A THEORETICAL FRAMEWORK FOR THE ADOPTION OF CLOUD COMPUTING IN HOSPITAL INFORMATION SYSTEMS

SHADY GOMAA ABDULAZIZ

FACULTY OF COMPUTER SCIENCE AND
INFORMATION TECHNOLOGY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2021

A THEORETICAL FRAMEWORK FOR THE ADOPTION OF CLOUD COMPUTING IN HOSPITAL INFORMATION SYSTEMS

SHADY GOMAA ABDULAZIZ

THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

FACULTY OF COMPUTER SCIENCE AND
INFORMATION TECHNOLOGY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2021

UNIVERSITY OF MALAYA

ORIGINAL LITERARY WORK DECLARATION

Name of Candidate: Shady Gomaa Abdulaziz [redacted]

Matric No: WHA110030

Name of Degree: Doctor of Philosophy

Title of Thesis: A Theoretical Framework for the Adoption of Cloud Computing in Hospital Information Systems.

Field of Study: Computer Science

I do solemnly and sincerely declare that:

(1) I am the sole author/writer of this Work;
(2) This Work is original;
(3) Any use of any work in which copyright exists was done by way of fair dealing and for permitted purposes, and any excerpt or extract from, or reference to or reproduction of any copyright work has been disclosed expressly and sufficiently and the title of the Work and its authorship have been acknowledged in this Work;
(4) I do not have any actual knowledge nor do I ought reasonably to know that the making of this work constitutes an infringement of any copyright work;
(5) I hereby assign all and every right in the copyright to this Work to the University of Malaya ("UM"), who henceforth shall be owner of the copyright in this Work and that any reproduction or use in any form or by any means whatsoever is prohibited without the written consent of UM having been first had and obtained;
(6) I am fully aware that if in the course of making this work, I have infringed any copyright whether intentionally or otherwise, I may be subject to legal action or any other action as may be determined by UM.

Candidate's Signature [redacted] Date: 27 January 2021

Subscribed and solemnly declared before,

Witness's Signature [redacted] Date: 24 February 2021

Name: [redacted]

Designation: [redacted]

UNIVERSITI MALAYA

PERAKUAN KEASLIAN PENULISAN

Nama: Shady Gomaa Abdulaziz [redacted]

No. Matrik: WHA110030

Nama Ijazah: Doktor Falsafah

Tajuk Tesis: Kerangka Teori untuk Penerapan Pengkomputeran Awan dalam Sistem Maklumat Hospital.

Bidang Penyelidikan: Sains Komputer

Saya dengan sesungguhnya dan sebenarnya mengaku bahawa:

(1) Saya adalah satu-satunya pengarang/penulis Hasil Kerja ini;
(2) Hasil Kerja ini adalah asli;
(3) Apa-apa penggunaan mana-mana hasil kerja yang mengandungi hakcipta telah dilakukan secara urusan yang wajar dan bagi maksud yang dibenarkan dan apa-apa petikan, ekstrak, rujukan atau pengeluaran semula daripada atau kepada mana-mana hasil kerja yang mengandungi hakcipta telah dinyatakan dengan sejelasnya dan secukupnya dan satu pengiktirafan tajuk hasil kerja tersebut dan pengarang/penulisnya telah dilakukan di dalam Hasil Kerja ini;
(4) Saya tidak mempunyai apa-apa pengetahuan sebenar atau patut semunasabahnya tahu bahawa penghasilan Hasil Kerja ini melanggar suatu hakcipta hasil kerja yang lain;
(5) Saya dengan ini menyerahkan kesemua dan tiap-tiap hak yang terkandung di dalam hakcipta Hasil Kerja ini kepada Universiti Malaya ("UM") yang seterusnya mula dari sekarang adalah tuan punya kepada hakcipta di dalam Hasil Kerja ini dan apa-apa pengeluaran semula atau penggunaan dalam apa jua bentuk atau dengan apa juga cara sekalipun adalah dilarang tanpa terlebih dahulu mendapat kebenaran bertulis dari UM;
(6) Saya sedar sepenuhnya sekiranya dalam masa penghasilan Hasil Kerja ini saya telah melanggar suatu hakcipta hasil kerja yang lain sama ada dengan niat atau sebaliknya, saya boleh dikenakan tindakan undang-undang atau apa-apa tindakan lain sebagaimana yang diputuskan oleh UM.

