# A MODEL FOR USER REQUIREMENT PERSPECTIVE ON THE SUCCESS OF THE HEALTH INFORMATION SYSTEM (HIS): THE CASE OF YEMEN

EBRAHIM ABDULWASEA ABDULLAH GHALEB



DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF INFORMATION SYSTEM

FACULTY OF INFORMATION SCIENCE AND TECHNOLOGY
UNIVERSITI KEBANGSAAN MALAYSIA
BANGI

2018

# MODEL PERSPEKTIF KEPERLUAN PENGGUNA KE ATAS KEJAYAAN SISTEM MAKLUMAT KESIHATAN (SMK): SEBUAH KES DI YAMAN.

EBRAHIM ABDULWASEA ABDULLAH GHALEB



DISERTASI YANG DIKEMUKAKAN UNTUK MEMENUHI SEBAHAGIAN
DARIPADA SYARAT MEMPEROLEH
IJAZAH SARJANA SISTEM MAKLUMAT

FAKULTI TEKNOLOGI DAN SAINS MAKLUMAT
UNIVERSITI KEBANGSAAN MALAYSIA
BANGI

2018

**DECLARATION**

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

23 July 2018

EBRAHIM ABDULWASEA
P75854

## ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and Most Merciful. All praises are to Allah for the strengths and His blessings to me in completing this thesis.

I would like to express my sincere gratitude to my supervisor, Dr. Ibrahim Mohamed for his guidance and support throughout this work. He has been a great source of inspiration to me. No words can express how grateful I am to him.

I am also grateful to my father, Abdulwasea Abdullah Ghaleb , and also all my uncles and cousins. Besides that, my mother, my brother and my sister too have always been extremely supportive of me. All I can say is that it would take another thesis to express my deep affection and gratitude for my family. Their prayers, patience, sacrifice, love, and encouragement have upheld my conviction towards pursuing this course.

Last but not least, to all my dear friends who have contributed either directly or indirectly to the success of this work, I thank you for everything. I would also like to thank all the members (lecturers and staff) of the Faculty of Information Science and Technology, the National University of Malaysia for their valuable support and warm friendship.

## ABSTRACT

Health information system (HIS), despite its importance for a secure access to patients' vital medical information among doctors, nurses, pharmacists, other healthcare providers, and the patients themselves, is still in its infancy in the developing countries. A number of barriers have been identified as the root cause of the problem, the most challenging of which is the lack of user requirements. Generally, the previous studies on HIS have not taken into account the factor of user requirements. Furthermore, to date, there is no comprehensive model available for the success of HIS, which takes the impact of user requirements factor in the developing countries into consideration. Thus, the present study addresses this gap by exploring the influence of user requirements factor on HIS in Yemen. The study, which is an extension of the Deleon's model and the Mclean's model, has included the user requirements factor in increasing the success level of the models to a greater height. By using the quantitative method, the data were collected and analysed concurrently. A copy each of the self-administered structured questionnaire was distributed to a total of 250 employees, under HIS departments in seven hospitals in Sanaa, Yemen, to examine their user needs and user requirements towards the success of HIS that influence user requirements for the same purpose. After being returned, the 200 questionnaires were manually examined and it was found that twenty (20) copies were incomplete. The data collected from a total of 180 returned questionnaires were then analysed using the SPSS statistical tool and AMOS. Specifically, the study used the descriptive data analysis as well as factor analysis. Structural equation modelling (SEM) using AMOS was used to validate the developed research model. The results from the quantitative data analysis reveal that the factors of health information quality and HIS users have influenced the employees' intention in using HIS. The results show that all of the goodness of fit indices of the model have met the recommended values, which suggests that the proposed model is acceptable. Thus, the results of the study have confirmed the Deleon and Mclean's results, which contribute towards enriching our understanding of the influence of user requirements on the success of HIS. It is anticipated that the developed model could be utilised for the successful implementation of HIS in Yemen.

# ABSTRAK

Sistem maklumat kesihatan adalah satu sistem yang penting dalam mendapatkan akses yang selamat terhadap maklumat perubatan pesakit bagi rujukan doktor, jururawat, ahli farmasi, pihak penyedia kemudahan kesihatan serta kegunaan pesakit sendiri. Walau bagaimanapun, bagi negara-negara membangun, sistem ini masih berada di peringkat awal. Terdapat beberapa halangan yang telah dikenalpasti sebagai punca masalah ini dan yang paling mencabar antaranya ialah kekurangan keperluan pengguna. Secara amnya, kajian terdahulu mengenai sistem maklumat kesihatan tidak mengambil kira faktor keperluan pengguna. Tambahan pula, sehingga kini masih tidak terdapat model komprehensif yang disediakan bagi kejayaan sistem maklumat kesihatan yang mengambil kira impak faktor keperluan pengguna di negara-negara membangun. Oleh itu, kajian ini menangani jurang yang wujud dengan melakukan kajian yang lebih teliti terhadap faktor-faktor yang mempengaruhi keperluan pengguna terhadap sistem maklumat kesihatan di Yaman. Kajian ini adalah lanjutan daripada model Deleon dan model Mclean dan faktor keperluan pengguna telah dimasukkan bagi meningkatkan tahap kejayaan model ini ke tahap yang lebih tinggi. Dengan menggunakan kaedah kuantitatif, data telah dikumpulkan dan dianalisis secara serentak. Satu salinan soalselidik berstruktur yang ditadbir sendiri telah diedarkan kepada 250 pekerja di bawah jabatan Sistem Maklumat Kesihatan di tujuh hospital di Sanaa, Yaman, bagi mengkaji keperluan dan kehendak pengguna terhadap kejayaan sistem maklumat kesihatan. Sebanyak 200 soalselidik yang dikumpul telah diuji secara manual melalui pemerhatian, dan terdapat 20 soalselidik yang tidak dilengkapkan dengan sempurna. Data yang diperolehi daripada sejumlah 180 soalselidik yang dikembalikan dianalisis menggunakan perisian SPSS dan AMOS. Khususnya, kajian ini menggunakan analisis data deskriptif dan analisis faktor. Model persamaan berstruktur (SEM) menggunakan AMOS telah digunakan bagi mengesahkan model kajian yang telah dibangunkan. Hasil daripada analisis data kuantitatif, didapati bahawa kualiti maklumat kesihatan dan faktor pengguna sistem maklumat kesihatan telah mempengaruhi niat pekerja dalam menggunakan sistem maklumat kesihatan. Hasil kajian menunjukkan bahawa semua indeks ketepatan padanan model ini memenuhi nilai yang dicadangkan, dan mencadangkan bahawa model yang dibangunkan ini adalah boleh diterima. Oleh itu, hasil kajian ini mengesahkan keputusan daripada kajian Deleon dan Mclean, yang menyumbang ke arah memperkaya pemahaman kita tentang pengaruh keperluan pengguna bagi kejayaan sistem maklumat kesihatan. Adalah dijangkakan bahawa model yang dibangunkan ini dapat digunakan bagi kejayaan pelaksanaan sistem maklumat kesihatan di Yaman.

**TABLE OF CONTENTS** **Page**

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF ABBREVIATIONS AND SYMBOLS

| | |
|---|---|
| AHP | Analytical Hierarchy Process |
| AMOS | And Analysis of Moment Structure |
| BPRE | Business Process Re-Engineering |
| CDSS | Clinical Decision Support Systems |
| CFA | Confirmatory Factor Analysis |
| CFI | Comparative Fit Index |
| CIS | Clinical Information System |
| CPOE | Computerized Provider Order Entry System |
| CRS | Clinical Reminder System |
| CSF | Critical Success Factor |
| DF | Degree of Freedom |
| DSS | Decision Support System |
| EFA | Exploratory Factor Analysis |
| EMR | Electronic Medical Record |
| ERP | Enterprise Resource Planning |
| FR | Functional Requirements |
| HDDU | Healthcare Data Demand And Use |
| HER | Health Electronic Record |
| HIE | Health Information Exchange |
| HIPAA | Health Insurance Portability and Accountability Act |
| HIS | Health Information System |
| HISQ | Health Information System Quality |
| HISU | Health Information System User |
| HMN | Health Metrics Network |
| IEEE | Institute of Electrical and Electronics Engineers |
| IFI | Incremental Index of Fix |
| IQ | Information Quality |
| IS | Information System |
| IT | Information Technology |
| IU | Intention to use |
| KMO | Kaiser Meyer Olkin |
| LIS | Laboratory Information System |
| MOPHP | Ministry of Public Health and Population |
| NB | Net Benefits |

| | |
|---|---|
| NFR | Non Functional Requirements |
| NIS | Nursing Information System |
| PACS | Picture Archiving And Communication System |
| PIS | Pharmacy Information System |
| QFD | Quality Function Deployment |
| RIS | Radiology Information System |
| RMSEA | Root Mean Square Error of Approximation |
| SEM | Structural Equation Modeling |
| SPSS | Statistical Package for the Social Sciences |
| SQ | System Quality |
| SRQ | Service Quality |
| TLIT | Tucker-Lewis Index Tile |
| UAB | User Advisory Board |
| UCD | User-Cantered Design |
| UN | User Need |
| UR | User Requirements |
| URL | User Requirements Document |
| US | User Satisfaction |

# CHAPTER I

# INTRODUCTION

## 1.1 INTRODUCTION

Recently, health information system (HIS) has raised great concern among researchers in improving its quality, efficiency, and outcome. Furthermore, it helps to reduce the cost of the healthcare service (Ahmad et al. 2014). In health organisations, the execution of HIS is inevitable due to various brokerage and domination factors involving organisations, people, and technology. As a result, HIS has created some critical parts of information technology infrastructure owing to the sensitivity and nature of the data processed through the time, especially that which is related to the treatment history, as well as the medical record of the patients (Kester et al. 2015).

Bearing this in mind, the concept of success and failure in the integration of the information system (IS) represents a challenging task in defining and measuring the success of HIS due to different interpretations of such concepts by different people (Babbie 2015). Success, however, is considered as a vital key element in any effort to foresee the future of a given project. Although the failure of information technology (IT) projects is claimed to be widespread, yet there has been no unified definition of the concept of success and failure among the earlier researchers (Thomas & Fernández 2008). The challenges in defining and measuring success rest in its differently interpreted meanings by different people. Busi et al. (2011) for instance, raised the argument that there are diverse factors that are assumed to have contributed to the success or failure of a given project. They also added that there have been different criteria as the contributors to such success and failure. Other researchers such as Maguire and Bevan (2002) on the other hand, pointed out that the ascription of being either successful or a failure is considered a community accomplishment that is reliant on the viewpoint of the subject.

Therefore, user requirements underlie the requisites of the people who are going to use a given system, or what is known as the end-users. System requirements consist of the requirements of other users and those without an identifiable human source which normally results from the intersection of various environments (i.e. technical, cultural and social). Unfortunately, user requirements are not easy to achieve (Teixeira et al. 2012). They are known as what the product or service should perform (Wysocki 2011).They can be high and general, and they are ruled out by the case in which such requirements are investigated (Pohl 2010). Functional requirements on the other hand, can be defined as the services that the system is expected to offer to the users (Sommerville 2011).

User requirements have the target of capturing some preferred behaviours among those captured by the functional requirements (Bo et al. 2007). Therefore, user requirements can lead to people's discovery of new functional requirements which can play a crucial role in the success of program projects (Mairiza et al. 2014). This is because, such requirements dwell with information on the essential issue of software quality, and they are also considered as operational qualifications. Besides that, user requirements are imposed by the environment in which the system should operate (Pohl 2010).

Since the role of user requirements is vital, it is crucial to identify the requirements which can be adapted as early as possible. Furthermore, previous experience has proven that many programming systems still suffer from some natural conflicts among such requirements. It is also verified that resolution strategies for handling such requirement conflicts often bring a change in the overall design of the guidelines, not by simply altering one module. Therefore, when it comes to the development of any software system, it is crucial for the software developers to make certain that they study such requirements in advance. This is to enable them to make decisions about the alternative design solutions (Mairiza et al. 2014).

With regard to this, the integral part of design is the understanding of user requirements since its importance is undeniable in making any reactive system successful. The organisation system focuses on things that a system must perform while

the second concept throws the limelight on the functions of a system such as the inputs and ensuing outputs (Maguire & Bevan 2002).

Regarding the IS in the health units, it is one of the most successful components of the overall health development. Thus, an appropriate and comprehensive IS is a vital component of the overall HIS improvement in acquiring nations (Lippeveld et al. 2000). This system (i.e. HIS), generally deals with the information of the patients obtained from the patients' records, health plan, surveys, healthcare service and a variety of other data sources in the health sector (Sengul 2013). There have been several strategies such as the National Information Technology Centre, Rural Internet Centre, Rural Info Centre and Universal Services Provider to support and lift the usage of ICT among the rural citizens (Samah et al. 2011). However, the advantages of adopting ICT in the healthcare service is even more significant whrer the Yemen population growth rate will remain high in the next 20 years. This is because,This is because, in compation to the slow economic growh, resulting in yemen pupulation being young but poor. Thus, it is expected that the increased effort by the government in offering and providing huge healthcare services to the society in the future will become a more pressing issue (Lee et al. 2012). Moreover, in comparison to other countries, Yemen is still a relatively scant country in relation to its use of computers and the internet (Al-Wazir & Zheng 2012). Thus, Yemen still needs to overcome a set of problems connected to the lack of best practices in implementing HIS in the organisations. This includes the international process for improving the standards such as the Capability Maturity Framework Integration because of its capability in systematically identifying their strengths and weaknesses. On the other hand, the lack of execution in the corporations and organisations will make them unable to assess their weaknesses and strengths efficiently and this would influence the effectiveness of the healthcare service (Nasir & Sahibuddin 2011).

Since information systems are usually advancing and costly, determining the factors that affect the success of these systems must be recognized (Al-adaileh 2009). Based on such previous research, there has been a constant debate regarding a set of suitable variables which can determine the users adoption of information system. The influence on IS projects is the contributor to the deployment of ICT. Initially, this

implies that there should be a long-term vision for improving such performance of the IT teams and staff in the Yemen health units.

## 1.2 BACKGROUND OF THE STUDY

Yemen as one of the Arab developing nations is situated at the southern area of the Arab Peninsular in the north. It is bounded in the north by Saudi Arabia, the Arabian Sea and Gulf of Aden in the south, Red Sea in the west and by the State of Oman in the east. The total area is estimated to be approximately 527,970 square kilometres, and it has a total population of around 25,235,000 people (Al-Fadhli et al. 2015). 75.5% of the population live in the rural areas (Nations 2012). Arabic is the official language of Yemen and over 90% of the population has Islam as the official religion. However, Judaism, Christianity, and Hinduism exist in small minorities (Penney 2000). The predominant ethnic group in Yemen is the Arabs, while the other groups include the Afro-Arab, South Asians and Europeans. Yemen consists of 21 administrative and geographical units which are called governorates or provinces. However, Yemen still faces multi-dimensional challenges in continuing to achieve the Millennium Development Goals. The current political, economic and social systems in Yemen are not stable. This lack of stability restricts the opportunity for the Yemeni government in enhancing its delivery and provision of services to its citizens. With regard to ICT as a medium in enhancing the delivery of the services, Yemen still lags seriously behind other countries in the region. It is reported that the rank of the telecommunication infrastructure in Yemen is lower than that of other countries in the same region (Bilbao-Osorio et al. 2013).



There is a prevalent perception that majority of the national and sub-national HIS are not able to provide information reinforcement needed for intervention in areas of planning and evidence-based health (Kaduruwane 2012). Moreover, the role of information in lending support to HIS in Yemen started from a basic statistical reporting system through an ICT-enabled Health Information Management System (Saleh et al. 2014). The constitution of many countries including Yemen emphasises on the role played by the government in guaranteeing the provision of healthcare as a right for the free healthcare service. The building blocks that materialise the implementation of such system are the development of HIS standards and a mechanism for using such standards.

The legislative support deemed necessary to enable a wider adoption by all stakeholders is vital in implementing such systems effectively. The IS technology is able to enhance the quality, efficiency and outcome of the system, to secure the safety of the affected people, and to lower the costs of healthcare. In spite of this, Ahlan and Ahmad (2014), stated that there is nonetheless an absence of HIS, especially in the developing countries and there is scarce literature exploring the acceptance of the end-users towards HIS. These limitations should be addressed when looking at the elements which will affect the users' approval of these methods. Moreover, the elements must be considered while developing the systems.

The user requirements terms of failure in IT projects are still being confronted with or challenged by several problems that originate from the sophisticated and changing nature of the domain. The rates of failure of IT projects have been reported as high by several researchers (Abu-Shanab & Al-Saggar 2013). As stated by Shore (2008), it is important to comprehend some early warning signs in the project as this can lead to actions that may elevate the chances of the project being deemed successful rather than a failure. It has also been argued that user requirements are important in measuring the success of HIS (Ajami & Mohammadi-Bertiani 2013).



### 1.3 PROBLEM STATEMENT

HIS is described as a very difficult task to perform (Adler-Milstein & Bates 2010; Cline & Luiz 2013; Sittig & Singh 2015; Parwani 2016). While there are evident and potential benefits of the use of technical innovations in healthcare services, yet there are also considerable risks (Lewis et al. 2012). It has been mentioned in the literature that the application of HIS in the developing countries, either partially or fully, has failed to meet or achieve the main objectives (Isabalija et al. 2011; Mukred et al. 2013). Frequently, technological companies in the health domain would belittle its complexity and dismiss the assumption that if something has been successful in another domain, then it can also be achieved in the health domain (Lewis et al. 2012). Considering the high rate of failure and the very visible and often politically embarrassing failure of a lot of ICT health projects, health systems on the other hand are very distinguishable from other IS environments due to their complexity, their lack of A single owner and they being hyper turbulent and information-sensitive (Estrin & Sim 2010). As a result

of this, many Health Information systems represent more specialised independent systems which are combined with one another (Ismail et al. 2010; Amin et al. 2011). It is stated by Grossmann et al. (2011) that HIS failures may lead to a slow progress or may even inhibit the advancement and also the improvement of solutions ready for overcoming failures and impediments of the system.

There is a universal understanding that successful systems and products can only be achieved by understanding their user needs and requirements (Maguire & Bevan 2002). In addition, it is worth mentioning that expanding the understanding of the system requirements and interest among the users are essential in guaranteeing such desired success (Ismail et al. 2012). These user requirements, as the integral part of the IS design, are critical in the accomplishment of interactive systems. However, the challenge lies in the specification of these needs and requirements. With regard to this matter, at present only a few studies have been carried out to gauge the satisfaction level of HIS users (Amin et al. 2011). Teixeira et al. (2012) argued that the lack of human considerations such as in the issue of the end-user requirements is among the issues that can well explain the failure of the implementation of IS in HIS. A research conducted by Ismail et al. (2010) indicated that addressing the expectations of user requirements is a distinct element which ascertains the success of HIS. However, there are still several issues that need to be addressed (Hayajneh & Zaghloul 2012; Ismail et al. 2012; Lin et al. 2012; Palvia et al. 2012; Nambisan et al. 2013; Karuri et al. 2014).

With reference to the above-mentioned problem statement, there is still a need for a framework on the user requirements of HIS in the developing countries to be proposed. According to Ahlan and Ahmad (2014), the identified issues which need to be addressed include the absence of accessibility to these methods, particularly in developing countries such as Yemen, as well as the inadequate work on the end-users' acceptance of HIS. These Limitations could be overcome when the researchers study the elements which influence the person approval of these system, and then consider those factors while developing the system.

As a conclusion, literature of the previous works related to IS has emphasised on the importance of user requirements in HIS. However, the cutting edge of these problems is the rarity of studies concentrating on the impact of the IS success factors

on user needs and user requirements in HIS. User requirements represent an IS that comprises of the capabilities of the users in working with the system. User requirements consist of information which the system developers must include in any application to help the users to perform specific tasks. Thus, in the context of the current study, user requirements will be defined as what the system should do and what the system components are. They are the actions that the product must perform. In other words, user requirements could be defined as the services that the system is expected to offer. There are initiatives made from the perspective of the users of HIS which are based on the success model of IS (Delone & McLean 2003).

The user requirements are derived from the review of the previous literature. In order to assure the initiative success of HIS, it is fundamental for the perspective of the users towards HIS to be developed. Thus, it is the users' duty to initially ensure a remarkable development of the health units in advance of the work campaigns. They also need to introduce selective services that comply with the requirements of the users, to assure the use of the development of user-friendly interfaces and to focus on the factors that affect the users of HIS.

Therefore, the final issue involves the lack of studies that empirically explore the aspect of user requirements in the health units. There has been a call for further studies to investigate how user requirements influence HIS. Therefore, the current research aims to recognise the main factors that impact the success of IS in the health organisations of Yemen by addressing their user requirements. This is achieved by adding the factor of user needs to the HIS success model (Moohebat et al. 2011).

Based on the existing literature, Figure 1.1 has been designed to illustrate the problem statement in a clear and simple manner. Thus, further research effort is needed in developing a new factor of HIS quality model in enhancing user needs and user requirements based on the three aspects discussed below.

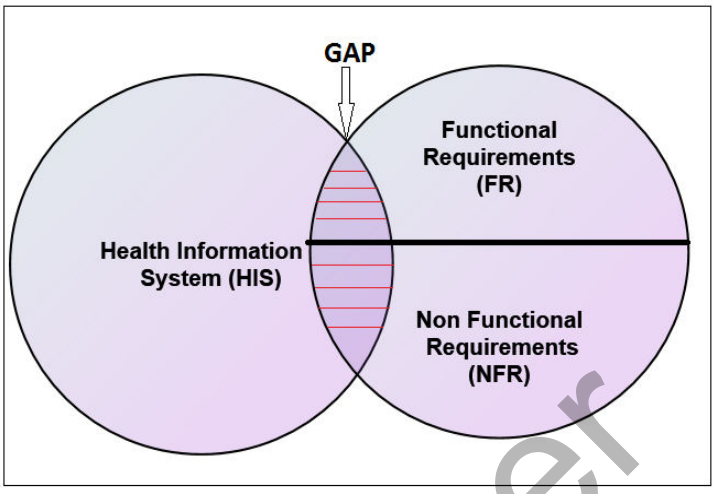


Figure 1.1 Illustration of the problem statement.

This study attempts to harness the factor of user requirements in HIS, which consists of several aspects. The first aspect is represented by the limited factors that affect the success of user requirements in the success of IS in HIS. The second aspect, according to Ahlan and Ahmad (2014), is the lack of previous studies which integrate between these three areas of research, which are the Functional Requirements (FR), the Non Functional Requirements (NFR) and the Health Information System (HIS) (Al-Ghaithi et al. 2009). The third aspect is the limitation of studies which deal with the quality of HIS in terms of its intention to use, service quality, information quality, system quality, user satisfaction and information quality (Delone & McLean 2003). Therefore, the current study aim to identify the major factors that effect the success of IS in health organisation of Yemen by addressing the Health information system quality by adding health information system users to the HIS success model.needs.



## 1.4 RESEARCH OBJECTIVES

1: To examine the effects of the health information system quality on the health information system users in Sana'a, Yemen.

2: To propose a model which examines the quality of the health information system among the health information system users in Sana'a, Yemen.

## 1.5 RESEARCH QUESTIONS

RQ1: Does the quality of the health information system have a positive effect on the users of the health information system in Sanaa, Yemen.

RQ2: Can a model for the health information system quality of the health information system users be proposed.

## 1.6 RESEARCH SCOPE

The scope of the study is a general outline of what the study would cover. It defines the methods and tools that assist in conducting the study (Carroll et al. 2011). This study aims to propose for new user requirements in HIS quality model for enhancing user requirements and user needs. Another broader scope definition of the research includes the proposal of a pragmatic framework for end-user requirements of IS in the health units of the Sanaa Province, Yemen. The present study attempts to address several issues with regard to end-user requirements and to propose solutions that may contribute to the success of IS. Specifically, the study is focused on aspects involving the end-users, as well as the user requirements and user needs for the IS. The study will propose a framework for user requirements and will select the health units during the user requirements of IS in the Sanaa Province of Yemen. It uses the quantitative research methodology by utilising the survey questionnaire in collecting the data. The study uses the SPSS.VS. 22.0 to analyse the data and to harness the Structural Equation Modeling (SEM) in developing and verifying the proposed model.



## 1.7 SIGNIFICANCE OF THE STUDY

The current analysis recognises the importance of going outside of the traditional issues by determining the user needs and user requirements of IS in the health units. The study looks at the process of organisational implementation and the international improvement of the process by proposing an IT implementation framework based on the understanding of user requirements as an integral part of IS. This study is significant since it will identify the end-user requirements factor of the health units of the Sanaa Province, Yemen as a case study in which the information will likely be collected from

the field. In addition, this particular study will also provide new insights on the information to improve the IT/IS project implementation by improving the user requirements of the health units, especially at the initial stages. Finally, its significance is represented by its provision of implications for the policy makers and also the recommendations in improving the performance of HIS user requirements in the context of the health units in the Sanaa Province, Yemen.

## 1.8 THESIS STRUCTURE

The group of the study uses a standard a regular thesis format whereby contents are organized information the following five chapters:

**I. Chapter I: Introduction**

This chapter provides the introduction, background of the study, problem statement, objectives, research questions, the scope of the work, and the significance of the study.

**II. Chapter II: Literature Review**

Chapter II consists of two sections. The first section of the chapter provides an overview of the related work on HIS in the developing countries. This includes the overview of user requirements in the health units and the literature related to the framework as well as the factors associated with the related process. The second section provides an overview of the related work done in the domain of HIS. This chapter investigates the related literature concerning the perspective of IS in HIS in the developing countries. It also looks at understanding the influence of user requirements in HIS, which leads to the discovery of the problem statement of the research and the understanding of the research gap. Moreover, this chapter focuses on HIS in the developing countries. Ultimately, in this chapter the various factors are elucidated, especially those which are related to user requirements and also the factors which influence the success of IS.

**III. Chapter III: Research Methodology**

In this chapter, the rationale for undertaking the quantitative study is discussed. Besides that, it also describes the research design, the research approach in terms of the

exploratory and confirmatory approaches, sampling size, survey design and analysis, and finally the data collection and analysis.

**IV. Chapter IV: Results and Discussion**

Chapter IV present the development of the proposed model for this study for the investigation of the critical determinants in the adotion of information system in HIS developing countries. The proposed model and the research hypotheses are develped based on the problem statement and literature revew to achieve the research objectives and to answer the research question.

**V. Chapter V: Conclusion and Future Works**

This chapter concludes the thesis with a discussion of the results and the findings in the context of the literature. It also highlights the consideration for the implications of the findings, and provides the suggestions on the direction of future research.

## 1.9 SUMMARY

As a conclusion, this chapter introduces the main issues and the relevant problem statements related to the research study. It discusses the specific objectives to be accomplished, the type of work to be pursued, and the overall scope of the research. Furthermore, it paints an overall picture of the current research work and how it is executed.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 INTRODUCTION

The previous chapter introduces the study problem which is the lack of a robust model in enhancing the quality of HIS that could help to reduce user requirements. This chapter provides the literature review, focusing mainly on the characteristics of the proposed framework for the study, which include: the Health Information System Quality (HISQ), the Health Information System User (HISU) which synthesises the existing related work conducted by the researchers, and the user requirements perspective of HIS in the healthcare units in the Sanaa Province, Yemen.

The review of this study is aimed at building a conceptual framework for the study. It discusses the IS success models, which are; i) DeLone and McLean model (2003), ii) DeLone and McLean IS success model (1992), iii) IS success sub- model of Seddon (1997). Besides that, it also clarifies the principles and facets of the study, justifies the study, reveals the way the study fits in with the current body of knowledge, and helps the researcher to depend on relevant models and theories. Furthermore, the study also emphasises on the gaps in the earlier connected studies. It also refines and argues on refocusing and even altering the problem of the research. The literature review in this chapter is divided into a few sections for ease of debate, namely: introduction, the information system, the information system in the health sector, HIS in the developing countries, requirements, development of the research model, definition of the operational constructs, the proposed framework for the study, and finally, the summary.

## 2.2 INFORMATION SYSTEM

According to Sweis (2015), information systems are defined as technological means which are commonly utilised tools widely used by organisations, each as indicated by the requirements of its field. It is rare to discover an organisation without an IS or some type of innovation to play out its day-by-day routine activities. In order to utilise the massive potentials of the information technology, almost all places on the planet have expanded national IT project policies to function as a model in performing the integration of IT in all elements of the culture (Muema 2014). These systems are typically created by all-around experienced people and qualified faculty in IS improvement. A successful IS venture results with the whole effective system and a satisfied end-user (McLeod et al. 2012). However, like any other ventures, an IS project is inclined to dangers and instabilities, and experiences the likelihood of disappointment. The inability to manage these dangers and vulnerabilities could lead a venture into disappointment in meeting its predetermined requirements and expected outcome result.

The information systems in the healthcare industry are complex. While the potential health and financial benefits from the use of technological innovation in health are large, the risks are also substantial (Lewis et al. 2012). As indicated by Muema (2014), majority of HIS applications created in nations around the world were either partial or total failures. Frequently, technology companies coming into the health domain underestimate its complexity and proceed on the assumption that if something has worked in another domain then it should be possible to achieve the same in health. Because of the high rate of failure, as well as the exceptionally obvious and frequently politically humiliating failures of several healthcare ICT ventures, there have been generous scholarly and industry research about the components which would cause little projects to be unsuccessful (Lewis et al. 2012).

## 2.3 INFORMATION SYSTEM IN THE HEALTH SECTOR

The health sector around the world is “overburdened and under severe pressure” (Clemensen et al. 2011). Consequently, there is increasing awareness among the governments in improving the entire health system (Kitsiou et al. 2010). Thus, developing an appropriate and comprehensive IS seems as an important component in

the success of the overall health system of the developing countries. IS within the healthcare sector is a connection between the people, the procedure and the technological innovation in assisting the functions and control in order to increase the quality of the medical care service by providing important information (Almunawar & Anshari 2012). These systems are referred to as HIS. Generally, HIS deals with patient information obtained from patients' records, the health plan, surveys, health service and a variety of other data sources in the health sector (Sllame & Aljafari 2014). The objective of IS is to improve the management of the health service through an optimal information support (Lippeveld et al. 2000). However, the development of IS in the healthcare sector has been proved to be difficult in the context of the developing nations. This issue is the result of organisational complexity (Jayasuriya 1999; Gladwin et al. 2003; Isabalija et al. 2011) and uncoordinated organisations would which means all maintain their own HIS (Jeppsson & Okuonzi 2000). Moreover, there are several problems within the IS in the healthcare sector such as the lack of trained personnel and also the lack of investigations on user requirements (Wilson et al. 2001; Zheng & Heeks 2008; Karuri et al. 2014; Westh et al. 2015). Due to the fast development of IT, the actual medical industry has evolved over time and the organisational framework and changes in the new technology of user requirements specifications have appeared. Therefore, Ismail et al. (2012) have called for a shift by focusing on user requirements instead of focusing only on the information technology in order to activate a bigger business success. As far as support system is concerned, all hospitals are capable to provide prompt assistance to users but one hospital requires backup support.Thus, this study extends the emphasis on IS in the public healthcare sector by investigating the different barriers which are related to user requirements perspective on the success of HIS, especially in the case of Yemen.



### 2.3.1 Health Information System Components and Levels

IS in the healthcare sector is like every other IS. It comprises and compasses of an organised set of components which can be interrelated and classified into two main entities: information process and its management structure. Information process is defined as a process in which the raw information data into a usable information from that may be utilised by the managers in the decision-making process and provide the healthcare services to the patients. This process comprises of data collection, data

transmission, data processing, data analysis and data presentation in the form of helpful information. On the contrary, the aim of the IS management system is usually to make certain that the resources are being well-used for producing high-quality information in a timely fashion. This structure also has two components, namely; IS resources and a set of organisational rules. The IS resources refer to all of the individuals involved such as the managers, programmers, planners, epidemiologists and statisticians, as well as the hardware (for example, the computers and communication technology), the software (for example, the data processing program) and also the financial resources. The organisational rules on the other hand, refer to the standards of the diagnosis and treatment, the definition of the responsibilities or duties of the staff, the procedures of supply management and the procedures in maintaining the computers (Lippeveld 2001).

In relation to the levels of IS in the healthcare sector, IS involves various levels of health services management. Each level requires its own information (AbouZahr & Boerma 2005). For example, the information that is required by the individuals at the communication level serves as the basis for evaluating the extent to which these health care services are able to meet the communication requirements. However, the type of information and the amount of information needed at each level can be determined by the planners and the managers based on the value of such information in making liable decisions about the whole health system and the efficient functioning of the healthcare services. At higher levels, particularly in policy formulation and the management of the national health system, information is needed for these purposes. These purposes underlie the importance and the need for information by all levels in this sector, which starts from the policy makers and the managers, and ends with the providers of the healthcare services, such as the doctors, health workers and the health technicians (Lippeveld et al. 2000). Hence, If This use of the information is not achieved by all levels, it will be compound to determine and justify the cost of establishing and maintaining IS in the healthcare sector if such information is not well-used by all levels (Kaduruwane 2012). As depicted in Figure 2.1, the need for information and sources in the healthcare system vary from the facility level information to the periodic nationwide surveys.

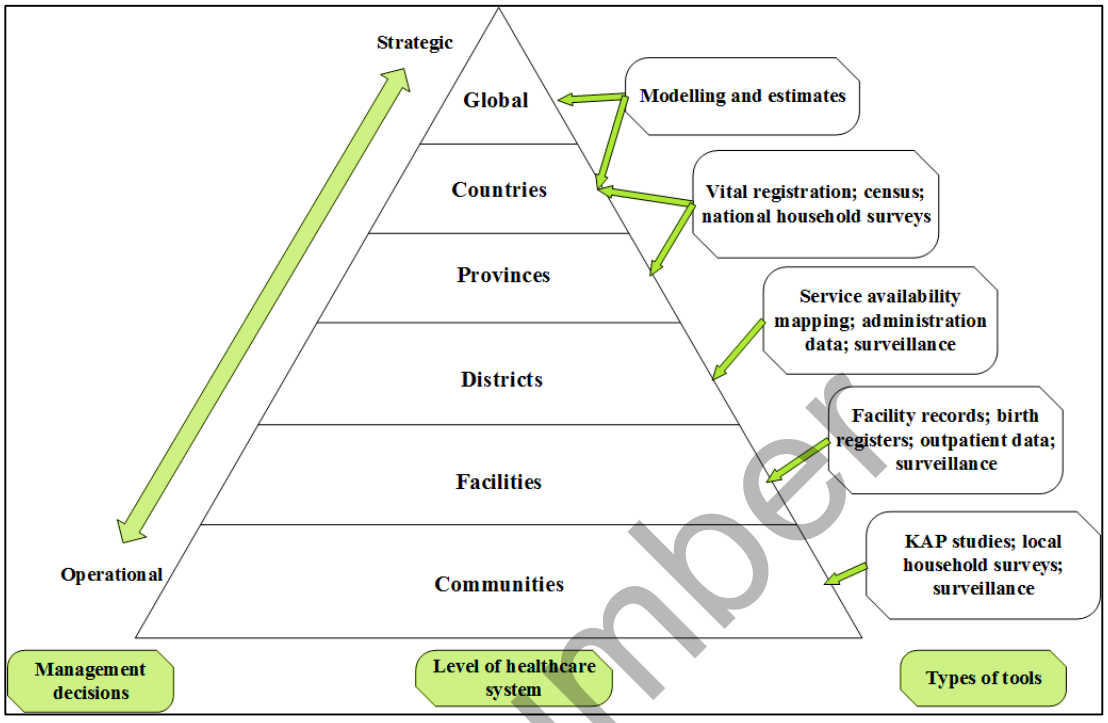


Figure 2.1 Data on the Needs and Sources at Different Levels of the Healthcare System. KAP = Knowledge, attitudes and practices.
Source: AbouZahr and Boerma (2005)

As indicated by Matshidze and Hanmer (2007), the providers of IS in the healthcare sector gather information on the health IS from the patients. This information includes the demographic, clinical, administrative and financial status of the patients. There are also other healthcare providers that constitute up to the healthcare team and provide the clinical information by which healthcare is constantly achieved. Moreover, it is important for the IS structure to allow for information that is necessary for making rational choices at all levels of the healthcare system to be generated. According to Mursalin and Haque (2001), the involvement of the health stakeholders at all levels is necessary in order to successfully develop HIS.

