zewditu memorial hospital

3.2. Final Research Model

Literatures from the early study shows that the models suggested for the evaluation of technology adoption and readiness are not always abundantly addressed the research goal. Therefore some extensions are very important to wrap potentially important aspects that are typical to adoption (Nguyen & Petersen, 2017). The previous portion shows security and privacy issues as major barriers to Organizational adoption and implementation of E-health, consequently this thesis consist privacy and security as one part of measuring variables based on strong literature support. Additionally, the five STOPE framework variables used as an eyeglass to evaluate the readiness of e-health implementation at Zewditu memorial hospital. Each factor is hypothesized to influence the readiness of e-health.

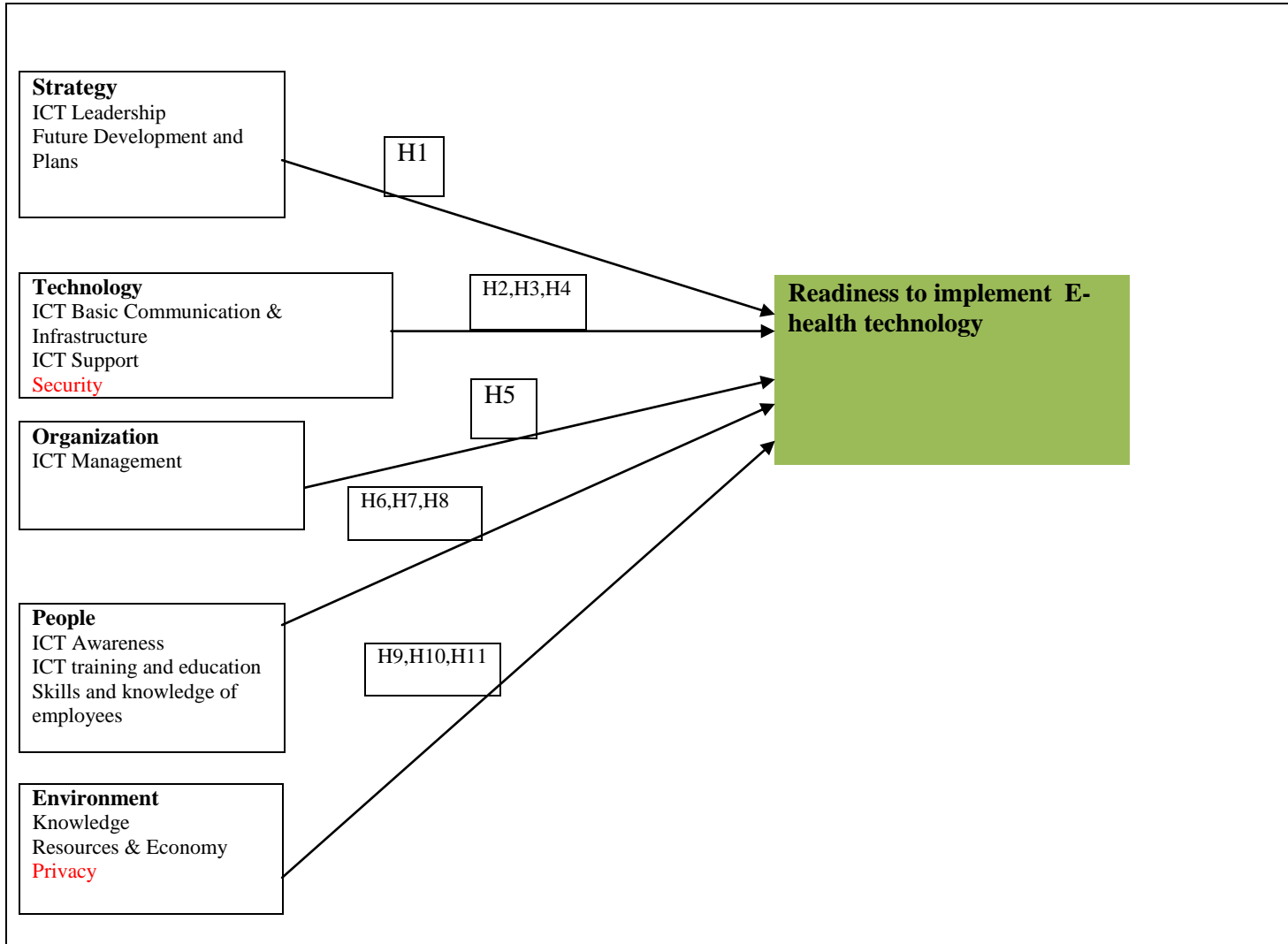


Figure3.1 Research model (source: own drawing)

Chapter four

4.1. Research methodology

On this chapter since the researcher has a list of research questions which need to be assessed, clear research design are applied. The objective of this study is conduct E-health readiness assessment for Zewditu memorial hospital by using the STOPE framework. The other key point of this chapter is to explain about the, research type, sampling and data collection procedures along with the systematic way of doing the analysis.

According to (Hevner & Chatterjee, 2010) the behavioral science research inquire about to develop theory that explains the behavior or character of firms and peoples. The initiation of this study is to assess the readiness of organizations and peoples in the association, so that it is grouped as behavioral science. The methodology use for this study is to assess Strategic, Technological, Organizational, people and Environmental readiness to adopt e-health readiness for Zewditu memorial hospital. Different factors were identified, hypothesis for relevant value are stated in the previous sessions, on the following topics the research approach, research type, research method, sampling and data collection methods, data analysis techniques, reliability and validity issues are discussed in detail in turn to achieve the main objective of research.

4.2. Research type

A Cross-sectional descriptive study design, make use of quantitative and qualitative study methods, Different research types are used for various kind of studies. In sequence of achieving the general objective of the study then, this research consider adequate amount of professionals from the Zewditu memorial hospital. Therefore it's much more preferable to use quantitative research, Moreover; this research approach is preferred because of its appropriateness for testing hypothesis which needs a statistical analysis as well as its generalizability nature (statisticssolutions, 2016). Survey is one of widely used scientific research method for hypothesis formulation and testing (Hevner & Chatterjee, 2010). It is also commonly used in behavioral sciences that support the applicability of quantitative approach (Hevner & Chatterjee, 2010). Hypotheses for quantitative analysis tend to be highly specific, describing clear relationships between the independent and dependent variables (statisticssolutions, 2016). But in general this study use a cross-sectional descriptive study design, use quantitative and qualitative study methods was applied to describe the readiness level of ZMH.

4.3. Research Approach

The research approach can have different groups mainly; deductive and inductive approach is typical classification (Gabriel, 2013). According to (Gabriel, 2013) this research concerned on testing of theory rather than generating of new theory, therefore it's grouped as deductive approach. Furthermore this study emphasis is generally on causality, rather than focused on exploring new phenomena or looking at previously researched phenomena from a different perspective. Additionally it begins with a hypothesis, whilst an inductive approach will usually use research questions to narrow the scope of the study (Gabriel, 2013). Therefore this study follow deductive reasoning since based on the literatures, a research model was developed which allows the investigation of strategic, technological, organizational, people and environmental factors that have a relation with the e-health readiness of ZMH. Based on STOPE model hypothesis is developed that enable the researcher to confirm the proposed relationships, whereas findings which are not consistent with the hypotheses lead to refusal.

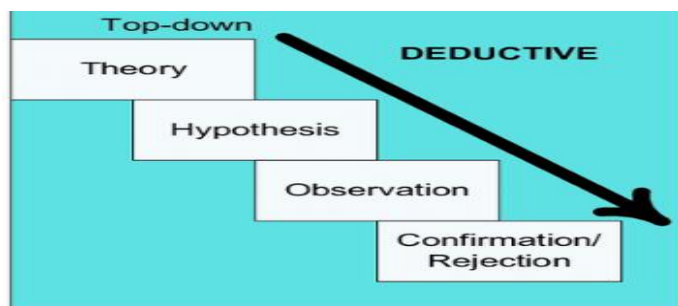


Figure4.1 Deductive reasoning, source: (Othman, 2013)

Study area, Target Population and Sampling Design

4.4. Study area

The study was carrying out in Addis Ababa, a capital city of the Federal Republic of Ethiopia. There are about 500 health facilities in Addis Ababa which range from government specialized hospitals to privately govern (Addsi Abeba health office, 2017). The specific target area of this research is Zewditu memorial hospital found in Addis Ababa Ethiopia. The main reason for the selection of this hospital is that, first according to the data collected from AAHB, in Ethiopian context the newly emerging health related technologies are preparing for implementing at ZMH (Teka, 2019). It's obvious that private hospitals

have much more tendency to use electronic health related technologies but governmental hospitals are the real reflection of Ethiopian society.

4.5. Target Population

The target populations for this study are professionals of Zewditu memorial hospital with 2 and more years of experience level. Since purposive sampling is chosen medical director, management, officers of administration (which have direct relation with the e-health technology), healthcare professionals, and IT experts working in health facilitation are the study area under discussion. Managers in IT division of hospital are also included in a target population, due to the reason that readiness assessment includes strategic and organizational issues. Employees who do not have any relation with the e-health technology are not covered on this research.

The ZMH has 1204 health professionals and 900 administrative staffs that are dedicated to providing health care services. The various departments, faculties and residents under specialty training in the hospital are included. Sample is taken from each group of the target population.

Division	Total no of staff
Hospital service giving health professionals	1413
IT/Data center	20
Administrators	200
Management (including Medical directors)	10
Total target Population	1643

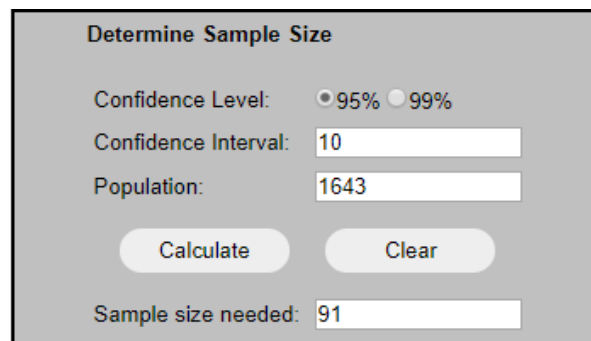
Table4.1 number of target populations

4.6. Sampling technique

Sampling is concerned with the selection of a subset from the population to estimate the whole population, minimized cost and also data collection can be faster than measuring the entire population (Gabriel, 2013). Generally there are two kind of sampling; the first one is probabilistic and the other is non-probabilistic sampling techniques. In probabilistic sampling design every population has equal chance of being part in the sample.