Tandatangan Calon Tarikh: 27 Januari 2021

[redacted]

Diperbuat dan sesungguhnya diakui di hadapan,

Tandatangan Saksi [redacted] Tarikh: 24 Februari 2021

Nama: [redacted]

Jawatan:

A THEORETICAL FRAMEWORK FOR THE ADOPTION OF CLOUD COMPUTING IN HOSPITAL INFORMATION SYSTEMS

ABSTRACT

Cloud Computing (CC) is becoming a favourable trend in managing digital data. However, there is a low CC adoption rate in Health-Care Institutions (HCIs) than in other industries due to many reasons like awareness, staff, and costs. This research aims to: (1) investigate the CC adoption in the Saudi Health-Care Institutions (SHCIs), (2) determine the factors that influence the CC adoption in selected SHCIs, (3) develop a theoretical framework for the deployment of CC adoption in selected HCIs based on factors determined earlier, and (4) validate a research framework for the adoption of CC in SHCIs. The purpose of this study is to determine the factors influencing CC adoption in SHCIs. The constructs used to develop a theoretical framework for deployment CC in SHCIs. Data were collected by a purposive sample of (230) health-care staff for three public hospitals in the Kingdom of Saudi Arabia (KSA) as a case study. Two hundred (200) research participants contributed extensively in answering the questionnaire and participated in assessing the improvised method; also, the researcher observations were employed. The data analysis was performed based on the Statistical Package for the Social Sciences (SPSS) to interpret the statistics for data analyses and regression. Besides, the structured equation modelling technique (SEM) using the partial least squares (Plsek & Greenhalgh, 2001) path modelling method was used to assess correlations between the developed framework themes of CC adoption in SHCIs as the independent variable with the intention to adopt CC as the dependent variable. Moreover, a thematic approach to the analysis was applied to allow the researcher to report the study observation findings. The findings of this study indicated that Compatibility, Complexity, IT Infrastructure Readiness, Relative Advantage, Sharing & Collaboration, Security and Privacy, Technology Readiness, Trust, Government Support, Regulatory Concerns, External

Support, Mobile Access, Soft Financial, Perceived Ease of Use are the significant factors affect CC adoption in SHCIs. Finally, this research's findings based on observational data indicated limited use of the intent of technology adoption HIS based-on CC. Factors that serve as barriers to implementing and accepting technology include the staff's capacity and expertise, management issues, resources, community, technological issues, environmental issues, rules of operation, insufficient infrastructure, and language issues. This research's findings can also guide future empirical research into the factors that affect CC adoption in the health-care context.

Keywords: Cloud Computing, Adoption, Factors, Health-care institutions, SEM, SmartPLS-SEM.

KERANGKA TEORI UNTUK PENGGUNAAN PERKOMPUTERAN AWAN DALAM SISTEM MAKLUMAT HOSPITAL

ABSTRAK

Perkomputeran awan (PA) menjadi tren pilihan dalam menguruskan data digital. Namun, terdapat tingkat penggunaan/ adopsi PA yang rendah di Institusi-institusi Penjagaan Kesihatan (IPK) daripada industri-indusri lain atas banyak alasan seperti kesedaran, staf, dan kos. Penyelidikan ini bertujuan untuk: (1) menyelidik penggunaan PA Pusat Kesihatan Saudi (PKS), (2) menentukan faktor-faktor yang mempengaruhi penggunaan/ adopsi PA di PKS terpilih, (3) membangunkan satu kerangka teori untuk penggunaan/ adopsi PA di PKS terpilih berdasarkan faktor-fakfor yang ditentukan terdahulu, dan (4) mengesahkan kerangka penyelidikan untuk penggunaan/ adopsi penggunaan PA di. PKS. Tujuan kajian ini adalah untuk menentukan faktor-faktor yang mempengaruhi penggunaan/ adopsi PA dalam PKS. Konstruk-konstruk yang digunakan untuk membangunkan kerangka teori untuk penyebaran PA di PKS. Data dikutip menggunakan sampel bertujuan dari (230) staf pusat kesihatan bagi tiga hospital awam di Kerajaan Arab Saudi (KSA) sebagai kajian kes. Dua ratus (200) peserta kajian memberikan sumbangan besar dalam menjawab soal selidik dan mengambil bahagian dalam menilai pembaikan kaedah; dan pemerhatian penyelidik juga digunakan. Analisis data dilakukan berdasarkan *Statistical Package for the Social Sciences (SPSS)* untuk menafsirkan statistik untuk analisis data dan regresi. Di samping itu, teknik pemodelan persamaan berstruktur *(SEM)* menggunakan kaedah pemodelan jalur separa terkecil digunakan untuk menilai korelasi di antara tema kerangka yang dibangunkan menggunakan PA di PKS sebagai pemboleh ubah bebas dengan niat untuk mengguna PA sebagai pemboleh ubah bersandar. Tanbahan pula, pendekatan tema untuk analisis diaplikasi untuk membolehkan penyelidik melaporkan hasil-hasil pemerhatian kajian. Hasil-hasil kajian ini menunjukkan bahawa Keserasian, Kerumitan, Kesediaan