### 2.3.2 Types of Health Information System

The IS in HIS sector plays a role in capturing or gathering information relevant to the healthcare services and also in displaying the information. This indicates that it is not only a system which encompasses the computers and softwares, but it also includes a variety of diagnostic devices, clinical guidelines, databases associated with clinical and business tasks and activities, medical terminology dictionaries, diagnostic imaging, pharmacy and others. HIS is categorised into operational, tactical and strategic ISs,

clinical and administrative ISs, the electronic health/patient record (HER/EPR), financial and clinical ISs, and decision support system (DSS). In addition, as cited in Yusof et al. (2007), there are several types of HIS, namely: Computerized Provider Order Entry System (CPOE), Electronic Medical Record (EMR), Clinical Reminder System (CRS), patient care IS, Clinical IS (CIS), Radiology IS (RIS), Laboratory IS and Hospital IS as different types of HIS.

## I. Hospital Information System

The hospital is recognised as a complicated institution which encompasses various units and departments, which in turn would provide the service of coordinating the healthcare services for the people in a given community or society (Adler-Milstein & Bates 2010; Amin et al. 2011). Information is required by the hospitals in order to obtain a more comprehensive picture of the needs of the patients, as well as the needs of the clinical, ancillary and financial management (Hayajneh et al. 2006). Therefore, the efficient functioning or performance of the hospitals in offering healthcare services to the people heavily depends on the capability of HIS in assisting the processes of diagnostic, management and services, as well as the practices and training of the employees or the staff (Amin et al. 2011). Hence, it is recorded as having the potential in enhancing the quality of the healthcare service. With regard to this, the quality of the healthcare service can been designed to support healthcare service (Winter et al. 2001), since It becomes an emerging tool in healthcare field for delivery high health service quality (Farzandipour et al. 2011).

HIS is commonly used in the previous related researches as a concept referring to a massive and integrated system, which is developed or designed with the aim of storing, manipulating and retrieving important administrative and clinical information (Ismail et al. 2010; Amin et al. 2011). Although the previous researches have pointed to several definitions of HIS, most of these definitions indicate that HIS is considered as a combination of IS which is developed or designed for better management of the hospital financial and administration activities (Peng & Kurnia 2010). According to Winter et al. (2001), HIS is described as the technical and social subsystem of any medical facility which consists of all the information processing, together with the humans involved or associated with in the system, as well as the technical role of

information processing. The concept of HIS as defined by the previous related researches refers to a computer-based system which is developed for managing information related to medical purposes and administration of a given hospital, thus assisting the health professionals in performing their job more effectively and efficiently.

As previously stated in this section, the various advantages of HIS include enhancing the quality of patients' care, reducing the cost of operation, accelerating the operational effectiveness and enhancing the diagnostic decision-making process (Devaraj & Kohli 2000; England et al. 2000; Tomasi et al. 2004). Yet, these benefits can only be realised when HIS is successfully assimilated and effectively used as part of everyday work routine. As added by Winter et al. (2001), HIS is also an advantage for the type of information being processed, functions, evaluation of the health system and providing support in the decision-making process related to the clinical and managerial aspects. HIS is mainly intended to store, process and communicate relevant information to the healthcare administration by using huge computerized databases. According to Farzandipour et al. (2011), HIS comprises of several types and levels that vary from departmental systems (those systems are restricted to a certain medical and monetary domain) to knowledge-based programs that are performed in offering intervention and diagnosis for patient care activities.

HIS plays a crucial role in managing activities associated with the processing of information in a particular hospital in order to enable it to perform well in offering high-quality healthcare service, as well as medical research to the patients. HIS constitutes of several components which are; the Financial Information System, the Picture Archiving and Communication System (PACS), the Nursing Information System (NIS), the Clinical Information System (CIS), the Radiology Information System (RIS), the Laboratory Information System (LIS) and the Pharmacy Information System (PIS). Each group has its own functions and divisions, along with the users in enhancing the hospital services described earlier (Ismail et al. 2013).

As mentioned earlier, HIS is regarded as a type of IS (Acharyulu 2012), which assists the physicians or the hospital administrators in making informed decisions concerning the monitoring and assessing, or the evaluation of the type of daily workflow

of the medical services in all departments within the hospital (Reichertz 2006; Ouma & Herselman 2008). It also functions as a means of communication between the different departments and helps the healthcare providers in easily accessing and utilising the information gathered from the various sources of the patients' data, including the laboratory, radiology department, pharmacy, and the medical history. In general, HIS aims at managing the information needed by the healthcare staff in carrying out their duties and activities more effectively and efficiently. Therefore, it should be capable in supporting the quality of the healthcare service and in meeting the needs of the people (Mehraeen & Ahmadi 2013). Although medical HIS has been progressively used and approved in the healthcare market, researches on its effective application are still very rare. Therefore, many medical HIS customers, who are mainly doctors, are not highly pleased with their systems. Therefore, the aspect of user requirements, particularly the non-functional aspects, should be given due attention in enhancing the satisfaction of the users of the clinical HIS (Lee & Pow 1996).

As pointed out by Lumumba (2014), the adoption of IS in majority of the hospitals in the developing countries, including HIS among the employees, still faces several challenges or barriers. Organisational and financial aspects are some of the factors which affect the adoption of the clinical, administrative, and managerial information systems in the hospitals (Wang et al. 2005). Other than that, among the barriers experienced in the adoption of HIS among the hospital staff are that such methods have failed to meet the expectations of the users (Farzandipour et al. 2011). According to Lin et al. (2012), the process of technology adoption among hospital employees is affected by issues that are related to the management or to the managers. In the context of the developing countries, only a limited number of hospitals would use or apply HIS, and only a few studies have been done with the aim of determining the factors affecting the implementation of HIS, for instance the study by Ismail et al. (2013). In another study conducted by Ojo (2013), the user requirements of HIS are associated with the efficient use of information and the capacity in developing the healthcare staff.

### 2.3.3 Health Information System Actors

Chen (2003) defined actors as the people or individuals or even the institutions that are affected by the application of IS. Hence, any human and organisation involved in the adoption actor that accepts, provides, supports or controls healthcare services (Mantzana et al. 2007). Based on the literature on adoption of adoption of IS in healthcare, the actors that are active in the adoption process are virtually viewed as crucial (Mantzana et al. 2007). The user community in the healthcare region is comprised of a variety of user groups (physicians, researchers, managers, administrators, nurses, et cetera). However, the negligence of any one of those actors will not provide a comprehensive picture of the relevant expertise, knowledge, skills, requirements, as well as the expectations (Farzandipour et al. 2011).

There are different categories of actors involved in the success of HIS as recognised by the attached researches. Cecez-Kecmanovic et al. (2014) identified the specialists of public health, the managers of the healthcare services and the experts of IT as the potential groups of actors since they are engaged in enhancing HIS. Every group has its distinctive specialist's health benefit administrators who are expected to expand productivity; the public health authorities are occupied with both enhancing adequacy and value, while the information technology specialists trust that a modernised system will diminish the weight of frame filling. Acharyulu (2012) also identified clients of IS in the health sector as the internal actors (pharmacists, doctors, nurses, laboratory technologists, and other individuals involved in interacting with the essential processes in the health sector) and the external actors (insurance providers, patients, their families and relatives and researchers of the healthcare services). In addition, as suggested by Mantzana et al. (2007), a research should focus its investigation on the roles played by those actors while adopting HIS so that this adoption having the technological tools that can be accessed by the users.

Chen process can be better enhanced in the healthcare setting. Wiley-Patton and Malloy (2004) pointed out that the outcome of those multiple actors with various interests and backgrounds and Interests. The adoption of HIS is the decision of the organisation in (2003) placed the emphasis on investigating the roles of the actors in adopting HIS since they often resist or reject such action. Therefore, our study

concentrated on the internal HIS, in the perspective of IS, with regard to user requirements and IS factors which may influence the perspective of such system. This is because the HIS sector is comprised of different types in different levels of the health sector, thus multiple actors with different backgrounds in different levels were taken into consideration while carrying out the current study.

## 2.4 HEALTH INFORMATION SYSTEMS IN THE DEVELOPING COUNTRIES

Recently, significant interest has been given to HIS in the context of the developing countries. This can be seen through the efforts made by both the governmental and non-governmental organisations, including international agencies and donors in improving healthcare (Mukred et al. 2013). A large number of developing countries have also started reforming their health system in response to several of the challenges that they face. The development of IS has become an important aspect of those reforms. It is stated that developed countries are distinguished from the developing countries in the way the information is produced, applied and utilised (Farzandipour et al. 2011).

Although many countries have made numerous initiatives to strengthen their HIS, yet some of these countries still have routine IS which is based on the use of paper in gathering and reporting information or data (Lippeveld et al. 2000). The same researchers have also pointed out about the insufficient or inadequate, complicated and inefficient IS routine. The reasons behind the lack of reliable and effective IS in such developing countries are the scarcity of resources and insufficient information. With regard to these aspects, Lippeveld (2001) stated that majority of these countries are still lacking in essential IT, which is the telephone line that connects the health institutions. The same researcher further added that although information and communication technology are available in the developing countries, which means that it is not the issue of the availability of resources, yet the use of IT and HIS among decision makers is still poor at all levels. In addition, insufficient attention is given in developing the capacity of the human resourses in the context of IS in such countries (Lansang & Dennis 2004; Nolen et al. 2005; McDonald 2011). Therefore, in the developing countries, HIS is not capable of sharing data and supporting the decision-making process because it is designed to be fragmented and is not-well integrated. Moreover, in the hospitals, the

staff or employees do not give their full support for the development of their knowledge and skills and they still resist any developmental change (Isabalija et al. 2011).

There are also other challenging issues that hinder the application of effective HIS in the context of the developing countries. Looking from a different perspective, some of these issues include the financial constraint (Garner et al. 1998; Oak 2007; Anwar et al. 2011), the culture of the society at large, the culture of the profession and also the complicated nature of the routine clinical and managerial processes (Littlejohns et al. 2003). Other serious issues affecting HIS are the cultural and socio-ecological factors. For instance, the access to information on the medical illustration of the human body is restricted and the information flow is exclusive for political purposes only (Drury 2005). Although many countries have attempted to use computer equipment in their daily work routine, yet they are still lacking in qualified staff that could maintain both the software and hardware. In addition, Bagayoko et al. (2010) argued that the failures are mainly due to the context or attitude of the local people towards modern technologies, which have not been taken into account by the application of the technological transformation from a specific cultural context to a different context. Finally, according to Lippeveld et al. (2000), the characteristics of IS in the healthcare sector would reflect the culture of the country which produces it. Therefore, the same researchers suggested that each country should design its own specific IS which reflects its dominant socioeconomic, political, and administrative context.



### 2.4.1 Previous Researches on Health Information System

The previous studies have been conducted on HIS in different parts of the world. For example, in a qualitative research by Farzandipour et al. (2011), the study assessed the application of HIS based on consumer requirements. The results indicated that the evaluated HIS software could not satisfy the requirements in relation to the patients' sent messages and the management of a dynamic medical order. The researchers suggested that future researches should identify the different challenges faced in applying HIS and its weaknesses, as well as the needs of various types of HIS users. Although the HIS investigated by the researchers was designed by taking into consideration the users of the system, yet it had failed to meet their needs.

Therefore, the improvement of any HIS needs to consider all groups neglects of the fact that on the off chance that it disregards any gathering, the outcome will miss important mastery, aptitudes, learning, requirements and expectations. Moreover, the wish and needs of the users are designed based on their viewpoints and experience in using the system. As evident in healthcare environments, health personnel tend to be skeptical and they may even reject the adoption of new technologies (Ribière et al. 1999).

As a result, the users may not be able to utilise HIS well. As previously stated, there should be more researches in identifying the issues and weaknesses of HIS to better understand the users' various needs. If their needs are not met or satisfied by HIS, they will not use such system effectively. These issues may become more serious due to the users' reluctance and difficulties in using the system (Amin et al. 2011). Previous researches have suggested that the achievement in the adoption of HIS mainly relies upon user expectation (Farzandipour et al. 2011).

The investigation of the clients' or the users' satisfaction and perception of HIS is more important than the evaluation of the technical aspects of the system since their views is the priority in designing a system compared to that of the developers or the designers. Thus, a given good IS can still be poor if the customers or the users perceive it as poor (Ribière et al. 1999). This implies that the adoption of any technology can be positively influenced by positive user attitude and perception (Bundschuh et al. 2011). User attitude might be among the crucial challenges which hinder the implementation of technologies (Jebraeily et al. 2012). Apart from that, the coaching of the methods in using such techniques forms a part in identifying the level of smoothness of such implementation (Ismail et al. 2010).

Previous researches have pointed to the tendency and rejection of the adoption of new technologies among health personnel (Ribière et al. 1999). As a result of this situation, they may not use HIS well. Hence, it is important for the researchers to investigate the matter using a more comprehensive strategy based on the objective of user requirements (Farzandipour & Meidani 2011; Cline & Luiz 2013).

Previous related studies have also identified various factors that affect either the failure or success of IT projects, specifically in the development and implementation of

HIS (Amin et al. 2011). It was also pointed out that among the causes behind the failure in the implementation of HIS is the focus or emphasis on the science itself only (Farzandipour et al. 2011). Lucas and Spitler (1999) was one of the first scientists to talk in detail about the failure of the programs. He also pointed out three categories of factors, namely: user behaviour and views, the program used, and program performance in describing his structure of IS failure.

The failure of HIS is attributed to the negligence of user requirement during the process of developing and implementing HIS. Therefore, designing and modifying or customizing HIS based on the needs of the users and analysing such needs can address the basic part of HIS adoption. In the healthcare domain, user community comprises of different groups of users, such as the physicians, nurses, administrators, managers, researchers and so forth. Thus, if any group is neglected, the adoption of HIS will be lacking important relevant skills, expertise, knowledge, specifications and objectives (Farzandipour et al. 2011).

In a prior research by Jebraeily et al. (2012), the results which were obtained through multivariate analysis revealed that typing capacity, analyses showed that age, typing ability, ease of data entry and computer error had significant correlations with complete user response. The results of the study concerning the reaction of user requirements and user needs to several facets of the Electronic Medical Records (EMRs) have important implications for the policy makers in terms of the recognition and identification of the reasons behind the medical receptionists' dissatisfaction with the EMR at the health center clinics. This is since such dissatisfaction well have undesirable the influence on the success of HIS implementation and the regular use of its, in addition to the quality of healthcare services provided by the clinics. This is because such dissatisfaction will have undesirable influence on the success of the implementation of HIS and its regular use, in addition to the quality of the healthcare service provided by the clinics. Thus, it was realised that the total satisfaction of the healthcare receptionists, together with the EMRs rely upon the simplicity of the data input frequency error in the computer data entry (Jebraeily et al. 2012).

Another previous study showed that the success in the adoption of HIS and its implementation is dependent on the users' responsiveness to the system (Al-Azmi et al.

2009). Yet, there are themes emerging from the results of another related study which were identified as the factors in determining the success of the implementation of HIS. These factors are human resource, system evolution, the scope of implementation, user-friendliness, support and managerial systems, including training, security ,hardware, good support system, quality human resource, user friendly and sufficient training of the end user (Ahmadi et al. 2014). It is likewise essential for any system to possess sources of authority that are familiar and trusted. These sources include professional society seals of approval, as well as patient and physician ratings, and quality would better serve or facilitate our understanding of the end-users (Mandl et al. 2015). However, more empirical studies on the identification of the issues and weaknesses in the adoption of HIS need to be conducted so that the needs of the users will be better understood.

Despite the fact that the previous related research has highlighted the importance of user expectation and user requirements, none of the software products of HIS could completely satisfy the expectations and requirements of the end-users in all fields. This could be due to the negligence or poor consideration of such needs and expectations of the users during the designing process. Therefore, as mentioned earlier, the research should examine this aspect based on the comprehensive approach which takes into account the goals and workflow of the organisations, as well as the user requirements (Farzandipour & Meidani 2011).

HIS is known as a massive and integrative system that is designed or developed for the purpose of storing, manipulating and retrieving administrative and clinical information. It offers the necessary information from each level of management at the appropriate time, in the appropriate form and to the appropriate site. Effective choices are then made based on such input of information. Thus, HIS plays an important role in the decision-making plans, in managing or organising, as well as in having control of how the hospital sub-systems operate since it offers information about the synergistic organisation of the process. HIS is able to enhance the quality of patient care through the evaluation of data, by suggesting better care and by making movement among the hospitals in a retrospective in forming a concurrent review regarding the quality and suitability of patient care).

In healthcare, IS is concerned with how information is processed, as well as how the doctors communicate and engage in medical tasks and practices. Apart from that, IS is also concerned with education and research, for example in information science and technology (Almunawar & Anshari 2012). In healthcare organisations such as the hospitals, IS has been given different labels, including the electronic health record, HIS and health record system (Aanestad et al. 2005; Holden & Karsh 2010; Almunawar & Anshari 2012; Sengul 2013).

Other previous studies have also identified several challenges faced by HIS, including the lack of budget related to IT, the lack of skills in IT, the lack of effective leadership, the users' resistance towards change, the lack of good infrastructure, as well as disrupting the structure of the national economy. Other challenges include to speedily change the operating environment where the expectations of healthcare quality are increasing, where no quality nursing is available and the incapability of outdated healthcare services in meeting the accelerating demand), the lack of formal social security, as well as the underdeveloped insurance products and investments (Mbananga & Becker 2002; Clayton et al. 2005; Ganesh & Al-Mujaini 2009; Boonstra & Broekhuis 2010; Watch 2012).

A study conducted by Sambasivan et al. (2012), which involved seven public hospitals and five private hospitals, had specifically focused on the Kuala Lumpur Computer-based Clinical Decision Support Systems (CDSS) as a crucial key aspect of decision-making regarding healthcare. The target of CDSS was in improving the quality of medical delivery. Therefore, the study had focused on determining the factors that affected the adoption of this CDSS among the hospital physicians. It was found that their positive attitude towards IT itself had strongly influenced their adoption, which supports the findings of an earlier study (Bundschuh et al. 2011). However, negative user attitude can be one of the most challenging issues that hinder the implementation of HIS (Jebraeily et al. 2012). As emphasised by Fadhil et al. (2012), based on the results of the study, it is found that training is regarded as a prime factor in the successful implementation of HIS. However, the lack of training or trained users would result in the users' rejection in adopting HIS because of their fear of losing their jobs, as well as their fear of being unable to handle their jobs well using HIS. Therefore, it is advised that the users of HIS should be well-trained on how to use the system through various

appropriate materials and techniques. They should also be actively involved in the early stage of the HIS implementation.

### 2.4.2 HIS in Yemen

Yemen is considered as the least-producing country in the eastern part of the world. Its weak HIS has been unable to generate quality details that are required on a regular basis in promoting the use of the details to boost performance in handling programs efficiently (Al-Ghaithi 2009). According to Al Serouri et al. (2011), the data provided by HIS has been poor. Despite the direction towards the development and improvement of the healthcare sector, Yemen has been poorly ranked in all central factors of healthcare access and services (Al-Fadhli et al. 2015).

A recent evaluation of HIS in Yemen has been performed by the Ministry of Public Health and Population (MOPHP) in collaboration with the Civil Registration Department of Ministry of Interior, Central Statistical Organisation, the World Bank, Health Metrics Network (HMN), and other main stakeholders (Al-Ghaithi 2009). The results of the assessment showed that Yemen still faced a major challenge in the development of HIS. The administrators of MOPHP, just like the administrators of other countries, believe that health information technology will not only enhance effective health information for the administration, but will also improve the healthcare delivery and public health service. Hence, several levels related to HIS such as the medical center details program are being organised and developed using IT to support the worldwide medical care system. The training from past major IT execution ventures that have been carried out well in the country has recommended that the users acceptance of the technology as one of the main factors in the success of a task. The understanding of how people who work with HIS agree to and use IT well, their basic IT information, the details of the user specifications and the factors that impact their development and use of IT do not only help in the design of HIS, but also allow for the efficient implementation and evaluation of the processes.

Generally, Yemen is one of the developing countries of which its HIS reflects almost similar characteristics to the HIS found in other developing countries with the same circumstances. During the last decade, enormous investment has been spent on

the HIS health sector in Yemen, but in a scrappy manner (Saleh et al. 2014). Unfortunately, although many Yemeni health sectors have implemented the fragmented IS; yet these systems have not been well-accepted by the staff of the health sectors. International donors in health are largely responsible for the problem, having prioritized urgent needs for data over longer-term country capacity-building (AbouZahr & Boerma 2005). This particular fragmented nature of the various sub-systems has the potential in limiting the capability in creating an entirely integrated HIS to offer information that is complete on the relevant healthcare procedures (Matshidze & Hanmer 2007). In Yemen, the high fragmentation and inefficiency of HIS are due to the uncoordinated financial commitment, and inadequate information quality, primarily due to the deficiency of knowledge of the information value (Al-Ghaithi 2009).

Moreover, the health planning in Yemen is still based on the traditional normative policy rather than strategic planning, even after the information has been made ready for use (Lafond 2003). The authors further added that it is necessary to enhance user requirements among the healthcare workers so that they value information and its use. According to WHO, the IS is not yet considered as will as the users in Yemen as reported by the regional Health system Observatory World Health Organisation (2006) and the Metrics Health Network of World Health Organisation (2009). The private sector also offers some servicing solution, especially for equipment used in radiology and intensive care. However, this is getting insufficient to fulfill the current specifications. Besides that, the health industry is not adequate since it is not clear. Furthermore, the inner and exterior interaction and information return are not completely institutionalised. Therefore, the current study focuses on identifying the factors that influence the intention of the Yemeni healthcare staff in their perception of the user requirements of the IS.



### 2.4.3 Previous Researches on the Challenges in the Implementation of HIS in Yemen

Yemen is aware of the importance of IT developed by the government service in all public sectors, including the health sector through the construction of ambitious ICT strategies (Al-Wazir & Zheng 2012). Like other less developed countries, the Republic of Yemen seeks to develop its health sector in order to sustain its developmental process. In fact, the last couple of years have shown many changes and steps aimed at

establishing IS in the public sector. Yemen has achieved tangible results in the field of the IS, especially in developing policies and plans, adapting infrastructure components and electronic application, and also in the development of human capacity (National 2009).

In a study conducted by Al-Fadhli et al. (2015), several challenges have been found in IS in the health sector of Yemen. The challenges include the reliable and understanding system, as well as the inaccurate data collection and health indicators due to the lack of uniformed statistical registers and collection tools. Moreover, the same study has also revealed that the current data collection is used for reporting purposes only, and that 36% of the facilities uses data for decision-making. Weak and unreliable HIS contributes to misinformed decisions and poor quality of the healthcare service. Other challenges are related to the lack of the process of exchanging health and fitness information at the government, healthcare and health facility levels. There is neither a system in acquiring information from all the resources and in producing comprehensive, nor are there other frequent opinions (Al-Ghaithi 2009). Yemen also does not possess a sufficient and modern control in supplying the framework for health and fitness information that covers important decision making process, notifiable diseases, and private market information including confidentiality and fundamental principles of official statistics. More recently, a number of different challenges have been encountered in achieving the recently-proposed strategies and plans in enhancing HIS in Yemen, which have been reported. These challenges are lack of IT budget, lack of IT skills, the lack of leadership, and resistance to change, the lack of leadership to change, insufficient infrastructure and also the interruption of the national economy framework (Al-Wazir & Zheng 2012).

The investigation that has been conducted in exploring the health sector in Yemen in relation to HIS was reported by WHO in conjunction with the MOPHP. It focused on exploring the challenges and opportunities of HIS in Yemen from the perspective of the country's infrastructure and organisation. The prospective of IS in HIS is still low in the country (Al-Wazir & Zheng 2012; Al-Fadhli et al. 2015).

Table 2.1 shows the summary of the prior studies that have been done on the effects or influence of various factors on the adoption of HIS, thus providing the indicators of the factors that have the most significant influence on the success of HIS.

Table 2.1 Summary of the Previous Studies on IS in HIS

| **Author, year and the country** | **Key Findings** |
|---|---|
| Amin et al. (2011) Malaysia | Differences between the different types of users of HIS (e.g. Malaysia) in terms of (I) HIS interface quality, (II) quality of HIS performance, (III) quality of HIS function, (Clayton et al.), and (IV) quality of HIS (the combination of HIS interface, function and performance). The problems emerged when the users felt reluctant and had difficulties in using the system. This HIS is just an example of HIS, with the hospital being the healthcare environment. |
| Farzandipour et al. (2011) Iran | They found that all HIS software have not met the user requirements with regard to the entry of patient and insurance data. All of the HIS software have failed to meet the user needs related to the sending of messages to the patients and in managing a dynamic medical order. |
| Sambasivan et al. (2012) Malaysia | The intention in utilising the system is reduced by the perceived threat, yet increased by the involvement and belief in the system. |
| Ismail et al. (2012) Malaysia | The interview results were classified into a few themes, namely human resource, system development, implementation scope, user-friendly system, support system, training, hardware and security. The success in the implementation of HIS is ascertained by the quality human resource, user-friendly system and great support system, together with sufficient training of the end-users.. |
| Yang and Kim (2013) South Korea | Consumer requirements and degree of difficulty, as well as the measure of importance in building a service system have been outlined using Quality Function Deployment (QFD). |
| Karuri et al. (2014) Kenya | The information on HIS is indispensable in checking a health system; it is crucial for analysing and enhancing the order of programs and the healthcare service. However, there are several problems with the IS in the healthcare sector such as the lack of trained personnel and the lack of investigation on user requirements. The successful adoption of HIS is primarily ascertained through a distinct element called the indicated user requirements. There are still several issues that need to be addressed. |

*Continue ...*

| *.... Continued* | |
|---|---|
| Ahmadi et al. (2014) Malaysia | It was discovered that doctors have high perception of science. Besides that, it was demonstrated that the improvement of the physicians' performance regarding their decision-making process can be achieved using HIS. The corresponding factors were ranked and prioritised via the Analytical Hierarchy Process (AHP). |
| Al-Fadhli et al. (2015) Yemen | The growth of the healthcare sector/service in Yemen is noticeable, which was measured based on the increment in the number of hospitals, health units, beds, health centers, and medical staff. However, it should be mentioned that the indicator of the healthcare sector/service in the country is considered to be among the lowest in the region.region. |

## 2.5 REQUIREMENT

The term 'requirement' has been defined by several previous researchers. Basically, this term refers to challenging issues, needs, goals or aims, abilities, demands, dreams, and attributes relevant to the users in a given organisation (Hickey & Davis 2004). Besides that, as defined by Darlington and Culley (2002), requirement refers to the real-world needs of a potential customer or client. Coughlan et al. (2003) used the term to relate to the worth of the users. In addition, as cited in the Webster's Collegiate Dictionary, requirement is the synonym of need. The Institute of Electrical and Electronics Engineers (IEEE 1990), defined the term requirement as the individual's or user's condition or capability that he/she needs in solving a particular problem or in achieving a particular aim. Such condition or capability should be possessed by the component of a system so that it can meet the relevant contract, specification, standard, or any other formally-imposed document. Requirement is also defined as the customers' declared needs, aims or conditions, or even a property that a given product must meet or satisfy so that it can be valuable to the stakeholder (Wiegers 2009). The above definitions indicate that requirement is something that a given system must meet. The above definitions indicate that requirement is something that a given system must meet.

### 2.5.1 The Importance of Requirement

Previous researches point to the evidence that the success in the delivery of a software system is attributed to the quality of such system in meeting the necessary requirements. The software engineer highly recognises the importance of this, especially the fact that inadequate requirement activities lead to serious insecurity of the software projects

(Wiegers & Beatty 2013). Moreover, according to Nelson (2007), there are almost ten infamous software projects which have failed over the past two decades. The author has highlighted poor requirement as one of the critical aspects of this failure.

The understanding of the requirements of a given system is regarded as the main reason for the success or failure of the system. This is because, to understand these requirements means to understand the issues or problems that need to be solved. It also means to understand the best solutions which will enable the system to fulfill the requirements of the user. According to the research of Wiegers (2005), the lack of understanding of the accurate requirements is expected to have negative effects on a given project, regardless of how well the rest of the project is executed. Other previous studies have confirmed the same idea on the importance of understanding software requirements (Schmidt et al. 2001; Hickey & Davis 2004).

The previous researches also indicate that among the main factors which help in the success of an analysis and the software system is the software requirements. For instance, Speight (2007) described three important features of a successful project: on-time completion, low costs (or costs within its initial budget) and its inclusion of the initially-approved functions or features. Their perspective of what a productive system is resembles the view advocated by the Standish group which defines a successful project as a project which should be accomplished promptly, within its budget and involves all the initially-described functions (Kenney & Leggiere 2003).

McAllister (2006) placed the emphasis on the need for system developers to design software systems that are capable of meeting the needs of the potential clients. This is especially true and applicable to the stakeholders when they emphasise on the need for understanding certain demands or requirements related to business, and acknowledging or specifying the requirements that a given system can meet. In addition, the most important and challenging issues faced in developing software systems are the quality of the specifications, the accomplishment of general understanding and the agreement on the requirements (Verner et al. 2005; McAllister 2006). This implies the effect that the efforts made in the requirement phase has on the success of the system.

As stated in the Standish Chaos report in 2002, there were 66% cases of software projects failure (Xia & Lee 2004). These failures are attributed to the misunderstanding

of the requirements, changes in the requirements and the lack of user involvement. As identified by Miller et al. (2007), the failure of such software projects is caused by three factors, namely; insufficient planning, insufficient requirements and the absence of support from the given organisation. Another cause of such failure is the delivery of inadequate attributes related to quality which does not conform to the plans and budget, as well as related to the requirements (Bergey et al. 2004). As for Browne and Rogich (2001), the failure of the software development phase in producing a comprehensive and accurate set of requirements is regarded as just about the most essential reason which leads to the failure of the projects in meeting the users' expectations. Havelka (2003) found that the failure of a system is caused by incomplete, incorrect and misunderstood requirements as well as the lack of validation and identification of such requirements. In the same line of argument, Bergey et al. (2004) pointed out that the lack of proper identification of quality requirements will make it challenging if not impossible to assess the success or failure of a system prior to its implementation.

Gottesdiener (2008) emphasised that poor identification of the requirements can lead to problems in the software application phase, including late delivery, products with poor quality, dissatisfied customers and also exhausted and demoralised software development teams. These issues would ultimately result in expensive reworking and expenditure overruns. As illustrated by Figure 2.2, fixing the errors related to the requirements is regarded as the highest cost among others.



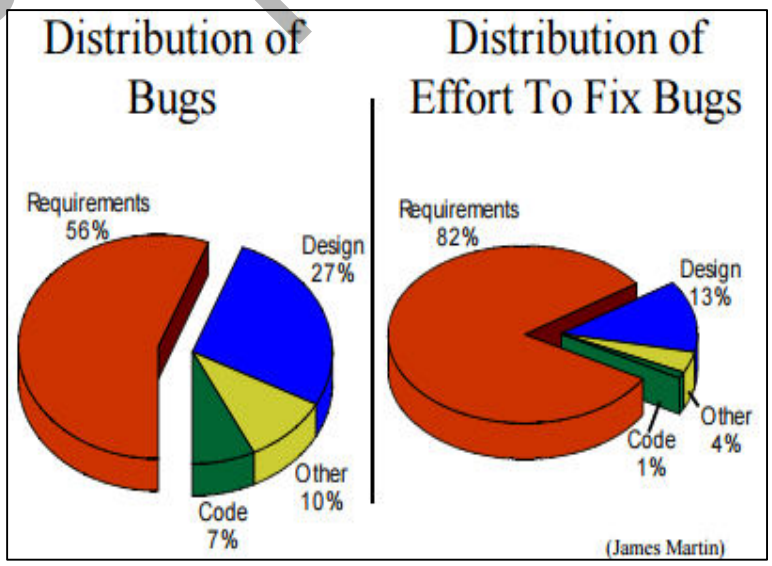


Figure 2.2 Charts of Bugs Fixing Errors
Source: (Bender 2009) .

Studies have also pointed out that 40-60% of the issues faced during the system development stage are caused by not enough or inadequate elicitation of the requirements (Moody & Sindre 2003). These issues would also consume almost 25-40% of the general budget of a method (Leffingwell & Widrig 2000; Wiegers 2005). Furthermore, Wiegers (2005) attributed the failure of software projects to the inadequate approaches which are adopted by several companies in constructing or developing these important project activities. This resultsan 'expectation gap' which refers to the difference between what is believed to be developed by the system developers and what is actually needed by the clients or customers. Such problems are not only limited to the system development phase, but may also affect the use of such system and its production, especially if these requirements are incomplete and incorrect.

## 2.6 USER REQUIREMENTS IN HIS

The previous researchers have identified the factors that are related to user requirements in the adoption of HIS. For example, according to Amin et al. (2011), the individuals' personal characteristics, constant training, and their involvement in identifying the requirements of a given system and in implementing the requirements contribute significantly to the success of the development of HIS. In their study, the researchers have integrated these critical factors affecting the users' acceptance of ubiquitous healthcare system, as well as the user requirements of the system in developing a ubiquitous healthcare system. It was found that user requirements vary even within the same group of users. Other important factors that determine such requirements are users' age, ability, level of education, location, culture, society, income and the availability of the supporting networks (Moorman & Oates 2010).