For this research purposive sampling is selected and implemented. For the first round of sampling (for the pilot test) purposive sampling is used and implemented. On the second round of survey the same procedure is applied but with conducting preliminary survey for identifying the number of medical directors, administrators, healthcare professionals, and IT experts working in ZMH. In addition, since convince sampling method is used for selecting professionals according to the ease of access while they have free time to fill the questioners and other data collection methods.

The actual sample size is obtained by using the online calculator software with 95% of confidence level and 10% of confidence interval (margin of error). As defined on the above section the administrators, the healthcare professionals, IT department professionals and the medical directors are among the major target groups so that the following table's shows each of the sample size as defined in the target population. The sample from each stratum is selecting by using purposive sampling due to the reason of addressing all intended participant those are closest to e-health services.



The image shows a screenshot of a web-based calculator titled "Determine Sample Size". It features a light gray background with a dark gray border. The interface includes the following elements:

- Confidence Level:** Two radio buttons are present, with "95%" selected and "99%" unselected.
- Confidence Interval:** A text input field containing the value "10".
- Population:** A text input field containing the value "1643".
- Buttons:** Two rounded rectangular buttons labeled "Calculate" and "Clear" are positioned below the input fields.
- Result:** A text input field at the bottom labeled "Sample size needed:" containing the value "91".

Figure4.2 Determined Sample size

4.7. Research Instruments

The most critical objective of data collection is ensuring that information rich and reliable data is collected for [statistical analysis](#) so that data driven decisions can be made for research (Lai, 2017). For attain the general objective of the study, this research use different data collection methods and procedures. Survey questioner is the well known and highly used data collection tool for quantitative research. Due to its chipper and effective time management nature the survey questioner is implemented for this study. The questioner which is developed for current research had two components one for demographic data and other for main variables (strategy, technology, organization, people and environment) to measure each construct items. It's obvious that the close ended type questioners are much more limits the response of the participants, but due to time efficiency and easiness of coding in to various tools, this research use close ended type of questioner. Additionally since closed ended type of questioner is suitable for hypothesis testing this research choose and implement for achieving of the general objective. A group of 54 questions are adapted from different researcher's works with modification to suit the current research type. In addition to this, based on the variables in the STOPE framework the questioner of this research includes 5- Likert scale questions and yes or no questions. The questioner is targeted for medical directors, administrators, for healthcare Professionals and IT experts. The survey questionnaire for healthcare professionals and IT experts included socio-demographic characteristics of respondents, ICT infrastructure availability, and Technology, People/Individual, and Environment readiness questions.

On this study, the questioner has been adopted and modified from various sources. once the questioner has been developed the pilot test is conducted to ensure the validity and reliability. Furthermore the developed questioners are checked by experts to evaluate the level and importance of the variables. Even if the questioners are not newly developed (adopted from different sources) checking whether this questions are feasible for the study area or not is the key issue. According to the finding of (Jha, 2017) generally the sample size for pilot study is considered to be around 10 percent of our effective sample size for our study as whole besides to this its recommended that pilot test normally assessed on 30 to 50 respondents accordingly. The researcher also suggested that pilot test is preferable to do on

separate group and exclude the group from final analysis. Therefore pilot study is conducted in Black lion hospital with 30 respondents for validation and reliability evaluation. Even the questioners are adopted from different sources making pilot study is very essential to be sure of whether it's perfect for the specified study area or not therefore by considering this the current researcher makes a pilot study assessment.

Moreover the structured interview is conducted for top level managements to assess the readiness level of the Zewditu memorial hospital. The questionnaire items were selected from literatures and modifications were made to meet the research objective.

Interview

The other data collection method used for this study is interview; top level managers have very tight schedules therefore qualitative methods were used to further explore the results found from the quantitative study using in depth semi-structured interview with selected participants

4.8. Data collection procedure

By aspiring of achieving general objective of the study, the researcher was first goes to human resource department of ZMH towards getting general information about the employs that perform in different sectors. Based on the data that are gathered from HR, defined targeted population is generated; on the bases of the above defined sample size the actual data is collected for almost one week, from March 8 to March 13. Since the researcher is not familiar with the whole stuff members within the hospital the data collection procedure is highly supported by the entire stuff members specifically the nurse stuff leader of ZMH to collect the questioner that are already filled by the target population. Before starting of the actual data collection the researcher of this study makes preliminary and general study of the target population, with aim of gating volunteer participants.

The IT and E-health department personals was the first to gather participate on the data collection process. From the result that is calculated on online sample calculator 82 questioner is distributed and collected within days. 8 questioners were incomplete and make the successful response rate 91.1%.

Measurement items

Most of the constructs employed in this research have measurement items which are validated in IS and IT adoption researches as well as readiness assessment works. However, these items were modified in the context of this study in order to meet the research objective.

4.9. Pilot study

In order to evaluate the questionnaires that are used for data collection is relevant and free from ambiguity it's important to make a pilot study. This research conducts a pilot study of 30 participants that are not included in the main research target population. For this reason Black lion hospital is selected due to the simplicity of making the test. A sum total of 24 valuable questionnaires are gathered from the participants (workers of Black lion hospital) with 80% response rate. Once the questionnaire results gathered reasonable comments are gathered from the participants. In accordance with the feedback the original questionnaires that are prepared for the main study group (Zewditu memorial hospital participants) alter and make improvement on some words and questions that makes ambiguity. Additionally reliability test was made to measure the internal consistency of the questionnaire with the help of composite reliability test and cronbatch's Alpha value in SPSS reliability tester. According to (Abdi, 2007) the composite reliability value should be range from 0 to 1. Accordingly the premier values indicate higher level of regularity between items, the same is true for the other side. On the same way the maximum value of the cronbatch's Alpha value should be 1 and the minimum of 0 where, values that are closer to 1 are higher degree of reliability of scale (Nguyen & Petersen, 2017). Based on the above concepts this study makes reliability tests using SPSS (cronbatch's Alpha) and smart PLS (composite reliability) and reported as follow.

Cronbachs Alpha

	Cronbachs Alpha
Awareness	0.736285
Basic communication	0.639670
E-health rediness	0.896574
Management	0.784888
Privacy	0.536340
Resource and economy	0.758597
Security	0.825537
Skill	0.486394
Strategy	0.683120
Support	0.618229
Training	0.696890

Figure 4.3 Cronbach's Alpha result for the pilot study

From the above statics result the cronbach's Alpha value of readiness is 0.885 results that are considered as an acceptable value based on (Kline, Sulsky, & Rever-Moriyama, 2000) study.

4.10. Reliability and validity test

According to (Mimi Mohaffyza Mohamad et al., 2014) "validity always refers to the degree to which empirical evidences and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores". So that the questioner and other basic data collection instruments are evaluated and tested by experts who have experiences.

On the other hand the reliability imitates the uniformity and reliability of the results over period of time (Mimi Mohaffyza Mohamad et al., 2014) . Furthermore, reliability is considered as the level to which a test is free from measurement faults, since the more measurement faults occur the less reliable the constraints (Nguyen & Petersen, 2017). Considering this in mind the internal consistency of the variables is measured in the pilot study both with Cronbach's Alpha. The result shows that all values are greater than the minimum values; furthermore this evaluation will be discussed in detail for all data sets in the next chapter.

4.1. Data Analysis and presentation Tools/Techniques

Since this research is the quantitative research it uses statistical technique in order to analyze and organize the proposed hypothesis. According to (Shamoo & Resnik, 2003) various analytical

procedures provide a way of drawing inductive inferences from data and distinguishing the signal (the phenomenon of interest) from the noise (statistical fluctuations) present in the data.

Based on the above sample size primary data are collected. Following the collection of data from the defined size of population the data is entered to the SPSS version16 (statistical package for social scientists) software which, have versatile package that allows diverse analysis and manipulations. This well organized and stored data pass through exhaustively analysis to come back with the research problems.

After completing the above process smart PLS is used for accomplishment of evaluating the validity and reliability of the generated hypothesis. Descriptive analysis has been conducted to analyze the demographic data of respondents using SPSS which is suitable and user-friendly tool for determining basic frequency based statistical measures. According to (CodeCracker, 2019) Smart PLS is a software with graphical user interface for variance-based structural equation modeling (SEM) using the partial least squares (PLS).In accordance with (Ringle & Silva, 2014) the partial least squares path modeling or partial least squares structural equation modeling (PLS-PM, PLS-SEM) is a method of structural equation modeling which allows estimating complex cause effect relationship models with latent variables while SEM is a statistical technique for testing and estimating causal relationships between variables based on statistical data and qualitative causal assumptions.

The new Smart PLS latest version (v3) is available in the market with superior features, it doesn't have free version for academic purpose unlike the previous version (v2). Hence, Smart PLS Version: 2.0.M3 was used for path coefficient modeling since it requires only registration with valid e-mail address to get its license from Smart PLS support team.

Chapter Five

5.1. Data Analysis and Findings

This chapter gives detail explanation about the main process of data preparation, data processing and analysis result side with the existing theory. First the descriptive demographic statistical results are presented. Then on the main analysis part essential statistics result that are found from smart PLS is disused in brief. The measurement model (reliability and validity test) and structural model through significance test, R-squared path analysis, and Q-squared are discussed. Finally the qualitative data analysis and discussion is presented according to the data obtained through the interview of the managers which was conducted based on the interview questions draw.

5.1.1. Data Preparation

The data that has been collected through the cross sectional survey using cloth-ended questioner were transferred from the manual data into computer system using SPSS. In the process of data preparation data set that are not complete and questioners with invalid response are rejected and dropped. Based on the defined sample size 91 usable questioners where distributed over different directorates of the zewditu memorial hospital. During the first phase of the data preparation 9 questioner results where drooped and discarded because of inconsistent and missed values. Therefore this research is done by the remaining eighty two individuals with 89% respondent's rate.

5.1.2. Demographic result presentation

This fraction of the survey is concerned about the personal information's that are important for achieving the main objective of the research. The respondents are required to answer the demographic information such as age, gender, specific professional positions and work experience within the hospital, in aim of having clear understanding about their background. All of the information's where filled by the respondents themselves. All the questions that are asked in the questioner are multiple choices that are suitable for selecting their own best answers. On the other hand the responses that are in text format are changed in to numeric format during the data coding process.

Respondents based on gender

When we observe the respondents sex information 52.4% of the respondents are males and the rest 47.6% are females. The statistics shows that more of the respondents are Males out of the total respondents.