Infrastruktur IT, Kelebihan Relatif, Berkongsi & Bekerjasama, Keselamatan dan Privasi, Kesediaan Teknologi, Kepercayaan, Sokongan, Kerajaan, Keperihatinan Peraturan, Sokongan Luar, Akses Mudah Alih, Kewangan Lembut, Anggapan Kemudahan Penggunaan adalah factor-faktor signifikan yang mempengaruhi penggunaan PA di PKS. Akhirnya, hasil kajian ini yang berdasarkan kepada data pemerhatian menunjukkan niat terhad penggunaan / adopsi teknologi berdasarkan PA. Faktor-faktor yang menjadi penghalang untuk mengimplementasi dan menerima teknologi termasuk kapasiti dan kepakaran staf, isu-isu pengurusan, sumber daya, masyarakat isu-isu teknologi, isu-isu persekitaran, peraturan-peraturan operasi, kekurangan infrastruktur, dan isu-isu bahasa. Penemuan penyelidikan ini juga dapat memimpin penyelidikan empirikal masa hadapan mengenai faktor-faktor yang mempengaruhi penggunaan / adopsi teknologi PA dalam konteks penjagaan kesihatan.

Kata Kunci: Pengkomputeran Awan, Penggunaan /Adopsi, Faktor-Faktor, Institusi Penjagaan Kesihatan, *SEM, SmartPLS-SEM*.

ACKNOWLEDGEMENTS

Alhamdulillah, First and Foremost, all thanks to Allah for giving me the strength and determination to complete this study. With His blessing, finally, I have finished the research and complete the thesis successfully. All sincere gratitude goes to the supervisor Dr. Norizan Mohd Yasin, for her invaluable supervision, encouragement, brilliant ideas, insightful comments, unwavering support throughout the study at the University of Malaya, and making time to help me that enables me to complete this study. May Allah s.w.t reward and bless her throughout all her endeavours. Next, my most profound appreciation goes to my parents and brother for their never-ending prayers, encouragement, support, and care, which made it possible for me to finish this work. Only Allah knows how much I appreciate that. Last but not least, my ineffable gratitude goes to my beloved wife, Asmaa, for being such patient and supportive and to the light of my life, my little kids Saief-Eldeen & Ziyad-Eldeen I love you all. I do not forget, many thanks to all my dear friends at the University of Malay for their help, advice, and support. All the people who have helped me, directly or indirectly, throughout my knowledge journey in completing this research. May Allah s.w.t bless all of you. With love, I have dedicated this thesis to all of you. Thank you.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS AND ABBREVIATIONS

ABC	:	Activity-Based Costing
ATT	:	Attitude Toward Changes
BI	:	Behavioural Intention
BSC	:	Balanced Score Card
CC	:	Cloud Computing
CCS	:	Cloud Computing Service
COTS	:	Commercial Off-The-Shelf
CSPs	:	Cloud Service Providers
DOI	:	Diffusion Of Innovation
EHR	:	Electronic Health Record
EMR	:	Electronic Medical Record
EU	:	European Union
GCC	:	Gulf Cooperation Council
GFS	:	Google File System
HCIs		Health-Care Institutions
HDFS	:	Hadoop Distributed File System
HIS		Hospital Information System
HIT		Health Information Technology
HIPAA	:	Health Insurance Portability and Accountability Act
HISS	:	Hospital Information Systems
HIT	:	Health-care Information Technology
IaaS	:	Infrastructure as a Service
IoD	:	Infrastructure on Demand
IoT	:	Internet of Things

IS	:	Information Systems
IT	:	Information Technology
KFSH&RC	:	King Faisal Specialist Hospital and Research Centre
KSA	:	Kingdom of Saudi Arabia
MoH	:	Ministry of Health
NGHA	:	National Guard Health Affairs
OPEC	:	Organization of Petroleum Exporting Countries
OPEX	:	Operational Expenditure
PaaS	:	Platform as a Service
PEOU	:	Perceived Ease of Use
PLS		Partial Least Squares
PU	:	Perceived Usefulness
QoS	:	Quality of Service
QRMs	:	Qualitative Research Methods
RFID	:	Radio-Frequency Identification
ROI	:	Return On Investment
SaaS	:	Software as a Service
SEM	:	Structural Equation Model
SHCIs		Saudi Health-Care Institutions
SLA	:	Service Level Agreement
SLOs	:	Service Level Objectives
SMEs	:	Small and Medium size Enterprises
SNECS	:	Saudi National E-health Cloud System
SPSS	:	Statistical Package for Social Sciences
SUS	:	System Usability Scale
SWOT	:	Strength, Weaknesses, Opportunities and Threats

TAM	:	Technology Acceptance Model
TCO	:	Total Cost of Ownership
TOE	:	Technology - Organization - Environment
UTAUT	:	Unified Theory of Acceptance and Use of Technology
VM	:	Virtual Machine

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Introduction

The important ultimate targets governments and institutions worldwide are to achieve high-quality health-care services. Current health-care systems face many challenges, such as an increase in chronic diseases, an increase in life expectancy, a shortage of health-care practitioners, and, ultimately, a rise in health-care service delivery costs (Organization, 2019). Therefore, new technologies for delivering health-care services are required. Several measures have been encouraged, such as privatizing health-care, moving toward proactive behaviour, and using information technology (IT) in the health-care field (Fatima et al., 2018; Wang et al., 2018).