Ahmad et al. (2015) pointed out that user requirements provides the clients and users with the abstract statements of the system requirements, and it also provides them with a more detailed description of its functionality. They mainly focus on what the users need and perceive or expect from a given system. User requirements were traditionally expressed, either explicitly or implicitly (Bo et al. 2007). As indicated by Teixeira et al. (2012), user requirements are indicative of the requisites of the people or potential customers and users of that particular system. The success of a particular

system begins with the successful understanding of the users (Maiden 2008). The benefits of the user requirements identification are that it makes the system highly productive and high in quality and it also reduces the expenses and cost spent in preparing and fulfilling the users' satisfaction. The successful identification or analysis of user requirements includes better understanding of the needs of the users and the diverse stakeholders, as well as the context where the software will be employed (Cheng & Atlee 2007). However, the analysis of such prerequisites is not a simple and easy procedure (Maguire & Bevan 2002).

Brownsell et al. (2012) referred to user needs or requirements as the information presented or developed in statements that formally specify and describe what user needs can be satisfied by using the designed or developed system. These statements are usually subjected to routine review, verification and refinement by the guiding group of the venture, such as the venture range, medical service providers and technology experts for the system design lifecycle.Then, they agree upon the concerns of the user requirements, their fit with the user needs and the practicality of the project constraints. The review focuses on the trends of the technology and its various applications, as well as the influence of the market and the economy. Since the development and introduction of IS serve as a change in the organisations which impacts many people, the social aspects of user requirements have been given a lot of attention by the researchers (Timpka et al. 2008). Besides that, it is also essential to refer to and also determine user requirements in the context of the work practice so that such identification will be precise and accurate. However, the absence of the description of the context in which the system is used may lead to the failure of the system in meeting the users' expectations, and will ultimately result in their rejection or resistance of the system besides incurring the necessary costs (Timpka et al. 2008).

Nguyen et al. (2014) reported that the previous researches have indicated that end-user participation in developing and implementing a system plays a critical role in making such system successful because this is indicative of user acceptance and has positive effects on the work procedures. Moreover, the active involvement of the end-users in designing and applying such systems will reveal their needs to the designers and developers and therefore will contribute positively to the clinical practice. With this regard, only a number of researches have been carried out with the aim of examining

and determining the level of satisfaction of the users of IS (Amin et al. 2011). As argued by Teixeira et al. (2012), the missing-out of human consideration, including the requirements of the end-users in a research is one of the most serious challenges causing the failure of a system. It should also be noted that whether a requirement is invariant or not is an issue concerning the stakeholders of the system, and it is supported by the requirements from the engineers (Ahmad et al. 2015). Since these activities are iterative in nature and require for successful applications, hence it is important for system designers to thoroughly and accurately understand their potential users in terms of their behaviour and their actual needs. This is known in the previous researches as elicitation of user requirements. It is a procedure that needs to be regarded properly with regards to the legal, cultural, sociological, and economical and other regional factors. This is because such factors exert an influence on user requirements and demands by shaping them (Moorman & Oates 2010).

### 2.6.1 Types of Requirements

Requirements play a crucial role in identifying the item or service, so they contribute to the quality of delivery of a given project. They also function as the basis in determining the clients' needs in solving any particular problem and in benefiting from a business opportunity. As stated by Wysocki (2011), there are basically four types of requirements: functional, non-functional, global requirements and product or project constraints. In contrast, Gottesdiener (2008) categorised requirements into three categories: business, user and software. As for Robertson and Robertson (2006), there are three main types of requirements: functional, non-functional and constraints. Besides that, Wiegers (2009) identified three patterns of requirements, two of which are consistent with those identified by Gottesdiener (2008). Thus, this sub-section discusses the following types of requirements:

#### A. Functional Requirements

Functional requirements are regarded to be among the most critical factors that control how a construction schedule is logically sequenced. They are defined as the requisites of functional dependencies among other components in both phases: the construction and completion phases. From these requirements, one that represents a challenging issue

in planning is the automated reasoning of sequencing logics (Chua et al. 2013). Moreover, functional requirements are described as the expected performance of a given product or service (Wysocki 2011). They provide a description of what is provided by a given system and how it should function and respond to its inputs. They also provide an explicit statement of particular or specific behaviors that should not be assumed by the system later. Functional requirements, be it high or general, refer to user requirements (Pohl 2010). They are actions performed by the product (Robertson & Robertson 2006). Putting it differently, functional requirements are services expected to be offered by a given system (Sommerville 2011). They are also recognised responsibilities or features accomplished by a software solution (Gottesdiener 2008). However, Wiegers (2003) distinguished between user requirements and functional requirements in the sense that the former refers to information about how users are capable of working with the system, while the latter refers to other information included in a certain application by software developers as to assist and guide the users in performing related tasks.

According to Thanh et al. (2008), the analysis of functional requirements is an appropriate method that can be used for analysing what is required by developing a particular system and analysing how it should function. This analysis clearly presents the relationship and sequence of the functions of the system. Furthermore, functional user requirements facilitate the users or clients' protection of their privacy, while at the same time support the healthcare providers in delivering healthcare services in a good manner. Thus, in the context of the current study, functional requirements talk about what the device should do and what are its components. They play a role in specifying the aims that need to be accomplished through the IT systems in each department and across the healthcare organisation and delineate species metrics for success (Carestream Health 2015). Hence, they are critical to be addressed in HIS especially for future user requirements.

**B. Non-Functional Requirements**

Non-functional requirements talk about the requirements which specify the characteristics of a product or service needed for performing the intended activities for which they are produced or designed. Such requirements are characteristics of the

product, including its attractiveness, functionality, quickness and reliability. Most of these non-functional requirements are related to standards of performance and general determinants of the product or service limits. In general, they are associated with the criteria of performance in determining how the system functions (Wysocki 2011). As documented in the previous related researches, non-functional requirements are the constraints of software design, external interfaces, legal and regulatory restrictions and the features of quality, including effectiveness, ability of implementation, its safety, accessibility, reusability, security, dependability, maintainability together with other software quality attributes of the particular system (Gottesdiener 2008; Sommerville 2011). They inform us of how the system should perform related tasks (Zaib et al. 2015).

Non-functional requirements also provide the information about the preferred behaviours which are also described as the functional requirements (Bo et al. 2007). Although non-functional requirements have received a lot of attention from the researchers since the 1960s, yet by far, no standards of specification have been described. Therefore, it is important to measure and validate non-functional requirements in order for them to be able to help produce or yield good results in software development. On the other hand, there has been a claim which regards non-functional requirements as functional requirements (Garmus & Herron 2001). Thus, the identification of the non- functional requirements which resulted in the discovery of new functional requirements contributes to the success of the software projects (Mairiza et al. 2014). They also play a role in addressing the essential issues of software quality and qualifying operations. Non-functional requirements exist in the context where the system operates. This is inclusive of the timing constraints, quality properties, standard adherence, programming language to be used, and so on (Pohl 2010).

Non-functional requirements are important since they identify which possible requirements can be adapted in the early stage of the development. This indicates that the inherent issues that many software systems still suffer from are related to the non-functional requirements. The resolution strategies that are used to handle such conflicts often lead to the change of the general plan rules, and not by simply changing one module. In this way, in developing any product system, it is vital for the programming designers to dissect such requirements and conflicts so that they can decide the alternative design solutions (Mairiza et al. 2014).

In majority of the cases, it is possible to transform global requirements into non-functional requirements by seeking the answers to these questions: what? why? how?. By doing so, the nature of the actual requirements can be better understood. It is added that the global requirements assume the highest degree of requirements within the system or project, and they are representative of the components of the system in general. Most of the requirements also appear to be global especially in the preliminary phases of a project. Yet, global requirements represent a fairly new term. Traditionally, they were labelled as general requirements, product constraints or constraining requirements (Wysocki 2011). Hence, non-functional requirements are the attributes of specific quality of a given designed system and they refer to the rest of the requirements which are not categorised as functional requirements.

## 2.7 THEORETICAL FRAMEWORK

The previous research points to different research models developed and used for investigating the implementation and success of new technologies. These models involve the HIS models serving as the grounds for the current study since they represent an integration of the various constructs related to the research area of this study.These models are created as a means of covering the gaps in the previous researches and in understanding the most important factors which affect the adoption of HIS. The user requirements are based on a well-known model, Delone and McLean (2003) IS success model. To be applied to an assortment of research areas, the dependent variable of HISQ contributes significantly to the success of IS projects and recent research has provided evidence underlying the moderate support for all interrelations. Thus, the models discussed below have been synthesized in constructing and developing the research framework for the present study, particularly for the users of the information system.

### 2.7.1 Information System Success Models

In order to determine whether an IS will be successful or not, researchers such as DeLone and McLean (1992) have developed an IS success model. As cited in Sang and Lee (2009), this model, which was proposed by DeLone and McLean (1992), has been subjected to validation by many scientists (Seddon 1997; Rai et al. 2002). As the most well-known model in the previous related researches, this provides an explanation for

the success of IS implementation at the individual and organisational levels (Pérez-Mira 2010). This model is considered as a theoretical framework since it provides an extensive knowledge of the achievements of IS, such as the connections among the most crucial measurements of achievements of IS. Being used in many studies, this model represents one of the most impactful theories in recent research on contemporary IS.

Since the validation of the initial IS success model by DeLone and McLean (1992) was recommended by those authors, many researchers have made the attempt to validate, enhance and extend this model (Molla & Licker 2001; Rai et al. 2002; Delone & Mclean 2004; Yusof et al. 2007; Wang & Liao 2008; Wang 2008; Yusof et al. 2008). As seen in Figure 2.3, previous studies have identified and determined six dimensions of the achievements of IS: in information quality, user satisfaction, service quality, system quality, and system use which almost all are independent variables.

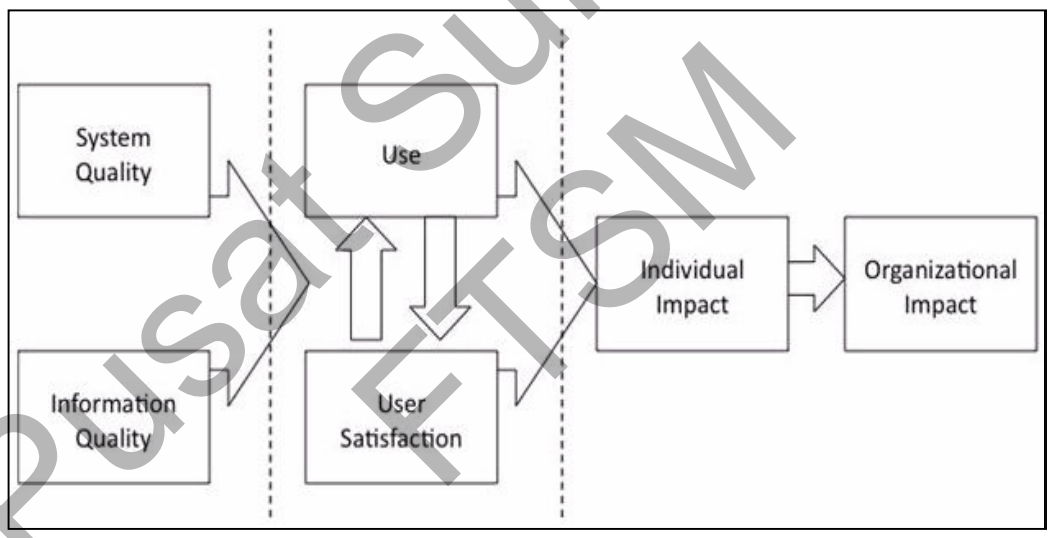


Figure 2.3 IS Success Model
Source: DeLone and McLean's IS Success Model 1992

The model, which was developed by Delone and McLean (2003), is regarded as a multidimensional measuring model which has interdependencies between various success factors and it defines the success of IS and the corresponding measures. They are categorised into six primary factors: information quality, system quality, service quality, intention to use, user satisfaction, as well as individual and organisational impacts (Figure 2.4). It has gained more acceptance and adoption by the previous studies compared to the other models. The IS success model has become more popular as a standardised model for determining and justifying the dependent variable in

information system research and has become more robust for the research on the evaluation of IS as pointed by Delone and McLean (2003).

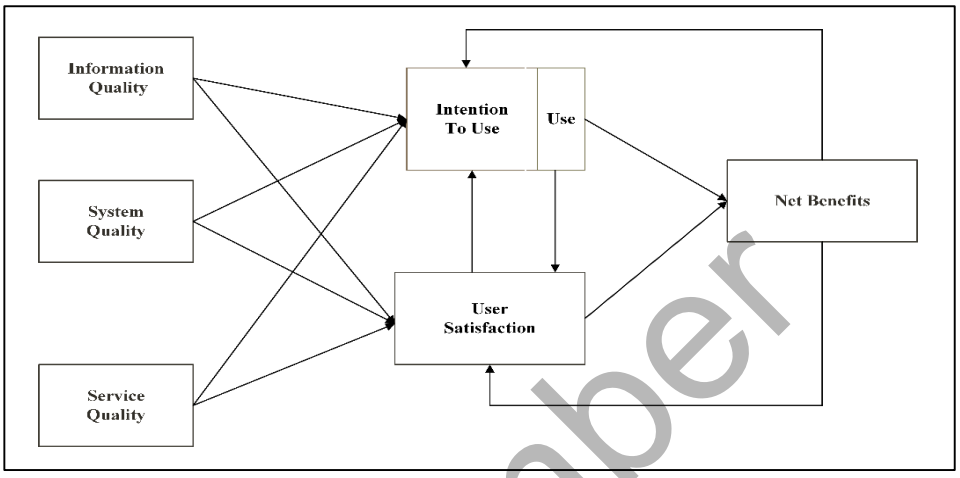


Figure 2.4 Revised DeLone and McLean IS success model.
Source: Delone and McLean (2003).

In addition, the original or altered Delone & McLean's model (2003, 2002), or the initial model of DeLone and McLean (1992), which was based on the Delone and McLean success model model (1992).This model was refined by Delone and McLean (2003), which was updated by referring to various studies conducted between the period of 1992 to 2003 (Petter et al. 2013). Figure 2.4 displays the main development or modification made to the earlier or original model. The added variable is known as the 'intention to use', which is intended for measuring the attitude of the users as an alternative measure of use, as well as measuring the individual impact and organisational impact. According to Delone and McLean (2003), the updated model is able to estimate a given system by focusing on the quality of the information and the services delivered by this system since this aspect is assumed to have the effect on the subsequent use or intention of use and user satisfaction (Delone & McLean 2003). The IS success model is useful due to its features which are able to positively or negatively affect the success of IS (Petter et al. 2013).

Although the studies which investigate user requirements in HIS indicate that the researchers have attempted to use and adapt this model, such adoption remains insufficient or unsatisfactory. By adopting the Delone and McLean (2003) model, specifically the criteria for assessing the quality of information, the previous researchers have evaluated the implementation of HIS in medical-teaching hospitals and have

developed various models based on this framework (Mirzaeian et al. 2014). In addition, as argued by Heo and Han (2003), the factor of the IS can be one of the most significant factors in in the contingency approach since the IS model underlies how computing has evolved and how it relates to occupational objectives and strategies (Heo & Han 2003).

IS success model have also been known research subject in many countries of the world. There are many marketing domain in talking about it and explain some point about it like Grover (1996) showed six efficiency categories based on the unit of analysis together with the type of evaluation context dimension, as well as the market measures. Distinct researchers who have concentrated on IS in this specific domain are Smithson and Hirschheim (1998) by creating a version which comprises of three zones of measures, which are: efficiency, effectiveness and understanding. The most could be achieved through the perception of the individuals, organisations, and the societies (Figure 2.5).

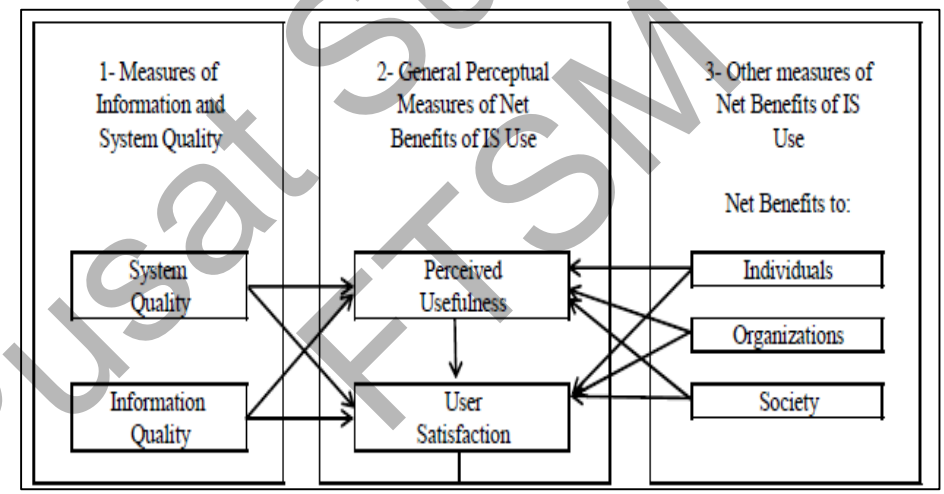


Figure 2.5 IS Success Sub-Model.
Source: Seddon (1997) .

Another IS success model, Seddon (1997), was created as an extension of the initial design of the model created by Delone and McLean (2003), by concentrating on its success and use. This is regarded as a good theoretical framework to consolidate the earlier research on IS success. It provides an explanation of the relationship among the tasks and it is also a variance model of the original IS actual success model by adding perceived usefulness, which refers to the instrumental usefulness realised or perceived

by IS. It also highlights the enhancement of the use of the system by focusing on the perceived usefulness and satisfaction of the users (Seddon et al. 2002; Gorla et al. 2010).

The present study aims to create a brand new model for enhancing the quality of HISU which can reduce or assist in healthcare. This model is developed by analysing the critical factors of HISQ that influence the HISU. In addition, this model is one of the more consensus models in measuring the success of HIS.

This IS success model has been observationally tried in the general public organisation (Tona et al. 2012). In addition, it has also been discussed in the previous researches in the literature review. The use of the Delone and McLean (2003) model represents the characteristics of the past experiments. On a conceptual level, the complex rapture of evaluation has led the research to hunt for alternative options in reference to the disciplines such as the economics, engineering, sociology, and education where the evolution has been widely analysed before. The vast majority of these researches concentrate on the improvement of the frameworks and ideas for IS assessment by using past research experience and knowledge. However, the significance motivated many scientists to search for the proof and solutions in organisational practices.

The model was developed based on new ideas and understanding angles on scientific evidence (Smart 2009). According to DeLong and McLean (2003), a product could be assessed in terms of its conditions of quality of information, service quality, and system quality. This is because, these qualities would impact the users of HIS. Some benefits will be achieved in using the device. One of the reasons for using this model is the need to measure the basic quality factors of the users of HIS and their impact on the process of user requirements as a HISU in the research.

### 2.7.2 Relationship Between User Requirements and User Needs

User requirements are centered on Business Process Re-engineering (BPR) and the knowledge of user requirements in a manner that facilitates the success of ERP implementation. The previous researchers have considered BPR as a crucial key factor in the success of ERP implementation (Singla 2009; Dezdar & Ainin 2011; Moohebat et al. 2011; Annamalai & Ramayah 2012; Surman & Bath 2013). In addition, user needs

in the ERP system are important and they are based on certain goals and capabilities that should be considered when implementing the ERP system. For instance, some prior studies have reported that the simplicity of use and little specialisation of the ERP device is crucial to the success (Supramaniam & Kuppusamy 2011; Upadhyay et al. 2011; Khattak et al. 2012). In general, user needs are regarded as very important for the success of ERP implementation because as assumed by the strategic choice theory, only the users have control over the success or failure of a system (Surman & Bath 2013).

The model which is shown in Figure 2.6 provides a description of the success of ERP implementation. As a comprehensive model, it comprises both user requirements and user needs. In this model, the actor can possess diverse interests. Therefore, this model indicates that user requirements are correlated with user needs.


Figure 2.6 Relationship between User requirements and User needs.
Source : Surman and Bath (2013).

### 2.7.3 Relationship Between User Requirements and Information Quality

This particular sub-section offers an evaluation of the prior related works on the relationship between user requirements and information quality. Many previous studies on the success of IS are based upon the IS actual success model by Delone and McLean (2003). For example, the research in Surman and Bath (2013) reported that the participants have regarded information quality to be under the category of user requirements. It was argued that user requirements, as a variable which ranked the highest, reflects its prospect for information quality and performance (e.g. ease of use) and system usability (e.g. accuracy). This implies that user requirements may not be met or satisfied if the system is not accessible and does not provide them with the appropriate information. The findings of this particular analysis demonstrate that there are many factors impacting the achievement of IS implementation which was ranked from the highest as follows: fulfilling user requirements, information quality, system

usability and efficiency and use, user developed and IS possession and communications with the relax of IT facilities. In comparing this model to the other earlier models by DeLone and McLean (1992, 2003) and its modified version by Seddon (1997), these factors are the most important factors used in evaluating the success of IS implementation (Elpez & Fink 2006).

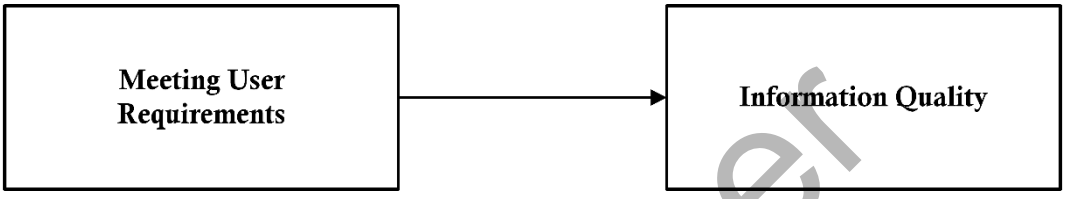


Figure 2.7 The Relationship of the Variables of IS Success in Meeting User Requirements and Information Quality .
Source : Elpez and Fink (2006) .

As seen in Figure 2.7, the model focuses on user requirements and information quality in relation to the actual achievement of IS in the public sector. As found by Elpez and Fink (2006), there is a relationship between user requirements and information system of the DeLone and McLean model. The same researchers have also shown that the factor of user requirements ranked the highest in the three case studies. Therefore, the study was concluded by emphasizing on the importance of meeting user requirements because it is an acceptance of IS success (e.g. Wateridge (1998), this study again provides evidence for this particular study. User requirements also correlated with user needs in another study on the assessment of the quality of information (Surman & Bath 2013). Yusof et al. (2008) pointed out that there is a relationship between two dimensions: technological and human. In the study which was conducted by Gorla et al. (2010), it was found that there exists a connection between user requirements and system quality.

### 2.7.4 Regions of Europe Collaborating for Healthcare

Based on the previous study done by Moorman and Oates (2010), the papers works as a structure for the reflection of user needs and requirements of the renewal of health User Advisory Board (UAB). The structure of this study provides the emphasis on the activity of UAB, and therefore of the improvement work. Figure 2.8 illustrates the representation of the user needs.

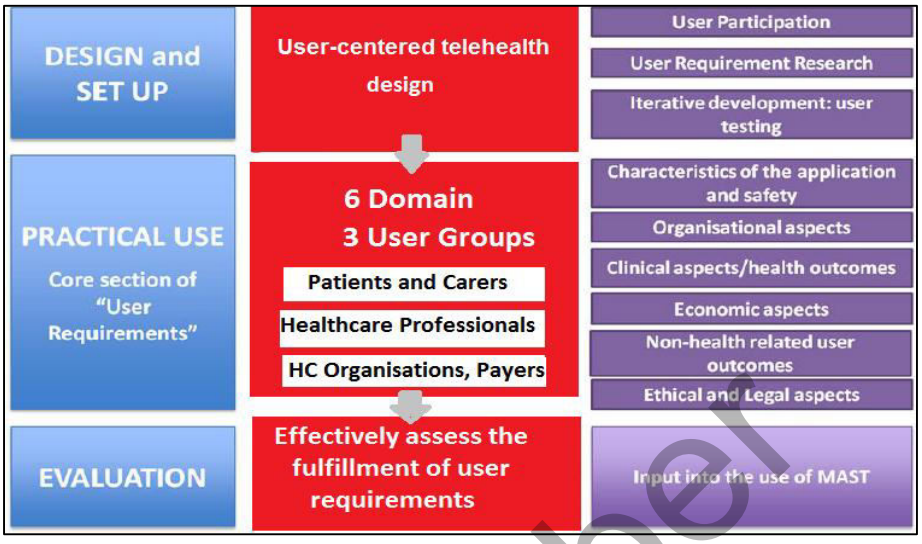


Figure 2.8 Matrix of a process view.
Source: Moorman & Oates (2010)

This provides study model comprehensive analysis of the user requirements of the telemedicine service is the availability of the users. User requirements are described as a comprehensive range of user needs, objectives, choices and restrictions of the users of the healthcare telemedicine solutions that must be taken into account at all levels. The consideration should be made starting from the structure of the design stage to the final stage of the implementation, such as the solutions, to make sure that the final solutions, such as all the elements and components (solutions, products, applications and et cetera) would reflect the effective purpose as to why it was originally conceived, while considering the users requirements, user needs and user preferences as much as possible. The delivery of this research is a frame of referrals for the reflection on user needs and specifications as they work on the restoration of a variety of user wellness and trials.

The needs and opportunities of the three groups of end-users (patients /informal carers, healthcare professionals and the organisations) have been captured from the previous literature. It will be used to structure and document the feedback process from the representatives of the real users who use the renewal of the health service. The place to start is the architectural model (Matrix) on the user requiremenrts to provide six-dimensional and three stages of telemedicine services

## 2.8 DEFINITION OF OPERATIONAL CONSTRUCTS

This section provides the definition of the most important and relevant concepts and terminologies. The definitions presented here are not based on the literal meaning of such concepts, but rather in accordance with the inner reasoning of the statistics in this study. In this sense, the meaning of the constructs is within the perspective of the study (Sekaran 2006). The definitions are presented below:

### 2.8.1 Health Information System Quality (HISQ)

This term refers to the framework of user requirements on the health information system quality (HISQ). The conceptual model of the current research encompasses: the information, system quality and also service quality of the success of HIS.

#### A. Information Quality

Information quality is defined as the degree to which information as output produced by IS can be good. Such information could be in the form of paper-based or digital reports (DeLone & McLean 1992). It is also described as the quality of the outputs of HIS (Yusof et al. 2007). The previous studies have paid a lot of attention to information quality as a crucial concern for both the public and private sectors Kaisara and Pather (2009), because of its strong association with the application of the web technologies (Delone and McLean 2003). As discovered by Thomas and Streib (2003), the most important reason why the citizens visit health IS is to obtain information. As defined by DeLone and McLean (1992), information quality describes the way of measuring the actual results of IS. In a comparable definition, it also denotes the measurement of information made in a system (Jennex et al. 1998; Maes & Poels 2006). It is also asserted as the basic element in determining the use of a system and whether the users are satisfied with such system or not, thus leading to their regular adoption of the system (Wangpipatwong et al. 2005; Wang 2008).

In IS, information quality is considered as one of the major factors that contribute to the users' perceived usefulness of such information (Lin & Lu 2000). In addition to that, how the users perceive information as useful strongly correlates to their use of the system, and this is true especially in the context of HIS (Rai et al. 2002; Yusof

et al. 2007). As reported by Ramayah et al. (2010), any IS that offers a high quality content will be more likely to contribute better to the users' intention in being actively involved in using the service. Therefore, information quality is deemed as an important factor that influences the adoption of HIS.

In the context of the existing research, the term information quality is described as the characteristics of information that satisfy user requirements in a meaningful and reliable way. With reference to Petter et al. (2008), those characteristics are relevance, accuracy, understanding, completeness, conciseness, availability, timeliness and also usability. In a study on the by Delone and McLean (2003), the researchers have emphasised on the importance of the relevance, accuracy and timeliness of the information.

**B. System Quality**

System quality is a term used to denote to the quality of information processing of the system. This also includes the software and hardware components. It underlies how or to what extent the system quality is technically good or sound (Gorla et al. 2010; Gorla & Somers 2014). The quality of a system also includes features such as stability, integration, and flexibility, which all contribute to the users' perceived ease of use of HIS (Pai & Huang 2011). As found by Li (2014), system quality has more substantial impact on the achievement of EHR than information quality and service quality. Moreover, the same researcher pointed out that the role of quality of system functionality and user-friendly interface is in facilitating the physicians' processes of communication and easy access to the clinical information. It is also described as the extent to which the system is effective at offering information that satisfies and fulfills the purpose for which it is designed and developed (Poels & Cherfi 2006).

As defined by Seddon (1997), system quality is a term that incorporates the accuracy of IS, user interface consistency, user simplicity and easiness, and the quality of documentation. It is also believed by DeLone and McLean (1992) that systems with higher quality are seen by the users as easier and highly useful to use (Petter et al. 2008). It describes the quality of the assistance provided to the users by the IS actual departments and IT support personnel. System quality encompasses various features,

including how the system is responsive, accurate, easy, flexible and technically competent, as well as how empathetic the personnel staff is (Petter et al. 2008; Gen-Liang 2012; Sook-Ling et al. 2015).

The IS is regarded as a point which connects the people of the society to the public of HIS. As people use and interact with these systems, they obtain information concerning the security of the service, and here is where IS becomes important. Besides that, the quality of a given website, the content offered and the easy information and service accessibility represent the most important aspects of the website. This means that the high system quality that meets the user requirements is what makes a given website excellent. In the context of HIS, system quality refers to the information that is accurate, clear and authorised, and which increases users of HIS (Yusof et al. 2007; Gorla & Somers 2014). Therefore, as for the present analysis, system quality could be described as the properties or traits of a system which enable it to perform its tasks in a way that fulfills user requirements (Poels & Cherfi 2006).

**C. Service Quality**

Service quality is described as the level to which normative expectations of a service for the receivers diverge from their perceptions of the performance of the given service (Gorla et al. 2010). As defined by Petter et al. (2008), service quality refers to the degree to which the expectations of the receivers of the service are sporadic with their perceptions of the actual service that they receive (Yang et al. 2005).

According to Strawderman and Koubek (2008), the term quality denotes several important traits, such as the users' expectations and perceived needs which should be considered when assessing the quality of a service. There are also other important elements of service quality which include training programs, maintenance, support and technical expertise of the IT personnel (Li et al. 2002). In the context of HIS, normally, the clinicians would assess the quality of the IT products and services to ensure that they meet the specifications and configurations based on their requirements (Hung et al. 2013). In a previous study on the success of HIS using a survey among the nurses, it was reported that the users showed a high level of satisfaction because of their high perceived usefulness, in addition to their perceived ease of use. Some prior researchers

have pointed out about the importance of constant augmentation of service quality during the implementation of a system in order to facilitate high system performance (Pai & Huang 2011; Monem et al. 2013). Based on this, in the context of the current research, the term of service quality users' expectations of IS in providing them with official transactions within the user requirements and related external organisation or citizens.

### 2.8.2 Health Information System Users (HISU)

The term HISU refers to the users of HIS in this study which covers their intention, satisfaction, needs, and requirements. All of the aspects are presented below:

#### A. Intention to Use

User intention is a concept that is used in the previous researches to refer to the users' psychological state or how the users willingly see the personal relevance and the importance of any system to the improvement process and its product (Wangpipatwong et al. 2008). Gorla and Somers (2014) defined it as the extent to which the staff and customers are willing to use and make good use of the capabilities of IS in their work. This encompasses the amount of functions utilised by them, the frequency of access to the system and the amount of time in connecting the system. In the circumstance of voluntary use, the specific use of the highlights might be a suitable way of measuring success (Williams et al. 2012).

#### B. User Satisfaction

It is referred to as the users' overall satisfaction and interface satisfaction (Gorla & Somers 2014). Delone and McLean (2003) assumed that system use and user satisfaction have the effect on the effectiveness of a computer system, and both factors are affected by the quality of the system and information quality. Subsequently, system use and user satisfaction have been used as the indicators of the success of IS. The results of the previous researches indicate that user satisfaction is highly correlated with information quality, system quality, and individual influence (McGill et al. 2003). As discovered by Mohamadali and Garibaldi (2010), user satisfaction underlies their

satisfaction with the quality of their work life, satisfaction with the interface used, satisfaction with the decision-making, satisfaction with the software together with the satisfaction with the system components.

**C. User Needs**

User needs refers to the users' physical and psychological attributes and their appreciation of the context in which a system will be used. In the field of information retrieval, information needs has been considered important because it provides insights into the capabilities of information retrieval in providing the users with the needed information. The concept has pertinent relevance (Maghrebi & David 2007). The previous researches have more precisely integrating usage context of resulting information in an information system (during creation and feedback) should enhance more partner users needs (Maghrebi & David 2007). Thus, user needs are not static, but can be influenced by the way a system is designed and operated.

Due to the advance and revolutionary nature of IT, the analysis of user needs is regarded as an integral part of the whole process. It is considered as an essential pre-requisite in designing good and efficient telemetric systems that offer information regarding the established methods in terms of the terminology of security, value, meeting the user requirements, simple to use and appropriate (Sommerville et al. 1998). It also provides information about the adoption of HIS (Farzandipour et al. 2011). The user needs analysis, when designed carefully, can serve various purposes for the patients, healthcare providers, program managers, communities, civil societies and the decision-makers in terms of the quality, coverage and efficiency of HIS (On et al. 2012).

As argued by Strauss et al. (2015), serious issues related to usability and the interface of the Health Information Exchange (HIE) are attributed to the lack of user needs analysis which provides the healthcare providers with the information about the patients and facilitates their decision-making process. Research has also indicated that addressing the expectations of the users will ensure the successful adoption of HIS (Farzandipour et al. 2011). As an integral part of HIS adoption (ArabChadegani 2013), user needs should be constantly assessed, analysed and implemented to enhance their overall satisfaction towards HIS (Amin et al. 2011; Sinha & Kurian 2014). Otherwise,

the failure to analyse the user needs indicate that HIS is still in its infancy stage (Farzandipour et al. 2011).

Many previous studies have obtained results that support that users are a crucial factor in determining the overall achievement of ICT adoption. For instance, user needs influence ICT adoption among healthcare employees indirectly through their perceived usefulness (O'Donnell et al. 2011). It was also identified as one of the importance factors in predicting use of the technologies in delivering (Mehraeen & Ahmadi 2013). Nowadays, due to the development of HIS in the healthcare centers, the use of IS preparation, applications and software has also increased. Great concern has been placed on the use of hospital IS in the healthcare sector due to their increased needs in the increasing complexity of the operations of the health department, and also due to the great diversity and innovation in the supply system. The failure in the implementation of the hospital IS has resulted in two other failures; the inability to fulfill the expectations of the decision-makers, and also the failure in the profitable implementation of the process (Ahmadi et al. 2012; Rahimi et al. 2014).