Gender	Frequency	Percent
Male	43	52.4
Female	39	47.6
Total	82	100.0

Table5.1 Respondent gender

Respondents based on Age

The respondent's age are classified as four groups, mainly as 20-25, 26-35, 36-45 and above 45 and implicit as 1, 2, 3 and 4 correspondingly. According to the statistics respondents with age ranges between 20 and 25 are 14.6% are accounts as the minimum value and age ranges between 36 up to 45 are recorded as the highest value of 47.6%. The other age groups 36-45 and above 45 are 21.95% and 15.85% respectively. This implies that more of the respondents, 39 (47.6% out of 82 respondents, have found within the age category of 26-35).

Age	Frequency	Percent
20-25	12	14.6
26-35	39	47.6
36-45	18	21.95
Above 45	13	15.85
Total	82	100.0

Table5.2 Respondent age

Respondents based on Job experience

The other demographic profiles that are answered by the respondents are job experience. It also categorized as three groups. Therefore the groups are marked as year of service by the profession (below 5 years), (from 5 to 10 years) and (11 and above years).

As described on the following table the respondents with work experience of less than five years is 36.7%, experience level between five up to ten years are 56% and the other 7.3% is for those who have work experience of above 10 years. Form the above description more of the respondent's age is from five up to 10 years.

Experience (in years)	Frequency	Percent
< 5	30	36.7
5-10	46	56.0
>10	6	7.3
Total	82	100.0

Table5.3 Respondent experience

Respondents based on profession

As defined on the previous sections this research is done by taking as health care professionals and non health care professionals (from Management and IT fields of specialization) from Zewditu memorial hospital as the target populations. On this concern the average percent of health care professionals is with the high level of percentage 48.8% and the minimum value of medical directors with only 6.1%.The other groups of various administrative bodies and IT directorate with 28% and 17% respectively. This implies that more of the respondents, 40(48.8% out of 82 respondents, have found within the health care profession).

Table5.4 Respondent profession

Profession	Frequency	Percent
Health care	40	48.8

Administrators	23	28.1
Medical directors	5	6.1
IT/Data center	14	17
Total	82	100.0

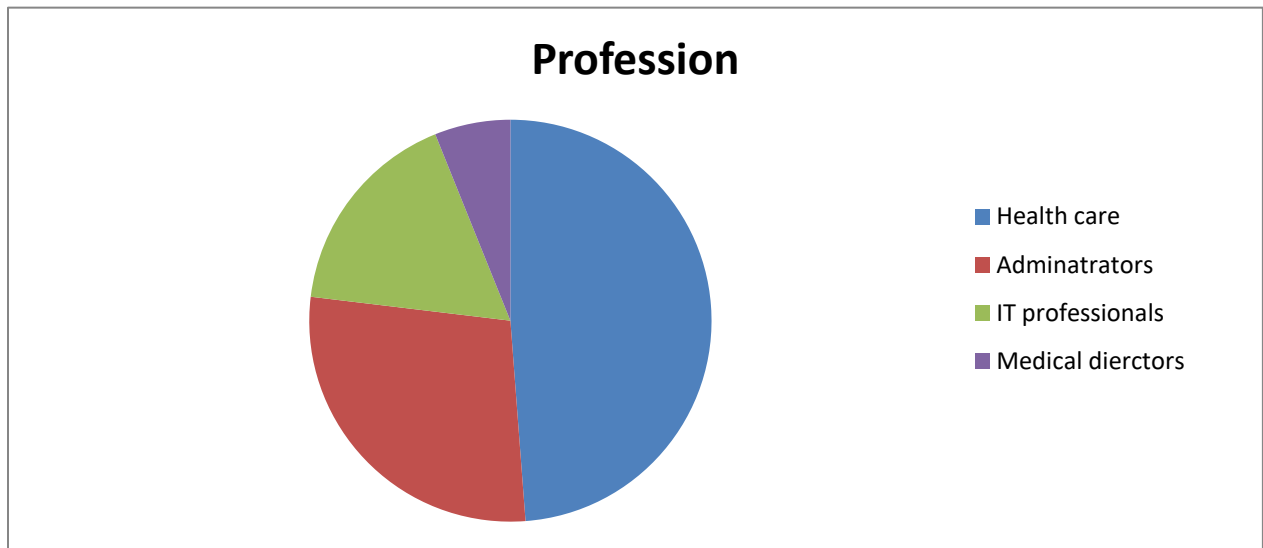


Figure 5.1 Graphical representation of the professional's distribution

5.2. Evaluation of measurement model

Evaluating the measuring model in PLS-SEM is the initial step, for beginning the process of validity. This permits to determine how well the item suited to the hypothetical defined construct (M, Jan-Michael, & Sven, 2015). According to (M, Jan-Michael, & Sven, 2015) generally there are two variables in PLS, which are called the observed and the latent variables. The former one is variables that measured directly from respondents where as the other one is inferred indirectly.

On the other hand there are two most well known scales in PLS, i.e. formative and reflective. In the case of formative since it checks many dimensions the statements are not correlated to one other. But in case of reflective all statements are measuring exactly the same thing, so that the statements are almost the same and hence much more correlated

(Nguyen & Petersen, 2017). Based on the above explanations all the indicators statement that is used on this research is reflective.

Measurement models, indicator reliability, internal consistency reliability, convergent validity and discriminate validity are the most important concept when we deal with reflective cases.

For the aim of achieving the general objective of the study, reliability is calculated using PLS algorithm with maximum iteration of 300. Some authors consider items whose Alpha coefficient is 0.7 as reliable; (Joseph F. Hair et al., 2014; Nils Urbac and Frederik Ahlemann, 2010; Chin, 2010; Ibrahim, 2016). Based on the outer loading value of those who has less than 0.7 are deleted and values greater than 0.7 are considered adequate, But, according to(Hussein *et al.*, 2018) indicators with outer loading between 0.40 and 0.70 should only be rejected if the procedure leads the values of composite reliability and average variance extracted into the acceptable range. Hence, if indicators with this range enable to have better CR and AVE, they will be retained for further analysis. The following table shows that the accepted values based on the following analysis. Table 5.1 shows 35 valid variables are retained for further analysis out of 56 measurement variables.

Table5.5 List of valid variables

Indicator	Calculated values	Category
SRQ5	0.85	Accepted
SRQ6	0.69	Accepted
SRQ7	0.64	Accepted
SRQ10	0.64	Accepted
TIN6	0.43	Accepted
TIN7	0.64	Accepted
TIN8	0.78	Accepted
T1	0.64	Accepted
T4	0.42	Accepted
T5	0.45	Accepted

T7	0.48	Accepted
T8	0.41	Accepted
T10	0.74	Accepted
T12	0.86	Accepted
T13	0.96	Accepted
O1	0.85	Accepted
O2	0.72	Accepted
O3	0.65	Accepted
O4	0.65	Accepted
O6	0.75	Accepted
O7	0.49	Accepted
P1	0.93	Accepted
P2	0.83	Accepted
P3	0.74	Accepted
P4	0.74	Accepted
P5	0.95	Accepted
P6	0.92	Accepted
P7	0.89	Accepted
E5	0.42	Accepted
E6	0.87	Accepted
E7	0.75	Accepted
E8	0.96	Accepted
E9	0.56	Accepted
E10	0.96	Accepted
E11	0.63	Accepted
R1	0.57	Accepted
R2	0.97	Accepted
R3	0.65	Accepted
R4	0.96	Accepted

5.2.1. Internal Consistency Reliability

According to the study of different researchers (Nguyen & Petersen, 2017) Cronbach’s alpha (α) is the most commonly internal consistency manager that we used when we have multiple Likert scale question in our questioner or survey. In most cases the value of cronbach’s alpha ranges from 0 to 1 where value that are 0.7 and above are considered as the most acceptable vales. On the other hand the composite reliability works same task like that of Cronbach’s alpha, but due to its over or underestimate scale reliability it’s much more preferable to use composite reliability. Due to this reasons the current study use the composite reliability test for reliability. For this study 0.7 and above was considered adequate measurement values for reliability evaluation. As shown in table all values are above0.7 thus it can be generalized that this research is greatly reliable.

	Composite reliability
Awareness	0.88
ICT basic communication	0.70
ICT management	0.84
ICT support	0.74
Privacy	0.75
Resource and economy	0.78
Security	0.91
Skill and knowledge	0.76
Strategy	0.79
Training and education	0.89
E-health Readiness	0.92

Table5.6 Composite reliability

5.2.2. Convergent validity (AVE)

According to (C.Michalos, 2014) convergent validity is supporting piece of evidence for construct validity. Convergent validity shows the test having the same or similar constructs should be highly correlated. In addition convergent validity referee how closely the new scale is related to other variables and other measurement of the same construct. A most mention applied decisive factor of convergent validity is the Average Variance Extracted (AVE) which shows the average communality for each latent factor in a reflective model. (Chun-Che, 2013) Suggested that the AVE values should be greater than 0.5. Table shows that all convergent construct values are greater than 0.5 except support which has value of **0.356** (with low level of convergence).

	Average Variance Extracted (AVE)
Awareness	0.791
ICT basic communication	0.701
ICT management	0.845
ICT support	0.356
Privacy	0.626
Resource and economy	0.511
Security	0.848
Skill and knowledge	0.621
Strategy	0.501
Training and education	0.741
E-health Readiness	0.995

Table5.7 Average variance extracted

5.2.3. Discriminate validity

According to (Badgalyn, 2016) "Discriminate validity refers to the extent to which factors are distinct and uncorrelated. The rule is that variables should relate more strongly to their own factor than to another factor." It's also called as vertical collinearity. There are many

ways of calculating discriminate validity but Average Variance Extracted (AVE) is a common method of testing discriminate validity (Gerbing and Anderson, 1988; wong, 2013). The square root of AVE for all factors should be greater than all the correlations between that construct and other constructs.