Health-Care Institutions (HCIs), including hospitals, have focused on delivering quality treatment to patients. IT is commonly used in HCIs to provide a reliable, safe, and useful information system for health-care (Sligo et al., 2017). IT, also is known as eHealth technologies, allows more accessible and more effective communication of information and the sharing of knowledge (Greenaway et al., 2015) for getting better patient care and improving the quality of services (QoS) (Chen et al., 2017). To allow for greater use of electronic Hospital Information Systems (already referred to as HISs) across countries in HCIs (Fragidis et al., 2017). According to (Tarver, 2016), the history of health-care systems started with the conventional manual paper-based system, which is now found to be unreliable and inefficient in the management of medical records that affect the efficiency of inadequate staff. This traditional system, later replaced by HISs (Andargoli et al., 2017). This proves to be more productive and accessible to maintain records and provide more reliable, timely information and reduce medical errors (Jimmerson, 2017).

Although used, the HIS in health-care allowed a better flow of information that improved the quality of care (Sirintrapun & Artz, 2015). Nevertheless, the implementation of this HIS in an organization is challenging, mainly when there is much staff with different job roles and information requirements. In contrast, HIS is highly safe, cost-saving, user-friendly, and achievable (Oyaro & Systems, 2018). However, most institutions using HISs still face many challenges, such as the need necessity for more information sharing, due to increased disease, whereas the higher life expectancy need for qualified staff and costs in addition to technological advancements (Heery et al., 2015). Hence the need for an improved method for delivering the resources required to provide quality health-care and better use of IT (Yeow & Goh, 2015).

Failure to adapt to these new technologies will cause inefficiency and inconvenience (Riahi, 2015), which relates to poor patients treatment and satisfaction. Because of advancements in technology, many institutions worldwide are turning towards more advanced information systems, simpler and easier to use and maintain, reducing technology costs and stepping up the information standard and services delivered through minimizing and removing errors (Jylhä & Suvanto, 2015).

Since the information requirements need to get more complicated, HISs are unable to satisfy these required alternative efficient and effective use in the management of systems; thereby changing from the current HISs to a cloud-based (referred to it as Cloud Computing (CC)) architecture (Mohammed, 2019). There is a trend of replacing the existing HISs. In contrast, the changing trend is considered a positive move because it encourages the program's efficacy. In addition to evolving technology, other Barriers hinder the implementation of HISs in developed countries HCIs the described points as stated in recent studies (Cook et al., 2017; Kim et al., 2017; Staley, 2015; Wager et al., 2017). Figure 1.1 shows HISs barriers in developed countries.