From the above studies, it can be seen that it is important to understand user needs in HIS, especially its relationship with the employees' attitude towards the adoption of IS. The cultivation of a new local culture should involve the user needs. Therefore, as an important construct investigated in the current study, user needs can be defined as the degree of use of IS among the healthcare employees to fulfill their work obligations and needs. By including this construct in the framework, user needs analysis will help IS developers and managers to be aware of what the users actually need from using such systems (Sommerville et al. 1998).



**D. User Requirements**

The term user requirements refers to the needs that a certain system will fulfill for the users, and what is expected to be met by using that system. User requirements are stated in a User Requirements Document (URD) using narrative text. Since they are signed off by the user, user requirements function as the basic input for developing a certain system (Juaim 2010). User requirements should be defined during the designing phase of the system since they provide a description of the tasks and functions supported and

carried out by the system. They also describe how the system will be implemented. In the design phase, user requirements reflect the developer's perspective. Moreover, since they are the needs of the stakeholders who interact directly with the system, such requirements have been argued as the most difficult challenges in a system development (Wilson & Howcroft 2002; Gottesdiener 2008; Ahmad et al. 2015). As added by Juaim (2010), the complexity of user requirements is partly attributed to the users' inability to express and communicate all of their needs and partly due to their incomplete, inaccurate and conflicting information. Therefore, it is important to analyse such user requirements carefully.

The previous researches on healthcare organisations have emphasised on the importance of defining user requirements since they define what is required from the software from the users' point of view. Generally, user requirements include not only the requirements of the people who access the system, but also those who deal with the hardware devices, databases, and other systems. Such requirements are usually stated in the document of concepts, especially in the systems developed by most government organisations (Gottesdiener 2008; Farzandipour et al. 2011). These studies failure to meet user requirements means that HIS has neglected the important aspects of HIS adoption. The need for more research which examine user requirements in the healthcare organisations at all units and levels has been highlighted in some previous studies. For instance, Maguire and Bevan (2002) argued that the understanding of user requirements represents an integral part in designing HIS, and plays a critical role in the success of its implementation because this success starts with better understanding of such requirements. However, user requirements which are fulfilled have never been investigated. To guide the development of future models, we have analysed user expectations and experiences and compared them with the visions of the developers (Westh et al. 2015).

The term of knowledge user requirements, change management, execution program, venture management application, together with significant management support are constructs with a lot of important factors for Enterprise Resource Planning (ERP) execution results. However, user requirements focuses on business process reengineering (BPR) and knowledge of user needs in the ERP system in order to successfully implement ERP. The previous researches have identified BPR as a vital

Critical Success Factor (CSF) in ERP implementation. Although the span of the report attempts to offer all aspects of user requirements, it will however provide the insight into just how user needs are able to influence the success of ERP implementation by focusing the span of ERP implementation Although the span of this article tries to provide all aspects of user requirements, will be provide an insight into how user requirements can impact ERP. Greater knowledge of consumer requirements, as based on the information and BPR of consumer needs, is favourably linked to the success of ERP execution (Dezdar & Ainin 2011; Moohebat et al. 2011; Schniederjans & Yadav 2013). In relation to this, the objective of this study is to explore the important factors for perspective of user requirements system by users and analyses the user requirements of the system using both the FRs and NFRs as the preliminary study in developing a HIS system based on these sub-factors; (1) Business roles (2) External interfaces (3) Authorisation (4) Security.

**i. Business Roles**

The previous researches have highlighted the effect of the business process management in the success of HIS implementation. The impact of the business process management on the success of HIS implementation is crucial, and is the subject of our investigation in this study. It plays a role in changing the business process to accommodate the HIS software, thus changing the way of doing business (Often provide better service for the patients and the employees), in addition to peoples' responsibilities and roles. Thus, healthcare departments often comprise of complicated processes, spanning from different groups and organisations. The implementation of HIS to manage and automate the processes are more important roles in improving the impact of healthcare enterprises (Al-Mudimigh 2010). In addition to the use/ nstallation of IT in clinical and diagnostics equipment, IS are uniquely positioned to capture, store, processes, and communicate timely information to decision makers for better coordination of healthcare at both at the individual and population levels. This includes data mining and decision support ability to identify potential adverse effects to the individual patients during a health check is to provide insights into the cause of the intricacy of the disease (Agarwal et al. 2011).

In February 2008, ISR Advertising on IS globe and other outlets invited intellectuals from around the globe to submit papers for a special number of titles on the role of IS in the healthcare organisations: synergies from the interdisciplinary perspective due to the variety of delivery systems across the nation's healthcare system, encouraging the call to forward the submission on parts of the healthcare system which include the providers (such as the hospitals and physicians), the payers (such as the employers, government, insurers and the consumers who are also the patients). The conference including miscellaneous documents impetus for a variety of theoretical and methodological perspectives (Agarwal et al. 2011).

At present, the exploration of the different organisations of the information system is needed in order to turn the attention to the role that the information system plays in the components. Will be taking a gender at what the segments of IS are. However, what do these segments exactly do for an organisation? From our definition above, it can be seen that the data collect, organise, store and circulate across the organisational fact. Hence, it can be said that one of the business roles is take information, and then change it into a hierarchical organisational knowledge. As IT develops, this role has advanced and became the backbone of the organisation. In order to get a full valuation of the role that IS plays, a survey has been done on how they have changed throughout the years (Bourgeois 2014). The understanding of the positions and parts of the connections are the basis of any enterprise. The idea for the business part can be concerted entirely without making any reference to the technology, although it can be made and allowed through automation. According to Kiah et al. (2014), the roles (the functions that the system offers) is the main criteria that can be used to evaluate and select the HIS software packages.



**ii. External Interface**

Some previous researchers, for example Sousa et al. (2014), have proposed a computer-aided and comprehensive approach to verify and specify user interface based on unit-checking technique. They pointed out that the specification of user interface for applications is more than the mere description of the graphical elements, but also includes the crucial elements of behaviour relevant to the interaction between the users and the system. Thus, a user interface is a "dialogue" which is capable of determining

the communication between the operator and the system, as well as the available functions and the information that should be offered at each moment (Sousa et al. 2014). The relationship between the user and the interface has been reported in the previous studies. In addition, the user interface should be created in a manner where it evolves from iterative to evolutionary, so that it can support the user interface development life cycle in a more flexible way. Task analysis is beneficial for the effective design of user interface because the problems that exist in the task analysis during the user interface design can be beneficial in both directions (Guerrero-García 2014). User interface is intuitive and enhances exploratory learning, it must not lead us user fear of making irreversible errors because this will lead to their stress and anxiety. Moreover, user interface of telemedicine applications which is not user-friendly can be associated with high human, patient safety standards and therefore lead to poor patient safety standards. Individual aspects are associated with functionality support and the design of the service interface (Moorman & Oates 2010).

The external interface requirements are the requirements related to the flow of information across distributed connections to the components, users, and other software applications, which are outside the limitations of the software application product. The user interface has some features that are crucial for its functionality (Wiegers 2003; Bäurle 2011; Wiegers & Beatty 2013), including the interactions between the database and other databases or software applications. Hence, system requirements are recognised as features such as performance and security (Mairiza et al. 2014). An adaptive user an interface is a user interface, which adapts itself by changing its layout and rearranging the screen elements based on user needs. Therefore, a flexible user interface is an interface that is capable of adjusting itself by changing its structure and putting in order the screen elements based on the user needs (Shakshuki et al. 2015). Yen and Bakken (2012) pointed out that the identification of the roles of the system (functions), and interfaces from the user perspective is important in designing a sound HIS.

**iii. Authorisation**

In the healthcare system, not all users are allowed to access all of the information. Therefore, there are several models of authorisation which restrict the users' access to

certain information at a certain time. However, the growing number of users and the increasing amount of information render user authorisation to be more challenging. This critical issue also restricts the spread of HIS. Majority of HIS are designed independently, and they still lack certification and authorisation mechanisms. As a result of this, the sharing of the healthcare service has become more challenging from the viewpoint of the business user, security requirements have become critical. If HIS are not secure, patients may obtain inaccurate healthcare information, and the quality and safety of providing health care can be reduced (Hsu & Pan 2013).

In healthcare organisations, the authorisation of the staff towards IS is regarded as an important factor that is associated with IS application. Besides that, the authorisation policy is usually developed based on the roles that offer a certain access to certain resources depending on the hierarchy and qualification of the objects in the system. For instance, this access is provided to the users based on their roles or positions and qualifications (Sandhu et al. 1996; Tari & Chan 1997). In a study by Hsu and Pan (2013), the concept of the authorisation of consumer identities and determining the associated authorisation according to the credentials was introduced in the healthcare system (Hsu & Pan 2013). The most challenging issue encountered by HIS is related to the authorisation system (Shelc 2015). From these previous studies, it can be stated that it is important for the administrators of the healthcare units to worry not only about who accesses the healthcare units within the organisation itself, but also about those who access them from outside of the organisation. By doing so, the users will be able to exchange information related to healthcare more quickly, accurately and effectively.



**iv. Security**

Non-Functional Requirements (NFRs) of the security in HIS are those requirements regarding the users' security which include generic, authentication, integrity, nonrepudiation, confidentiality privacy and availability (Khatter & Kalia 2013; Mairiza et al. 2014). It is pointed out that all systems offer the users with security and data protection as a priority. This is usually offered in the form of IDs and passwords for the users or employees in HIS and others (Ahmadi et al. 2014). It is very crucial to ensure that the security of the data is stored in the device since such data would be valuable and confidential. In an earlier study, it is recommended that security should be achieved

through back-ups for every information of the patients, the audit trails used for monitoring the usage and access of the data and the use of log-in identification code with a password since unsecured data may be subjected to violation and abuse (Ismail et al. 2010). One of the major challenging issues faced by patient information is the issue of security.

Besides that, there is another serious issue which is the security of the networks through which the information about the patients can be transferred between and inside the organisations (Tähkäpää 2014). The previous researches have highlighted the effect of protected management of the data and patient utilising HIS on the quality of patient care, patient rights and the healthcare professionals, as well as their work practices (Kyhlbäck & Sutter 2007). However, the lack of such secure data management will result in the loss of verification, data confidentiality safety, web server healing time, and also authorisation security, which will result in the ultimate failure of the system (Goel et al. 2011). These studies have also considered functionality, security and quality of the system as important elements in defining the success of HIS. The term security denotes the security of the users and the system, such as confidentiality of the data analysis used and also the probabilities of server downtime, in addition to system failure (Goel et al. 2011).

In a qualitative study by Ismail et al. (2010) which investigated the growth and implementation of IS in three hospitals in Malaysia, the findings obtained through the interviews with the personnel, namely the providers and the end-users have revealed various themes; the scope of implementation, human resource, security, system development, support system, user-friendliness, hardware and training. In addition to that, the success of HIS implementation is determined by the good support system, quality human resource, adequate training and user-friendliness of the end-users. By obtaining knowledge of the users of the system regarding their features, goals, and results of the device will assure that HIS is secure and confidential. This is because, all these aspects are expected to result in the decrease of users' resistance while increasing their acceptance and involvement in HIS implementation (Jebraeily et al. 2012). Researches have indicated that the medical providers and patients have paid more attention to both privacy and security of the healthcare information. In addition,

efficient training and effective technical support will facilitate the hospital staff in learning and using HIS in their daily work tasks (Peng & Kurnia 2010).

Based on the previous researches, in relation to service quality, HIS users have regarded functionality and efficiency as the most desired qualities of HIS (Muema 2014). Therefore, it is recommended that NFRs, including security, reliability, modifiability, performance etc. As the system in general, and larger in scale, customisation of the system operations as per different users' perspectives becomes more difficul.Thus, NFRs are primarily concerned with the security requirements (Khatter & Kalia 2013). It is necessary for the health information technology to comprehensively manage medical information and secure the exchange of such information between the healthcare consumers and the providers. Since the current study focuses on the hospitals, security is viewed as the most crucial issue which must be well thought out. This is due to the fact that data that is related to healthcare such as the patient's name and his/her diseases are very sensitive. While some believe that data is more secure in a physical environment, others believe that it is more secure to maintain or keep the data in a digital form. Here, security implies the prevention of any unauthorised access to the data and the elimination of the chance in losing it. Therefore, another important factor that should be measured is the users' or the professionals' level of acceptance of data security in digital form (Sengul 2013). However, due to the increasing advances of the technology, there have been more emerging requirements related to security, including those requirements which are pertinent on how the privacy of medical records can be preserved. Such requirements have been outlined in a few well-known American Health Insurance Portability and Accountability Act (HIPAA) privacy rules in the USA and the European Data Protection Directive 95/46/EC within the European Union (Kiah et al. 2014).



## 2.9 THE CONCEPTUAL FRAMEWORK.

The current conceptual framework which comprises of several other end-users in the health units, conceptual framework was constructed as one of the principal goals at this stage of the research work developed based on DeLone and McLean (2013) as previously mentioned. The proposed framework aims to elicit information about the HISU of the IT project in the environment of the healthcare unit. Therefore, this phase

focuses on the presentation of the user requirements framework and the introduction of its elements in a precise manner. For this, the first step is to examine the impact of the quality of the healthcare IS on HIS users in Sana'a, Yemen. In addition to that, the study has also formulated the hypothesis which informs the development of the framework. The second step is to propose a model which examines the quality of HIS on HIS users in Sana'a, Yemen.

## 2.10 SUMMARY

To summarise the main aspects of the study in this chapter, the chapter has reviewed the previous researches that are relevant to the success of HIS in different contexts, including in Yemen. Specifically, it focuses on the influence of information on the user requirements factor, which forms the structure of this study. For the last few years, user needs and user requirements in HIS in the developing nations have gained a lot of attention, in addition to the efforts made by the private and government agencies, the donors and the sector, as well as other development partners seeking to enhance the overall healthcare unit. Based on the review of the prior studies, the success of IS in the healthcare unit of several developing countries is still in its infancy due to several barriers. These barriers, which have been identified in the previous researches, are lack of expertise and skilled people, and lack of good telecommunication systems which together make it harder for many countries to acquire knowledge about the technology. In addition, many developing countries including Yemen are not well-informed and updated with the latest information technology due to the insufficient information about the advances and advantage of the information technology. Moreover, Yemen's health planning is still based on the traditional normative planning rather than the strategic planning, even after information has been made ready for the last few years.

Generally, the previous studies have classified the factors that impact the success of IS in the healthcare unit into three main groups; IS quality factors, IS users and organisational. To conclude, the issues have become a common problem the users will be demotivated in using HIS. Without the assurance of protection of privacy and reliability of transactions with the Patients, users will oftentimes abandon the use of HIS. The most important factor which characterises HIS is the issue of user requirements. It is important for the system to have an effective structure of information

in fulfilling user needs and specifications regarding data comfort. Hence, HIS is a aspect that performs a key part in assisting users' objective to use of IS services by motivating them to discuss their private information and to connect to the IS.

# CHAPTER III

# METHODOLOGY

## 3.1 INTRODUCTION

The current study uses the quantitative method to investigate the factors which influence the perspective of IS in terms of the quality factors of HIS, the information system users and the organisational factors, including the information on the developing countries (Case Study: Yemen). Thus, this chapter presents a theoretical study, the description and justification of the research approaches used in the current study. Then, it moves on to describe the population and the sampling context of the study, which is followed by a detailed explanation of the collected data. This comprises of the description of the development of the instruments for the quantitative data collection. In addition to that, the chapter also offers a description of the data analysis process, such as the reliability and validity of the tools employed for the data collection and how the quantitative data were analysed. Finally, the chapter ends with the realisation of the main facets of the research methodology.



## 3.2 THEORETICAL STUDY

The first phase of the methodology is called the theoretical study. With the purpose of gaining better understanding of the main problems of the domains, the research has comprehensively reviewed the previous literature in HIS of the developing countries including Yemen, which includes the barriers associated with information technology for the user perspective models. User requirements are associated with healthcare, the barriers of information use, requirement factors and the components of information on user requirements. Figure 3.1 depicts this phase which comprises of the input, activities and the deliverables.

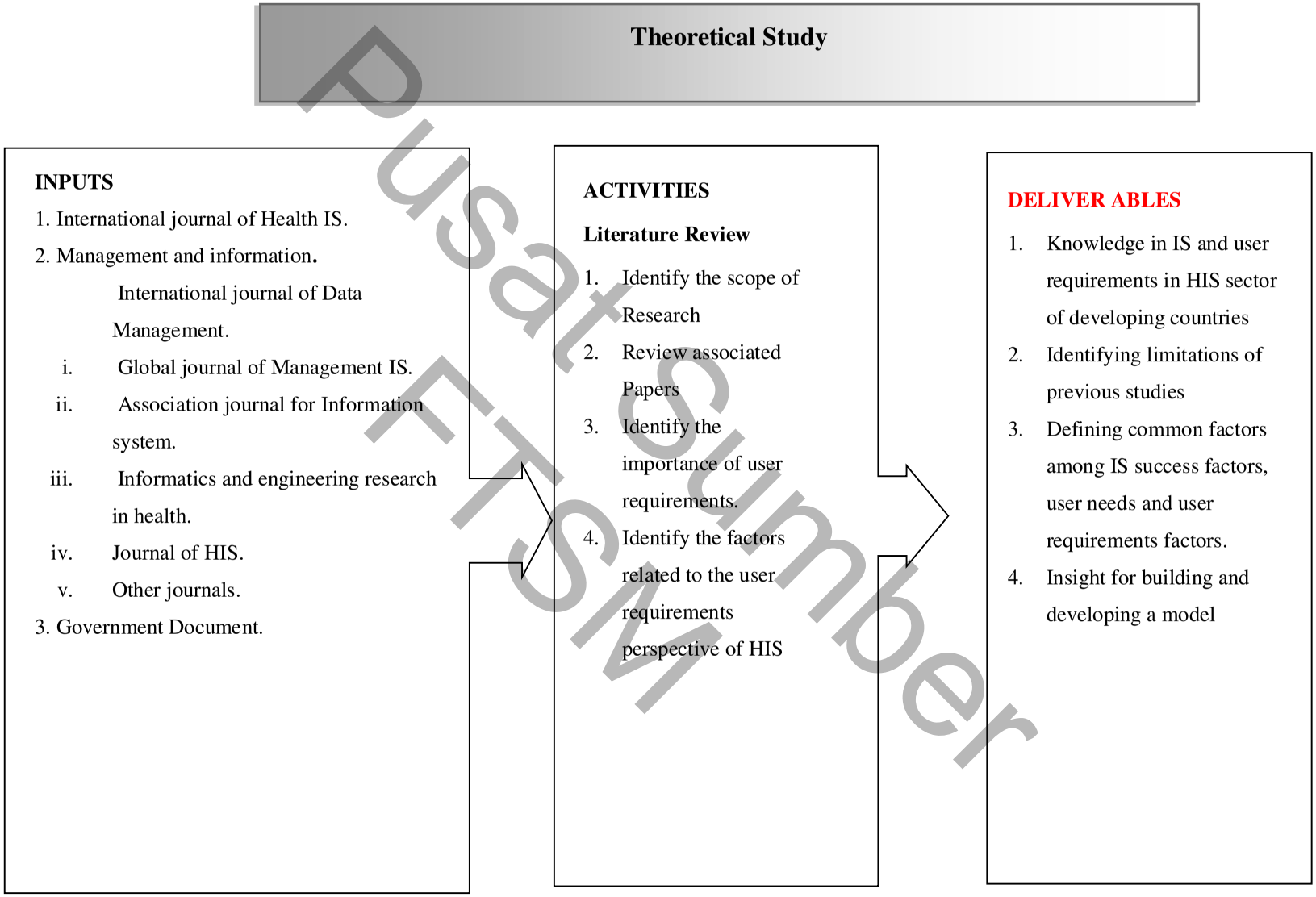


Figure 3.1 phase of Theoretical Study for Model Development.

### 3.3 RESEARCH APPROACH

A research approach refers to a structured set of logics steps to keep the research in the right direction. In conducting a study, it is important to select the quantitative approach. However, the application of the quantitative approach should be strongly based on the research objectives since employing the quantitative method in a research design strengthens the researcher, while at the same time minimising his weakness (Creswell 2013). A quantitative study is utilised for testing independent theories by evaluating the relationship of all the variables. This method is widely used and preferred by most of the information system researchers (Gable 1994).

Creswell et al. (2011) stated that a research process consists of several important phases. Figure 3.2 illustrates the adoption of the quantitative design which can be fulfilled by following several phases, such as: the research process, literature review, research problem, research objective and questions, conceptual framework design, survey design and data analysis and framework development.

The software solutions employed for data collection and analysis in this particular study are the Statistical Package for Social Sciences (SPSS) version twenty-two (V.22) and the Amos version 2.2. SPSS is a computer program used for statistical analysis which deals with quantitative survey, in addition to the approach strategy used in this research. SPSS was utilised in this research to insert and process the information. SPSS can provide various statistics for every aspect of the research questionnaire. Besides that, SPSS was used to perform the analysis of the demographic profiles of the survey respondents. In addition to that, SPSS is useful in determining the causal relationship between the dimensions and the questionnaire items.

AMOS is one of the latest softwares developed for Structural Equation Modelling (SEM). The theoretical framework can be converted into AMOS graphics for inter-relationship modelling and analysis purposes. More importantly, AMOS helps to compute the multiple equations of the inter-relationship of the model simultaneously. The use of the AMOS software assists the researchers in creating path diagrams using drawing tools rather than composing the equations or even in typing the commands. Furthermore, it can help the researchers to validate the measurement model with the Confirmatory Factor Analysis (CFA), thus helping the researcher to move forward with

the Structural Equation Modelling (SEM). Hence, the use of AMOS in analysing and testing the theory is efficient, fast, and user-friendly. This research adopts the quantitative method as shown in Figure 3.2. This type of study is one of the mainstays of scientific research; it comprises a seven-step process as follows: literature review, research problem, research objectives and questions, conceptual framework design, survey design, data analysis and model development, and discussion, conclusion, limitation and future research.



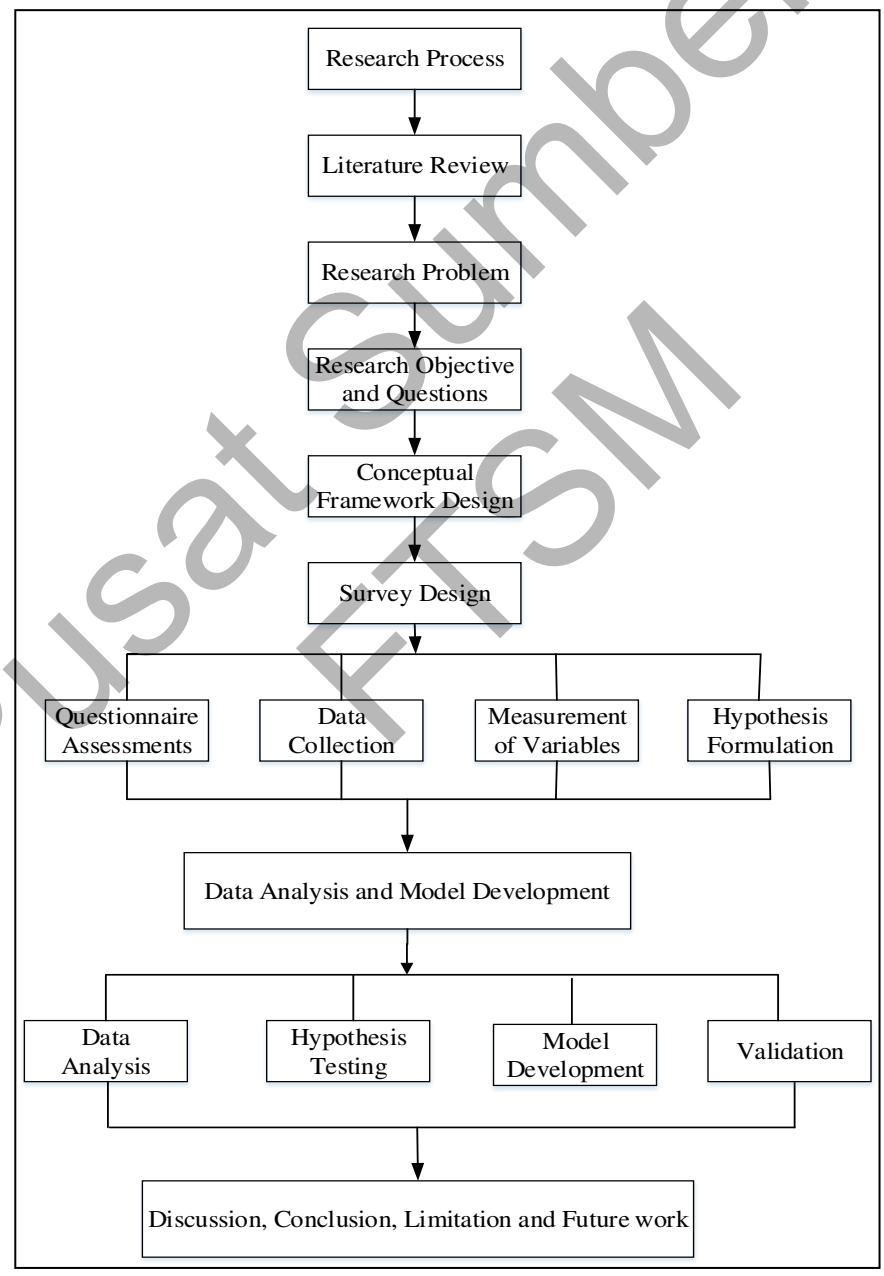


Figure 3.2 Phases of the Quantitative Research Approach Adopted in the Current Study.

## 3.4 THE PROPOSED CONCEPTUAL FRAMEWORK FOR THE STUDY

The factors have been adapted from the leading studies on HISQ. By classifying the measurements attained from the past studies, several different factors have been recognised. The factors mentioned above are categorised into seven main constructs, namely; service quality, system quality, information quality, user satisfaction, intention to use, user requirements and user needs. The theoretical conceptual model proposed in this study comprises of two dimensions, which are HISQ and HISU. Each dimension includes several factors as shown in Figure 3.3. HISQ is classified into: system quality, service quality, and information quality. The second dimension, which is HISU, consists of the intention to use, user satisfaction, user requirements and user needs.

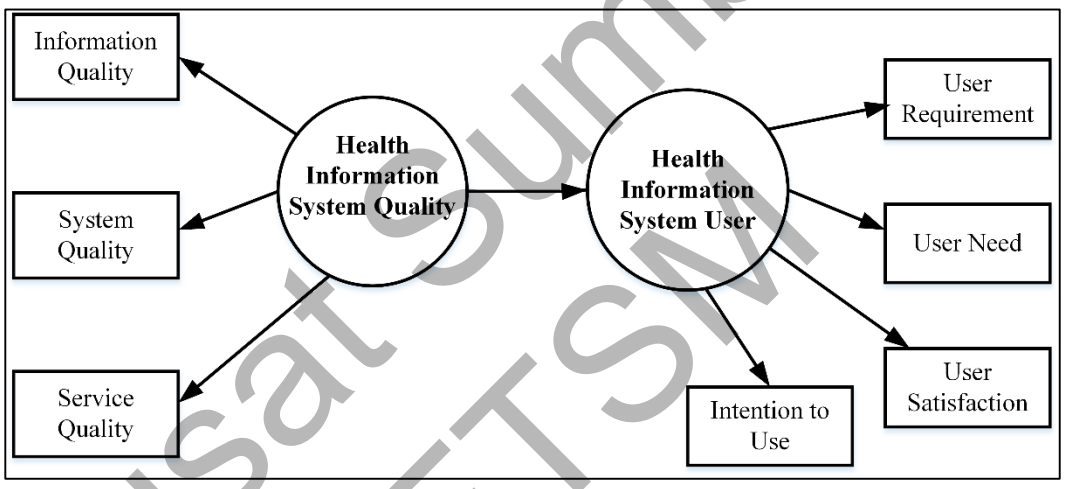


Figure 3.3 Conceptual Framework.

In the previous studies conducted by Delone and Mclean (2004), Thus, Conceptual framework was constructed as one was constructed as one of the principal goals at this stage of their research. An effective conceptual model can help the researchers to better grasp the overall direction of the research. This is accomplished by using a simplified representation of how the study environment interacts with the selected variables in predicting and explaining the outcomes. Based on the review of the literature on user requirements and user needs framed within the framework of Delone and Mclean (2004), this study was able to identify and select the factors which affect user requirements and user needs. The links and structure between the factors of the product are also conceptualised based on the understanding of the grade of the HISU

used in HIS. Therefore, the result of the analysis calls for some tests to verify the appropriateness of their validity (Figure 3.3).

A preliminary summary of the possible common factors is identified and also compiled from the dimension (HISU). The list includes seven main common factors or dimensions as shown in Figure 3.3. The variables are categorised as exogenous and endogenous variables. The exogenous variable is a factor that is considered independent, which means that the variable is within one formula and is not directly related to the other variables in the same formula. However, the endogenous variable has a direct relationship with the other variables in the model which enables for them to be put in a formulated form.

The exogenous latent variables include the HISQ system quality factors (for example information quality factors, service quality factors and system quality factors). The endogenous latent variables include characteristic factors that comprise of auditability. Therefore, the independent variables in this study show the demotion of HISU. Figure 3.3 illustrates all the factors, as well as the relationship between them.

### 3.5 SURVEY DESIGN

A survey design is considered as a crucial tool in measuring the effectiveness together with the functionality of user requirements in IS in the health units in Yemen. Accordingly, in this research, the relevant survey is designed using a quantitative analysis approach for investigating the variables which constitute of user requirements, selection of the research model and the fulfillment of the research objectives. In relation to this, in comparison to other research designs, the survey design is widely used in business and management research due to its simplicity and applicability (Ismail 2004). Therefore, most of the studies on IS have been done via survey instruments since the IS community benefits from its accessibility to the source of information. According to Pinsonneault and Kraemer (1993), there are three survey methods. The aim of the first method is to produce a quantitative description of particular aspects of the population. In the second approach, the main method of data collection is done through organised and predefined questions given to the respondents. In the third method on the other hand, a large portion of the study population is used in the collection of information,

yet the collection is carried out in such a manner that a generalised conclusion can be made of the whole population. In this study, the sub-sections below are followed:

### 3.5.1 Questionnaire Assessment

The current research employes the quantitative approach by using the questionnaire as a research tool for addressing the research objectives. Such research tool for data collection is very conducive for studies which involve finding the answers to questions regarding the association among the measured variables since it is able to describe, predict and control a specific phenomenon (Leedy & Ormrod 2005). The approach is very suitable in defining the best concept using various alternatives (Anderson 1997). Therefore, the assessment of the questionnaire is based on the review of the literature. The questionnaire was then assessed by five experts in the area.

### 3.5.2 Quantitative Data Collection

This study adopts both primary and secondary data collection. The data were collected from the health units in Yemen. In this study, the design used for data collection is a self-administered questionnaire to collect the necessary data. The present study uses this particular design for a few reasons. First, there were limited resources in the context of the research. Second, based on the researcher's experience and knowledge, most of the hospitals that use IS in Yemen tend to be unwilling to participate in manual surveys since these are the traditional method and requires a lot of time. However, the researcher has chosen the manual survey questionnaire in order to obtain the original information when he/she reads the survey questionnaire from the paper and/or traditional system. This technique of data collection can cover large samples of the population. Every division in the HIS was given the questionnaires based on the number of employees identified in each division according to the sampling frame. The questionnaires were also distributed with the assistance of the team selected by the researcher to assist in information distribution and collection. The data for the questionnaire responses were collected from several departments in both hospitals between March 2017 and May 2017.

Data collection is an important aspect of research methodology. The data were collected from the health units in big Sana'a Province in Yemen. According to

Johansson et al. (2004), all sides of an organisation is able to influence how the user requirements work. This technique is less expensive since the response to its items is less time consuming compared to other data collection methods. The next sub-section describes the development of the data collection instruments applied in the current study. The very first component is the pilot study, followed by the description of the quantitative information collection instruments.

**A. Pilot Study**

In order to decrease the biasness in the wording and format of the instrument, a pilot study was conducted as suggested by Sekaran (2000) before distributing the questionnaires to the specific respondents. This particular procedure assesses the soundness of the measurement in relation to its reliability. Thus, the participants are able to respond to the questions with no ambiguities and are therefore able to provide clear answers.

As described by Creswell (2013), it is preferred to conduct a pilot study before distributing the questionnaires to the targeted respondents. Creswell stressed on the benefits of conducting a pilot study in order to reduce ambiguity. He further added that a pilot test helps a researcher to better understand whether the respondents face any difficulties in interpreting and understanding the questionnaire, and therefore is able to determine if there are any ambiguous biased questions. Creswell (2013) defended it as a process where a researcher can make internment changes based on the responses from a few people who have completed and assessed the instrument. According to the author, a pilot test ensures that the individuals in the sample are able to comprehend the questions and are therefore able to complete the survey.

Thus, in this particular analysis, a pilot test was performed to verify the instrument before starting with the survey. The sample size of the pilot test was 15 respondents who are made up of physicians, nurses and other health unit employees. They were asked to give their opinion about the instrument and their genial understanding of the instrument to ensure that the survey instrument would be effective in data collection. Upon completing the pilot study, the questionnaire was enhanced, altered and distributed among the owners of HIS.

## 3.6 SAMPLING DESIGN

A sampling design ensures that the sample used in this particular research represents the population from where the sample is drawn. This research focuses on the population of HIS agencies because these agencies depend heavily on IS resources for their business, and are closely related to the operations of healthcare requirement. These agencies also serve as the custodians of the government and private sectors' classified information and depositories of HIS. The sampling success depends on the sampling preparation design. Thus, this section discusses the sampling design in terms of the unit of analysis, sample size and seam-required sample size.

### 3.6.1 Unit of Analysis and Sampling Frame

The unit of analysis is a major entry in this research. The unit of analysis refers to the type of unit an analysis a specialist uses in measuring the variables (Ouma 2014; Mohammed et al. 2015), where the unit of analysis is used to describe the models and relates to what is being analysed. This study attempts to examine the relation between the factors of HISQ, HISU in the HIS sector. Hence, the unit of analysis chosen is the healthy individuals across three managerial levels. The data were collected through the study method from the objective participants at three managing stages in HIS.

Users refer to the position of organisation members who are responsible for IS. These members are formally authorised to use HIS organisational resources and to make decisions. The typical level is the top-level users or top users, which are also referred to as senior users or executives (Reiss 2013). The users at this level in this study includes the individuals who hold titles such as doctor officer, nurse officer, technician officer, administrator officer, and professional officer and other users who work under HIS.