	<i>AW</i>	<i>BC</i>	<i>MN</i>	<i>SP</i>	<i>ST</i>	<i>PR</i>	<i>RS</i>	<i>SK</i>	<i>SC</i>	<i>TR</i>	<i>RD</i>
<i>AW</i>	0.89										
<i>BC</i>	0.067	0.83									
<i>MN</i>	0.2584	0.20157	0.91								
<i>SP</i>	0.4427	0.16212	0.54815	0.59							
<i>ST</i>	-0.3871	-0.03511	-0.10925	-0.25617	0.70						
<i>PR</i>	0.3920	0.26140	0.76729	0.69976	-0.21923	0.78					
<i>RS</i>	0.5113	0.18135	0.29439	0.54005	-0.11292	0.4382	0.71				
<i>SK</i>	0.2772	0.05903	0.27482	0.43600	-0.09390	0.3892	0.483	0.78			
<i>SC</i>	0.5728	0.09985	0.37809	0.50871	-0.35986	0.4341	0.412	0.459	0.91		
<i>TR</i>	0.3482	0.21123	0.31253	0.54691	-0.40289	0.6896	0.404	0.540	0.25	0.86	
<i>RD</i>	0.3266	0.09481	0.50430	0.63445	-0.06473	0.5832	0.570	0.325	0.34	0.34	0.99

**Bold on the diagonal are square roots of AVEs, off diagonals are correlations*

Table 5.8 discriminate validity

For simplicity of reports the data are coded as AW (Awareness), BC (basic communication), MN (management), and Support (SP), Strategy (ST), Privacy (PR), Resource (RS), Skill (SK) Security (SC), Training (TR) and E-health readiness (RD).

The above table shows that the cross-loading of every one of the variables was more than the inter-correlations of the construct of all the other observed variables in the model. Consequently,

this result verified the cross-loadings assessment standards and provided acceptable validation for the discriminate validity of the measurement model. As a result, the suggested conceptual model was supposed to be acceptable, with confirmation of adequate reliability, convergent validity, and discriminate validity and the verification of the research model. The following table also shows the discriminate validity through cross loading.

Table 5.9 discriminate validity through cross loading

	<i>AW</i>	<i>BC</i>	<i>SP</i>	<i>MN</i>	<i>PR</i>	<i>RD</i>	<i>RS</i>	<i>SC</i>	<i>SK</i>	<i>ST</i>	<i>TR</i>
E10	-0.3971	-0.0293	-0.1467	-0.2805	0.9814	-0.2300	-0.1476	-0.12	0.38	0.394	0.10842
E11	-0.1328	-0.0413	0.1149	-0.0094	0.5378	-0.0522	0.1011	0.09	0.05	0.222	0.16275
E5	0.0568	-0.1077	-0.3118	-0.0367	0.0018	-0.2134	0.7269	-0.05	0.08	0.047	0.18134
E6	0.4297	0.0009	0.1348	0.2925	-0.0458	0.2213	0.7827	0.37	0.32	0.281	0.33486
E7	0.3698	0.2195	0.0362	0.4884	-0.1445	0.3182	0.6739	0.30	0.32	0.448	0.29535
E8	0.6014	0.0385	0.1320	0.4222	-0.0334	0.2568	0.8066	0.32	0.38	0.209	0.39075
E9	0.2300	0.1518	0.3237	0.3609	-0.0914	0.3272	0.7719	0.39	0.27	0.280	0.52943
O1	0.3205	0.2127	0.4168	0.8020	-0.1364	0.6014	0.3271	0.27	0.36	0.422	0.44619
O2	0.2232	-0.0715	0.3514	0.7677	-0.2516	0.5059	0.3814	0.39	0.45	0.441	0.56301
O3	0.0564	0.0622	0.1961	0.6609	-0.2425	0.2671	0.3489	0.22	0.34	0.295	0.38117
O4	0.2904	0.1161	0.3052	0.7127	-0.1848	0.4182	0.2156	0.26	0.28	0.476	0.27401
O6	0.4356	0.2203	0.6418	0.7789	-0.2013	0.6706	0.5814	0.4003	0.43	0.383	0.67859
O7	0.5355	0.0591	0.1675	0.4112	-0.0747	0.2620	0.3961	0.2347	0.18	0.256	0.10960
P1	0.8677	0.0194	0.2261	0.3841	-0.3784	0.3154	0.4471	0.1885	0.49	0.259	0.33018
P2	0.9095	0.0940	0.2334	0.4027	-0.3165	0.3771	0.4623	0.2957	0.52	0.352	0.25802
P3	0.3570	0.1012	0.2873	0.2841	-0.2263	0.2510	0.1954	0.1539	0.67	0.232	0.29760
P4	0.1232	0.0809	0.3621	0.4720	0.1388	0.3752	0.5714	0.3901	0.44	0.178	0.78110
P5	0.5311	0.0689	0.3192	0.4916	-0.3324	0.4143	0.4194	0.2334	0.89	0.279	0.42935
P6	0.3671	0.1213	0.4970	0.5458	-0.0405	0.5328	0.4714	0.2673	0.38	0.103	0.92183
P7	0.3116	0.1535	0.4332	0.6085	-0.0164	0.5691	0.4689	0.3041	0.39	0.220	0.87712
SRQ10	0.0691	0.1244	0.3932	0.2731	-0.2565	0.3779	0.1422	0.0835	0.15	0.601	0.08337
SRQ5	0.3151	0.2077	0.2503	0.5426	-0.3317	0.7346	0.3669	0.4081	0.28	0.854	0.27893
SRQ5	0.3151	0.2077	0.2503	0.5426	-0.3317	0.7346	0.3669	0.4081	0.28	0.854	0.27893
SRQ6	0.2051	0.1552	0.0175	0.2530	-0.4298	0.2310	0.1478	0.0391	0.18	0.615	-0.13855
SRQ7	0.3667	0.0837	0.1567	0.3529	-0.1854	0.3644	0.4166	0.2440	0.26	0.720	0.10646
T1	-0.0047	0.2305	0.5432	0.1978	-0.1865	0.2769	0.0147	0.0494	0.06	0.163	0.24184
T10	0.2967	0.1998	0.8931	0.5466	-0.0334	0.8159	0.3192	0.2134	0.38	0.266	0.60342
T11	0.2967	0.1998	0.8931	0.5466	-0.0334	0.8159	0.3192	0.2134	0.38	0.266	0.60342
T12	0.2907	0.0457	0.2447	0.3470	-0.1383	0.3024	0.5065	0.8982	0.79	0.294	0.34554
T13	0.2304	0.0611	0.2610	0.4450	-0.0481	0.4028	0.4021	0.9439	0.65	0.330	0.32305
T4	-0.0092	-0.0530	0.6974	0.2379	0.0218	-0.0069	0.0150	0.2382	0.13	0.058	0.00676
T5	-0.0040	0.1533	0.5996	0.2193	-0.0962	0.1911	-0.0034	0.2455	0.05	0.168	-0.16236
T7	0.1536	-0.2502	0.6395	0.2400	-0.0298	0.1433	0.1818	0.2002	0.25	0.017	0.22215
T8	0.1091	0.0150	0.7717	0.1475	-0.0849	0.2322	0.1619	0.1890	0.19	0.213	0.00396
TIN6	0.1343	0.7612	-0.1514	0.0956	0.1577	-0.0821	0.0591	0.1213	0.02	-0.08	-0.1050

TIN7	-0.0852	0.7586	0.1153	0.1410	0.1582	0.1109	0.1799	0.0396	0.05	0.046	0.1109
TIN8	0.1662	0.9292	0.1500	0.1708	-0.0621	0.2494	0.1655	0.0958	0.10	0.215	0.03424
R1	0.2341	-0.1687	0.034	-0.4835	0.4561	0.5432	0.3212	0.4578	-0.89	-0.32	-0.566
R2	-0.1466	-0.151	-0.232	-0.1463	-0.567	0.9626	-0.2453	-0.122	0.55	-0.38	-0.897
R3	-0.2567	-0.296	-0.9457	0.2345	-0.567	0.6543	-0.3456	-0.678	-0.23	0.064	-0.765
R4	-0.4013	0.2386	-0.3003	-0.0370	0.1582	0.9789	0.1582	0.1475	-0.20	0.134	0.00396
R5	-0.4123	0.2567	-0.2390	-0.0279	0.1543	0.9789	-0.1563	0.0145	-0.30	0.213	-0.3357

5.2.4. Cross loading

All observed variables were more than the inter-correlations of the construct of all the other observed variables in the model. Therefore, these findings confirmed the cross-loadings assessment standards and provided acceptable validation for the discriminate validity of the measurement model. As a result, the suggested conceptual model was supposed to be acceptable, with confirmation of adequate reliability, convergent validity, and discriminate validity and the verification of the research model.

5.3. Evaluation of the Structural Model

The inner structural model (structural model) indicates the relationships between the independent and dependent latent variables (M.Ringle, Bido, & Silva, 2014). Poles apart methods are used for evaluation of the measurement model. The major ones are coefficient of determination (R-square), effect size (F-Squared), significant testing, and predictive relevance (Q-square).

5.3.1. Measuring determination coefficient (R²)

R square is numeric measure that represent the amount of the variance for dependent variables that explained by and independent variable in regression model

The R square value ranges from 0 to 1. An investigation a high R-squared between 0.85-1 indicates that all movement of dependent variable is completely explained by movement in the independent variable that we are interested in. R² readiness value of this research is 0.86 which is closer to 1 therefore according to researchers exogenous variables of readiness have high dependency.

R Square

	R Square
Awareness	
Basic communication	
E-rediness	0.925962
Management	
Privacy	
Resource	
Security	
Skill	
Strategy	
Support	
Traning	

Figure5.2 R square value

Therefore, the following shows revised path diagram of internal consistency of the variables based on the retained values.