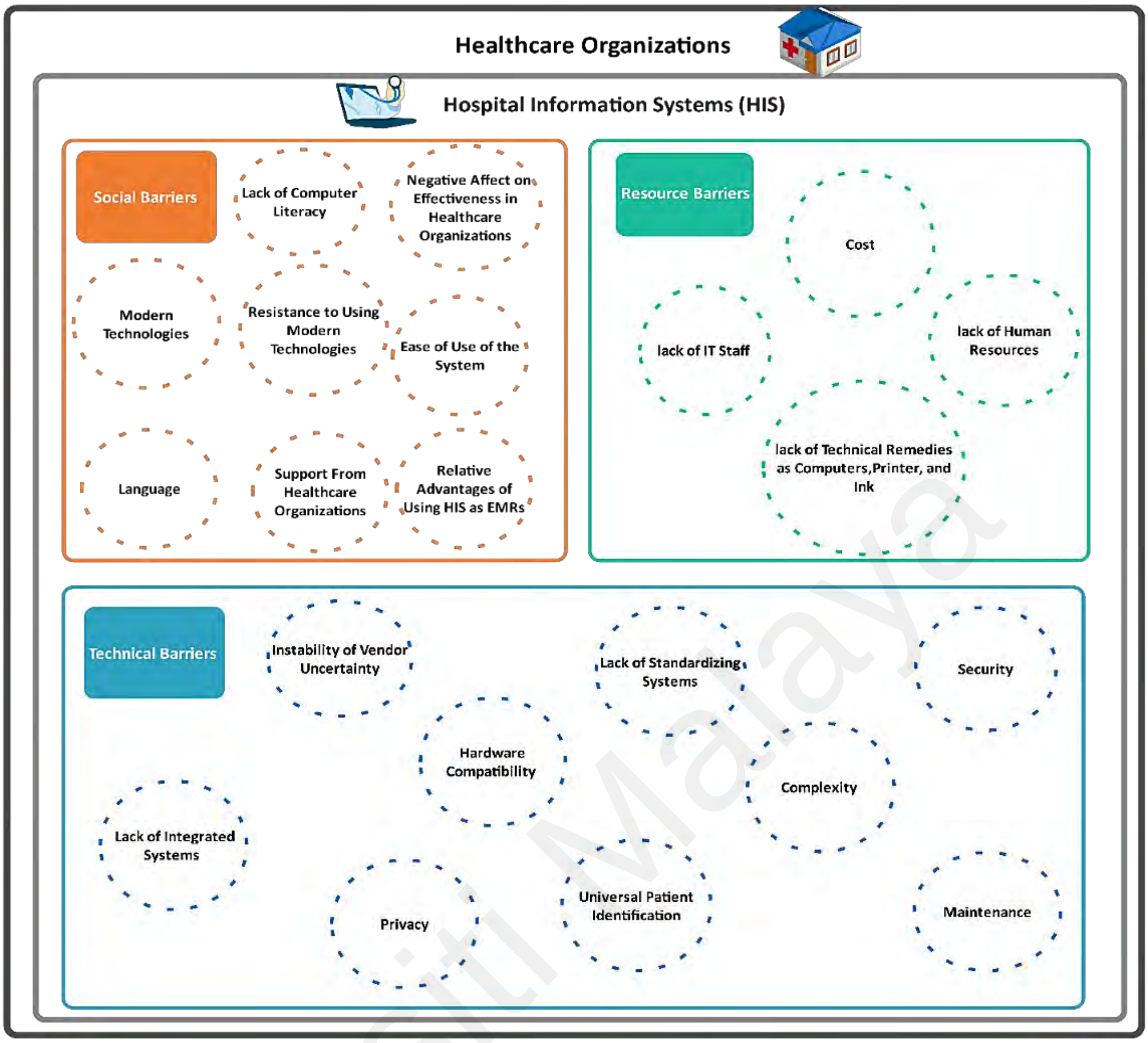

Figure 1.1: HISs Barriers in Developed Countries (Wager et al., 2017)

The problems facing public health-care in established countries over the next few years stem primarily from population demographic change. The population's average age continues to grow progressively (Bloom & Luca, 2016), thereby presenting a real health-problem because it is the elderly that constitute the largest health-users. This ever-growing demand needs to see. Meanwhile, with scarce public financial resources, public sector services suppliers are under tremendous pressure to reduce cost, and health-care is one of the government's top budget targets. There is also a decline in the number of children born (Seçkin et al., 2016), worsening the financial problem because fewer people get paid to the public. Another massive issue in health-care is affordability, as it is essential to provide health-care for all people, including those living in outlying regions.

While treatment, especially among specialists, is often complicated to get (Razmak, 2016). It was compounding this fact that the people born in the 1940s would begin to age over the next few years, ensuing in an inevitable rise in retirees' numeral resulting from either the population growth within these years. The result will in a less fruitful population resulting in a shortage of productivity and a gap that will grow exponentially in the coming years (Lim et al., 2019). Today, health-care still lacks qualified health-care professionals; this gap is still until nowadays (Burke, 2018). The implementation of IT helps providers to provide faster and better effective citizen-health-care. With its scope, the internet offers both a global and a local possibility of providing health-care (Mamlin & Tierney, 2016).

Furthermore, the internet can serve as a resource for enhancing services to geographically distributed communities, encouraging the sharing of information, growing income, lowering costs, and improving patient care quality. Higher-income rates, higher education, and computer literacy rates within the community, and several people's willingness to make informed choices nowadays allow citizens to do things electronically much more comfortably. The ability to link patients with health-care practitioners through IT and health-care professionals at all levels to each other is desirable to policymakers around the world (Groves et al., 2016). Given the task of providing access to an increasingly older population and the available financial and human assets, researching and recognizing how IT can enhance health-care delivery services to people is essential.

Therefore, eHealth is described as using emerging IT, especially the internet, to develop or encourage health-care. There are two main eHealth targets. The first is to give the patient more liability, power, and awareness so he/she can become an informed part of his / her health-care (La Rocca & Hoholm, 2017; Miah et al., 2017). The second goal is to use IT in primary and secondary care to improve patient and health-care in the most appropriate and productive ways.

On the other hand, the adoption of eHealth in HCIs in developing-country is weak due to barriers such as (1) human: relating to values, behaviours, and attitudes, (2) occupation: relating to the existence of jobs, (3) technical: relating to computers and IT, (4) organization: relating to organization management, (5) financial: money and finance-related, and (6) legal and regulatory: rules, regulations, and laws related.

Also, this refers to pushing for the use of innovative technologies such as system developed framework based on CC architecture, which is now a standard technology to overcome some of the barriers to eHealth (Devadass et al., 2017; Sabr & Neamah, 2017).