The inclusion of the members is considered ideal for the study on strategic and executive organisational issues because such members are involved in the strategic planning process (Segars & Grover 1999). According to Sekaran and Bougie (2016), the time, cost and willingness of the participants are the most important criteria for any research in identifying his/her scope. Thus, the reference population comprises of seven HIS hospitals. The survey targeted the general hospitals in the Sana'a province, which is in the capital of Yemen, namely; 1) 48 Model Hospitals, 2) Saudi German Hospital,

3) University of Science Technology Hospital, 4) Azal Hospital, 5) Modern German Hospital, 6) Yemen German Hospital, and 7) Dr. Abdukader Al-Mutawakel Hospital. Therefore, all the hospitals where the current study was carried out are urban hospitals. These seven hospitals are located in the Sana'a province of Yemen. This particular province was selected since it comes with a distinctive research chance to explore the user needs of IS in HIS in Yemen. The approval from the Ministry and the hospitals are shown in Appendix C.

### 3.6.2 Questionnaire Design

The questionnaire began with one page of introduction, which identifies the topic of the research (the definition and type of HIS), the purpose of data collection and the sincere acknowledgement in advance to all the respondents for their cooperation. The paragraph ensured all respondents that this research is about the generalisation of the findings without any other purpose.

The main goal in adopting the questionnaire as a major instrument is to empirically examine all the hypothesis and their relationships. It is an efficient and rapid tool for gathering data with little effort and time. By using the tool, a large number of participants can be involved (Khan 2007). Thus, it is essential to create a set of questionnaires which are able to capture the necessary information in dealing with the goals of the research. In this particular work, the objective is to essentially determine the actual effect of the IS element on user needs within the HIS. For the goal of the study, the questionnaires include eight parts: -

- Part 1- a set of questions related to the demographic profile of the respondents.
- Part 2 - a set of questions related to Information quality.
- Part 3- a set of questions related to System quality.
- Part 4- a set of questions related to Service quality.
- Part 5- a set of questions related to Intention to use.
- Part 6- a set of questions related to User satisfaction.
- Part 7- a set of questions related to User requirements.
- Part 8- a set of questions related to User needs. See Figure 3.4 below.

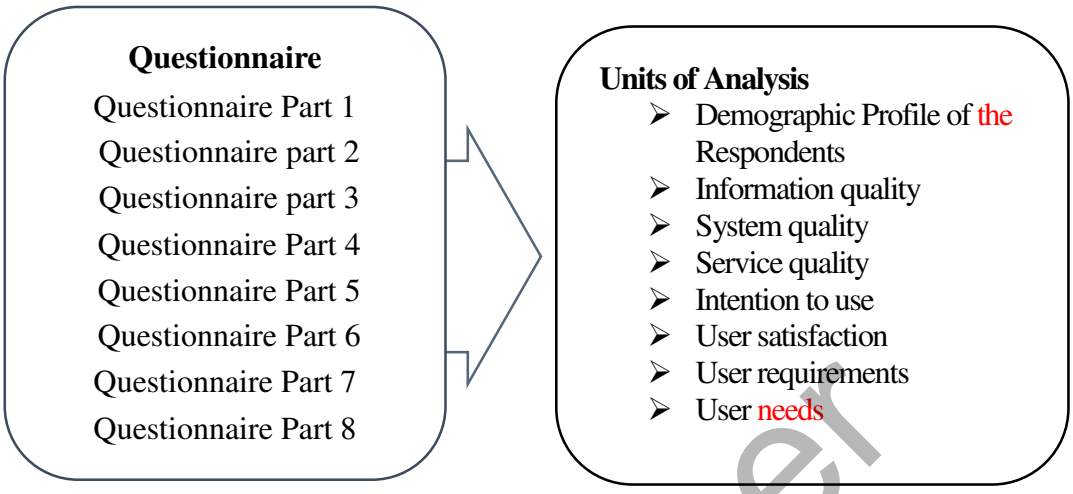


Figure 3.4 The Groups of Units of Analysis and the Questionnaire.

The final part includes the independent' comments, if there were any. The questionnaire generally consists of nine pages as Gerard (2003) has recommended that self-administered questionnaires should be more than six pages. such as system quality, information quality, service quality, intention to use, user satisfaction, user requirements and user needs. The questionnaire of this study consists of 42 items, where the method of answering is based on the seven-point Likert scale. Literature has proven that questionnaires with the Likert scale are often used to evaluate the established attitude, by providing a selection of responses to a certain issue or even claims (Jamieson 2004).

This research achievement a period range using a seven-point Likert scale to to measure the evaluated factors such as system quality, information quality, service quality, intention to use, user satisfaction, user requirements and user needs. In addition, the ordinal Likert scales are used to assess the respondents' profile. In this specific investigation, the Likert scale has been created to precisely determine how well the subjects agree or disagree with the statements with the following anchors: (1) Totally disagree, (2) disagree, (3) somewhat disagree, (4) neutral, (5) somewhat agree, (6) agree. (7) totally agree.

The questionnaire was reviewed by several faculty members, as well as doctoral students of Universiti Kebangsaan Malaysia, Universiti Malaya, Qatar University and

Lincoln University College, Civilization University in Sana'a Yemen in verifying the content and validating the measurement items.

This has helped in examining the strengths and weaknesses of the questionnaire in terms of the construction of the questions, the wording, order or sequence of the questions, and et cetera. After the completion of the review, the problems were diagnosed and the wording of the questions were revised, thus producing a comprehensive, easy-to-answer and understandable questionnaire. To raise the response rate, the researcher has adopted the guidelines and suggestions of (Sudman & Bradburn 1983). Initially, the questionnaire was translated into the Arabic language. It is expected that it will be easier for the respondents to comprehend the questions rather than posing it in the English language, thus encouraging them to respond to the survey questions. This move is supported by Sekaran (2000) who mentioned that a researcher should consider the language of the respondents and ensure the development of the translation of the instruments accordingly. Therefore, the Arabic Translation of the questionnaire was completed by a native Arab who is fluent in both languages (English and Arabic), as well as having the expertise in the field of actual IS. The Arabic survey was consequently converted again into English by another person who has the similar qualifications. Ultimately, the translation designs were examined and they were unlike the original version.



### 3.7 SAMPLING SIZE

A sample is a subset of the public and also has certain people from that population. The selected sample from a population might be utilised as something to alternative information about that particular population (Ramsey & Schafer 2012). The sample size depends on the required accuracy, sample heterogeneity, the variable member and the appropriate statistical tools (Sekaran 2006). The study sample comprises of the employees at the top and middle levels, as well as the executive levels of HIS. Sample determination is one of the most important aspects for any empirical research to be considered acceptable; a sample must represent the entire target population.

The sampling process involves the utilisation of a few population units as the basis for drawing conclusions regarding the general population (Jansen et al. 2007). The

sample is called a subject of the population which comprises of the people selected from it (Al-Omari et al. (2008); in order for it to be able to reach generalised findings on the basis of the whole population (Sekaran 2006). It refers to a population as a group of people, events or things of interest that the researcher aims to explore.

This research has employed probability sampling where the representative individuals were selected from the population under consideration. This type of sampling is considered to be a strenuous form of sampling in a quantitative research. This is due to the reality that in probability sampling, the researcher is able to make certain that the sample chosen is symbolic of the whole public and therefore he/she could make the generalisation of the research results to cover the whole public. Simple Random Sampling is a type of probability sampling which is very widely used due to its rigorous form. In this type of sampling, the participants are chosen at random from the population, thereby ensuring that every individual has equal chance of being selected and that the sample is symbolic of the population like a whole (Creeswell 2012).

In the context of the current study, the population consists of the users of HIS who are responsible for the selection of the suitable users for the requirements of the elicitation purposed. The sampling procedure is used in the selection of the population. Sampling is limited to a particular group of people who can provide the required information; they are selected based on the pre-established criteria to ensure that they possess the needed information. In the current research, 250 questionnaires were distributed among the organisations which were chosen as the representative of the relevant population. Initially, 200 questionnaires were returned which account for a 72% response rate. The achieved rate is sufficient for analysis as the recommended number of filled questionnaires for conducting a research on a large population is 100 as demonstrated in Alreck (1985).

With regard to the minimum sample size needed for SEM, a huge debate in the literature could be found about the exact number of respondents that have to be obtained to have the ability to utilise SEM. However, there is basically no sharp cut reactions to it since each analysis varies (among other things) in the terminology of the population attributes, in terms of the population characteristics, and the number of constructs

employed in a model. Hair et al. (2010) has provided the additional suggestion for the minimum sample size based on the characteristics of product complexity and important measure model. Table 3.1 shows the number of latent constructs and items.

Table 3.1 Number of latent constructs and items

| **Model Characteristics (Number of latent constructs and items)** | **Minimum Sample Required** |
|---|---|
| Five or less latent constructs. Each latent construct has more than three items. | 100 sample |
| Seven or less latent constructs. Each construct has more than three items. | 150 sample |
| Seven or less latent constructs. Some constructs have less than three items (just identified model). | 300 sample |
| More than seven latent constructs. Some constructs have less than three items (just identified model). | 500 sample |

Two hundred and fifty surveys (250) have been distributed by the researcher to the respondents who are the clients in seven hospitals which use HIS. The researcher obtained two hundred (200). The researcher received all of the questionnaires except for a total of fifty (50) questionnaires. After checking the two hundred questionnaires received, twenty (20) of them were incomplete in their personal details, as a result of that, these surveys were ignored. Consequently, the final responses included 180 surveys which represented 72% (180/250) *100 of the total number of surveys distributed as illustrated in Table 3.2, which was acquired during the three months of the survey period. The rate of response is considered excellent since as stated by Sekaran (2006), a 30% response rate is acceptable for conducting surveys.

Table 3.2 Summary of Response Rates

| **Description** | **Total** |
|---|---|
| The Total distributed surveys | 250 |
| Uncompleted Surveys | 20 |
| Unreturned surveys | 50 |
| Returned and entered surveys | 180 |
| Response rate | 72 % |

## 3.8 MEASUREMENT OF VARIABLES

The multi dimensional and interdependent characteristics of high quality HIS need to be considered to determine and evaluate each part of this dependent variable. Measuring the possible connections among these measurements is important to separate the results of different to one or more of these reliant factors and dimension (Delone & McLean 2003). Individual perspective relates to the characteristics of the individual end-users, while technological perspective relates to the characteristics of the technology such as, system quality, service quality, information quality; where features and company context indicate the company backup environment. This research addresses several types of variables such as exogenous, endogenous, and dependent latent variables.

Variable is anything that can take on varying or different values (Akbulut-Bailey 2011). The value can vary at different times for the same person or aim, or at the same time for different persons or objects (Alam & Noor 2009). The dependent variable is a variable which is of the first interest to the author. Every study has independent and dependent variables. The independent variable is analysed in this study in order to discover the answer or even answers to the research issue. In this particular situation, the study has tested the independent variables which are information quality, service quality, system quality, and the dependent variables which are intention to use, user satisfaction, user needs and user requirements. These variables are believed to have some impact towards the independent variable (HISQ perspective success in HIS), either in a negative or positive way. Besides that, this research has one dependent variable called HISU in HIS in the Sana'a Yemen data collection.

### 3.8.1 Measurement of Information Quality

The review of literature has led to various definitions of information quality which could be illustrated as a large value property of information among the users and the attribute of information to fit a reason or to meet the requirements or specifications of the beneficiary's expectation (Gorla et al. 2010). Yet, another definition of information quality is the degree where the information possesses the content structure and also time features which foster a sustained worth to the people. Information quality additionally represents the distinction between the required and obtained information (Pérez-Mira 2010).

The measurement of information quality is data feature which meets the intellectual, functional, complex, and graphical needs of the information creators, directors, and experts (Eppler & Wittig 2000). Information quality, which could be online screens or reports, describes the production of systematic details as high quality (Eppler & Wittig 2000; Stvilia et al. 2005; Ameen & Ahmad 2013). Reports or online screens information quality is expected to have a strong impact on the efficiency of IS. Thus, information quality could be described as the degree to which IS satisfies its designed purpose (Poels & Cherfi 2006).

According to Kim et al. (2009), the difference between information quality and system quality is that the former is in conformity with the efficiency of the model, which values the extent of IS resource and the source of information quality use, while the latter connotes the high quality of detailed output by the system, rather than the high company system itself. Table 3.3 shows the items of information quality.

Table 3.3 Information Quality Scale

| No | Items | Source |
|---|---|---|
| IQ1 | The information provided is relevant and useful for my work. | (Wang et al. 2007; Pohl 2010; Abdullah 2013) |
| IQ2 | The information provided is complete | (Lin & Lee 2006; Abdullah 2013; Ameen & Ahmad 2013) |
| IQ3 | The information provided is sufficient | (Seddon & Kiew 1996; Abdullah 2013) |
| IQ4 | The information provided is consistent | (Wang et al. 2007; Abdullah 2013; Ameen & Ahmad 2013) |
| IQ5 | The information provided is up-to-date | (Pitt et al. 1995; Seddon & Kiew 1996; Wang 2008; Khayun & Ractham 2011; Abdullah 2013; Ameen & Ahmad 2013) |
| IQ6 | The information provided is timely | (Lin & Lee 2006; Abdullah 2013; Ameen & Ahmad 2013; Miss & Bosede 2014) |

### 3.8.2 Measurement of System Quality

The second exogenous latent variable of the conceptual framework is the system quality variable. System quality is worried about the high company actual IS handling, which contains the software program and information elements, and is a better way of measuring the technical soundness of a system (Gorla et al. 2010). Ameen and Ahmad (2013) have mentioned that system quality is predicted to have a powerful effect on the performance of IS, which may be identified as the degree to which an actual IS could fulfill its intended purpose. With the appropriate business/IT alignment, the success of

an effective IS plays a central role in the fulfilment of strategic business goals goals, including improved profitability or even sustained growth.

The concept of system quality was initially introduced by McLean and DeLone (2003), who defined it as quality which is manifested in the general functionality of a program, and measured by individual perception. According to DeLone & McLean (1992), system quality researches depend on the IS model of success as it examines the issues of interface design quality and technology acceptance. Table 3.4 shows the items of system quality.

Table 3.4 System Quality Scale

| No | Items | Source |
|---|---|---|
| SQ1 | The HIS is reliable. | (Khayun & Ractham 2011; Abdullah 2013; Ameen & Ahmad 2013) |
| SQ2 | The HIS is stable. | (DeLone & McLean 1992; Delone & McLean 2003; Abdullah 2013) |
| SQ3 | The system is fast to recover from errors. | (DeLone & McLean 1992; Seddon & Kiew 1996; Delone & McLean 2003; Abdullah 2013) |
| SQ4 | The system is convenient to use. | (Seddon & Kiew 1996; Abdullah 2013) |
| SQ5 | The HIS is of high quality. | (Wang 2008) |
| SQ6 | The HIS provides information that is relevant to my job. | (Wang et al. 2007**;** Abdullah2013) |

### 3.8.3 Measurement of Service Quality

The service quality measure focuses on the type of service provided as the main dimension for this variable. Service quality can be defined as the degree of discrepancy between customer normative expectations for service and their perception and service performance (Delone & McLean 2003; Gorla et al. 2010; Ameen & Ahmad 2013). Therefore, service quality is the previous exogenous variable of the conceptual framework which concentrates on the type of service offered as a primary dimension of variable. Service quality or even system quality is described as the amount of discrepancy between the normative expectations for services and definitely the notion of service performance from the view of the beneficiary (Gorla et al. 2010). Table 3.5 shows the service quality items.

Table 3.5 Service Quality Scale

| No | Items | Source |
|---|---|---|
| SRQ1 | The HIS is trustworthy. | (Lin & Lee 2006; Khayun & Ractham 2011) |
| SRQ2 | The HIS provides a proper level of on-line assistance and explanation. | (Lin & Lee 2006; Wang et al. 2007) |
| SRQ3 | I feel safe in my transactions with the HIS service. | (Wang et al. 2007) |
| SRQ4 | HIS provides assurance in solving problems. | (Wang & Liao 2008; Osmani 2015) |
| SRQ5 | It provides prompt HIS service to the users. | (Abdullah 2013) |
| SRQ6 | It provides follow-up service to the users. | (Lin & Lee 2006) |

### 3.8.4 Measurement of Intention to Use

In the context of the need of HIS to contemplate on the users' perception towards HIS and to examine the considerable elements influencing the citizen's effect in using HIS. In the current study, intention to use is to measure the items. Table 3.6 shows the intention to use items.

Table 3.6 Intention to Use Scale.

| No | Items | Source |
|---|---|---|
| IU1 | I would use HIS for gathering information. | (Carter & Bélanger 2005; Ayyash 2013) |
| IU2 | I would use the services provided by HIS HIS. | (Carter & Bélanger 2005; Ayyash 2013) |
| IU3 | I would not hesitate to provide information for HIS. | (Carter & Bélanger 2005; Ayyash 2013). |
| IU4 | I would use HIS to inquire about system service. | (Carter& Bélanger 2005; Ayyash 2013) |
| IU5 | Overall, I intend to continue using HIS. | (Wang et al. 2007) |

### 3.8.5 Measurement of User Satisfaction

User satisfaction is described as the grade to which an individual thinks that by employing a particular system will improve their job performance as previously mentioned in (Davis 1989). When the employees think that the use of a specific system will improve their work performance, the acceptance rate of a new improved system will increase. A study conducted has shown that user satisfaction is among the most influential factors of the intention to use of HIS in Yemen (Mohamadali & Garibaldi 2010). In addition, many researches on new IT enhancements have identified that recognised effectiveness is a significant impacting aspect on the objective to use. Besides that, numerous researchers have also said that user satisfaction and system use affect the computer system and system quality (Koufaris & Ajit Kambil 2001; Pavlou 2003; Chau et al. 2007). Table 3.7 shows the user satisfaction items.

Table 3.7 User Satisfaction Scale

| No | Items | Source |
|---|---|---|
| US1 | HIS has met my expectations. | (Wang 2008; Lin et al. 2012) |
| US2 | I am satisfied with the efficiency of HIS. | (Wang 2008; Khayun & Ractham 2011; Abdullah 2013) |
| US3 | I feel very confident in using this Prototype. | (DeLone & McLean 1992; Seddon & Kiew 1996; Delone & McLean 2003; Abdullah 2013) |
| US4 | Overall, I am satisfied with HIS. | (Wu & Wang 2006; Khayun & Ractham 2011; Lee et al. 2012; Abdullah 2013) |
| US5 | I completely satisfied in using this Prototype. | (Wu & Wang 2006) |

### 3.8.6 Measurement of User Requirements

User requirements refer to what needs and requirements that a certain system has to fulfill for the users and what is expected to be met by using that system. User requirements function as the basic input for developing a certain system (Juaim 2010). The measurements of user requirements are information, which represents the capability of a system in fulfilling the user requirements. Functional requirement is defined in this study as what the system and its components should do. Then, the information system will be effective (Schniederjans & Yadav 2013). Table 3.8 shows the user requirements items.

Table 3.8 User Requirements Scale

| NO | Items | Source |
|---|---|---|
| UR1 | The users take entire responsibility to make a decision for the requirements. | (Hasan 2015) |
| UR2 | The users are responsible for the functions of the business role. | (Hasan 2015) |
| UR3 | The users are responsible for the definition of the requirements of the system. | (Hasan 2015) |
| UR4 | I use HIS to identify the defects in the requirements. | (Gottesdiener 2008; Hasan 2015) |
| UR5 | The presentation style of my computer HIS interface is easy to understand. | (Bharati & Chaudhury 2004; Lee et al. 2009) |
| UR6 | I frequently need to use the HIS when my own computer (laptop or desktop) is not available. | (Paisley & Sparks 1998; Scornavacca 2010) |
| UR7 | HIS does not use my personal information for other purposes without my authorisation. | (Zaied 2012) |
| UR8 | The output information of the information system is secure. | (Zaied 2012) |
| UR9 | Overall, I trust the security measures of the information system. | (Zaied 2012) |

### 3.8.7 Measurement of User Needs

User needs refer to an individual's own judgment about the necessity of a particular service. In the field of IS, the concept of user needs is found in the previous literature as perceived information needs (Scornavacca 2010; Farzandipour et al. 2011). Therefore, the identification of the main information requirements are typical to certain functions in the health system across different countries and geographies. User needs were measured by 5 items of the questionnaire. These items are derived from (Scornavacca 2010; Ling et al. 2011; Nasir & Sahibuddin 2011). Table 3.9 illustrates the five items of the user needs measurement scale.

Table 3.9 User Needs Scale

| No | Items | Source |
|---|---|---|
| UN1 | My job frequently requires me to rely on HIS. | (Scornavacca 2010) |
| UN2 | My everyday work-related tasks require me to frequently need the support of HIS. | (Scornavacca 2010) |
| UN3 | I frequently have to use HIS in order to meet my work obligation. | (Scornavacca 2010) |
| UN4 | I am expected to use HIS all the time to meet my work obligations. | (Scornavacca 2010) (Nasir & Sahibuddin 2011) |
| UN5 | The content of HIS meets my needs. | (Scornavacca 2010) |

## 3.9 DATA ANALYSIS AND MODEL DEVELOPMENT AND VALIDATION

The phases of this study are data analysis, validation, and model development based on the constructed framework. This involves three case studies and structured expert reviews in evaluating the framework through the phases by using heuristic evaluation. During this evaluation, data were collected and analysed from the feedback of the questionnaires. The input, data analysis, model development and validation design and hypothesis testing are presented below:

### 3.9.1 Quantitative Data Analysis

This part describes the data analysis procedure applied in this specific research. Creswell (2013) considered the data analysis stage as the most meaningful, in which raw data must be converted into meaningful information by using analytical procedures to answer the research questions. Therefore, since this study includes quantities data analysis procedures must be selected to suit the data.

Data analysis involves data entry of the responses, information system and selection of the appropriate data analysis design (Sekaran & Bougie 2016). Data analysis aims to achieve two objectives; to obtain an overview of the sample data and its attributes, and also to test the goodness of the data and to validate the proposed hypotheses. Therefore, before the data analysis can begin in this study, the gathered data is transformed into a suitable form for analysis. Then, the data is analysed using the SPSS.VS.22.0 Software. Specifically, this software is used to obtain descriptive statistical figures, frequencies, average means and standard deviations.

The use of specific software was recommended by Bryman (2012) to facilitate the analysis process. Hence, for this study, SPSS.VS.22.0 as a software analytical program was used to facilitate the analysis of the quantitative data. Therefore, different techniques of analysis namely descriptive statistics, exploratory factor analysis, reliability and validity and correlation were performed in this stage. Structure Equation Modelling SEM with AMOS version 22, was used. SEM involves a confirmatory factor analysis. The purpose of using the SEM technique is to test the hypotheses and to evaluate the study model. Lastly, a thematic analysis approach was utilized for the interpretation of the quantitative data. The next sub-section describes the quantitative data analysis procedure.

### 3.9.2 Quantitative Data Analysis Procedure

This study used the SPSS.VS.22.0 analysis and Analysis of Moment Structure (AMOS) version 22 software as two primary statistical equipment to analyse the data gathered from the questionnaires. For the purpose of analysis of the descriptive data of the respondents and the investigated variables, this research has adopted a number of steps for data analysis. These steps include descriptive analysis, assessment of the reliability and validity, factor analysis, correlation analysis as well as structural situation modelling analysis.

Performing the demographic profile analysis of the respondents was the first step in the data analysis. Descriptive statistics which include frequency and percentage were applied in interpreting the professional and personal data of the respondents.

Moreover, the descriptive analysis of the investigated factors was performed using means, standard error and standard deviation.

The evaluation of the validity and reliability of the study were performed. The validity and reliability analysis was the next stage of the data analysis to evaluate the reliability and validity of the things for each construct used in the present study. The reliability test was conducted by applying the Cronbach's Alpha to ensure the reliability of the items in measuring the constructs and factors were tested for validity analysis by applying the Kaiser-Meyer-Olkin (KMO) and Bartlett's test to the data. The purpose of these tests is to measure the sampling adequacy (Williams et al. 2010).

The Exploratory Factor Analysis (EFA) was used to identify the relationships between the observed variables (items) and the unobserved variables called the constructs. In short, EFA is used to lower the amount of products and to identify the latent factors. The reason for this step is to evaluate the content and to build credibility. The exploratory aspect of the research discovers the factors that increase the described typical difference. Eigen value is one means of indicating the total difference described by aspect research. The most popular method of aspect research is major elements. The principal elements with a Varimax spinning are used in this study using SPSS.VS.22.0.

Correlation analysis between independent and dependent variables was the fourth step and was carried out to characterise the relationship among the investigated factors. The aim of the correlational analysis is to identify the power and direction of the investigated variables.



### 3.9.3 Structural Equation Modelling

By applying the Structural Equation Modelling (SEM) as suggested by Byrne (2010), the data was analysed using the SEM method, which entails a confirmatory factors analysis as well as structural model analysis. Using SEM was appropriate as a method of analysis and evaluation model for this research.

SEM is a statistical method that is popular for instrument validation and model testing. The purpose of model testing is to assess the righteousness of fit between the hypothesized structural data analysis model and the data set. According to Hair et al.

(2010), SEM contains two kinds of models: measurement model which describes how measured items are grouped to concentration latent factors, and the structure model which specifies the relation among these constructs in the model. In other words, the measurement model is the confirmatory factor analysis model which relates measurement variables to latent variables, while the structural design relates latent variables among themselves.

Byrne (2010) has distinguished SEM from older techniques. Firstly, SEM is viewed as a confirmatory method instead of an exploratory method of SEM test data. Secondly, SEM estimates the mistakes of the variance parameters explicitly. Thirdly, SEM is able to incorporate both observed and unobserved variables. Moreover, SEM helps to solve estimation and hypothesis testing problem (Arbuckle 2008). Finally, SEM provides the means to evaluate the degree to which a hypothesised structural model matches the dataset (Hair et al. 2010). This means that SEM allows the research to assess the model fit and also to test the structural model simultaneously. Moreover, such SEM is now among the most frequently used techniques by the researchers from different disciplines. However, the question of how the model that best represents the data reflects the theory is known as model fit.

Based on the previous reasons which justify the potential of SEM, it is therefore regarded as ideal for any exploration completed in this particular study since SEM can answer the questions that involve multiple regression analyses between a group of measured independent variables and a single measured dependent variable. The primary goal of this analysis is to suggest a model to explore the impact of user needs and user requirements factors on the achievement of IS that best describes the users of HIS. In order to carry out this aim, the software package called Analysis of Moment Structure (AMOS) version 22 was used for the modelling. SEM is appropriate as a method of analysis and model evaluation for this study. The current research analysis followed the steps of SEM, as synthesized from the different researchers (Byrne 2010; Hair et al. 2010).

### 3.9.4 Goodness of the Model Fit

This research has applied SEM in order to test the hypotheses using 2 steps. The first step is the Confirmatory Factor Analysis CFA measurement design which was used to determine the product fit indices and also the next convergent validity of every latent adjustable in model. Convergent validity refers to the dimensionality of the item constructs and the removal of the unreliable items. The next step is the identification of the very best fit and the testing of the hypotheses among the constructs as suggested in the model. In addition, the goodness of fit indicators (such as Chi square, amount of independence (df), the $X^2$ /df ratio, Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA)) show whether the data help to support the adequacy of the hypothesized factor structure and the pattern of the presumed interrelations between the factors. These measurement indices could be utilised to look at the model fit (Byrne 2010; Hair et al 2010).

Goodness of fit suggests how effectively the specified item reproduces the covariance matrix of all the indicator items. Chi-square ($X^2$) is the fundamental statistical measure in SEM to quantify the differences between the covariance matrices. It is a statistical measure of distinction used to compare the found and estimated covariance matrices. Furthermore, the chi-square statistic is sensitive to the sample size, thus enabling this measure to find small statistically significant differences when the sample size becomes large (Hair et al. 2010). For this reason, the chi-square goodness fit is not regarded as a sole indictor of model fit. To overcome this problem, the $x^2$/df ratio attempts to make it less dependent on the sample size. According to Hair et al. (2010), a chi-square two or three times as large as the degree of freedom is acceptable.

The Comparative Fit Index (CFI) is one of the most commonly used indices. This class of fit contains indices such as Tucker-Lewis Index (TLI), incremental fit index IFL, but generally, the CFI has strong performance power and robustness. The range of CFI value is between (0) and (1), and higher values indicate better fit. CFI values above 0.90 are usually related to a good fit of the model (Hair at all. 2010). In addition, the Incremental Index of Fix (IFI) was developed to address the issue of the sample size. As such, its computation takes into account the degree of freedom. Thus, IFI, TLI and CFI values of above .90 reflect a well-fitting model. Moreover, RMSEA

better represents a model fit of the population. The previous research had sometimes pointed at a cut-of value of .05 or. 08 as acceptable. RMSEA has already been recognised as probably the most informative criteria in covariance structure modelling. As the empirical examination of several measures found that RMSEA is best suited to be used in a confirmatory model strategy when samples become larger. Lower RMSEA values indicate better fit (Hair et al. 2010). Table 3.10 shows the recommended values for the indices mentioned above.

Table 3. Measure of Model Fitness

| Fit Measure | Recommended Value | Source |
|---|---|---|
| $X^2$/do | <3.0 | (Byne 2010; Hair et al. 2010) |
| CFI | >=0.90 | (Byne 2010; Hair et al. 2010) |
| IFI | >=0.90 | (Byne 2010; Hair et al. 2010) |
| RMSEA | <0.08 | (Byne 2010; Hair et al. 2010) |
| NFI | > 0.90 | (Bollen 1989 ; Hair et al. 2010) |

Based on the above discussion, the workout of the product must be analysed by utilizing the SEM evaluation for verification purposes.

### 3.9.5 CFA and SEM Model

This particular part of the analysis describes the method in using CFA for the investigated model. As mentioned in the earlier chapters, the theoretical model in this study consists of eight latent constructs. According to Hair et al., (2010), CFA enables us to evaluate just how effectively the measurement variables represent the constructs. The structure model specify how these latent constructs influence one another both directly or indirectly (Byrne 2010). Regarding this, the model was tested using AMOS Version 22, and graphics were used to depict the statistical relationship in a pictorial form. In this graphical form the latent variable and the observed variables are represented by elliptical and rectangular shapes respectively.

## 3.10 MODEL DEVELOPMENT AND VALIDATION

A survey is an arrangement of organised inquiries created to gather information from the respondents. The questionnaire in the current study has been designed based on the literature review. The first part of the questionnaire is concerned with the personal and

demographic information of the respondents or members including their age, gender, job position, institution in which he or she works, period of working, work experience, educational qualifications and educational majors. All these statistical backgrounds are related to the independent variables which are predicated to have an impact on the reliant variable.

Part 2 to part 8 of the questionnaire consists of the items related to the user requirements of the information system in the health units. The major aim of the current study is to evaluate or assess the benefits or advantages brought up by the application of HIS in the health units in Yemen in terms of carrying out their work-related tasks in order to achieve their goals effectively.

## 3.11 THREATS TO VALIDITY AND RELIABILITY

This section describes how the quantitative methods were validated. The questionnaire assessment includes tests for reliability and validity, that will be discussed below.

### 3.11.1 Validity

Validity describes the accuracy of a measurement in measuring what it is designed to measure (Churchill 1995; Davis 2005). Validity is identified by Anderson and Hair (2010) as the level to which the scale or the measurement set accurately measures the concept under study. Two typical methods of validity assessment are utilised in this particular study; content validity and construct validity. According to Hair et al. (2010), content validity is the procedure in examining the relationship of the variables and their conceptual definitions. Besides that, it describes the professional and experts' subjective agreement about specific things and concepts.

In this particular research, the logical validity/content validity of the research instrument was started by consulting five (5) experts. The five experts were requested for their feedback as to the level to which the items in the questionnaire were clear and suitable for gauging the concepts they were meant to measure. They were also requested for their feedback on the modification of the questionnaire items with respect to the phrases for their clarity and comprehensiveness. Table 3.11 below contains the demographic data of the five experts.

Table 3.11 Demographic Data of the Experts.

| No | Name | University | Email | Expertise |
|---|---|---|---|---|
| 1 | Dr: Adnan Mukred | Civilization University in Sana'a Yemen | adnanmukred@cuy.edu.my | Information system and HIS expert Adoption and also Diffusion Health Information System. |
| 2 | Dr**:** Ali Abdulbaqi Ameen | Lincoln University College | abdulbaqi@lincoln.edu.my | Information Technology, Research methodology and data analysis |
| 3 | Dr.: Abdullah Al-Swidi | Qatar University | swidi@qu.edu.my | Human Resource Management, Research methodology and data analysis |
| 4 | Dr : Abdulgabbar Mohammad Saif | Thamar University | Agmss79@tu.edu.my | Software Technology and Management. Data mining & big data. |
| 5 | Dr Murad abdu saeed | University of Malaya | Muradsaeed@um.edu.my | Faculty of Languages and Linguistics post-doctoral fellowship researcher |

This questionnaire was evaluated by the experts since evaluation by domain experts help to determine the accuracy of the embedded knowledge. The five experts were chosen to validate the questionnaire and also answer the questionnaire prepared for this evaluation process. It was found that the five evaluators were able to identify 75% of the problems. Although with more evaluations more problems can be identified, yet this is at decreasing efficiency (Nielsen 1994). For the evaluation of this study, the evaluators were selected from different organisations.

Table 3.12 below shows the revised questionnaire by the experts, where the researcher has made some changes to the questionnaire based on the experts' comments and feedback.

Table 3.12 The Revised Questionnaire by the Experts

| No | The statement before content validity | The statement after content validity |
|---|---|---|
| 1 | The information provided is relevant and useful for your work. | The information provided is relevant and useful for my work. |
| 2 | The system is convenient to use. | The system is easy to use. |
| 3 | The users take the entire responsibility to make a decision about the requirements. | The users take the entire responsibility to make a decision for the requirements. |
| 4 | Use requirements health information system to identify requirements defects. | I use requirements health information system to identify requirements defects. |
| 5 | Information system provided are up-to-date information. | The information provided is up-to-date. |
| 6 | The information system provided is timely. | The information provided is timely. |
| 7 | Enable for desired business processes | HIS for desired business processes |

### 3.11.2 Reliability

Reliability is concerned with the balance and consistency of the measurement (Sekaran 2000). In other words, reliability measure is a single measure which offers consistent results free from random errors (Sekaran 2000). A reliability test covers two dimension, namely stability and inner consistency. Stability may be identified through the testing of the reliability test, while internal consistency is determined through the homogeneity of the things used to measure the construct (Sekaran 2000; Zikmund 2003). The results of the reliability tests of the research are provided in Chapter 4.

## 3.12 SUMMARY

This study has adapted the survey methodology to achieve the research objectives. The purpose of the proposed method and its constructs was identified from the literature review, operationalised and measured to develop the variables. The research instrument for data collection was designed based on the research objectives. Thus, this chapter has underlined the procedures and activities conducted in preparing a manual survey. The questionnaire was originally written in English. It was then translated into Arabic which

is the official language in Yemen. In addition to the description of the pilot study, this chapter has also described the sampling design which utilised the stratified technique and discussed the methodology of data analysis, which was aided by two statistical tools, namely the AMOS VS.22 software, to analyse the collected data. The data were initially imported from the employees' questionnaire into data sheets of SPSS.VS.22.0. This chapter presented the analysis strategy, which consists of various steps starting from ensuring that the instruments were reliable and valid, analysing the profile of the demographic variables, describing the statistical analysis of the variables, and deriving the correlational analysis between them.The SEM technique was used to test the models and the hypotheses developed, as well as to verify the proposed model. The chapter described the research approach adopted in the study and this is followed by Chapter Four where the analysis of the information takes place using the SPSS.VS.22.0 software to develop the migration model for the health units in information system in the Sana'a province of Yemen. In terms of experience in computer, the classification of the duration of work was quoted from (Putzer & Park 2010).