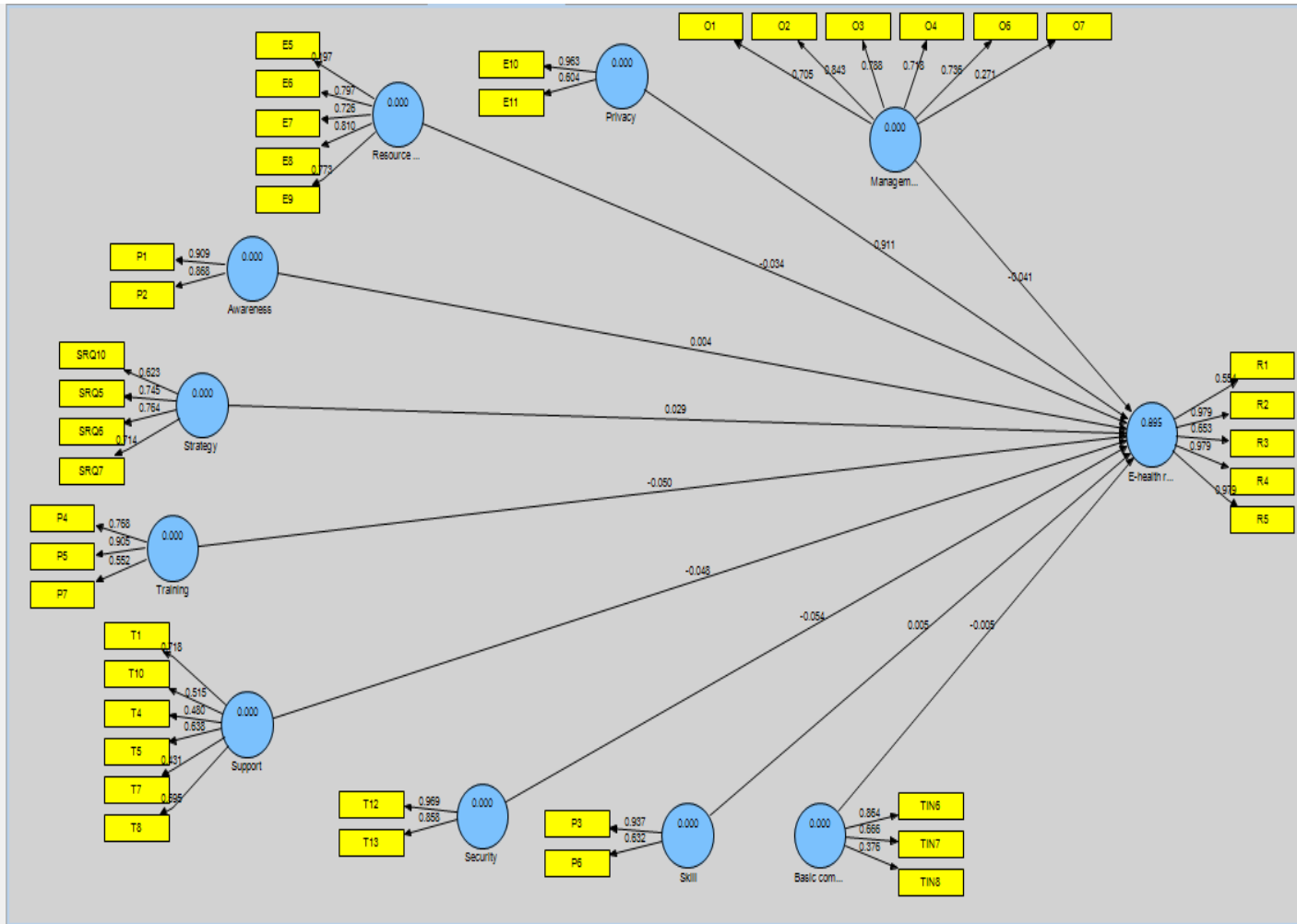


Figure 5.3 Revised path model

5.3.2. Significance Test

Studies show that Bootstrapping is one of the very well known statistical packages to generate T values. The T-statistics shows the significance of outer model. In this process about 5000 subsamples are taken from the sample (Leulsegd, 2017).

On this study a two-tailed t-test with a significance level of 5% is used, Wong, shows that the path coefficient will be significant if the T-statistics is larger than 1.96. In this bootstrapping result as indicated in the following table all T- statistically significant. On the other hand T-statistics result of the outer model are larger than 1.96, thus the outer model loadings are highly significance.

Indictor variable	T-statics
Awareness-> Readiness	2.0390
ICT basic communication-> Readiness	3.7389
ICT management-> Readiness	3.5448
ICT support-> Readiness	4.7389
Privacy-> Readiness	2.9877
Resource & economy-> Readiness	2.007
Security-> Readiness	2.5679
Skill and knowledge -> Readiness	1.9878
Strategy-> Readiness	3.5972
Training & education-> Readiness	2.9201

Table5.10 T-statics value

5.3.3. Evaluation of Predictive Relevance (Q²)

Predictive relevance can be calculated by using a technique of blindfolding in SmartPLS. Q² greater than 0 indicates the model is predictive of the given endogenous variable under investigation. On other hand it is irrelevant to predict the given endogenous variable if Q² is less than or equal to 0. Based on the assessment the value is above zero confirming that the structural model reveal predictive relevance for Readiness.

	Q ²
Readiness assessment of ZMH to adopt e-health	0.345

Table5.11 Q square value

5.3.4. Path study (Path coefficient)

According to (Leulsegd, 2017) the path coefficient explains and evaluate causal model by examining the relationship between a dependent variable(Readiness) and two or more independent variable(privacy, skill, strategy, security, ICT basic management, awareness, Training and education, management, resource and economy and ICT support). Then value of path coefficient range between -1 to +1.The values that ranges closer to +1 represent strong positive relationship whereas value closer to -1 is inverse relationship. Conversely if the value closer to 0 implies that weak relationship between the construct.As we can see from the following table all values have positive relationship that is >0 except the two variables which are less than <0 .

Path Coefficients

	Str	awareness	basic	mangemt	privacy	rediy	resourec	security	skill	support	tarning
Str						0.517331					
awareness						0.094740					
basic						0.048216					
mangemt						0.034490					
privacy						0.078295					
rediy											
resourec						-0.127919					
security						0.018601					
skill						-0.040706					
support						0.467444					
tarning						0.280684					

Figure 5.4 path coefficient

5.4. Hypothesis testing

Variety of literatures and scientifically proven theoretical facts shows that using of bootstrapping with a re-sampling of 5000, the path estimates and t-statistics were calculated for the hypothesized relationships. With initial concept of literature review this research generates 11 hypotheses. But from the above statically values the knowledge domain (hypothesis number 9) is removed out from the hypothesis group. As shown in the above table, all fourteen ten variables

show path coefficient value range between -1 to +1 and t-values greater than 1.96. Thus, all hypotheses were proven to be valid.

Constructs	Path coefficient	T-value	
H1 Strategy -> readiness	0.517	3.597	Supported
H2 ICT BCI -> readiness	0.048	3.738	Supported
H3 ICT support -> readiness	0,467	4.738	Supported
H4 Security -> readiness	0.018	2.567	Supported
H5 Management -> readiness	0.034	3.544	Supported
H6 Awareness -> readiness	0.094	2.039	Supported
H7 Training and education -> readiness	0.280	2.920	Supported
H8 Skill -> readiness	-0.040	1.987	Supported
H9 Resource and economy-> readiness	-0.127	2.007	Supported
H10 Privacy -> readiness	0.078	2.987	Supported

Table5.12 List of supported hypothesis

As shown in the above table 5.12 all hypotheses show path coefficient value range between -1 to +1and t-values greater than 1.96 .Thus all nine hypotheses proven to be valid and supported.

5.5. Readiness evaluation analysis

As mentioned in the methodology part the readiness assessment is made from the medical directors and management in order to evaluate the readiness of themselves and their hospital. A readiness assessment instrument has been developed and dispersed through five mangers of zewditu memorial hospital. Figure 5.5 shows that readiness analysis is coded as 1,2,3,4 and 5 as in five scales as in a five-point Likert type scale.

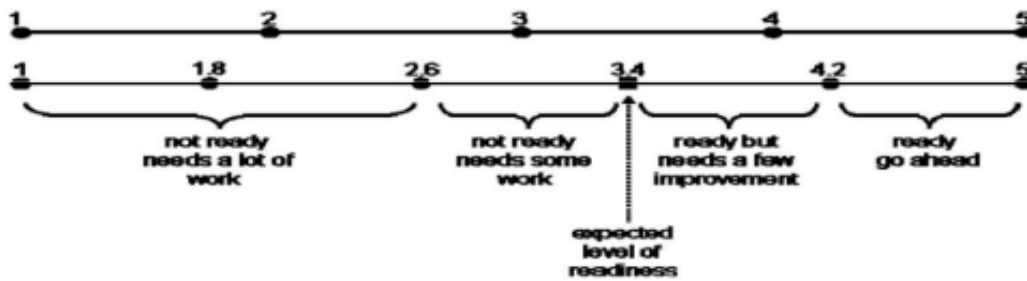


Figure 5.5 Evaluation models of the E-LRS

Variables	Mean score	Readiness level
Strategy	4.7	Ready go ahead
Technology	4.3	Ready go ahead
Organization	4.5	Ready go ahead
People	2.8	Not ready needs some work
Environment	4.1	Ready but needs a few improvement

Table 5.13 interview result of e-readiness

5.6. Qualitative data analysis

Qualitative data analysis is the process in which we move from the raw data that have been collected as part of the research study and use it to provide explanations, understanding and interpretation of the phenomena which we are studying. Based on this concept the researcher makes interview with the peak level managers of the (including the medical director) hospital. Since the impact of top level managers is very important and key issues in achieving the implementation of e-health in health care environments. All the interview questions are developed anchored in the strategically, technology, organizational, people and environment perspectives. In view of that, the interview results have been examined reported in the following session.

Strategic direction

Mission of ZMH

‘To promote health and wellbeing of Ethiopians through providing and regulating a comprehensive package of preventive, curative and rehabilitative health services of the highest possible quality in an equitable manner.’

Vision of ZMH

‘In a year of 2012, the focal point of ZMH is to come up an excellent researches on health issues and to generate visionary, honest and committed professional in order to be model for other hospitals in Ethiopia’

All managers have similar perspectives in using ICT for leadership and for future development plan to achieve the organization mission and vision, and values of the hospital. Additionally they agree that information communication can be the major tool for facilitating the daily activities of health care professionals and the management. This lead to the effective achievement of the mission and vision of the hospital

Technology direction

ICT basic communication and infrastructure, ICT support and security

According to the interview, currently the distribution of hardware and software can be scaled as on medium level. But there are plans and preparedness on improving of the infrastructure quality and quantity.

In terms of training and support the availability of operational and maintenance persons is one of the constraint that affects the adoption and implementation of e-health. Currently there are qualified personals in the hospital but still it needs more work in helping e-health implementation. There is strategic plan that for implementation of electron record system for the next two years (2020/21).

One of the major problems in health sectors that make them not to adopt e-health is the lack of security, but the most of the environment of ZMH has trust on merits of e-health.

Organization direction

Management

‘As a ZMH medical director I believe that the degree to which top level managers support is very significance and the commitment level have much more effect on adoption and implementation of new e-health technologies.’

‘Most of the management body’s are responsible for believe that we can be very beneficial from the merits of e-health. Therefore as much as we can we are struggling for solving the major challenges that are obstacles to achieve e-health goals. The current infrastructures are not sufficient for implementing e-health, so that we are trying to solve the problems with in correlation with Addis Ababa health biro.’