Problems and web complexity affecting several groups of people and different technologies used, which are hoped to increase overtime (Goodwin et al., 2016). Apart from technological problems, human factors such as aversion to technology use have led to low acceptance of the technology. Using new technologies refers to the desire to learn new technology, which caused behavioural changes that interrupt their regular use and system processes. Despite the above obstacles, health-care providers in developing-countries such as the Kingdom of Saudi Arabia (KSA) have voluntarily indicated their intention to innovate in enhancing their eHealth services by going forward with CC technology. Based on its current model of CC provides software, infrastructure, and platform services over the internet. Increases storage capacities and device functionality are making it cost-effective.

The HISs are more interoperable and accessible, such as more resource-optimized and integrated (Devadass, Sekaran, Thinakaran, et al., 2017; Sabr & Neamah, 2017).

Increases the efficacy and reliability of the systems used by improving fragmentation and isolation problems and managing IT resources intelligently. Collaborating stakeholders on CC systems included physicians, patients, hospitals, and other institutions that aimed to offer appropriate treatment and care to patients where information and expertise could be created and shared (Devadass, Sekaran, Thinakaran, et al., 2017). It estimated that by 2017 the demand for health-care CC reached $5.4 billion in US dollars (Baumers et al., 2016).

To show the changing trend in CC adoption despite various challenges and barriers due to the potential benefits it provides (Sabr & Neamah, 2017). In the health-care sector, there has been a slow rate of technology adoption caused by technological activities. Making changes easy to adapt is essential by understanding human aspects of adoption, such as attitude, ease of use, level of acceptance, and readiness (Organization, 2015). In this context, the recent studies highlighted the lack of academic research on cloud computing CC in developing-country like the KSA, indicating the need for more research effort in this field. In sum, the previous studies have mainly looked into human and technology issues in general. This research looked at the collaborative effort by improvising the present HISs using CC architecture (Alharbi et al., 2016a). The research results of recent studies show that cloud computing CC in KSA has received little attention, and little academic research has conducted a country-wide survey of CC implementation and, in particular, none in the context of Saudi health-care. In short, further work is required to study the CC adoption in KSA in wide-ranging in the HCIs in specific nowadays. In this context, the lack of systems or methodologies to help the organization implement its cloud computing makes it impossible for lots of organizations to adopt cloud computing successfully, effectively, and efficiently (Chang et al., 2016; Gangwar et al., 2015b). Once cloud computing is introduced, organizations will closely examine the suspected shortcomings of cloud computing projects and why the projects fall flat among cloud computing readiness status (Rad et al., 2017). Several issues that cause organizations to avoid adopting and implementing cloud storage include doubts about usability, customer apprehension or lock-in details, concerns about data privacy, cost, integrity issues, and poor connectivity (Roehrs et al., 2017; Sighom et al., 2017).

Otherwise, CC keeps us linked during the pandemic of Covid-19; Simultaneously, the governments worldwide enforce lockdowns and region quarantines. Individuals and companies rely on technology to carry on their lives. This pandemic prevented their regular opportunity to physically walkabout. So, they switch to the internet and various online resources to continue working, doing business, or entertaining. The ongoing pandemic demonstrates how CC is becoming essential in nowadays world. The cloud allows for many of the conveniences and resources available online. CC plays a critical function, from sports to productivity applications to the services businesses to institutions use (Gupta et al., 2020; Lakkireddy et al., 2020; Singh et al., 2020; Tech, 2020 Alsanea, 2015).

Moreover, a study by West Monroe Partners (2020) supporting health services says the health-care industry is leading the banking and even the energy and utility sectors when it comes to cloud use (Partners, 2020). To automate programs and improve patient satisfaction, many hospitals, HCIs, and government health-care service institutions have digitized and taken their data to the cloud. This early adoption of the cloud is a significant advantage in fighting the pandemic, as it increases the ability to analyse relevant data to enhance response. Cloud storage is more than just storing the data (Gupta et al., 2020; Jiménez-Zarco et al., 2019; Singh et al., 2020; Tech, 2020). It also reduces IT costs for health facilities because they eliminate the need to train workers, purchase equipment, and provide the IT people and resources with physical space. It also enables interoperability by facilitating the convergence of data and systems.

Furthermore, telemedicine is provided in the cloud. Remote accessibility of data and interactive online resources allows physicians and other health-care workers to provide services from a distance. Tele-health-care is becoming more critical as people are seeking to stop communicating directly with others. It is useful for treating some types of diseases and collecting health-care applications (Gupta et al., 2020; Singh et al., 2020; Tech, 2020). Additionally, it is the KSA proceeding to deliver health-care services to all nations in "Saudi nationals" at a free charge (Al Otaibi & Sciences, 2017). Figure 1.2 shows the KSA profile.