# CHAPTER IV

# RESULTS AND DISCUSSION

## 4.1 INTRODUCTION

This chapter presents the main outcomes obtained in the current study. The Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) were performed using SPSS.VS.22, followed by AMOS VS.22 in descriptive statistics, as well as based on the survey where thematic analysis was performed. The chapter begins with the analysis of the respondents' data, the verification of the reliability and validity, hypotheses testing, and the confirmation of the hypothetical and model of goodness-of-fit. Section 4.2 provides the personal and professional data of the respondents in this study. This is followed by Section 4.3 which covers the end result of the descriptive data of the investigated factors. To evaluate the validity of the information in each construct which are applied in this study, Section 4.4 provides the results of the validity and the reliability analysis of the independent and dependent variables. Section 4.5 describes the factor analysis results, while Section 4.6 shows the correlation results. The Structural Equation Model results are discussed in Section 4.7. Section 4.8 illustrates the development and the validation of the investigated model. To answer the research questions, some quotes were used to further clarify some issues related to the survey responses. Finally, the last section concludes the chapter by giving the summary of the results and discussion.

## 4.2 DEMOGRAPHIC DATA

This particular section presents the end result of the respondents' demographic data associated with their region, age, position, gender, and education level. In addition, the professional data, for example their job title, years of service, computer usage and experience in using IS are included. These results are discussed in subsections in the following pages.

### 4.2.1 Results of Participants 'Personal Data

The respondents' personal data include area, gender, age and education. Thus, the sample size of the current study covers the best hospitals which are the seven hospitals in the Sana'a Province of Yemen with a frequency of 6.7%.to 17.2%. Table 4.1 presents the sample size and the results of the respondents' personal data of the public health sector employees. As shown in Table 4.1, the majority of respondent were male as they represented 67.8% compared to females which represented 32.2%. Over two third of the respondents were younger than 40 years old, and the results reveal that those who are between 30 to 39 years old represent probably the largest percentage where this group is represented by nearly 37.8% of the respondents. On the other hand, the group of respondents between 20 to 29 years old is represented by 27.8%, while respondents between the age of 40 to 49 years are represented by 21.1%. Those who are more than 50 years represent only 13.3% percent of the total number of respondents. The age categories are adopted from the previous studies (Gupta et al. 2008; Holtz 2010).

Table 4.1 Analysis of the Respondents' Personal Data

| Characteristics | Item | Frequency | Percentage | Valid Percentage |
|---|---|---|---|---|
| Area | 48 Model Hospitals | 25 | 13.9 % | 13.9 % |
| | Saudi German Hospital | 41 | 22.8 % | 22.8 % |
| | University of Science Technology | 31 | 17.2 % | 17.2 % |
| | Hospital | 35 | 19.4 % | 19.4 % |
| | Azal Hospital | 16 | 8.9 % | 8.9 % |
| | Modern German Hospital | 20 | 11.1 % | 11.1 % |
| | Yemen German Hospital | 12 | 6.7 % | 6.7 % |
| | Dr. Abdukader Al-Mutawakel Hospital | | | |
| Gender | Male | 122 | 67.8 % | 67.8 % |
| | Female | 58 | 32.2 % | 32.2 % |
| Age | 20-29 years | 50 | 27.8 % | 27.8 % |
| | 30-39 years | 68 | 37.8 % | 37.8 % |
| | 40-49 years | 38 | 21.1 % | 21.1 % |
| | 50 years | 24 | 13.3 % | 13.3 % |
| Level of education | Diploma | 30 | 16.7 % | 16.7 % |
| | Bachelor | 76 | 42.2 % | 42.2 % |
| | Masters | 48 | 26.7 % | 26.7 % |
| | Doctorate | 25 | 13.9 % | 13.9 % |
| | Other | 1 | .6 % | .6 % |

Regarding the respondents' educational level, the results reveal that people who received their Bachelor education are considered the highest percentage with 42.2% in the current study. On the other hand, the results demonstrate that the rate of users with a PhD level is probably the lowest in comparison with the other degrees. The results are shown in Table 4.1.

### 4.2.2 Results of the Respondents' Professional Data

The respondents' professional data include their position, experience in computer usage in using HIS, and also the reasons for not using HIS. The end results are given in Table 4.2.

As shown in Table 4.2, the results regarding the professional data of the respondents through the distribution of the respondents' level of position indicate that more than 48% are physicians and nurses (32.2% of the respondents are physicians while 16.7% are nurses). This is followed by professional users with 15.6%, technicians 16.7%, administrators with 14.4% and finally 4.4% is represented by the others such as the secretaries and receptionists.

Table 4.2 Results of the Respondents' Professional Data

| Characteristics | Item | Frequency | Percentage | Valid Percentage |
|---|---|---|---|---|
| Position | Doctor | 58 | 32.2% | 32.2% |
| | Nurse | 30 | 16.7% | 16.7% |
| | Technician | 30 | 16.7% | 16.7% |
| | Administrator | 26 | 14.4% | 14.4% |
| | Professional | 28 | 15.6% | 15.6% |
| | Others | 8 | 4.4% | 4.4% |
| Experience in using computer in your job | <1year | 9 | 5.0 % | 5.0% |
| | 1-4 years | 39 | 21.7% | 21.7% |
| | 5-9 years | 75 | 41.7% | 41.7% |
| | 10-14 years | 46 | 25.6% | 25.6% |
| | 15-20 tears | 10 | 5.6% | 5.6% |
| | 20 years and more | 1 | .6% | .6% |
| Experience in the current job | <1year | 7 | 3.9% | 3.9% |
| | 1-4 years | 31 | 17.2% | 17.2% |
| | 5-9 years | 60 | 33.3% | 33.3% |
| | 10-14 years | 58 | 32.2% | 32.2% |
| | 15-20 tears | 19 | 10.6% | 10.6% |
| | 20 years and more | 5 | 2.8% | 2.8% |

The results also show that 5.0% of the respondents have less than one year of experience in computer usage, and only 6% of the respondents have experience in using computer for a period of more than 20 years. Besides that, 21.7% of the users have experience in computer usage between 1 to 4 years. Around 41.7% of them have experience in using the computer between 5 to 9 years. Majority of the respondents, with more than 78.0%, are familiar with the technology. Familiarity with the technology may create the opportunity for the success of HIS.

For this study, the categories of frequent use of HIS in relation to the respondents' work are based on the study conducted by Naser (2012). From the results in Table 4.2, it can be seen that majority of the respondents have not used HIS in their work experience since it is shown that 3.9% of the respondents have less than one year of work experience, and only 2.8% of the respondents have work experience of more than 20 years. Apart from that, 17.2% of the users have work experience of 1 to 4 years. Meanwhile, 33.3% of them have work experience of 5 to 9 years. This is followed by 32.2% of the respondents who have work experience of between 10 to 14 years, while another 10.6% stated that they have work experience of between 15 to 19 years.

## 4.3 DESCRIPTIVE ANALYSIS

The current study uses descriptive statistics in analysing the results of all the factors. These include the mean, standard error and standard deviation. This particular section provides the evaluation of the outcomes of the examined factors related to user requirements through the conceptual model.

### 4.3.1 Descriptive Analysis for Information Quality.

This particular section provides the descriptive data for every product of information quality. The respondents were asked whether they agree or disagree with the specified statements pertaining to the perspective of user requirements on the achievement of HIS by utilising the specified Likert Scale with "Strongly Agree" (7), which is the highest, to "Strongly Disagree" (1), which is the lowest. The outcome of the descriptive statistics for every item for quality are presented in Table 4.3.

As seen in Table 4.3, the descriptive statistics for the first variable based on the respondents' responses to the six items of this variable reveal that the mean value of 5.53 represents the scale of agreement. Mean is used to measure the central tendency of all variables. The results show that the mean value for these items range from 5.50 to 5.58. More precisely, the overall findings indicate that there are six items with mean values greater than 5.0, and none of the items scored a mean value of less than 5.0. Table 4.3 describes the common deviations of the six questions, as well as the mean.

Table 4.3 Descriptive Statistics for Information Quality

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| IQ1 | The information provided is relevant and useful for my work. | 5.58 | .109 | 1.468 |
| IQ2 | The information provided is complete. | 5.52 | .103 | 1.380 |
| IQ3 | The information provided is sufficient. | 5.50 | .105 | 1.412 |
| IQ4 | The information provided is consistent. | 5.53 | .104 | 1.396 |
| IQ5 | The information provided is up-to-date. | 5.56 | .105 | 1.403 |
| IQ6 | The information provided is timely. | 5.51 | .108 | 1.447 |

The results indicate that the information provided to the respondents is relevant and useful for their current work. System quality affects the intention of the users in bringing success to the hospitals which has the highest mean value of 5.58, and standard deviation of 1.468. The information provided is also complete with a mean value of 5.52 and standard deviation of 1.380, since information completeness is the central item in system quality for the success of HIS. In addition, the respondents agreed that "The information provided is timely", with a mean value of 5.51 and standard deviation of 1.447. The next most important item is the item which states that HIS will improve the quality of the work that they do.

The results also show that the respondents agreed that 'The information provided is up-to-date', with a mean value of 5.56 and standard deviation of 1.403, which is the average important item in building the success of their information quality. This is followed by the item which states that 'The information provided is consistent', with a mean value of 5.53 and standard deviation of 1.396. Finally, the least important and low-value item is the one which states that 'The information provided is sufficient' with a mean value of 5.50 and standard deviation of 1.412. In short, the results suggest that the respondents agreed with the claims about the impact of consumer needs on the achievement of HIS. The end result also suggests that the respondents agreed that the

information that is completely accurate is the central item in creating the user needs for the achievement of HIS.

### 4.3.2 Descriptive Analysis for System Quality

The descriptive analysis for system quality provides the illustrated data for every product for comprehended method of quality. The respondents were asked whether they agree or disagree with the provided claims with respect to the perspective of user requirements on the success of HIS by using the given Likert scale with “Strongly Agree” (7), which is the highest to “Strongly Disagree” (1), which is the lowest. Table 4.4 shows the distribution of the comprehended method of quality variables.

The mean value of the system quality variable ranges between 5.38 - 5.42, which represents the scale of "agree’ and "neutral" (mean value of 5.36 - 5.35). The statement "HIS provides information that is relevant to my job" has the highest mean value of 5.42 and standard deviation of 1.406. This is followed by the statement "HIS is of high quality" which has a mean value of 5.41 and standard deviation of 1.417. "The system is able to recover from errors’ has a mean value of 5.35 and standard deviation of 1.360. The item "HIS is stable" has a mean value of 5.38 and standard deviation of 1.351, which has the same mean value of 5.38 as the item “HIS is reliable”. On the other hand, the standard deviation for the item "HIS is reliable" is 1.379. Next, the item “HIS is stable" has a standard deviation of 1.351. Table 4.4 describes the common deviations for the six questions, as well as the mean values.



Table 4.4 Descriptive Statistics for System Quality

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| SQ1 | HIS is reliable. | 5.38 | .103 | 1.379 |
| SQ2 | HIS is stable. | 5.38 | .101 | 1.351 |
| SQ3 | The system is able to recover from errors. | 5.35 | .101 | 1.360 |
| SQ4 | The system is easy to use. | 5.36 | .103 | 1.377 |
| SQ5 | HIS is of high quality. | 5.41 | .106 | 1.417 |
| SQ6 | HIS provides information that is relevant to my job. | 5.42 | .105 | 1.406 |

In summary, the results indicate that the respondents "agreed" that the following statements are affected by their user requirements, which are: "HIS is reliable", "HIS is stable", "The system is able to recover from errors", "The system is easy to use", "HIS

is of high quality", and also "HIS provides information that is relevant to my job". The results also indicate that the respondents agreed that secured user requirements of HIS are the most important item affecting their user requirements and user needs in the success of HIS.

### 4.3.3 Descriptive Analysis for Service Quality

In this particular area, service quality is put through the descriptive data to figure out their characteristics. The respondents were asked to rate the degree of their agreement with the number of statements pertaining to the service quality factor using the seven-point Likert scale with “Strongly Agree” (7), which is the highest, to “Strongly Disagree” (1), which is the lowest. Table 4.5 exhibits the distribution of the service quality variables of the study.

As revealed by the results in Table 4.5, the mean value of service quality ranges between 5.08 to 5.14. The items "I feel safe in my transactions with the HIS service" and "HIS provides assurance in solving problems" have similar highest mean value of 5.14 and standard deviation of .103. This is followed by the item "HIS provides a proper level of on-line assistance and explanation", which has 5.11 mean value and 1.357 of standard deviation. "HIS is trustworthy" has the mean value of 5.12 and standard deviation of 1.347. "Provide prompt HIS service to the users" has the mean value of 5.10 and standard deviation of 1.350. Table 4.5 describes the mean values and the standard deviations for the five items.



Table 4.5 Descriptive Statistics for Service Quality

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| SRQ1 | HIS is trustworthy. | 5.12 | .100 | 1.347 |
| SRQ2 | HIS provides a proper level of on-line assistance and explanation. | 5.11 | .101 | 1.357 |
| SRQ3 | I feel safe in my transactions with the HIS service. | 5.14 | .103 | 1.379 |
| SRQ4 | HIS provides assurance in solving problems. | 5.14 | .103 | 1.387 |
| SRQ5 | Provide prompt HIS service to the users. | 5.10 | .101 | 1.350 |
| SRQ6 | Provide follow-up service to the users. | 5.08 | .101 | 1.357 |

In summary, the results shown in Table 4.5 suggest that majority of the respondents had responded that each statement has affected their user requirement perspective in the achievement of HIS.

### 4.3.4 Descriptive Analysis for Intention to Use

Descriptive statistics for the intention to use is applied for each item. Table 4.6 illustrates the end result of the descriptive statistics for the goal to employ. The respondents were asked to rate their degree of agreement with a number of statements pertaining to the service quality factor using the seven-point Likert scale with “Strongly Agree” (7), which is the highest, to “Strongly Disagree” (1), which is the lowest. Table 4.6 exhibits the distribution of the intention to use variables of the study.

Table 4.6 shows that the general outcome indicates that the intention to use has mean scores ranging between 5.39 - 5.63, which demonstrates the size of ‘Agree’ and ‘Somewhat Agree’. The item "Overall, I intend to continue using HIS" has the highest mean score of 5.63 and standard deviation of .1.099. The following item is "I would use HIS for gathering information" with a mean value of 5.47 and standard deviation of 1.080. "I would use the services provided by HIS" has a mean value of 5.53 and standard deviation of 1.090, while the item "I would not hesitate to provide information to HIS" has a mean value of 5.45 and standard deviation of 0.929. The item "I would use HIS to inquire about system service" has the lowest mean value of 5.39 and standard deviation of 1.028. Table 4.6 describes the mean values and the standard deviations for the five items.

Table 4.6 Descriptive Statistics for Intention to Use.

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| IU1 | I would use HIS for gathering information. | 5.47 | .081 | 1.080 |
| IU2 | I would use the services provided by HIS. | 5.53 | .081 | 1.090 |
| IU3 | I would not hesitate to provide information to HIS. | 5.45 | .069 | .929 |
| IU4 | I would use HIS to inquire about system service. | 5.39 | .077 | 1.028 |
| IU5 | Overall, I intend to continue using HIS. | 5.63 | .082 | 1.099 |

The study reveals that the respondents agreed that they would not hesitate to use HIS. They would like to use HIS to improve their performance in their transactions with the user requirements of HIS, to improve the quality of the service that they receive and to provide a valuable service.

### 4.3.5 Descriptive Analysis for User Satisfaction

Five things have been utilised in measuring user satisfaction. The respondents were requested to rate the degree of their agreement with a number of claims pertaining to the factor of personal satisfaction using the seven-point Likert scale with “Strongly Agree” (7), which is the highest, to “Strongly Disagree” (1), which is the lowest. Table 4.7 displays the dispersion of the user satisfaction variables of the research.

Table 4.7 illustrates that the highest mean value of 5.08 and standard deviation of 1.160 are with regard to the item "Overall, I am satisfied with HIS". For the item "I feel very confident in using this prototype", the mean value is the lowest at 5.01 while the standard deviation is 1.098. The following item, "HIS has met my expectations" has a mean score of 5.03 and standard deviation of 1.106, while the item "I am satisfied with the efficiency of HIS " has a mean score of 5.08 and standard deviation of 1.160. Finally, the user satisfaction item which relates to "I am completely satisfied in using this prototype", has a mean score value of 5.07 and standard deviation of 1.163. Table 4.7 shows the mean score values and the standard deviations for the five items.

Table 4.7 Descriptive Statistics for User Satisfaction

| No | Item | Mean | Sed. Error | Std. Deviation |
|---|---|---|---|---|
| US1 | HIS has met my expectations. | 5.03 | .082 | 1.106 |
| US2 | I am satisfied with the efficiency of HIS. | 5.04 | .083 | 1.118 |
| US3 | I feel very confident in using this prototype. | 5.01 | .082 | 1.098 |
| US4 | Overall, I am satisfied with HIS. | 5.08 | .086 | 1.160 |
| US5 | I am completely satisfied in using this prototype. | 5.07 | .087 | 1.163 |

The experimental results reveal that the respondents agreed that the use of HIS has several benefits which include; it can easily boost the usefulness of their transactions with the hospitals, it elevates the overall performance in transactions with the hospitals, it improves the service quality that they will receive compared to dealing with real people for the same service, and finally it provides a valuable service for them.

### 4.3.6 Descriptive Analysis for the System, User Requirements.

The user requirements are measured using nine items. These nine items were adopted from the distribution of the questions. The respondents were directed to rate the degree of their agreement with a number of claims pertaining to the user needs factor using the seven-point Likert scale with “Strongly Agree” (7), which is the highest to “Strongly Disagree” (1), which is the lowest.

The results indicate that the items have mean values ranging between 5.01 to 5.31. The item "The users are responsible for the business role functions" has the highest mean score of 5.31 and standard deviation of 1.065. This is followed by the mean value attained by the item "The users take entire responsibility in making a decision for the requirements" which achieved a mean value of 5.01 and standard deviation of 1.065. Next is the item "The users are responsible for the requirements definition of the system" with a mean value of 5.11 and standard deviation of 1.162, while the item "I use HIS to identify the defects in the requirements” has a mean value of 5.13 and standard deviation of 1.196.

The user requirement item which links to the statement "The presentation style of my computer HIS interface is easy to understand" has a mean value of 5.21 and standard deviation of 1.224. Next, the item "I frequently need to use HIS when my own computer (laptop or desktop) is not available" has a mean value of 5.03 and standard deviation of 1.228. The item "HIS does not use my own data for different purposes without my approval " has a 5.18 mean value and a 1.192 standard deviation. The item "Overall, I trust the security measures of the information system” has a mean value of 5.24 and standard deviation of 1.188. Finally, the item “The users are responsible for the business role functions" has the lowest mean value of 5.01 and standard deviation value of 1.065. Table 4.8 demonstrates the mean scores and the standard deviations for the nine items.

The study reveals that the respondents agreed that user requirement is related to the success of HIS. This is because, it is able to boost the usefulness of their transactions together with the hospitals, enhance their overall performance in the transactions together with the clinics, enhance the administrative quality that they will obtain

compared to dealing with real people for the same service, and provide a valuable service for them.

Table 4.8 Descriptive Statistics for User Requirements

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| UR1 | The users take entire responsibility in making a decision for the requirements. | 5.07 | .081 | 1.083 |
| UR2 | The users are responsible for the business role functions. | 5.01 | .079 | 1.065 |
| UR3 | The users are responsible for the requirements definition of the system. | 5.11 | .087 | 1.162 |
| UR4 | I use HIS to identify the defects in the requirements. | 5.13 | .089 | 1.196 |
| UR5 | The presentation style of my computer HIS interface is easy to understand. | 5.21 | .091 | 1.224 |
| UR6 | I frequently need to use HIS when my own computer (laptop or desktop) is not available. | 5.03 | .092 | 1.228 |
| UR7 | HIS does not use my personal information for other purposes without my authorisation. | 5.18 | .089 | 1.192 |
| UR8 | The output information of the information system is secure. | 5.31 | .085 | 1.139 |
| UR9 | Overall, I trust the security measures of the information system | 5.24 | .089 | 1.188 |



### 4.3.7 Descriptive Analysis for User Needs.

User needs are measured using five items. It is the call for a stronger emphasis on data investigation of the patients in the health units, patient information, as well as the needs requirement from the developer. The respondents were asked to rate the degree of their agreement with a number of claims pertaining to the user need factor using the seven-point Likert scale with “Strongly Agree” (7), which is the highest, to “Strongly Disagree” (1), which is the lowest.

The fifth construct of user success on the component of HIS is user needs. This construct consists of five items which are related to user needs in using HIS. The mean values for user needs in using HIS are shown in Table 4.9. The descriptive analysis indicates that user needs has mean values ranging between 5.18 to 5.31, which represents greater than the neutral value scale. The item "I frequently have to use HIS in order to meet my work obligation’ scored the highest mean value of 5.31 and a standard deviation of 1.063, while the item “My everyday work tasks require me to

frequently need the support of HIS" has the lowest mean value of 5.18 and a standard deviation of 1.129. The next item "I am expected to use HIS all the time to meet my work obligation", and the item "The content of HIS meets my needs' have the lowest mean value of 5.18, but they have different standard deviations in which the item "I am expected to use HIS all the time to meet my work obligations" has a standard deviation of 1.173 while the item "The content of HIS meets my needs" has a standard deviation of 1.183. Table 4.9 describes the mean values and the standard deviations for the five items.

Table 4.9 Descriptive Statistics for User Needs

| No | Item | Mean | Std. Error | Std. Deviation |
|---|---|---|---|---|
| UN1 | My job frequently requires me to rely on HIS. | 5.24 | .083 | 1.115 |
| UN2 | My everyday work tasks require me to frequently need the support of HIS. | 5.18 | .084 | 1.129 |
| UN3 | I frequently have to use HIS in order to meet my work obligation. | 5.31 | .079 | 1.063 |
| UN4 | I am expected to use HIS all the time to meet my work obligation. | 5.18 | .087 | 1.173 |
| UN5 | The content of HIS meets my needs. | 5.18 | .088 | 1.183 |

## 4.4 VALIDITY AND RELIABILITY

Validating the constructs and the items within these constructs need to be conducted before starting with the data analysis. Validity indicates the level to which the items effectively assess the constructs meant to measure, whereas reliability refers to the degree of stability of the scale. In other words, the validity and reliability of the instrument are concerned with reducing the possibility of getting incorrect answers during the data collection. In this study, most of the items selected for the constructs are adapted from the previous researches in order to ensure their content validity. The survey was subjected to the validity and reliability testing described as follows:

### 4.4.1 Results of Validity Assessment Through Factor Analysis

With regard to validity test, factor analysis is carried out on reliant variables and independent variables, and also in order to look at the validity. In this study, eight user requirement perspectives on the success of HIS factors were tested to measure the

intention for the success of IS among HIS users. These factors are called; system quality, information quality, service quality, intention to use, user satisfaction, user requirements and user needs. Validity was taken into consideration before starting with the factor analysis to determine whether these factors were distinct or not.

Using the analysis tool of the SPSS.VS.22.0, the factors were tested for validity analysis by applying the Kaiser Meyer Olkin (KMO) test to the data. The purpose of this test is to measure the sampling adequacy (Pallant 2010). The KMO test varies from 0 to 1, in which higher value means more suitable interpretation. According to Tabachnick and Fidel (2012), KMO should be equal to or higher than 0.60 in order to persist with the factor analysis. Hair et al. (2010) pointed out in greater detail that KMO value of 0.90 is excellent; 0.80 is good; 0.70 is middling; 0.60 is mediocre; 0.50 is acceptable but poor; while below 0.50 is rejected. The KMO results for all the constructs are between 0.849 and 0.941. Table 4.11 presents the KMO values for all constructs.

Table 4.10 KMO result for each variables

| **Construct** | **KMO** |
|---|---|
| Information Quality | 0.935 |
| System Quality | 0.941 |
| Service Quality | 0.939 |
| Intention to Use | 0.849 |
| User Satisfaction | 0.892 |
| User Requirements | 0.915 |
| User Needs | 0.845 |



According to Tabachnick et al. (2001), a higher value of validity test of 0.6 or more is considered appropriate to proceed with the element analysis. Thus, the outcome of the reliability and validity tests in this study show that the data is suitable for more aore analysis.

### 4.4.2 Results of Reliability Analysis

Reliability suggests that the scores from an instrument are consistent and stable (Hair et al. 2010; Pallant 2010). Using the Cronbach's Alpha, the accuracy test is conducted to ensure the reliability of the items in measuring the constructs or factors (Hinton et al.

2004). This test measures the consistency of the items. In other words, it tests the consistency of the respondents' answers to all of the items.

The Alpha value normally ranges between 0 to 1. Hair et al. (2010), proposed that the reasonable value of the alpha is at least 0.70 in order for it to become a good way of measuring reliability, and in such a situation the end result may be generalised. Hinton et al. (2004) proposed four unique levels of accuracy: a great fitness level range (0.90 and above), a high level range (between 0.70 to 0.90), a moderate level range (between 0.50 and 0.7) and a low level range (0.50 and below). In this study, the reliability test, which is "the outcome of the Cronbach's Alpha" for every construct is provided in Table 4.10. The Cronbach's Alpha is usually translated as the coefficient of the internal consistency of all the respondents.

Table 4.11 Cronbach's Alpha for All Variables

| **Model Construct** | **Cronbach's Alpha** | **Number Of Items** | **Result** |
|---|---|---|---|
| Information Quality | 0.983 | 6 | Excellent Reliability |
| System Quality | 0.985 | 6 | Excellent Reliability |
| Service Quality | 0.986 | 6 | Excellent Reliability |
| Intention to Use | 0.908 | 5 | Excellent Reliability |
| User Satisfaction | 0.984 | 5 | Excellent Reliability |
| User Requirements | 0.924 | 9 | Excellent Reliability |
| User Needs | 0.905 | 5 | Excellent Reliability |



Based on the above results of reliability coefficient, the Cronbach's Alpha value for each measurement tool was more than the excellent reliability and suggested values. None of the items was eliminated when the alpha values displayed excellent internal consistency. The values are between 0.986 and 0.905. The level of the Cronbach's Alpha result range is excellent at 0.90 and above. Moreover, this is an indication of the high level of consistency and reliability of the questionnaire answers which depended on the data analysis of the respondents' answers and the testing of the hypotheses in the present study.

## 4.5 FACTOR ANALYSIS

Factor analysis is a test that is mainly related to data reduction. In other words, it aims at reducing the number of items and combining them in a similar set of the construct

(Pallant 2010). This means that this analysis allows for the deletion of things that do not load significantly on its intended element, and that each construct or factor contains a group of similar items. In order to carry out the factor analysis, the data reduction technique of SPSS.VS.22.0 was used in the present study. In this technique, the factor analysis is usually called the Exploratory Factor Analysis (EFA) which utilises the principle component analysis and also performs the Varimax rotation. The principle component analysis is about identifying the quantity of elements to account for the optimum length of the discrepancy in the data. On the other hand, the Varimax rotation criterion helps to make the pattern of the items related to a certain element even more distinct (Hair et al. 2010). Appendix E shows the output of the SPSS result. However, to proceed with the factor analysis test, it is necessary to obtain the Eigenvalues test on the data since such evaluation is an essential step.

### 4.5.1 Eigenvalues Test

Eleven factors were extracted with Eigenvalue greater than one, and the total of their cumulative value is 81.563 % of the variance as shown in Table 4.12. According to Hair et al. (2010), in human behavioural science where information is often not accurate, a combination of investigated factors which considers for 75% of the total variance is considered acceptable. Generally, a good factor analysis means that only a few factors elucidate a large portion of the discrepancy, while the other remaining factors explain the relatively small portion of variance for the investigated construct. Table 4.12 shows the Eigenvalues and total variance for the investigated construct.



Table 4.12 Eigenvalues and Total Variance for Investigated Construct

| Component | Total | Initial Eigenvalues % of variance | Cumulative % |
|---|---|---|---|
| 1 | 21.215 | 45.137 | 45.137 |
| 2 | 6.573 | 13.985 | 59.122 |
| 3 | 2.913 | 6.198 | 65.321 |
| 4 | 2.542 | 5.409 | 70.730 |
| 5 | 2.107 | 4.484 | 75.214 |
| 6 | 1.768 | 3.761 | 78.975 |
| 7 | 1.217 | 2.588 | 81.563 |

Table 4.12 shows that the first factor is information quality which has the highest Eigenvalue of 21.215, thus explains the 45.137% of the variance. The second factor is

system quality with an Eigenvalue of 6.573, and this factor explains about 13.985 of the variance. This is followed by information quality, system quality, and service quality, intention to use, user satisfaction, user requirements, and user needs.

Table 4.13 shows the results obtained from the primary component evaluation together with the driven component matrix. The factor loading of all the constructs are presented. All of the loaded items are above 0.40. In addition, a cross loading of the items are not found in the final factor analysis. The Varimax rotation is often used in surveys to find out how the groupings of items measure exactly the same construct. According to Hair et al. (2010), by using SPSS, researchers are able to perform a principal Component Analysis, setting the extraction method based on the seven values and then observing the rotated factor matrix.

items of user requirements in HIS are shown in the final rotated component matrix and the factor loading of all the constructs are presented in Table 4.13.

Table 4.13 Rotated Component Matrix for the Investigated Constructs

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|
| SRQ 4 | .926 | | | | | | |
| SRQ 2 | .921 | | | | | | |
| SRQ 5 | .916 | | | | | | |
| SRQ 1 | .906 | | | | | | |
| SRQ 3 | .903 | | | | | | |
| SRQ 6 | .891 | | | | | | |
| SQ1 | | .920 | | | | | |
| SQ6 | | .916 | | | | | |
| SQ3 | | .914 | | | | | |
| SQ4 | | .907 | | | | | |
| SQ5 | | .905 | | | | | |
| SQ2 | | .899 | | | | | |
| UR3 | | | .751 | | | | |
| UR2 | | | .744 | | | | |
| UR1 | | | .724 | | | | |
| UR4 | | | .710 | | | | |
| UR5 | | | .658 | | | | |
| UR6 | | | .656 | | | | |

*Continue…*

*..continued*

| | | | | | |
|---|---|---|---|---|---|
| UR7 | .611 | | | | |
| UR8 | .525 | | | | |
| UR9 | | | | | |
| US4 | | .864 | | | |
| US5 | | .860 | | | |
| US1 | | .850 | | | |
| US3 | | .831 | | | |
| US2 | | .827 | | | |
| IQ6 | | | .745 | | |
| IQ2 | | | .729 | | |
| IQ1 | | | .726 | | |
| IQ3 | | | .711 | | |
| IQ5 | | | .687 | | |
| IQ4 | | | .662 | | |
| UN3 | | | | .763 | |
| UN4 | | | | .718 | |
| UN5 | | | | .651 | |
| UN2 | | | | .638 | |
| UN1 | | | | .605 | |
| IU2 | | | | | .833 |
| IU3 | | | | | .752 |
| IU1 | | | | | .737 |
| IU4 | | | | | .720 |
| IU5 | | | | | .562 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
a. Rotation converged in 7 iterations.



Since the survey questions were translated from English to Arabic and most of the factors and items were examined for the first time in Yemen in the context of the HIS system, there might be a misunderstanding of the questions and the analysis showed different variances for some measurement items in the survey. It is observable in Table 4.14 that the one item which has a loading below the value 0.40, or has various factor loadings from its own predicted elements must be taken out of the analysis. Taking into account this limitation, the item (UR9) was removed after the exploratory factor analysis. Factor loading of 0.40 is the minimum suggested value in information system study (Straub et al. 2004). In this study, all of the things have an element loading of more than 0.4.

Table 4.14 The removed Item after factor analysis

| Item | Item detail |
|---|---|
| UR9 | Overall, I trust the security measures of the information system |

## 4.6 CORRELATION ANALYSIS

Correlation analysis is a statistical method that will show the power and guidance of the connection among pairs of variables (Pallant. 2010). In other words, the aim of performing a correlation analysis is to answer the following questions: Is there a relationship between the variables? What is the direction of this relationship? Is it a positive, negative or zero relationship? How strong is the relationship between the pair of variables? To answer these questions, Pearson correlation is accustomed to examine the sturdiness of the connection between a set of factors. Pearson correlation coefficients have only one value ranging between -1 and +l. A positive correlation means that the increase in one variable leads to the increase in the other and vice versa. Negative correlation and a correlation of zero means that there is no connection between the two variables.

In addition, a correlation of 1 or -1 means that the correlation is perfect. To interpret the correlation value, the following categories have been suggested by Pallant (2010). Hence, the following correlation coefficients ranging from 0.10 to 0.29 refers to a small correlation, correlation coefficients ranging from 0.30 to 0.49 means a medium correlation and correlation ranging between 0.50 and 1.0 refers to a high correlation. These results indicate the importance of these factors in explaining the variance in behavioral intention as shown in Table 4.15.

The results of the evaluation displayed in Table 4.15 show that there is significant correlation among the constructs. The table summarises the Pearson's correlations with a two-tailed significance test. Correlation analysis is used to clarify that the independent variable contributes information for predicting the dependent variable. A medium and positive correlation is found among majority of the variables as shown in Table 4.15.

Table 4.15 Correlation Analysis of the Investigated Factor

| | | IQ | SQ | SRQ | IU | US | UR | UN | NB |
|---|---|---|---|---|---|---|---|---|---|
| IQ | Pearson Correlation | 1 | .330** | .693** | .557** | .544** | .612** | .587** | .485** |
| SQ | Pearson Correlation | | 1 | -.065 | .400** | .430** | .477** | .463** | .372** |
| SRQ | Pearson Correlation | | | 1 | .401** | .347** | .353** | .377** | .332** |
| IU | Pearson Correlation | | | | 1 | .568** | .616** | .662** | .401** |
| US | Pearson Correlation | | | | | 1 | .609** | .594** | .470** |
| UR | Pearson Correlation | | | | | | 1 | .720** | .485** |
| UN | Pearson Correlation | | | | | | | 1 | .538** |

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

**Note :** IQ information quality**,** SQ system quality, SRQ service quality, IU intention to use, US user satisfaction, UR user requirements, UN user needs

The results demonstrate that the highest correlation value is between the elements of service quality, system quality, information quality, user satisfaction, intention to use, user requirements and user needs. This indicates that the more capable a user is in his ability to use a technology, the higher possibility he has in accessing the resources of HIS, and the benefits offered by such systems and their user needs of HIS in their work lead to more success of HIS.