People direction

ICT awareness, Training and education, skill and knowledge of employees

The major challenge that all the management body agreed is the people domain. The understanding level and skill of the employees even the major doctors are limited. We believe that training and education is one of the key solutions for awareness creation not only for e-health but also about basic ICT services. As a result we are hopeful to have better results in the area of awareness. Currently there are training practices which are specifically responsible for training individuals throughout the hospital, but in contrast to the awareness level we believe that mush more work is expected from the hospital in order to achieve the major goal.

Environmental direction

Knowledge, resource and economy, privacy

‘The resource mostly the financial resource is one of the major challenges that hinder the adoption of e-health. Infect this problems are not only the challenge of ZMH but one of the most headache within the country. Additionally the IT infrastructures that are put in through the hospital are not sufficient enough therefore much more work is expected for this domain. It’s obvious that this problem cannot solve within a day’s so that sluggish and progressive change will be implemented for next periods.

Chapter six

6.1. Discussion, conclusion and recommendation

6.1.1. Introduction

On this chapter first the respondents' demographic and topic related characteristic is discussed. On the main analysis part both structural and measurement model results have been presented and discussed. Four respondent groups were formed based on their gender, Age, experience level and profession. Age group of 20-25, 26-35, 36-45 and above 45 on the other hand experience level of below 5 years, from 5 to 10 years and 11 and above years. Moreover the respondent's profession is categorized under administrators, health care professionals, IT department personals and medical directors.

Distribution of respondents by type of profession, gender ,age and experience level

Type of profession	Gender						Age									
	Male		Female		Total		20-25		26-35		36-45		Above 45		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Administrators	12	52.1	11	47.9	23	28.1	3	3.6	13	15.8	5	6.09	2	2.4	23	28
Healthcare	22	55	18	45	40	48.8	1	1.2	22	26.8	15	18.2	2	2.4	40	48.7
IT personals	12	88.2	2	11.8	14	20.7	2	-	8	-	4	-	-	-	14	17
Managements	4	80	1	20	5	6	-	-	-	-	2	-	3	-	5	6.09
Total	50	60.9	32	39.1	82	100	6	4.8	43	42.6	26	24.3	7	4.8	82	100

Table6.1 Summery on the distribution of respondents by type of profession, gender and experience level

Following this based on the literatures and the research works which were reviewed, this research develop conceptual model by making STOPE framework as initial point. Due to flexible nature of the frame work additional variables are added, and 11 usable hypotheses is developed. Subsequent techniques of measurement model and Structural model, repeated tests have been made to see how the proposed model fits to the sample dataset. In relation to this, the measurement model reliability test, the indictor reliability test had made.

For the point of testing the conceptual model and corresponding hypotheses, evaluation of measurement model and structural model was performed. The result indicated that the measurement instrument was valid and reliable. Hence CR ($0.703 < CR < 0.88$), AVE ($0.547 < AVE < 0.777$), discriminate validity and outer loading values lied in acceptable range. Therefore the results are scientifically accepted. Additionally Convergent and Discriminate validity was also assessed to check how well the indicators were congregate to their construct and at the same time not indicating something else, so that all values are on the acceptable range and the measure model is scientifically valid and reliable.

	Average Variance Extracted (AVE)	Composite reliability
Awareness	0.791	0.88
ICT basic communication	0.701	0.70
ICT management	0.845	0.84
ICT support	0.356	0.74
Privacy	0.626	0.75
Resource and economy	0.511	0.78
Security	0.848	0.91
Skill and knowledge	0.621	0.76
Strategy	0.501	0.79
Training and education	0.741	0.89
E-health Readiness	0.995	0.92

Table 6.2 the summery of AVE and Composite reliability

In contrast the structural model assessment was done through Q^2 and R^2 measures. Basic Communication & Information Infrastructure, Awareness, Strategy, Resource and economy, security, training, IT support, skills and knowledge of employees, Management, and privacy had a significantly positive effect which the degree of explained variance ($R^2 = 0.869$ much more closest to one), predictive relevance result is on high level ($Q^2 = 0.345$), and Consequently, all indicators of the conceptual model except the knowledge domain forecast Readiness

assessment of Zewditu memorial hospital to implement E-health in effective manner. Therefore the model was acceptable.

Initially related hypothesis is generated, but after implementation of the path coefficient analysis of all sampled datasets, the final result makes the researcher to drop some of the hypothesis. As shown on table 6.1 the path coefficient of this research fall between -0.127 to 0.517 and the T statistics value are greater than 1.97. So that each identified factor in the model has either positive or negatively determine the readiness assessment of e-health. Except the skill and resource economy factors all have positive effects

Factors	Path coefficient (β)	T Statistics	Status
Strategy	0.517	3.597	Positive
ICT BCI	0.048	3.738	Positive
ICT support	0.467	4.738	Positive
Security	0.018	2.567	Positive
Management	0.034	3.544	Positive
Awareness	0.094	2.039	Positive
Training and education	0.280	2.920	Positive
Skill	-0.040	1.987	Negative
Resource and economy	-0.127	2.007	Negative
Privacy	0.078	2.987	Positive

Table 6.3 the positive and negative status based on the path coefficient and T-value

Based on their beta coefficient magnitude, these factors can be arranged from the highest to the lowest as: Strategy, ICT support, Training and education, Awareness, privacy, ICT BCI, ICT management, security, skill and resource, economy respectively.

6.2. Discussion in relation to hypothesis

Strategy related hypothesis

H1: Strategy determines the readiness to adopt and implement e-health at Zewditu memorial hospital.

The above table shows that, in relation with other strategy, has more positive relation with e-health readiness assessment at zewditu memorial hospital (the path coefficient=0.517 and the T-statistics =3.597). The result is closest to one so that it's possible to say that strategy can determine the readiness of e-health adoption at the area of zewditu memorial hospital. As many researchers shows that (Nguyen & Petersen, 2017), strategic planning is dominant with E-health implementation adoption. Additionally (Abera, Mengesha, & Musa, 2014) stated that strategy is highly related to e-health readiness in adoption and implementation of telemedicine,

ICT Basic Communication & Information Infrastructure related hypothesis

H2: ICT Basic Communication & Information Infrastructure determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

The ICT basic communication and information structure shows significant positive relationship with readiness assessment of Zewditu memorial hospital. Table6 shows that the beta coefficient and the T-statistics value are 0.048 and 3.738 respectively. So that basic communications and information infrastructure is one of the determinant factors for e-health adoption and implementation at zewditu memorial hospital. Therefore the more communication with or within the hospital increases they become ready to put into practice e-health technologies and be beneficiate from the merit. This finding helps the studies that are made by the previous researchers.

ICT Support related hypothesis

H3: ICT support determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

This hypothesis is designed and developed with the motivation that are made by (Sachs, 2000).The study shows that the he present of ICT experts with relevant degrees and access to ICT expert consultants have high impact on the adoption of the new technology. Current study

made empirical evidence with the help of path coefficient and T-statistics package of SMART PLS tool. From the experimental analysis the presence of ICT support positively affect readiness assessment of e-health at Zewditu memorial hospital (path coefficient= 0.467, T-statistics= 0.467). This tells that the current subdivision of Zewditu memorial hospital perceived the presence of support that are related to e-health technologies helps a lot in understanding and make them ready, not only adopting e-health but also implement electron health systems. This result highly supports what Sachs (2000) renowned. Therefore accelerate the readiness level at the study area.

Security related hypothesis

H4: Security issues determine the readiness to adopt and implement e-health in Zewditu memorial hospital.

The empirical result shows that Security is determinate significant factor for readiness of zewditu memorial hospital for implementation of e-health, (β =0.018, T-statistics=2.567). This explained that the security is one of the dominate factor for e-health readiness. Security is the most major concept for the health sectors. So that, if Zewditu memorial hospital perceives E-health technology is being more secured than other computing paradigms and if the security requirements with E-health could possibly addressable, the readiness of department for e-health will be enhanced. Security issue even if cloud providers believe that they can protect companies' data more securely than the companies themselves (Alam, 2018). This will highly support the study that is made by sallah and Janczwiki (2016) security is one of the biggest reasons for implementing or not implementing newly emerging technologies.

Management related hypothesis

H5: Management determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

This hypothesis is developed an initial concept of papagiannidis and Gangwar (2015) which states that the impact of top level management is one of consistence factor in influencing IT implementation. The top level management deep understanding on the importance and values of

e-health related is the major factor in readiness to implement new technologies. The result of this study show that this significant positive relationship between management and readiness of e-health. Due to this in we can conclude that there is high level of understanding the merits of the e-health technologies in the study areas. Most researches exposed the above results. For example (Nguyen & Petersen, 2017) strongly accepted top leave management have strong positive relationship with readiness.

ICT awareness related hypothesis

H6: ICT awareness determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

Awareness is found to be significant factor for E-health readiness ($\beta = 0.094$, T-statistics=2.039).As the result shows awareness is determinate factor for E-health readiness. This implies that ICT awareness could facilitate the readiness process of Zewditu memorial hospital., this study supported the research of Kesse-Tachi, Asmah, & Agbozo *et al.*,(2019) which noted the deficient in understanding of the importance of E-health and the low level of understanding about the importance of E-health technology are great hindrances to E-health adoption.

ICT training and education related hypothesis

H7: ICT training and education determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

This hypothesis was supported since the result shows that there is significant positive values within training and E-readiness (path coefficient= 0.280, T-statistics=2.920). This finding indicates that there is strong relationship between them. This result supports what (Abera et al., 2014) noted, E-health training (Health informatics) training programs at all level will ensure that health care professionals and management have considerate the role of ICTs in health and that qualified personnel are available to manage and operate E-health services.

Skills and knowledge of employees related hypothesis

H8: Skills and knowledge of employees determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

The result of this study showed a significant negative relationship between skill and E-health readiness of Zewditu memorial hospital ($\beta = -0.040$, T-statistics=1.987). As result shows, there is weak indirect relationship between them. This indicated that Skills and knowledge of employee's issues are not the promoters of E-health readiness at the area of Zewditu.

As to why Skills and knowledge of employees has a negative relationship with E-health readiness of Zewditu memorial hospital, the researcher offers a reason contradictory with Abera and Musa, 2014; Leulseged,(2017) who noted that, Prior to skill and knowledge of employs is the major factor for approval of new technology, organizations need to invest on employee's skill that enables its employees to acquire capacity on their tasks.