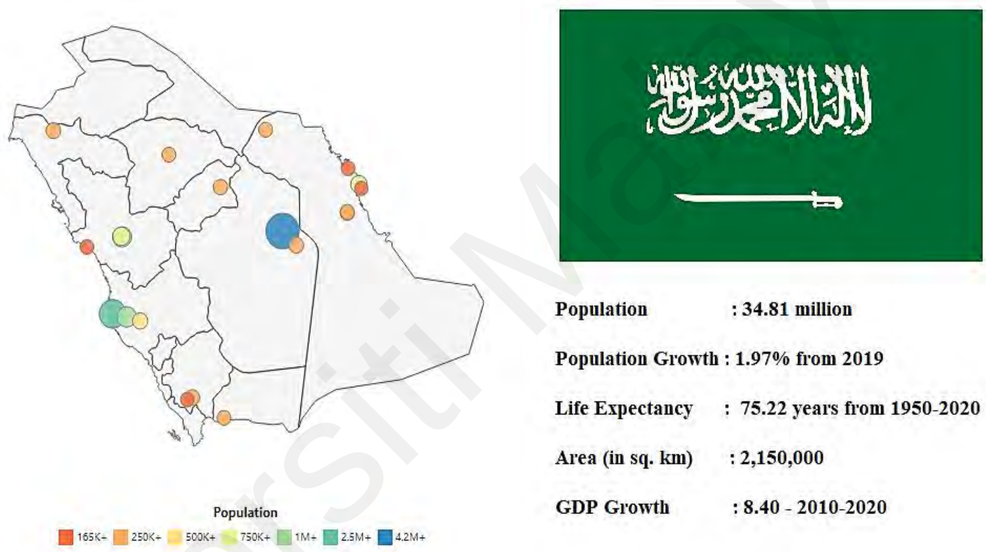

Figure 1.2: The KSA Country Profile

The "KSA Ministry of Health (MoH)" is a leading government provider and has complete accountability for all "health-care" facilities. The MoH is also responsible for controlling private-sector health-care facilities. Besides the MoH, other related government departments contribute to providing health-care services to the community (Amin et al., 2020; MoH, 2016). The private-sector also provides health-care services, mostly in urban areas. There are 462 hospitals in KSA classified into three categories ("i.e., Health Ministry, other government agencies, private sector"). The government budget's economic contribution to the "MoH" in 2017 amounted to approximately SAR 67 billion (Health, 2020), up to 7.61 % of the overall government budget. The "Council of Health Services and the MoH in KSA" have usual out a countrywide strategy for health-care facilities to address the demands of the Saudi health-care system (Alomi et al., 2015). This comprehensive health-care plan recognizes the need for health-care system improvement and change by introducing several essential programs, such as the National eHealth strategy.

For various reasons, several countries have similar health-care problems, and the KSA was selected as the case study of current research. Due to the country's vast geographical area, the provision of "KSA health-care services" is an important challenge for the "Saudi government", its many rural areas, and the instability of its health-care systems. That all contribute to increased costs in the supply of high-quality health-care services. In the health-care sector, electronic systems are introduced behind those of other areas, such as the banking and industrial sectors. "MoH" current strategy in version 4/2019 listed the challenges that affect health-care services in KSA (Health, 2019), as shown in Figure 1.3. These challenges as the following: (1) Providing Health-care Services, (2) Burden of Disease, (3) Quality and Safety, (4) Health Manpower, (5) Financial Sustainability, (6) Digital Transformation.