## 4.7 STRUCTURAL EQUATION MODELLING

The structural equation modelling was utilised to examine the model. SEM was used as a confirmatory method in this study since it is able to estimate the error variance for all parameters, to integrate both the unobserved and observed variables together and also to analyse the indirect relations. The confirmatory factor examination was utilised to examine the model fit indices.

### 4.7.1 Measurement of the Model Goodness-Fit

The aim of the model testing is to look at the goodness of fit between the hypothesised information and the structural design set. Thus, the physical fitness of the unit was analysed using the SEM data interpretation for confirmation purposes.

The incremental fit indices such as IFI and CFL account for 0.754 and 0.753 respectively. This indicates that the model is 0.753% to 0.754% acceptable. The CMIN/DF accounts for 5.093, which is greater than 3 while RMSEA accounts for 0.151, which is greate than 0.08. Figure 4.1 shows the CFA measurement model for the exogenous constructs.

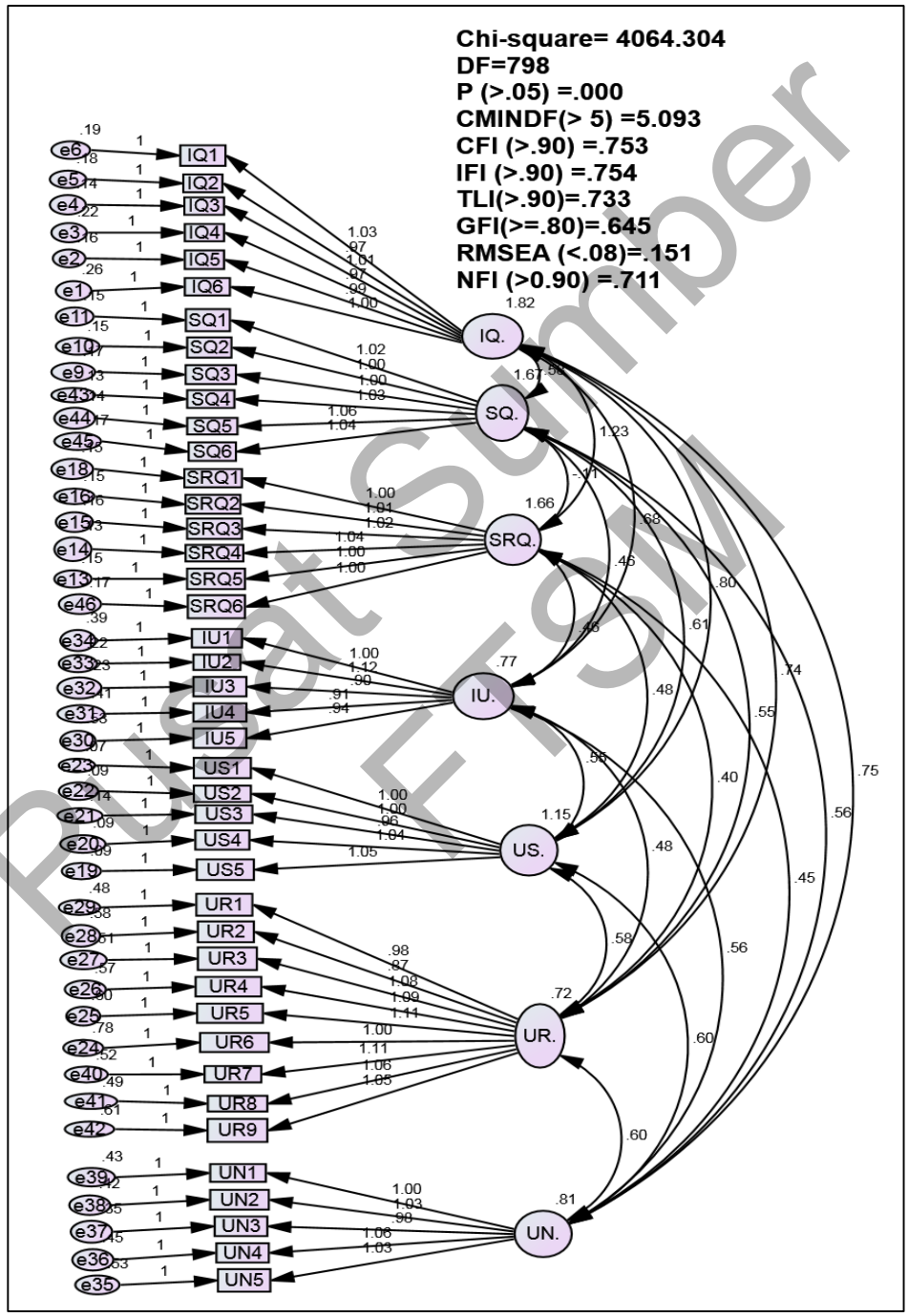


Figure 4.1 The CFA Measurement Model (Exogenous Correlation).

Table 4.16 summarises the incremental fit indices, CMIN/DF and RMSEA for the exogenous correlation. However, some of the values are unacceptable since the values of 1FI and CFI are less than 0.90. The values of IFI and CFI should at least equal to 0.90. It can be concluded that this model does not fit the data well and there is a need to modify this particular model to find the ideal model..

Table 4.16 Goodness for Fit for the Exogenous Correlation

| **Indices** | **X2** | **CMIN** | **DF** | **RMSEA** | **IFI** | **CFI** | **TLI** | **NFI** | **P** |
|---|---|---|---|---|---|---|---|---|---|
| Value in the model | 4064.304 | 5.093 | .798 | .151 | .754 | .645 | .733 | .711 | .000 |

### 4.7.2 Modifications of the Exogenous Model

The model was tested and modified through the confirmatory factor analysis, which indicates significant results as shown in Figure 4.2. The values in the modified model which are presented in Figure 4.2 and Table 4.17 show that the incremental fit indices of IFI and CFI account for 0.931 and 0.931 respectively, which indicate a very good model fit. In addition, CMIN/DF accounts for 1.982, while RMSEA accounts for 0.074 respectively. These values of CMIN/DF and RMSEA fall within the recommended values. From these results, it could be concluded that the model fits the information perfectly and is thus acceptable.

With reference to Hair et al. (2010), the goodness of fit index, comparative fit index, root mean square approximation, chi square data, and level of independence estimates are computed to verify the model. Thus, the measures of model fit as depicted in Figure 4.2 indicate that the exogenous model fits the data very well since CMIN/DF is less than 3, the IFI and CFI are higher than 0.9, while RMSEA is less than 0.08. Table 4.17 shows the goodness of fit of the CFA models.

Table 4.17: Goodness of Fit of the CFA Models

| **Indices** | **X2** | **CMIN** | **DF** | **RMSEA** | **IFI** | **CFI** | **TLI** | **NFI** | **P** |
|---|---|---|---|---|---|---|---|---|---|
| Value in the model | 1268.655 | 1.982 | 640 | .074 | .931 | .773 | .924 | .871 | .000 |

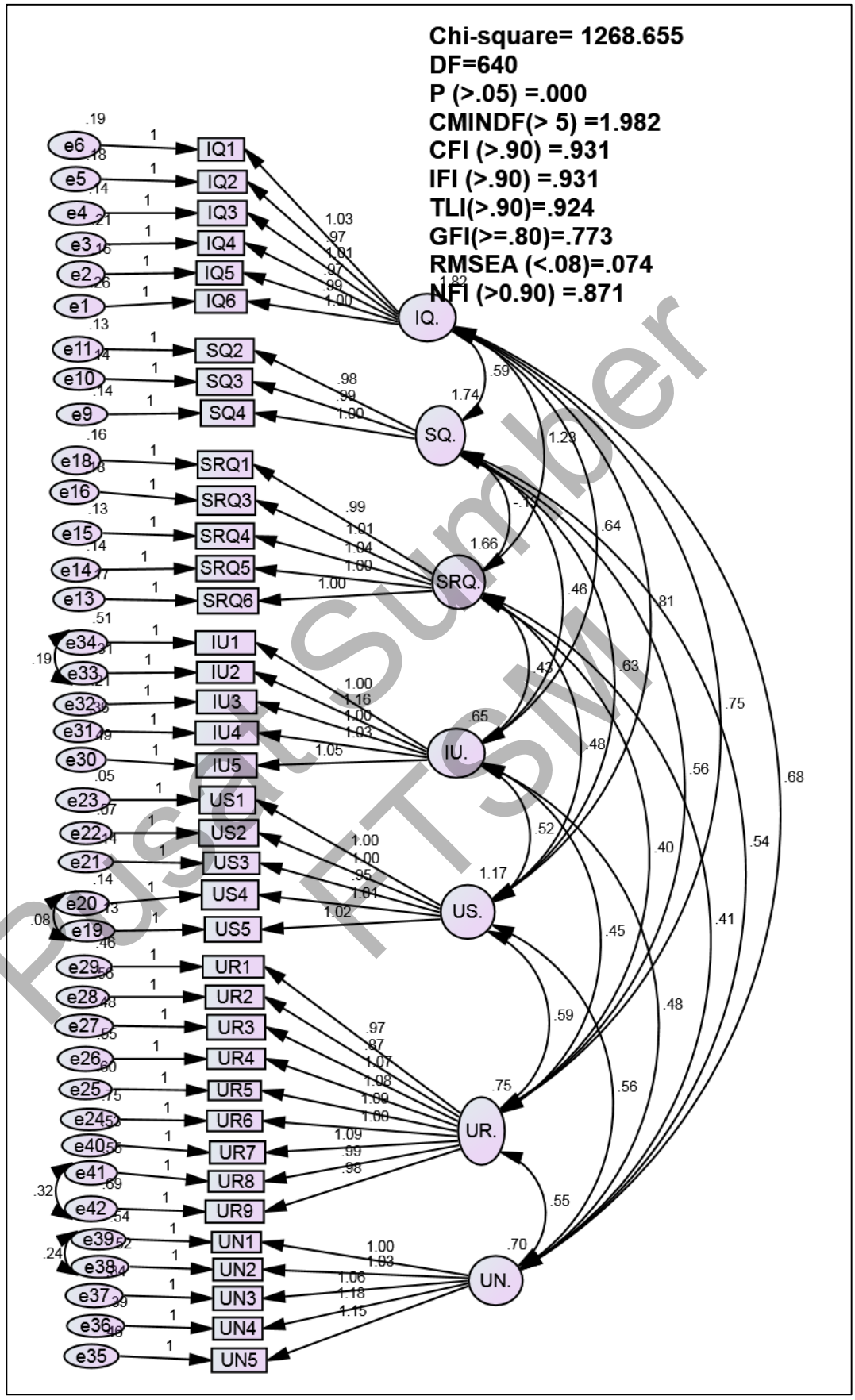


Figure 4.2 Modification of the overall exogenous model.

## 4.8 DEVELOPMENT AND VALIDATION OF THE INVESTIGATED MODEL

This section presents the results to answer two research questions: Does the quality of the health information system have a positive effect on the users of the health information system in Sanaa, Yemen? Can a model for the health information system quality among health information system users be proposed?

The improvement of the proposed model depended on the model created and tried through the speculation testing process as delineated earlier in the previous sections. The conceptual model proposed in Chapter II of this study was created depending on the unified theory of use, in addition to the acceptance of the technologies as proposed by Venkatesh et al. (2003), as well as the outcome of the literature review presented in Chapter II. Amidst the improvement phases of the proposed model, the following tasks were performed. First, the structural model was constructed completely by joining the examined constructs that have been "previously tested and validated" and by integrating them into the proposed model. Then, the developed model was validated by estimating the integrity of-fit as shown in Table 4.18.

Looking at the comprehensively-developed model, various things have been excluded from the model due to the model fit. Such excluded items have either low standardised regression weight or standardised residual covariance that is greater than 2.58, or do not load significantly on its intended construct. The items which have been excluded from the model are presented in Table 4.18

Table 4.18 Excluded Items from the Model

| Construct | Deleted Item |
|---|---|
| System quality | HIS is reliable. |
| | HIS is of high quality. |
| | HIS provides information that is relevant to my job. |
| Service quality | HIS provides a proper level of on-line assistance and explanation. |

Table 5.18 shows that the items which constitute the effort expectancy factor1 were excluded four items were deleted since the total correlation is less than 0.40 (Hair et al. 2010).

The standardised regression weight refers to the factor loading of items, which should be between -1 and +1, and at best to exceed 0.70 (Hair et al. 2010). The standardised residual covariance on the other hand, should have an absolute value of less than 2.58 (Byrne 2010). Item loading with high values means a much better convenience of the product on the factor. The residual covariance should have an absolute value of less than 2.58 (Byrne 2010). Item loading with high values means a better convenience of the item factor. The recurring covariance between two things will be the big contrast between the example covariance as well as the suggested model. Therefore, for the purpose of model refinement, these items have been excluded. As a result, each item conforms to the criteria of model fit.

Based on the results of SEM analysis, the integrated model was formulated. In examining the effectiveness of the developed model, two steps had been adhered to, as proposed by Byrne (2010). According to this researcher, these two steps in examining the success of any structural developed model will determine the overall goodness of fit of the causal model, and estimate the greatness and measurable hugeness of each coefficient path and the variance for each endogenous latent construct. Thus, regarding the developed model in the present study as presented in Figure 4.3, it signifies the criteria of integrity of wellness lists as proposed by the earlier researchers. Thus, the model fits the empirical information well. The details about the model and the model fit refer to the AMOS tabular output in Appendix E. Moreover, in the same figure, the path coefficient values between the facter are given .

For the HIS in Yemen, the conceptual model for the success of HIS was proposed based on the data analysis. The model was developed based on the outcome of the path data analysis. The developed model reveals that the success of user requirements in HIS of an individual and the organisation significantly contributes to the intention to use HIS among HIS users.

The proposed model of the research includes seven endogenous and exogenous variables, where the main endogenous variable status of the variable is relative to the specification of a particular model and the causal relations among the independent variables. An exogenous variable is by definition one whose worth is totally causally independent from some other variables in the product. In the final developed model, the

user requirements success of HIS has the most significant effort on the respondents of HISU as shown in Figure 4.3.

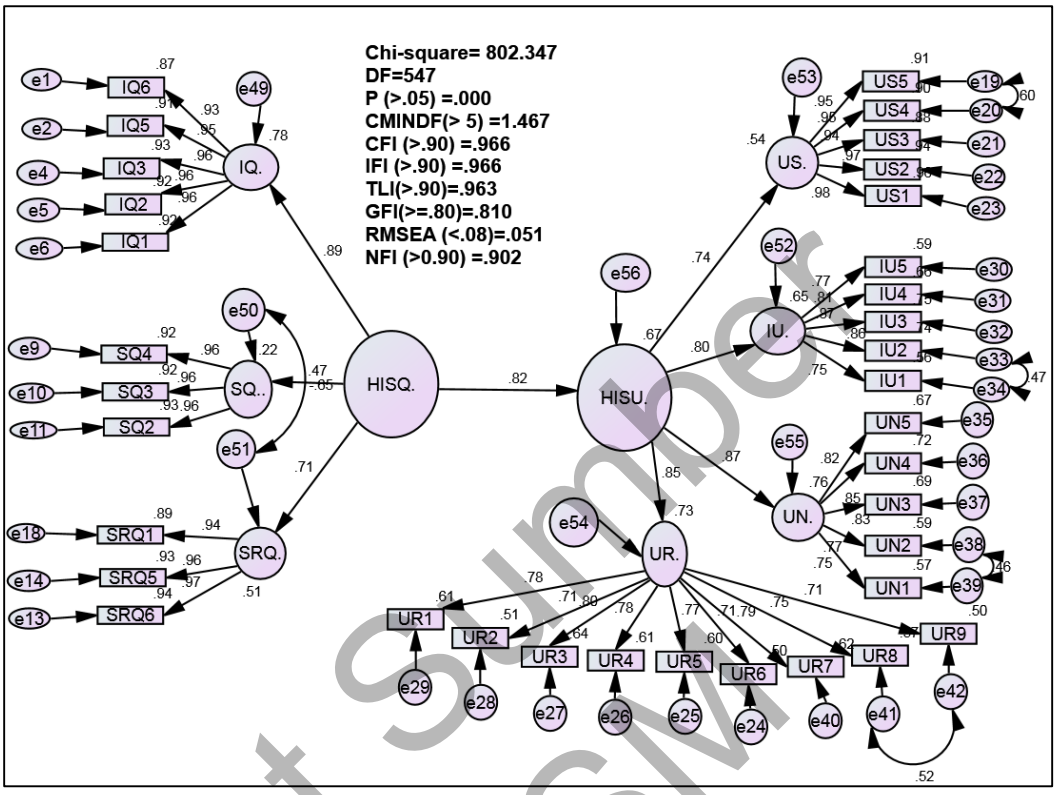


Figure 4.3 The proposed model.

### 4.8.1 Results of the Overall Structural Model

One of the research objectives is to propose a framework for user requirement factors that influence HIS success. To achieve this objective, SEM is considered a suitable data analysis method. Recently, the use of the SEM method for instrument validation and testing is now famous in the domain of HIS. According to Byrne (2010), the proposed model should be substantively meaningful and statistically well fit. In addition, SEM has the potential to analyse multiple relationships between independent and dependent variables simultaneously as opposed to other generation models such as ANOVA and MANOVA which can only analyse one causal relationship at a time.

According to Hair et al. (2010), the common measure for model analysis which are used in the present study includes the $X^2$ and degrees of freedom, the CFI or TLI. RMSEA on the other hand, usually provides sufficient unique information in evaluating a developed model. The value .82 shows the effect between the demotions. The results

of these measures reveal that this model is a very fit model because all measures fit within the range of the recommended values (all the test results are generated from Amos version 22, as shown in Appendix E).

As previously discussed in the CFA, some criteria were used to measure the goodness of fit which were applied to the full casual model in this study. The results of these criteria are presented in Table 4.19.

Table 4.19 Reliability Weight and Goodness of Fit Indices

| Name | Abbreviation | Acceptable level |
|---|---|---|
| Coefficient Alpha | A | A >0.70 |
| Standardised regression weight | B | B >0.40 |
| Normalized Chi-square | $X^2$ /df | 1.0 < $X^2$ /df < 3.0 |
| Root mean square error of Approximation RMSEA | RMSEA | < 0.08 |
| Comparative fit index | CIF | >=0.90 |

Table 4.20 presents the results of the goodness of fit for the overall model. As mentioned in Chapter III, the data set is efficiently large at 180 samples in this study, where $x^2$ =802.347, p value =0.000, $x^2$/df =1.467 is below 3. In addition, the CFI is 0.966, which is above 0.90, and the IFI is 0.966, which is also above 0.90, CMIN = 1.467, which is also less than 5, the Normed Fit Index NFI = .902, which is also above 0.90, while the Tucker-Lewis Index (TLI) = .963. Regarding the REMSEA, it is estimated as = 0.051, which is below the 0.080 recommended value by Browne & Cudeck (1993). The closer the Root Mean Square Residual RMR is to 0, the better is the model fit. According to Hair et al. (2010), the values of RMR as high as 0.08 are deemed acceptable. In the research developed model, the value of RMR is .064, which means a better fit.

Table 4.20 The Measures of Model Fitness

| Fit Measure | Recommended Value | Fitness Measure | Conclusion |
|---|---|---|---|
| $X^2$ /df | <3.0 (Barrett 2007) | 1.467 | Acceptable |
| CFI | >0.90 (Barrett 2007) | 0.966 | Acceptable |
| IFI | >0.90 (Barrett 2007) | 0.966 | Acceptable |
| RMSEA | <0.08 (Barrett 2007) | 0.051 | Acceptable |
| CMIN/DF | < 5 (Barrett 2007) | 1.467 | Acceptable |
| NFI | >0.90 (Barrett 2007) | .902 | Acceptable |

Table 4.20 shows that all the measures of goodness of fit fall within the recommended values, and the current study model has a good fit with the data based on the assessment criteria. The model provides the inter-dependent connection of all the investigated factors. This model also highlights the framework for user requirements perspective on the success of HIS. Identifying the right user requirements and user needs of a user are the most critical factors that influence the use of HIS. Thus, this developed model has the potential to explain the usage of HIS.

### 4.8.2 Discussion of Hypotheses Testing

As shown in the measurement model in Figure 4.3, the developed model contains 8 paths between HISU and the user requirements. The significant levels of these paths are at 0.001, 0.01, and 0.05. Besides that, Table 4.21 shows that the path coefficient is statistically significant when the P-value <0.05, from the data analysis of the results based on the proposed model, the model was constructed based on the path interpretation results. In the present case, all the p-values are 0.00. This means that the results are significant. Table 4.21 below illustrates the outcomes of the hypotheses testing.

Table 4.21 The results of hypotheses testing

| Path | | | Estimate | S.E. | C.R. | *P* | Conclusion |
|---|---|---|---|---|---|---|---|
| HISU | <--- | HISQ | 0.565 | 0.085 | 6.687 | 0.001 *** | Significant |
| SRQ | <--- | HISQ | 1.000 | | | | |
| IQ | <--- | HISQ | 1.276 | 0.132 | 9.673 | 0.001 *** | Significant |
| SQ | <--- | HISQ | 0.656 | 0.153 | 4.280 | 0.001 *** | Significant |
| IU | <--- | HISU | 1.000 | | | | |
| US | <--- | HISU | 1.232 | 0.151 | 8.035 | 0.001 *** | Significant |
| UN | <--- | HISU | 1.128 | 0.149 | 7.589 | 0.001 *** | Significant |
| UR | <--- | HISU | 1.144 | 0.156 | 7.319 | 0.001 *** | Significant |

Note: HISU health information system user, HISQ health information system quality, Estimate = standardised regression weights (path estimate), S.E = standard error, C.R. =critical ratio (t-value), P = critical (p-value) = significance value. * p <0.05; ** p <0 .01; *** p < 0.001.

The model shows to which degree that both the user requirement factors and the constructs influence the Yemeni users' intention in using HIS. The indicators include the health information system user (HISU) and account for a significant variance in the dependent variables. However, the health information system quality is significant.

For the testing of the research hypotheses, the SEM approach was applied to confirm or reject the proposed hypotheses. This analysis aims to obtain the required results to answer the RQ2 research question: Can health information system quality model for the health information system user be proposed? As discussed earlier, to explain the study hypotheses, the estimated coefficient, the critical ratio and level of significance (Alpha) were used in the present study. The estimated coefficients must be different from zero. Moreover, the critical ratio must be greater than 1.96, and finally the level of nakedness must be less than 0.05, 0.01 or 0.01 (Hair et al. 2010). Therefore, the hypothesized model was statistically examined in a simultaneous data analysis of the whole model of variables to identify the level to which it is considered with the data. If the goodness-of-fit is sufficient, the unit argues for the plausibility of postulated relations among the variables; if it is insufficient, the tenability of that relation is unacceptable (Byrne 2010).

The first hypothesis is to investigate the effect of HISQ on HISU, since the hypothesis on HISQ has been shown to reflect a positive effect on HISU. This hypothesis is proven to be significant based on the analysis made on the results of HISU whereby this hypothesis has the p-value = .000 ($p<0.05$).

The first sub-hypothesis is to investigate whether data quality could have a positive impact on HIS users among the users of the health information system in Yemen. This hypothesis is proven to be significant based on the analysis made on the results of HISU whereby this hypothesis has the p-value = 000 ($p<0.05$).

The second sub-hypothesis is to investigate whether system quality could have a positive impact on HIS users and the integration among the users on the health information system in Yemen. Based on the hypothesis, the system quality factor would have a positive effect on the health information system users in increasing the system quality. This hypothesis is supported since the p-value=0.000 ($p<0.05$).

The third sub-hypothesis is to investigate the influences of the daily service to see whether it could have a positive impact on HIS users and the integration among the users on the health information system in Yemen. Based on the hypothesis, the factor of service quality would have a positive effect on the health information system users

in increasing the system quality. This hypothesis is supported since the p-value=0.000 ($p<0.05$).

In addition, the evaluation was performed through two steps: first and second order of CFA for each model. The evaluation was used to measure the scale and to verify whether the data fits the hypothesized measurement model. CFA is taken as a prior step to a full SEM model in measuring the relationship between the observed measures and the latent variables (Browne & Cudeck 1993). The analysis of the causal relationship between the factors is investigated and the hypotheses is tested. The structure model was designed through SEM with the aid of AMOS version 22. The models were then analysed and the results are presented in this chapter. All the relationships were investigated and the finding shows that all the hypotheses are significant. Table 4.22 summarises the results of the hypothesis testing.

Table 4.22 Summary of Hypothesis Testing

| NO | Hypothesis | Result |
|---|---|---|
| H1 | Health information system quality will have a positive effect on health information system users among the users of the health information system in Yemen. | Significant |
| H1a | Information quality will have a positive effect on the health information system users among the users of the health information system in Yemen. | Significant |
| H1b | System quality will have a positive effect on the health information system users and the integration among the users of the health information system in Yemen. | Significant |
| H1c | Service quality will have a positive effect on the health information system users and the integration among the users of the health information system in Yemen. | Significant |

Finally, the HISQ-HISNU model in HIS was developed. By applying the structural equation modelling, the developed model was validated, and its dimensionality was achieved by testing the factor loading and by correcting the value of the exogenous variable. The validation of the model was accomplished through construct validity and goodness of fit as recommended by the researchers.

### 4.8.3 Discussion of the Investigated Factors

To study the influence of the investigated factors on the user requirement intention in the success of the information system in HIS in Yemen, this sub-section discusses the main determinants in the success of the information system.

Concerning the results gained from the quantitative data analysis in this research, the model reveals that HISQ is the strongest independent variable (IV) that predicts the dependent variables (DV) of HISU. This construct measures the user's ability and the third self-confidence in using such information system. Therefore, it is important to organise training practice programs to facilitate the solving of the emergent problems that may lead to the development of self-confidence among the users of HIS and to increase their abilities when performing their specific tasks. The HISQ may lead to a higher level of success rate. The result is agreeable with those results obtained by the prior studies which shows that HISQ plays a main role in the acceptance and usage of the technology (Browne & Cudeck 1993). For each individual, we multiplied the rated importance measure with the rated performance measure for each attribute, sumed up the products, and divided it by the sum of the weights (to normalise the function) as follows:

$$M = \sum_{i=1}^{7} C_i F_i$$



The result of the maturity model analysis offers interesting insights into the model. First, not all the coefficients are positive. This means that the critical success factors are the technical competence of the learners, user-friendly design, learner community development and platform accessibility all have positive associations. This deviates from the expected relationship. Without doubt, the users are the target group around the healthcare service where the entire platform is built, and therefore their individual attitudes are extremely important. The previous researches have found seven factors that affect the overall attitude towards user requirements (Ahlan and Ahmad 2014). To determine the user satisfaction level, a detailed survey targeting the user requirements in HIS in Sanaa, Yemen was conducted. Overall, the objective of the

research is to achieve this objective: To propose a model that examines HIS quality on HIS users in HIS in Sana'a, Yemen.

In the equation, $C_1$, $C_2$, $C_3$, $C_4$, $C_5$, $C_6$, and $C_7$ are coefficients while $F_1$, $F_2$, $F_3$, $F_4$, $F_5$, $F_6$, and $F_7$ are factors. Thus, the first dimension is divided into three sub-factors namely; Factor Information Quality (FIQ), Factor System Quality (FSQ) and Factor Service Quality (FSQ). The second dimension is the dependent variable (HISU) which is divided into four sub-factors namely; Factor Intention to Use (FIU), Factor User Satisfaction (FUS), Factor User Needs (FUN), and Factor User Requirements (FUR). As mentioned earlier, the Maturity model uses the data analysis by excel equation for our model as the following: coefficient of factors (CF) = $C_1F_1 + C_2F_2 + C_3F_3 + C_4F_4 + C_5F_5 + C_6F_6 + C_7F_7$. HISU is really unique in Sanaa, Yemen. The equation for the data analysis using the Excel software is shown in Appendix F.

i. F (Factors) = the responses in the questionnaire. E.g. 5975

ii. C (coefficients) = f / (No. of responses * (NO. of items*scale)), (E.g. $C_1$ = 5975 /52920 = 0.112906273.

iii. M (Model) = $C_1F_1 + C_2F_2 + C_3F_3 + C_4F_4 + C_5F_5 + C_6F_6 + C_7F_7$

The multiple linear regression equation of the model for User Requirements Elicitation Success Model (URESM) is as follows = $C_1F_1 + C_2F_2 + C_3F_3 + C_4F_4 + C_5F_5 + C_6F_6 + C_7F_7$. Therefore, URESM = 715.187075 + 677.8027 + 614.9184 + 474.2891 + 408.0476 + 1353.139 + 430.5374 = **4673. 922.** Thus, the user requirements elicitation success model (URESM) is equal to 4673.922.

This is the First scientific way in finding the maximum of the factors values in this equation = $F_{1\ Max}$, $F_{2\ Max}$, $F_{3\ Max}$, $F_{4\ Max}$, $F_{5\ Max}$, $F_{6\ Max}$, and $F_{7Max}$ are factors, of the 2 dimensions (HISQ independent variables and HISQ dependent variables). This is the meaning $F_{1\ Max}$ = [Total responses * (scale * NO. of IQ items)], $F_{2\ Max}$ = [Total responses * (scale * NO. of SQ items)], $F_{3\ Max}$ = [Total responses * (scale * NO. of SRQ items)], $F_{4\ Max}$ = [Total responses * (scale * NO. of IU items)], $F_{5\ Max}$ = [Total responses * (scale * NO. of US items)], $F_{6\ Max}$ = [Total responses * (scale * NO. of UR items)], $F_{7\ Max}$ = [Total responses * (scale * NO. of UN items)].

Therefore, $F_{1Max}$ = (180*42) = 7560, $F_{2Max}$ = (180*42) = 7560, $F_{3Max}$ = (180*42) = 7560, $F_{4Max}$ = (180*35) = 6300, $F_{5Max}$ = (180*35) = 6300, $F_{6Max}$ = (180*63) = 1140, $F_{7Max}$ = (180*35) = 6300.

The second scientific way in finding the maximum of the Coefficient Values in this equation , $C_1$, $C_2$, $C_3$, $C_4$, $C_5$, $C_6$ and $C_7$ are coefficients of the 2 dimensions (HISQ independent variables and HISQ dependent variables). $C_{1\ max}$ = $F_{1\ Max}$ / (Total responses * (scale * NO. of items)), $C_{2\ max}$ = $F_{2\ Max}$ / (Total responses * (scale * NO. of items)), $C_{3\ max}$ = $F_{3\ Max}$ / (Total responses * (scale * NO. of items)), $C_{4\ max}$ = $F_{4\ Max}$ / (Total responses * (scale * NO. of items)), $C_{5\ max}$ = $F_{5\ Max}$ / (Total responses * (scale * NO. of items)), $C_{6\ max}$ = $F_{6\ Max}$ / (Total responses * (scale * NO. of items)), $C_{7\ max}$ = $F_{7\ Max}$ / (Total responses * (scale * NO. of items)).

$C_{1\ max}$ = $F_{1\ Max}$ / (180 * 294), $C_{2\ max}$ = $F_{2\ Max}$ / (180 * 294), $C_{3\ max}$ = $F_{3\ Max}$ / (180 * 294), $C_{4\ max}$ = $F_{4\ Max}$ / (180 * 294), $C_{5\ max}$ = $F_{5\ Max}$ / (180 * 294), $C_{6\ max}$ = $F_{6\ Max}$ / (180 * 294), $C_{7\ max}$ = $F_{7\ Max}$ / (180 * 294).

The third step automates the multiplication creation by both such as the Factor multiplied by the coefficients ($F_{iMax}$*$C_{iMax}$) is as follows = $C_1F_1$ + $C_2F_2$ + $C_3F_3$ + $C_4F_4$ + $C_5F_5$ + $C_6F_6$ + $C_7F_7$. $M_{Maximum}$ = ($F_{1Max}$ * $C_{1Max}$) + ($F_{2Max}$ * $C_{2Max}$) + ($F_{3Max}$ * $C_{3Max}$) + ($F_{4Max}$ * $C_{4Max}$) + ($F_{5Max}$ * $C_{5Max}$) + ($F_{6Max}$ * $C_{6Max}$) + ($F_{7Max}$ * $C_{7Max}$).. $M_{Maximum}$ = (7560*0.1428571428571429) + (7560*0.1428571428571429) + (7560 *0.1428571428571429) + (6300*0.119047619047619) + (6300*0.119047619047619) + (11340*0.2142857142857143) + (6300*0.119047619047619) = **7920.** Thus, the user requirements elicitation success model (URESM) $_{Maximum}$ is equal to **7920.**

The importance rating of the equation maximum score is 7920 average 4526 and minimum 1131. M = 4673.922. Thus, by studying the rating between the average and maximum is what the user requirement elicitation success model in Sana'a, Yemen is designed for. By following these three points, the rating Maximum, Average and Minimum for the user requirement Elicitation Success Model is thus concluded.

i. If all the total responses (180) choose the highest scale (7) among all the questions of the survey (42) questions, the Maximum result would be 7920.

ii. If all the total responses (180) choose the Average scale (4) among all the questions of the survey (42) questions, the Average result would be 4526

iii. If all the total responses (180) choose the lowest scale (1) among all the questions of the survey (42) questions, the Minimum result would be 1131. Table 4.23 provides the study of the rating details.

Table 4.23 Rating of the Equation Details

| NO | Rating | Score |
|---|---|---|
| 1 | Maximum | 7920 |
| 2 | Average | 4526 |
| 3 | Minimum | 1131 |

## 4.9 FRAMEWORK VERIFICATION THROUGH BY THE EXPERTS

Following the validation of the statistical model with the help of SEM structure equation modeling, the newly-proposed framework was validated by IS experts to confirm that the framework was developed based on the aims of the study, and to ascertain that it has achieved its intended purpose. The validation process initially started with a description of the framework by the researcher. To accomplish this, the two dimension categories involved in the framework were used as shown in Figure 3.3. The dimension and factors which are related to each category of the framework were explained in detail. Accordingly, the framework was validated by three experts with extensive work experience in the academic and practical fields in information system.

The experts have an extensive range of experience when it comes to government IS. The experts were requested to validate the proposed framework in terms of its completeness, variable relationships, correlation and strength of the relationship in the study framework. They were also requested to provide an explanation for the framework adopted in HIS. The three experts have strong work experience in HIS. Shown in Appendix C is Table 4.24 followed by a discussion of the framework verification results by the experts.