Resource and economy related hypothesis

H9: The resource and economy determines the readiness to adopt and implement e-health in Zewditu memorial hospital

Like the above described domain, the same is true for this variable. The study offers experimental evidence that IT resources negatively influence E-health readiness of Zewditu memorial hospital (path coefficient=-0.127, T-statistics= 2.007).The result shows that the amount of different resource that are found in Zewditu memorial hospital would not determine the implementation of E-health technology. In association with high IT resources are more familiar with the most recent IT and carry on with energetic IT trends (Hsu et al., 2014). This generally implies that the resource and economy of Zewditu hospital is at infant stage, this have strongly negative effect on the hospitals performance. Former studies show that resource and economy have significant positive relations. But this research comes with the negative results.

Privacy related hypothesis

H10: A privacy issue determines the readiness to adopt and implement e-health in Zewditu memorial hospital.

Privacy is the last hypothesis that is developed with an initial point of (Sahama, Simpson, & Lane, 2013) is. As the study elucidate economically advanced countries are spending much more financial resources on the technical aspect of e-health implementation but the privacy issue is one of the biggest challenges on the implementations process. With this motivation this research did an experimental investigation and come up with significantly positively results (path coefficient=0.078 and T-statistics of 2.987). As the result indicates the privacy issues and regulations are the most determinate factor of readiness e-health at Zewditu memorial hospital. This result supports what the previous studies explained earlier.

6.3. Discussion in relative to research questions

At the beginning of this study two major research questions are planned to be answered.

1. What is the status of Zewditu memorial hospital readiness for e-health implementation
2. What are the major factors that determine E-health adoption and implementation of zewditu memorial hospital readiness (strategy, technological, Organization, people and environmental factors)?

Question number one What is the status of Zewditu memorial hospital readiness for e-health implementation?

This question aims to answer the general status of ZMH hospital to implement e-health. To addresses the status the strategy, technological, organizational, people and environmental factors are assessed. As we can see from the survey questioner and interview results much more work expected for improving the readiness level within the hospital. The T-statistics and path coefficient values demonstrate that strategically ZMH have good status of readiness. The same is true for technological domain, relative to other domain (organization, people and environment domain) for instance the availability of well organized support personals the major strength of the hospital.

Moreover both the different staff groups and the medical directors show that there is good management support in the adoption and implementation of e-health technologies therefore the readiness level in terms of management support is in good manner but still needs more work.

On the other hand status of peoples in the direction of awareness (this is not only about the e-health technologies but also the basic capacity in using of the ICT infrastructures) should give serious attention and should work more works are expected since the status in infant stage. The hospital should come up with different strategic plan in training and empowering of stuffs. Continuous follow up also done to increase the skill of individuals and groups. Additionally the resource and economy from the environment domain is at infant stage therefore grave concentrations are expected.

Question number two What are the major factors that determine E-health adoption and implementation of zewditu memorial hospital readiness (strategy, technological, Organization, people and environmental factors)?

This question is answered on the previous section (title which states the discussion in relation to the research hypothesis). The major factors that highly affect the determination of e-health in the context of Zewditu hospital are; strategy, ICT support, ICT basic communication, Management support, privacy, Training and education, security, awareness, resource and economy and skill in increasing orders as below.

6.4. Conclusion

In this fast growing and fast changing digital era Information communication and technology has influenced all aspect of life. The e-health technology provides lots of merits to the health world. Tele pathology, Tele medicine, electronic record systems are the very well known worth that is provided by the health sectors. Nevertheless, because of the short of prose's, hospitals couldn't be sure whether they are ready or not or which factors encourage or hold back their readiness.

The major aim of this study is to assess the readiness level of Zewditu memorial hospital which is found in Addis Ababa, Ethiopia. This assessment is done by making STOPE framework as initial eyeglass. Different frameworks and theories are studied for making conceptual frameworks that helps to make an investigation on readiness. Due to flexible nature of STOPE framework some additional variables (security and privacy) are added as evaluation criteria. The entire domain on STOPE framework composed different sub domains. The study findings shows that all the general factors (except the knowledge domain) that are defined on this research are significantly (either positively or negatively) affects the readiness of health implementation at

zewditu memorial hospital. But as we compare to one another there is significant variation between them. As its expressed by the experimental results except the resource & economy domain and the skill domain which that hamper the readiness level at the zewditu memorial hospital, all of the other variables has found to be the facilitator for readiness intended for implementation process. Comparative to other variables the strategic domain is the major factor on promptness at zewditu memorial hospital. This implies that Zewditue memorial hospital have enhanced strategically readiness and preparedness toward adopting and implementing of e-health technologies as compared to the other domains. While all the other domains have low values. For instance the resource and economy domain is the nastiest of all of them have very weak relation with readiness. Therefore except for the strategic domain serious attention should be given for improvement of the readiness level at the study area.

This study has higher contribution on adding significant values for practctioners. Practically this study have higher values on helping of the Ethiopian governmental hospitals specifically ZMH to have effective implementation of resources during the implementation phase of e-health technologies. In other words it addressed the potential failures that are faced during the implementation of e-health. It also helps a lot to know more about the characteristics of employs, so that the hospital will have earliest planes on how to introduce new adopted e-health technologies. .

6.5. Recommendations

6.5.1. Recommendations for practitioners

The results that are conducted from this research have vital impact on having clear perceptive about the readiness level of Zeweditu memorial hospital towards e-health. Based on the research finding the following recommendations are given.

As the result shows strategy is the major factor for readiness of e-health at the specified area. Therefore the Ethiopian government minister of health should give more apprehension on aligning the strategy with the mission vision and goal of the Zewditu memorial hospital in order to improve and achieve the goal of E-health.

Moreover the finding of the result shows that support also the major determinate factor for the readiness of e-health in the context of ZMH. Consequently practitioner should give more

emphasis on using of educated personals with the deep experience level and with higher degree of motivation to help and train the newly adopted e-health technologies; In addition having clear understanding about on how to use international and national guidelines are the major influencing factor that needs more concern to enhance the readiness level of employs that are found at ZMH.

The next most important determinate factor is the understanding level of firms within the organizational domain. Once the hospital works on raising the acceptance level of management on the changes, it's exceedingly possible to make ready on the acceptance and implementations of the e-health technologies. Hence practitioners should give more focus on the empowerment of management. This conclusion is supported by other researchers that are concerned on the different topics (Nguyen & Petersen, 2017).

The privacy and security issue also the most important factors that hospitals should give more weight on the making all the systems to increase the capability of hospital performance on the above listed issues.

6.5.2. Recommendations for future studies

Various studies show that how both technology adoption and readiness assessments are at infant stage in developing countries like Ethiopia. Therefore much more researches are expected to carry out in the specified region.

On the other hand, due to the flexible nature of the STOPE framework this research adds some constraints like privacy and security. But addressing the security issues is not the main goal of the study therefore futures researchers should have more concern about the confidentiality, integrity and availability features of security in depth.

Due to time constraint the scope of this research is limited on specific hospital and areas. But it's possible to extend for many organizations to take a broad view.

On the other hand the future researchers recommended giving more emphasis on combining and integrating different models to come up with different results. This have vital role on addressing different factor. On this hardest time of covid 19 the ability of the technology adoption specifically e-health becomes the main recommended tool to get the service of health care centers. Therefore it's highly recommended to encourage technology adoption researchers on

every aspect of other technologies. More focuses should give for early implementation phases (readiness level) of technology adoption.

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Appendix A: Measurement items adapted from different source

Latent variables	Indicators	Items	Adopted from
Strategy	St1	My hospital has a clear articulated mission, vision about implementing e-health technology	(Abera and Musa, 2014; Negash, Leuleged and Musa, 2018)
	St2	My hospital policies are in place to promote and manage use of e-health in the organization	
	St3	The hospital provides plan, fund or any other support of e-health in your facility.	
	St4		
		My hospital has a direction, commitment and a future development plan for basic ICT and information infrastructure, e-service infrastructure, and ICT support to adopt e-health technology.	
	St5	Institutional policies are in place to promote and manage the use of e-health in your hospital.	
	St6	My hospital implement strategic plan related to ICT Provisioning/supply and support	
	St7	My hospital involves staff and other stakeholders in planning for the new technology e-health projects	
	St8	There is a plan that is needed and accessible by human resources for ICT awareness, education, and ICT Training to prepare readiness to adopt e-health.	
	St9	We feel it is a strategic necessity to use this technology to fill the gap of health related problems	
St10	In order to strengthen the capacity of ICT knowledge, the healthcare provider will be willing and Committed to accept additional responsibilities.		
Technology	T1	In what extent do you agree e-health is more advantageous than traditional health care system	(Abera and Musa, 2014; Negash, Leuleged and Musa, 2018)
	T2	Did the hospital have good internet quality?	
	T3	Using e-health would improve the effectiveness of my hospital operations and performance	(Nguyen & Petersen, 2017)
	T4	Speed of connections is appropriate ICT/Internet for the proposed use that operates in your facility	(Abera and Musa, 2014; Negash, Leuleged and Musa, 2018)
	T5	It is easy for my hospital to become skillful at using this technology	(Nguyen & Petersen, 2017)
	T6	Do you agree that your healthcare facility uses Internet for information exchange with another similar facility	(Abera and Musa, 2014; Negash, Leuleged and Musa, 2018)

	T7	Hardware and software required for the proposed project are readily available at your facility.	
	T8	In your health facility, the required ICT (telephone/internet/bandwidth) is easily available to adopt e-health	
	T9	In your healthcare facility, the required ICT (telephone/internet/bandwidth) is easily affordable to adopt e-health technology for the institutions involved.	
	T10	Availability of operations and maintenance persons will be a problem if e-health technology is adopted.	
	T11	Support is available within a reasonable time frame for the proposed use	
Security	SK12	In your health care facility the security capabilities or options that are strong enough to adopt this technology	(Nguyen & Petersen, 2017)
	SK13	It is easy for my company to integrate security policies for this technology	
Organization	O1	My hospital level of agreement with the legal framework of IT for e-health	(Abera, Mengesha, & Musa, 2014)
	O2	Top management supports e-health projects or initiatives	
	O3	Top management support is important to provide the resources for my hospital to adopt this technology	(Nguyen & Petersen, 2017)
	O4	E-health software keeps patient data from being abused	(Leulseged, 2017; Negash, Leuleged and Musa, 2018)
	O5	Your facility has high bandwidth connectivity to the Internet to speed up downloading and attaching files	(Abera, Mengesha, & Musa, 2014)
	O6	As far as you know, does information exchange between your facility and other health facilities exist	
	O7	My facility allocates enough budget to e-health projects	
People	P1	Our employees have basic knowledge about e-health adoption	(Nguyen & Petersen, 2017)
	P2	Awareness of ICT and Internet's role in e-health in the organization exists among the planners.	
	P3	Your facility propose training for the proposed project	
	P4	My hospital has technical, business and managerial skills on the use of technological innovation	
	P5	What quality level do you think the training and education for ICT has at your hospital?	

	P6	My organization has programs in place to train the users to create awareness before implementing new technologies like e-health	(Abera, Mengesha, & Musa, 2014)
	P7	Do you believe that policy makers, government officials, and healthcare providers prefer e-health to Improve the shortage of healthcare providers?	
Environment	E1	Your hospital communicate with other health facility electronically	
	E2	Currently ICT is used for memorials between this institution and other healthcare institutions advantage	
	E3	A memorial system is available between this institution and other healthcare institutions to provide patient care in certain specialties	
	E4	Do you believe in science- and technology-sponsored e-health technology	
	E5	The hospital covers international training expenses.	
	E6	The technology infrastructure of commercial and financial institutions is capable of supporting e-health.	(Abera, Mengesha, & Musa, 2014)
	E7	Do you agree that there have been organizational efforts to cover the cost of e-health technology	
	E8	The relevant material is available in language easily understood by all the staff and other users of information.	
	E9	The health facility healthcare provider has been influenced by culture to accept e-health technology.	
Privacy	PR1	We believe there are effective laws to protect consumer privacy	(Nguyen & Petersen, 2017)
	PR2	It is not difficult for my hospital to protect privacy for e-health implementation	
E-health readiness	R1	In the context of strategy support for e-health we are ready	(Salifu, 2017)
	R2	In the context of technology support for e-health we are ready	
	R3	In the context of management support for e-health we are ready	

R4	In the context of people support for e-health we are ready	
R5	In the context of environment support for e-health we are ready	

Appendix B: Survey Questioner

Dear Sir/Madam:

My Name is Bitaniya Alayu. I am a postgraduate student of Addis Ababa University in information system program. I want to study the research thesis project on readiness of health facility to adopt e-health in Zewditu memorial hospital. The research is undertaken as academic requirements of partial fulfillment of the requirements for the Degree of Master of Science in Information System.

The significant and the purpose of readiness assessment are to evaluate preparedness of each organizational component. This process can lead to the correct decision making.

Among others, I have collect relevant data for the purpose. One way to address this purpose is to make questioner survey. The questioner is framed and directed towards the strategy, Technology, Organization, People and Environment point of view. You have been selected for the study due to the assumption of your involvement in the health care related technologies. I do sincerely hope that you take the time to answer all questions, and do so honestly.

Your name, address, and other personal information should not be written on this questionnaire. Your responses to this questionnaire will be used for this research purpose only. It will not be used for other research, even if it is somewhat related to other kinds of research. You can stop at any time during the interview or complete self-administered questionnaire. While your cooperation in answering every question will help us understand important questions with regards to e-health readiness, you are not obligated to answer every question.

Thank you in advance for your kind collaboration and dedicating your time. If you have any inquiry, please feel free and contact me at bitaalyu3@gmail.com or 0912492429

Yours sincerely
Bitaniya Alayu

QUESTIONNARIE

Demographic information

Please answer the correct answer by putting the circle mark

1. What is the respondent’s age?

- A) 20–25 B) 26–35 C) 36–45 D) Above 45 years

2. Gender

- A) Male B) Female

3. What is your profession in the Zewditu memorial hospital?

4. Year of service by the profession at this hospital _____

Likert scale numbers range from 1-5 denote as follow 1= strongly agree 2= agree
3=uncertain 4= disagree 5= strongly disagree

Part one: The following statements and questions are intended to measure the extent to which the **Strategy readiness** of Zewditu memorial hospital on e-health adoption.

01 Strategy						
q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	My hospital has a clear articulated mission, vision about implementing e-health technology					
2.	My hospital policies are in place to promote and manage use of e-health in the organization					
3.	The hospital provides plan, fund or any other support of e-health in your facility.					

4.	My hospital has a direction, commitment and a future development plan for basic ICT and information infrastructure, e-service infrastructure, and ICT support to adopt e-health technology.					
5.	In planning for the new e-health project, the implementation plan includes proper budgeting and Identification of resources.					
6.	Institutional policies are in place to promote and manage the use of e-health in your hospital.					
7.	My hospital implement strategic plan related to ICT Provisioning/supply and support					
8.	My hospital involves staff and other stakeholders in planning for the new technology e-health projects					
9.	There is a plan that is needed and accessible by human resources for ICT awareness, education, and ICT Training to prepare readiness to adopt e-health.					
10.	We feel it is a strategic necessity to use this technology to fill the gap of health related problems					
11.	In order to strengthen the capacity of ICT knowledge , the healthcare provider will be willing and Committed to accept additional responsibilities.					

The following statements and questions are intended to measure the extent to which you and your organization are technically ready for e-health. Please answer the following infrastructure related question by putting tick sign (√).

02 Technology (infrastructure related questions)				
q.no	Questions	Yes	No	Have no idea
7.	Do you have computer in your hospital			
8.	If yes for the above question do you use it for your job?			
9.	Do you have any training that is related to the computer usage?			
10.	Do you use the computers other than the health services?			
11.	Do you have internet connection on your organization (hospital)?			
12.	If yes for the above question do you use the internet service?			
13.	Did the hospital have website?			
14.	Do you think the hospital is ready to adopt e-health?			

02 Technology						
q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	In what extent do you agree e-health is more advantageous than traditional health care system					
2.	Did the hospital have good internet quality?					
3.	Using e-health would improve the effectiveness of my hospital operations and performance					
4.	Speed of connections is appropriate ICT/Internet for the proposed use that operates in your facility					
5.	It is easy for my hospital to become skillful at using this technology					
6.	Do you agree that your healthcare facility uses Internet for information exchange with another similar Facility?					
7.	Hardware and software required for the proposed project are readily available at your facility					
8.	In your health facility, the required ICT (telephone/internet/bandwidth) is easily available to adopt e-health					
9.	In your healthcare facility, the required ICT (telephone/internet/bandwidth) is easily affordable to adopt e-health technology for the institutions involved.					
10.	Availability of operations and maintenance persons will be a problem if e-health technology is adopted					
11.	Support is available within a reasonable time frame for the proposed use					
12.	In your health care facility the security capabilities or options that are strong enough to adopt this technology					
13.	It is easy for my hospital to integrate security policies for this technology					

The following statement and questions are planned to measure the degree to which the **organizational readiness** of Zewditu memorial hospital impact on e-health implementation. Please select the correct answer by putting tick sign (√) on the scale ranging strongly agree through Strongly Disagree in the appropriate space provided.

03 Organization						
q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	My hospital level of agreement with the legal framework of IT for e-health					
2.	Top management supports e-health projects or initiatives					

3.	Top management support is important to provide the resources for my hospital to adopt this technology					
4.	E-health software keeps patient data from being abused					
5.	Your facility has high bandwidth connectivity to the Internet to speed up downloading and attaching files					
6.	As far as you know, does information exchange between your facility and other health facilities exist?					
7.	My facility allocates enough budget to e-health projects					

The following statements and questions are proposed to measure the degree to which the People readiness of Zewditu memorial hospital in e-health adoption and implementation.

04 People						
q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	Our employees have basic knowledge about e-health adoption					
2	Awareness of ICT and Internet's role in e-health in the organization exists among the planners.					
3	Our IT employees have the skills and knowledge to manage E-health projects					
4	Your facility propose training for the proposed project					
5	My hospital has technical, business and managerial skills on the use of technological innovation					
6	What quality level do you think the training and education for ICT has at your hospital?					
7	My organization has programs in place to train the users to create awareness before implementing new technologies like e-health					
8	Do you believe that policy makers, government officials , and healthcare providers prefer e-health to Improve the shortage of healthcare providers?					

The following statements and questions are planned to measure the extent to which external factors affect environment readiness of Zewditu memorial hospital in e-health adoption and implementation.

05 Environment						
q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	Your hospital communicate with other health facility electronically					

2.	Currently ICT is used for memorials between this institution and other healthcare institutions					
3.	A memorial system is available between this institution and other healthcare institutions to provide patient care in certain specialties					
4.	Do you believe in science- and technology-sponsored e-health technology?					
5.	The hospital covers international training expenses.					
6.	The technology infrastructure of commercial and financial institutions is capable of supporting e-health					
7.	Do you agree that there have been organizational efforts to cover the cost of e-health technology					
8.	The relevant material is available in language easily understood by all the staff and other users of information.					
9.	The health facility healthcare provider has been influenced by culture to accept e-health technology.					
10.	We believe there are effective laws to protect consumer privacy					
11.	It is not difficult for my hospital to protect privacy for e-health implementation					

E-health readiness

q.no	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	In the context of strategic support we are ready to implement e-health					
2.	In the context of technology support we are ready to implement e-health					
3.	In the context of management support we are ready to implement e-health					
4.	In the context of good awareness, training and skill we are ready to implement e-health					
5.	In the context of environment support we are ready to implement e-health					

Appendix C: Interview questions that are prepared for Management

1. How do you understand e-health on your context?
2. Do you think e-health technologies are important in helping of healthcare services?
3. Did the hospital have clear policies to promote e-health?
4. How do you evaluate the training in accordance with the technology, and how do you explain the performance of trainers?
5. How do you explain the financial support of the government to implement e-health?
6. As medical director (manger) how do you evaluate the preparedness of your staffs

for implementing e-health?

7. What are the major challenges that you face during implementing of ICT projects?

Thank you in advance

Appendix D: Letter of cooperation from AAU to all whom it concern

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Addis Ababa University
College of Natural Science
School of Information Science

Date: February 5, 2020

Ref No. SIS/42/2020/2012

To whom it may Concern

Subject:- Student Bitaniya Alayu Abera

Dear Sir /Madam,

Student Bitaniya Alayu Abera (ID.No GSE/4422/11) is graduate student at the School of Information System, Addis Ababa University. He is currently conducting a MSc. Thesis research under the title “Readiness Assessment of Black lion Hospital to Adopt E-health”.

I would like to thank you in advanced for all the assistance that you would provide to the student.

With Regards

Tibebe Beshah (PhD)
Head, School of Information Science



☒: 1176

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Appendix E: Logo of Zewditu memorial hospital

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ZEW DITU
MEMORIAL HOSPITAL

#StayHomeSaveLives