Table 4.24 Verification Profile

| Expert | Name and Position | Specialist Areas | Years of Experience | Email |
|---|---|---|---|---|
| E1 | Dr: Ali Abdulbaqi Aaaoc. Prof. of Information Technology, Research methodology and data analysis in Lincoln University Malaysia. | Academic Expert in Information system, Research methodology and data analysis | 5 | abdulbaqi@lincoln.edu.com |
| E2 | Dr: Adnan Mukred, Director of IT office at Civilization University in Sana'a Yemen. | Information system and HIS expert | 5 | adnanmukred@cuy.edu.com |
| E3 | Dr :Abdulgabbar Mohammad Saif. Lecturer at Thamar University. | Expert in Software Technology and Management. Data mining & big data. | 6 | Agmss79@tu.edu.my |



## 4.10 SUMMARY

This chapter provides an extensive discussion on the data analysis techniques used in this study and the results obtained in analysing the proposed model. The factor analysis test shows that the only loaded items more than 0.4. The regression and correlation tests prove that eight variables are supported (Information quality; system quality, service quality, intention to use, user satisfaction, user requirements and user needs). The research hypothesis and the model are discussed and the results obtained from these investigations are presented. Finally, the two dimensions can be used for the success of HIS among the users in Yemen. The findings are presented and discussed in the following chapter.

# CHAPTER V

# CONCLUSION AND FUTURE WORKS

## 5.1 CONCLUSION

This final chapter presents the conclusion of the study. The first section summarises the main findings of the study, with regard to the investigated factors obtained in the present study. The following section describes the user requirement factors that influence the success of HIS. Next, the chapter highlights the most significant theoretical and practical implications of the research area. The chapter then concludes by discussing the model that examines the quality of HIS on HIS users in Sana'a, Yemen.

## 5.2 SUMMARY ON THE FINDINGS

The aim of this study is to investigate the influence of user requirements and user needs factors on the success of HIS in Yemen. To achieve this aim, the research objectives and questions were formulated and presented in Chapter I, while the research hypotheses were established and depicted in Chapter IV. Then, the formulated research questions were answered and the relationships among the investigated factors were investigated.

To achieve the first research objective (RO1) of this study, information on the effect of the health information system quality on the health information system users among the users of the health information system in Sana'a, Yemen and the information system perspective models and previous studies were explored in Chapter II

However, as far as the study is concerned, there has been no study which deals with the information on the effect of the health information system quality on the health information system users among the users of the health information system of the Dealon and Maclean's IS Success Model, Technology Acceptance Model Delone and McLean (2003), and user requirements and user needs -privacy factors as adopted from

the literature. Therefore, this study has proposed an IS model to examine the effect of the health information system quality on the health information system users among the users of the health information system in the private sector of Sana'a, Yemen. The IS model is proposed in Chapter III and presented in Figure 3.3. By proposing this model, the study claims that (RO1 and RO2) have been achieved.

The findings of such study can be considered as the basis of the future development of effective Health information system quality strategies. In other words, investigating the factors impacting users' HIS adoption will result in the project's success. A comprehensive study like the present, incorporating IS factors, users of HIS initiative adoption and users issues could be invaluable to the issues related to IS; with the IS factors impact on user requirements in HIS in sana'a Yemen.

Accordingly, the main determining factors of IS adoption were obtained through the intersection of HIS and the information system acceptance models literature. The result of this intersection has managed to identify a lot of factors that influence the employees' intention in adopting IS in HIS in the developing countries. These factors are classified into several categories according to the literature discussed in the previous chapters and the user requirements perspective on the success of HIS. The categories of HIS factors are, namely; information quality, system quality, service quality, intention to use, user satisfaction, user requirements and user needs. The individual factors such as the individual factors of quality and users which were mentioned in the previous chapters were also included in HISU.

The second objective of this study (RO2) is to propose a model which examines the quality of HIS on HIS users in Sana'a, Yemen. The study involved the interaction with the human subjects, whereby the questionnaire was employed to assess the relationship between the investigated factors. The questionnaires were distributed to 250 respondents who work in hospitals in the Sana'a Province of Yemen. The respondents represent various professions in the field of healthcare such as the physicians, nurses, professionals, pharmacists, laboratory technicians, radiologists and other types of employment. Based on the proposed model and by analysing the collected data obtained from seven hospitals, the HIS model was formulated.

The descriptive data analysis, the validity and reliability tests, factor analysis and correlational analysis were accomplished using the SPSS.VS.22.0 statistical package version 22. The model was tested, validated and refined by applying the SEM technique. Then, the model was constructed based on the results of the path analysis. As a result, the model reveals the relationship among the investigated factors.

By applying the SPSS.VS.22.0, the descriptive analysis was conducted in order to obtain a summary of the respondents' personal and professional data using the mean, standard error and standard deviation, together with the descriptive analysis and the reliability and validity tests which were also performed on the data. Subsequently, to test and confirm the model of the current study, the SEM method was used with the AMOS version 22, which involved the confirmatory factor analysis and structural model analysis.

With regard to model development, the model has proposed a framework for user requirement factors that influence the success of HIS by eliminating items that could not measure the construct accurately. These items either have a low regression weight or with cross-loading, which were therefore eliminated from the model. The second step takes into consideration the fitness of the overall model as presented in Chapter IV. By following the steps mentioned above, including the refinement, Table 4.19 shows that the model has satisfied the goodness-of-fit criteria. Moreover, the findings of the quantitative analysis are mostly in line with the objective. Accordingly, the second research objective (RO2) is achieved.



### 5.2.1 Summary of the Findings of the Investigated Factors

The first objective of this study (RO1) is to examine the effect of HIS quality on HIS users in Sana'a, Yemen. Based on the findings obtained from the factor analysis, most of these factors have direct and positive effect on the users' intention to adopt the HIS.

This study has also investigated the effect on user requirements. Other factors such as user need, user satisfaction and intention to use are found have been an indirect effect on the intention to use through the HIS. In addition, the quantitative findings are presented in seven themes namely; information quality, system quality, service quality,

user requirements, user needs, intention to use and finally user satisfaction. These findings are often in line with the quantitative findings of the study.

## 5.3 CONTRIBUTIONS

This study attempts to bridge the gap in the previous researches through its empirical investigation of IS factors that impact the users, as well as the user requirements in adopting the HIS within the context of the Sana'a Province in Yemen as one of the developing countries. In spite of its global importance, there is little knowledge regarding the factors that impact the employees' user requirements, which therefore forms a barrier in obtaining the required benefits offered by these systems.

This study demonstrates that the HIS model can be beneficial in explaining and understanding the successful tendencies of users in the HIS sector, before and during the implementation of HIS.

The findings of such research can be regarded as fundamental for future strategies in developing the success of HIS in Yemen that are characterised by poor user requirements. This means that a plan for successful investment in this area can be gained by investigating these factors that impact the employees of HIS. In addition, there are a number of studies that have investigated the user requirement factors through the success of HIS models in the developing countries such as Yemen.

Thus, this study attempts to cultivate the information on user requirements among the managers and users of HIS by proposing a model that investigates the impact of these factors in HIS. This model is presented, tested, refined and validated in Chapter IV, section 4.7 and 4.8. The correlation among the investigated factors can be another important contribution offered by this study. Based on the literature review, this study is one of the genuine empirical studies that links the information system to the successful process of HIS in the developing countries including Yemen.

This study intends to be a valuable source for further conceptual research on the role of HISU factors in the success of HIS. Besides that, its general contribution is by identifying, conceptualizing and implementing the emerged key user requirement factors that predict the success of HIS. The results can be replicated in further

investigation of the success of HIS in a different context. It provides further understanding of the user requirements and user needs of the Yemeni employers in HIS towards IS adoption. Finally, the findings of this study have confirmed that the factors of user requirements and user needs in the success of HIS are an essential contribution in promoting HIS in Yemen.

## 5.4 IMPLICATIONS

The results of this study have implications for researches aimed at developing or promoting the success of HIS in Yemen. These implications are discussed in further detail in the following sub-sections:

### 5.4.1 Implications for the Development of HIS in Yemen

Although the strengthening of IS in HIS is crucial for health development at the community level, it has been recognised that the success of HIS in Yemen as one of the developing counties is still in its infancy stage and has not been studied widely. As stated by Al-Ghaithi (2009), a robust HIS is vital in the successful implementation of HIS program plan. This study takes into consideration the influence of the user requirement factors, and it is among several studies if not the first study that deals with the success of HIS at hospitals in the Sana'a Province of Yemen.

To understand the problem requires for the identification of the factors that determine the employees' acceptance or rejection of HIS. Moreover, to achieve maximum efficiency in HIS deals with the function of technological capabilities, and the extent to which an individual adopts and uses IS which should be less difficult than before. Thus, the results of this study could be beneficial to the policy makers of HIS in Yemen so that implementing HIS among the users will be less difficult than before. The results also reveal that HIS users demonstrate high receptiveness to the success of HIS.

Therefore, the successful tendencies of the users can lead to the faster deployment of HIS implementation, which in turn, leads to the improved healthcare service. The senior managers of HIS should make a comprehensive strategy for improving their users' ability to use the technology, especially HIS. However, for any future implementation, the senior managers should take into consideration both the

theoretical and practical training programs to clearly identify the benefits offered by such system and to facilitate system difficulties. Apart from that, other aspects that need to be considered include the increase in organisational awareness among the users, the facilitation of access to information resources, increased level of information sharing in an appropriate manner and the identification of users who can strongly influence other users. The failure to consider such concerns in the implementation of IS may lead to further reluctance to change among its users .

This research has significant implications for the managers and users of HIS. The managers need to consider the factors that could promote the use of HIS in Sana'a, Yemen. The understanding of the influence of these factors on the success can help in developing and accelerating the implementation process of HIS in the country.

### 5.4.2 Theoretical Implications

The user requirement model provides better understanding of the success of HIS. The validity of the model was confirmed in the context of HIS in Yemen. Moreover, in this study, the validity and reliability of the core constructs have been demonstrated adequately. For this, SEM was used to test and validate the model. The understanding of the relationship between the factors and the users' of HIS success in using the information system is also provided by the model. The predictors of the user requirements are the HIS factors. Furthermore, the attitude was predicted using user needs and user requirements. It is proven that the combined model of this study explains 73% of the variance of success.

### 5.4.3 Practical Implications

The current study has a number of significant practical implications for the decision makers of HIS before and during the implementation of HIS. The results of this study are expected to help the decision makers in structuring their priorities in the success of HIS according to the degree of importance of the investigated factors in increasing the success of HIS.

In terms of system implementation, it is necessary to increase the success level among the user requirements of HIS. Therefore, the study on HIS provides significant

benefits for the users of HIS. Such benefits are represented by increasing the success rate and promoting the users in using HIS. The implication in using the HIS success model based on the user requirement factors is that it will promote for the implementation of HIS in the private sectors or in other developing countries with the same conditions.

This study, like other studies, has some constraints and implications related to the interpretation of the results. The present research was designed based on the extensive literature and the sample size is within the reasonable limit taken from seven hospitals in Sana'a, Yemen. Although the perceived results were obtained, there are still some constraints and implications in the current study.

First, whereas the previous researches focus on the technology, the organisational or the individual streams in the success of HIS, this research on the other hand focuses on the users' role in the success of HIS. Although all the streams are usually dealt with separately, they are infact interrelated. Thus, the successful implementation of HIS requires for all the streams to be combined which therefore calls for more investigation. Secondly, the main constraint of this research is its focus on some important factors of user requirement. Therefore, more factors should be taken into consideration in the investigation. For instance, this study has identified the user requirement item factors in groups, hence the user requirement factors can be individually identified in future researches. Thirdly, the findings obtained in this research were collected from just one type of HIS-named hospitals in one province in Sana'a, Yemen. As a result, the findings may not have covered all types and levels of HIS. Finally, the instruments for collecting the data were limited to the survey distributed to the respondents, conducted among specific managers who are information-rich. Other quantitative methods such as documentation that may enrich the data has not been used in this study since the investigated area is complex and wide.

In Yemen, more researches on the healthcare users at different levels such as the health units, health centers, dispensaries, health offices in the province and top health authority should offer a clear picture of HIS of each province. By obtaining a clear picture of each province may even lead to the accurate capturing of the success of HIS at the national level. This study can become a basis for future researches in several

sectors of the country in investigating the barriers and enablers of the success of HIS in this population.

## 5.5 SUGGESTIONS FOR FUTURE WORK

This study has identified the following constraints, which can lead to valuable recommendations for future research:

1. First, there is a need to investigate other factors that influence user requirements and the selection of the techniques during requirement elicitation, which have not been discovered during this study. To do this, other methods could be used in future studies such as observation and case study.

2. Second, with regard to the empirical evidence to allow for the conceptual framework, more experiments in different domains such as the education, ministry and telecommunication may be conducted. In this way, the framework could be further refined.

3. Third, the prototype for user requirements and technique selection for the requirements could be further improved using the fuzzy logic approach such as in an expert system.

4. Fourth, the sample of the study was taken from HIS employees. However, future research can explore the influence of the investigated factors among the employees of the private sector since both public and private sectors provide healthcare services.

5. Finally, based on the findings of the quantitative analysis, external environmental factors such as the patients' user requirements and internal environmental factors such as the users' commitment towards information as well as the motivation from the top management are among the main barriers that influence the successful process in the healthcare context. Therefore, it can be suggested for further studies to include such factors surrounding the user requirements and user needs.

## 5.6 SUMMARY

This chapter summarises the work conducted in this thesis, namely the research background, objectives, contributions, implications, and the recommended future work in the field. It also highlights the attainment of the specific research objectives at the completion of the study. In other words, this chapter discusses the overall process and outcome of the current study. Finally, the influence of the user requirement factors has been extensively studied in this study; the outcome supports the importance of the user requirement factors in the success of HIS.

**REFERENCES**


Aanestad, M., G. Macueve, E. Macombe, E. Monteir, F. Mukama, H. C. Kimaro, J. L. Nhampossa, J. Lungo & H. Muquingue 2005. Strategies for development and integration of health information systems: coping with historicity and heterogeneity.

Abdullah, Z. S. 2013. Hospital information systems implementation framework: critical success factors for Malaysian public hospitals. *Curtin University* 19-363

AbouZahr, C. & T. Boerma 2005. Health information systems: the foundations of public health. *Bulletin of the World Health Organization* **83**(8): 578-583.

Abu-Shanab, E. & A. Al-Saggar 2013. Reasons behind it project failure: the case of Jordan. *Busi*3)188-190.

Acharyulu, G. 2012. *ness Strategies and Approaches for Effective Engineering Management* ( Assessment of Hospital Information System Quality in Multi Specialty Hospitals. *International Journal of Innovation Management and Technology* **3**(4): 349-352.

Adler-Milstein, J. & D. W. Bates 2010. Paperless healthcare: Progress and challenges of an IT-enabled healthcare system. *Business Horizons* 53(2): 119-130.

Agarwal, R., G. Gao, C. DesRoches & A. Jha 2011. The role of information systems in healthcare: Current research and road ahead. *Information Systems Research* **22**: 419-428.

Ahlan, A. R. & B. I. e. Ahmad 2014. User Acceptance of Health Information Technology (HIT) in Developing Countries: A Conceptual Model. *Procedia Technology* 16: 1287-1296.

Ahmad, M., N. Belloir & J.-M. Bruel 2015. Modeling and Verification of Functional and Non-Functional Requirements of Ambient Self-Adaptive Systems. *Journal of Systems and Software* 107: 50-70.

Ahmad, M., A. U. Rajapaksha, J. E. Lim, M. Zhang, N. Bolan, D. Mohan, M. Vithanage, S. S. Lee & Y. S. Ok 2014. Biochar as a sorbent for contaminant management in soil and water: a review. *Chemosphere* 99: 19-33.

Ahmadi, H., M. S. Rad, M. Nazari, M. Nilashi & O. Ibrahim 2014. Evaluating the factors affecting the implementation of hospital information system (HIS) using AHP method. *Life Science Journal* 11(3): 202-207.

Ahmadi, M., A. Ghaderi, F. Khorrami & S. Zare 2012. Needs assessment of the information management systems at medical universities based on critical success factors and business system planning.

Ajami, S. & Z. Mohammadi-Bertiani 2013. Training and its impact on hospital information system (HIS) success. *Journal of Information Technology & Software Engin* 2012 2(4): 2-7.

Akbulut-Bailey, A. Y. 2011. Information sharing between local and state governments. *Journal of Computer Information Systems* 51(4): 53-63.

Al-Azmi, S. F., N. Al-Enezi & R. I. Chowdhury 2009. Professional practice and innovation: users' attitudes to an electronic medical record system and its correlates: a multivariate analysis. *Health Information Management Journal* 38(2): 33-40.

Al-Fadhli, A. A., M. Othman, A. Rashed & A. Ramasamy 2015. Telehealth in Yemen: An Overview and a Proposed Model. *Proceedings of the 5th International Conference on Computing and Informatics,(ICOCI 2015, Istanbul, Turkey).* pp. 121-126.

Al-Ghaithi, A. J., Al-Gohaly, F., Sheikh, R., Taha, A. F., Alkumaim, G., Talab,A. A. & Alwageeh, A. S 2009. Republic of Yemen and Health Metrics Network. Health Information system Assessment Report. . *The Ministry of Public Health and Population, Sana'a Yemen*: 45.

Al-Mudimigh, A. S. 2010. Health Information System Implementation: The Role Of Business Process Management On Successful Implementation. *Global Journal of Computer Science and Technology* 10(13): 73-79.

Al-Omari, A. I., K. Jaber & A. Al-Omari 2008. Modified ratio-type estimators of the mean using extreme ranked set sampling. *Journal of Mathematics and Statistics* 4(3): 150.

Al-Wazir, A. A. & Z. Zheng 2012. E-government development in Yemen: assessment and solutions. *Journal of Emerging Trends in Computing and Information Sciences* 3(4): 512-518.

Al Serouri, A., J. Øvretveit, A. A. Al-Mudhwahi & M. Y. Al-Gonaid. 2011. Strengthening Health Systems in Yemen: Review of Evidence and Implications for Effective Actions for the Poor. Dlm. (pnyt.). Ed. *Health Management-Different Approaches and Solutions* pp.268-299.

Alam, S. S. & M. K. M. Noor 2009. ICT adoption in small and medium enterprises: An empirical evidence of service sectors in Malaysia. *International Journal of Business and management* 4(2): 112.

Almunawar, M. N. & M. Anshari 2012. Health Information Systems (HIS): Concept and Technology. *arXiv preprint arXiv:1203.3923*.

Alreck, P.L.S.,R.B.,Ed. 1985. The survey research handbook.lllinois,irwin.

Ameen, A. B. & K. Ahmad 2013. A Conceptual Framework Of Financial Information Systems To Reduce Corruption. *Journal of Theoretical & Applied Information Technology* 54(1): 54-72.

Amin, I., S. Hussein, W. Rahim & W. Isa 2011. Assessing User Satisfaction of Using Hospital Information System (HIS) in Malaysia Essay. *International Conference on Social Science and Humanity IPEDR*.1(5) 210-213.

Amin, I. M., S. S. Hussein & W. A. R. W. M. Isa 2011. Assessing user satisfaction of using hospital information system (HIS) in Malaysia. *People* 5 12: 13.

Anderson, J. G. 1997. Clearing the way for physicians' use of clinical information systems. *Communications of the ACM* 40(8): 83-90.

Annamalai, C. & T. Ramayah 2012. Does an implementation stage act as a moderator in enterprise resource planning (ERP) projects in India? An empirical study. *Asian Journal of Research in Banking and Finance* 2(2): 200-227.

Anwar, F., A. Shamim & S. Khan 2011. Barriers in adoption of health information technology in developing societies. *Int J Adv Comput Sci Appl* 2(8): 40-5.

ArabChadegani, R. 2013. Increasing quality of hospital procedures by using Hospital Information System (HIS). *Advances in Environmental Biology*: 1466-1473.

Babbie, E. R. 2015. The practice of social research Ed.: Nelson Education.

Bagayoko, C.-O., J.-C. Dufour, S. Chaacho, O. Bouhaddou & M. Fieschi 2010. Open source challenges for hospital information system (HIS) in developing countries: a pilot project in Mali. *BMC medical informatics and decision making* 10(1): 22.

Bäurle, F. 2011. A user interface for semantic full text search. *Masterarbeit, Albert-Ludwigs-Universität Freiburg, Lehrstuhl für Algorithmen und Datenstrukturen 3-48*.

Bender, R. 2009. Requirements Based Testing Process Overview. New York: Queensbury 3-13.

Bergey, J., S. Dietrich, D. Firesmith, E. Forrester, A. Jordan, R. Kazman, G. Lewis, H. Lipson, N. Mead & E. Morris. 2004. Results of SEI Independent Research and Development Projects and Report on Emerging Technologies and Technology Trends. Laporan 1-107.

Bharati, P. & A. Chaudhury 2004. An empirical investigation of decision-making satisfaction in web-based decision support systems. *Decision support systems* 37(2): 187-197.

Bilbao-Osorio, B., S. Dutta & B. Lanvin 2013. The global information technology report 2013. *World Economic Forum*. pp. 1-383.

Bo, C., M. Xiang-Wu & C. Jun-Liang 2007. An adaptive user requirements elicitation framework. *Computer Software and Applications Conference, 2007. COMPSAC 2007. 31st Annual International*. 2 pp. 501-502.

Boonstra, A. & M. Broekhuis 2010. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC health services research* 10(1): 1.

Browne, G. J. & M. B. Rogich 2001. An empirical investigation of user requirements elicitation: Comparing the effectiveness of prompting techniques. *Journal of Management Information Systems* 17(4): 223-249.

Browne, M. W. & R. Cudeck 1993. Alternative ways of assessing model fit. *Sage focus editions* 154: 136-136.

Brownsell, S., S. Blackburn & M. Hawley 2012. User requirements for an ICT-based system to provide care, support and information access for older people in the community. *Journal of Assistive Technologies* 6(1): 5-23.

Bryman, A., Becker, S. & Ferguson, H 2012. Understanding research for social policy and social work: themes, methods and approaches Eds 6(1): 97-13.

Bundschuh, B. B., R. W. Majeed, T. Bürkle, K. Kuhn, U. Sax, C. Seggewies, C. Vosseler & R. Röhrig 2011. Quality of human-computer interaction-results of a national usability survey of hospital-IT in Germany. *BMC medical informatics and decision making* 11(69): 2-12.

Busi, F., M.-L. Barry & A. Chan 2011. Critical success factors for instrumentation and control engineering projects in the South African petrochemical industry. *2011 Proceedings of PICMET'11: Technology Management in the Energy Smart World (PICMET)*. pp. 1-8.

Byrne, B. M. 2010. Structural equation modeling with AMOS: Basic concepts, applications, and programming Ed.2nd, New York/London: Routledge. pp. 815-824.

Carestream health 2015. Functional Requirements for Enterprise ClinicalData Management: Solving Technical Problems, Satisfying User Needs pp.1-9.

Carroll, C., A. Booth, D. Papaioannou & A. Sutton. 2011. Experiences of e-learning and its delivery among learners who work: A systematic review. Dlm. (pnyt.). Ed. *Supporting workplace learning* pp. 47-67. Springer.

Cecez-Kecmanovic, D., R. D. Galliers, O. Henfridsson, S. Newell & R. Vidgen 2014. The sociomateriality of information systems: current status, future directions. *Mis Quarterly* 38(3): 809-830.

Chau, P. Y., P. J.-H. Hu, B. L. Lee & A. K. Au 2007. Examining customers' trust in online vendors and their dropout decisions: an empirical study. *Electronic Commerce Research and Applications* 6(2): 171-182.

Chen, M. 2003. Factors affecting the adoption and diffusion of XML and Web services standards for E-business systems. *International Journal of Human-Computer Studies* 58(3): 259-279.

Cheng, B. H. & J. M. Atlee 2007. Research directions in requirements engineering. *2007 Future of Software Engineering*. pp. 285-303.

Chua, D. K., T. Nguyen & K. Yeoh 2013. Automated construction sequencing and scheduling from functional requirements. *Automation in Construction* 35: 79-88.

Clayton, P. D., S. P. Narus, W. A. Bowes III, T. S. Madsen, A. B. Wilcox, G. Orsmond, B. Rocha, S. N. Thornton, S. Jones & C. A. Jacobsen 2005. Physician use of electronic medical records: issues and successes with direct data entry and physician productivity. *AMIA annual symposium proceedings*. **2005** pp. 141.

Clemensen, J., A. Denning, M. A. Craggs & J. Rasmussen 2011. Patient Empowerment and New Citizen Roles through Telehealth Technologies-The Early Stage. *Etelemed 2011*.pp.119

Cline, G. B. & J. M. Luiz 2013. Information technology systems in public sector health facilities in developing countries: the case of South Africa. *BMC medical informatics and decision making* **13**(1): 13.

Cline, G. B. & J. M. Luiz 2013. Information technology systems in public sector health facilities in developing countries: the case of South Africa. *BMC medical informatics and decision making* 13(1): 1.

Coughlan, J., M. Lycett & R. D. Macredie 2003. Communication issues in requirements elicitation: a content analysis of stakeholder experiences. *Information and Software Technology* 45(8): 525-537.

Creeswell, J. 2012. Planning, Conducting, and Evaluating Quantitative and Qualitative Research. *America:*.

Creswell, J. W. 2013. Research design: Qualitative, quantitative, and mixed methods approaches Ed.: Sage publications.

Creswell, J. W., A. C. Klassen, V. L. Plano Clark & K. C. Smith 2011. Best practices for mixed methods research in the health sciences. *Bethesda, MD: National Institutes of Health* 10.

Darlington, M. & S. Culley 2002. Current research in the engineering design requirement. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture* 216(3): 375-388.

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*: 319-340.

DeLone, W. H. & E. R. McLean 1992. Information systems success: The quest for the dependent variable. *Information systems research* 3(1): 60-95.

Delone, W. H. & E. R. McLean 2003. The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems* 19(4): 9-30.

Delone, W. H. & E. R. Mclean 2004. Measuring e-commerce success: Applying the DeLone & McLean information systems success model. *International Journal of Electronic Commerce* 9(1): 31-47.

Devaraj, S. & R. Kohli 2000. Information technology payoff in the health-care industry: a longitudinal study. *Journal of Management Information Systems* 16(4): 41-67.

Dezdar, S. & S. Ainin 2011. Critical success factors for ERP implementation: insights from a Middle-Eastern country. *Middle-East Journal of Scientific Research* 10(6): 798-808.

Drury, P. 2005. The eHealth agenda for developing countries. *World Hospitals and Health Services* 41(4): 38.

Elpez, I. & D. Fink 2006. Information systems success in the public sector: Stakeholders' perspectives and emerging alignment model. *Issues in Informing Science and Information Technology* 3(2): 219-231.

England, I., D. Stewart & S. Walker 2000. Information technology adoption in health care: when organisations and technology collide. *Australian Health Review* 23(3): 176-185.

Eppler, M. J. & D. Wittig 2000. Conceptualizing Information Quality: A Review of Information Quality Frameworks from the Last Ten Years. *IQ*. pp. 83-96.

Estrin, D. & I. Sim 2010. Open mHealth architecture: an engine for health care innovation. *Science* 330(6005): 759-760.

Fadhil, N. F. M., M. Jusop & A. A. Abdullah 2012. Hospital Information System (His) Implementation In A Public Hospital: A Case Study From Malaysia. *Far East Journal of Psychology and Business* 8(1): 1-11.

Farzandipour, M. & Z. Meidani 2011. Hospital information systems vendors meet user needs. *Health Information Management Journal* 8(4): 553.

Farzandipour, M., F. Sadoughi & Z. Meidani 2011. Hospital information systems user needs analysis: A vendor survey. *Journal of Health Informatics in Developing Countries* 5(1).

Finstad, K. 2010. Response interpolation and scale sensitivity: Evidence against 5-point scales. *Journal of Usability Studies* 5(3): 104-110.

Gable, G. G. 1994. Integrating case study and survey research methods: an example in information systems. *European journal of information systems* 3(2): 112-126.

Ganesh, A. & A. Al-Mujaini 2009. Electronic Medical Record System: Have we Bitten off More Than we Can Chew? *Oman medical journal* 24(1): 1.

Garmus, D. & D. Herron. 2001. Function point analysis: measurement practices for successful software projects Ed.: Addison-Wesley Longman Publishing Co., Inc.

Garner, P., R. Kale, R. Dickson, T. Dans & R. Salinas 1998. Implementing research findings in developing countries. *British Medical Journal* 317(7157): 531.

Gen-Liang, Z. 2012. Consumer acceptance of Internet as a channel of distribution. *Journal of Business and Management Research* **1**: 20-27.

Gladwin, J., R. Dixon & T. Wilson 2003. Implementing a new health management information system in Uganda. *Health Policy and Planning* 18(2): 214-224.

Goel, S., R. Kiran & D. Garg 2011. A framework for efficient enterprise resource planning (ERP) implementation in technical educational institutions. *African Journal of Business Management* 5(34): 13197.

Gorla, N. & T. M. Somers 2014. The impact of IT outsourcing on information systems success. *Information & Management* 51(3): 320-335.

Gorla, N., T. M. Somers & B. Wong 2010. Organizational impact of system quality, information quality, and service quality. *The Journal of Strategic Information Systems* 19(3): 207-228.

Gottesdiener, E. 2008. Good practices for developing user requirements. *Crosstalk, March*.pp.17.

Grossmann, W. Alexander Goolsby, LeighAnne Olsen & a. J. M. McGinnis 2011. Engineering a learning healthcare system. look at the future: Workshop summary. Washington, DC: The National Academies Press.pp.341.

Grover, L. K. 1996. A fast quantum mechanical algorithm for database search. *Proceedings of the twenty-eighth annual ACM symposium on Theory of computing*. pp. 212-219.

Guerrero-García, J. 2014. Evolutionary design of user interfaces for workflow information systems. *Science of Computer Programming* 86: 89-102.

Gupta, B., S. Dasgupta & A. Gupta 2008. Adoption of ICT in a government organization in a developing country: An empirical study. *The Journal of Strategic Information Systems* 17(2): 140-154.

Hair, J., Black, W., C. & Babin & R. B. & Anderson 2010. Multivariate data analysis. a global Perspective Ed: 7th London: Pearson

Hair, J. F., W. C. Black, B. J. Babin & R. E. Anderson 2010. Canonical correlation: A supplement to multivariate data analysis. *Multivariate data analysis: a global perspective. 7th edn. Pearson Prentice Hall Publishing, Upper Saddle River*.

Hasan, F. S. 2015. A Systematic Stakeholders And Techniques Selection Framework For Software Requirements ElicitationSystem. PhD, Thesis.pp.246.

Havelka, D. 2003. A user-oriented model of factors that affect information requirements determination process quality. *Information Resources Management Journal* 16(4): 15.

Hayajneh, S. & A. A. Zaghloul 2012. Barriers to the adoption of health information technology in Arab countries' hospitals: practitioners' perspective. *24th International Conference of the European Federation for Medical Informatics Quality of Life through Quality of Information–MIE2012*.

Hayajneh, Y. A., W. A. Hayajneh, I. I. Matalka, H. Z. Jaradat, Z. Q. Bashabsheh & M. S. Alyahya 2006. Extent of Use, Perceptions, and Knowledge of a Hospital Information System by Staff Physicians. *evaluation* 3: 4.

Heo, J. & I. Han 2003. Performance measure of information systems (IS) in evolving computing environments: an empirical investigation. *Information & Management* 40(4): 243-256.

Hickey, A. M. & A. M. Davis 2004. A unified model of requirements elicitation. *Journal of Management Information Systems* 20(4): 65-84.

Hinton, P., C. Brownlow & McMurrayF 2004. SPSS expliained Ed.: Routledge.

Holden, R. J. & B.-T. Karsh 2010. The technology acceptance model: its past and its future in health care. *Journal of biomedical informatics* 43(1): 159-172.

Holtz, B. E. 2010. An examination of the adoption of electronic medical records by rural hospital nurses through the unified theory of acceptance and use of technology lens Ed.: Michigan State University.pp. 24.

Hsu, W.-S. & J.-I. Pan 2013. The secure authorization model for healthcare information system. *Journal of medical systems* 37(5): 1-5.

Hung, C.-J., H. H. Chang, C. J. Eng & K. H. Wong 2013. Service quality and perceived value of technology-based service encounters: evaluation of clinical staff satisfaction in Taiwan. *Health Information Management Journal* 42(1): 29-36.

IEEE 1990. Ieee standard glossary of software engineering terminology.

Isabalija, S. R., K. G. Mayoka, A. S. Rwashana & V. W. Mbarika 2011. Factors affecting adoption, implementation and sustainability of telemedicine information systems in Uganda. *Journal of Health Informatics in Developing Countries* 5(2): 16-24.

Ismail, A., A. T. Jamil, A. Fareed, A. Rahman, J. Madihah, A. Bakar, N. M. Saad & H. Saadi 2012. The implementation of Hospital Information System (HIS) in tertiary hospitals in malaysia: a qualitative study. *Malaysia Journal Of Public Health Medicine* 10(2): 16-24.

Ismail, A., A. T. Jamil, A. F. A. Rahman, J. M. A. Bakar, N. M. Saad & H. Saadi 2010. The implementation of Hospital Information System (HIS) in tertiary hospitals in malaysia: a qualitative study. *Malaysian Journal of Public Health Medicine* 10(2): 16-24.

Ismail, N. 2004. AIS alignment and firm performance in SMEs. *Unpublished PhD thesis, Loughborough University, UK*.pp . 434.

Ismail, N. I., N. H. Abdullah, A. Shamsudin & N. A. N. Ariffin 2013. Implementation differences of Hospital Information System (HIS) in Malaysian public hospitals. *International Journal of Social Science and Humanity* 3(2): 115.

Jamieson, S. 2004. Likert scales: how to (ab) use them. *Medical education* 38(12): 1217-1218.

Jansen, K. J., K. G. Corley & B. J. Jansen 2007. E-survey methodology. *Handbook of research on electronic surveys and measurements*: 1-8.

Jayasuriya, R. 1999. Managing information systems for health services in a developing country: a case study using a contextualist framework. *International Journal of Information Management* 19(5): 335-349.

Jebraeily, M., Z. Piri, B. Rahimi, N. Ghasemzade, M. Ghasemirad & A. Mahmodi 2012. Barriers of electronic health records implementation. *Director General* 8(6).

Jennex, M., L. Olfman, P. Panthawi & Y.-T. Park 1998. An organizational memory information systems success model: an extension of DeLone and McLean's I/S success model. *System Sciences, 1998., Proceedings of the Thirty-First Hawaii International Conference on*. 1 pp. 157-165.

Jeppsson, A. & S. A. Okuonzi 2000. Vertical or holistic decentralization of the health sector? Experiences from Zambia and Uganda. *The International journal of health planning and management* 15(4): 273-289.

Johansson, S., T. Bieber, R. Dahl, P. S. Friedmann, B. Q. Lanier, R. F. Lockey, C. Motala, J. A. O. Martell, T. A. Platts-Mills & J. Ring 2004. Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization, October 2003. *Journal of allergy and clinical immunology* **1**13(5): 832-836.