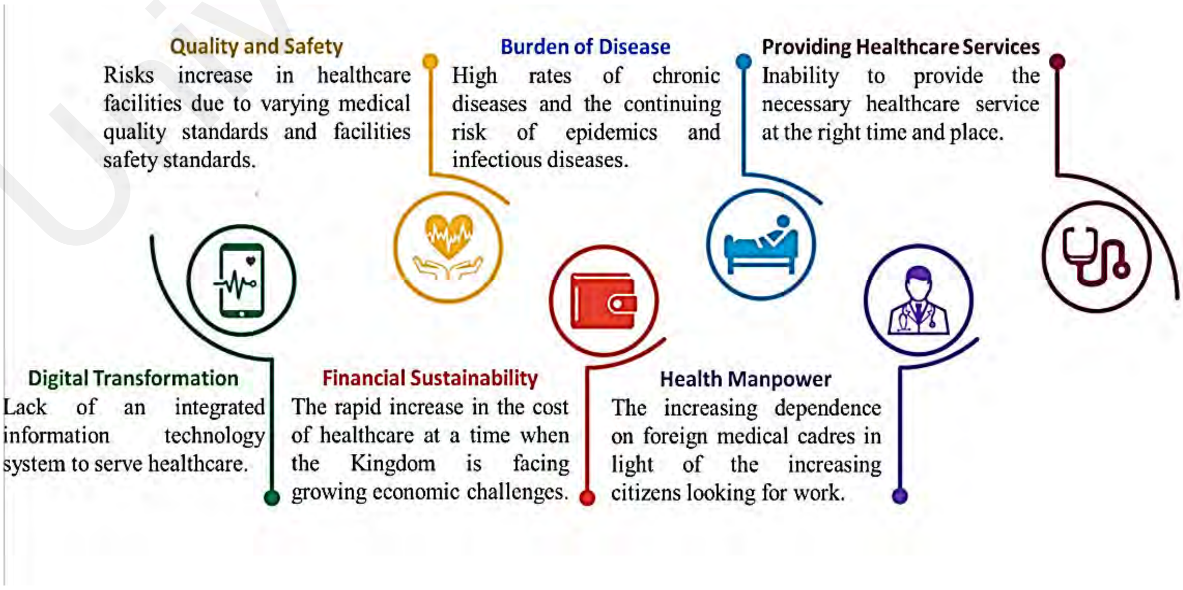

Figure 1.3: The Challenges that Effect on Health-Care Services in KSA (Health, 2019)

1.2 Problem Statement

The implementation of information technology helps providers to provide faster and more effective health-care (Mamlin & Tierney, 2016). In the health-care industry, as a result of the complication of the current technology adopted as HISs. Many HCIs are thinking about moving from traditional systems to new technologies (Almubarak, 2017). CC provides a solution to incorporate these technologies and use new IT outsourcing forms (Chasib & Al-Najjar, 2020; Williams, 2012). Concurrently, CC gives a solution, though, providing to outsource information and distribution services in terms of infrastructure, platform, and software (Darwish et al., 2019). The ability to access more generous data sharing and accessibility creates an increasing demand for hospital CC solutions (Altowaijri, 2020; Almubarak, 2017). Different HCIs adopt some types of CC services to meet their requirements and to enhance the quality of health-care services (AbuKhousa et al., 2012). CC adoption in the HCIs will positively affect health-care outcomes as stated in the recent studies (Ali et al., 2018; Almubarak, 2017; Griebel et al., 2015; Masrom et al., 2014; Grindle et al., 2013; Ahuja et al., 2012). Additionally, with CC solutions, there is no need for buying costly hardware and software licenses due to all processing controlled with the aid of the CC provider (Griebel et al., 2015; Ahuja et al., 2012). CC will help health-care vendors lessen the charges of maintenance and IT staff (Ali et al., 2018; Masrom et al., 2014). Although CC appears to be a perfect option for improving HISs, it was slow to adopt (Alharbi & Ali, 2018; Almubarak, 2017; Sirintrapun & Artz, 2015). Whereas only 4% of United States HCIs use CC facilities. As anticipated, the acceptance of CC services in developed countries is lower such as the KSA, as, in some of their departments, these countries still use less prevalent methods and conventional manual paper-based records (Griebel et al., 2015). These findings provide an explanation for the low and delay adoption of CC within the Saudi Health-Care Institutions (SHCIs). This is because the HISs serve as a foundation for the adoption of

CC solutions in SHCIs. This issue encourages researchers to focus on the factors that influence the cause adoption rate of cloud services by the HCIs. In looking for reasons for such slowness in the adoption of CC in HCIs, researchers attributed that to the lack of information on different factors associated with the individual, organizational, technical, and environmental factors (Alharbi et al., 2017b; Almubarak, 2017; Lee, 2015; Lian et al., 2014; Tweel, 2012). Therefore, it is essential to fill the gap associated with the unclear information of these factors affect the CC adoption in the health-care industry. Recently research has determined some factors in specific industries and nations (Almubarak, 2017; Deilr & Brune, 2017; Alharbi et al., 2016; Alsanea, 2015; Alkhater et al., 2014; Ratnam et al., 2014; Hailu, 2012; Tweel, 2012). Besides to the findings of the recent studies indicate to CC in KSA has not acquired obtained much observation and little academic studies conducted the implementation of CC in the country and, in particular, none in the Saudi health-care context. In sum, the overall analysing adoption of CC in KSA and inside the health-care sector specifically requires more investigative.

1.3 Research Objectives

Developing the theoretical framework for adopting CC in HCIs is the primary purpose of this study by identifying factors that influence health-care staff's adoption. However, the study has three essential objectives. These objectives serve as research guidelines, and benchmarks for having a better overview of the results of the method, the purposes of the study are as follows:

1- To investigate the status of CC adoption in the SHCIs.

2- To determine the factors that influence the CC adoption in selected SHCIs.

3- To develop a theoretical framework for the deployment of CC adoption in selected HCIs based on factors determined earlier.

4- To validate a research framework for the adoption of CC in SHCIs.

1.4 Research Questions

The researcher will attempt to answer the following questions:

1- What is the status of CC adoption in SHCIs?

2- What are the factors that influence CC adoption in SHCIs?

3- How would the theoretical framework be developed for the deployment of CC adoption in selected HCIs based on determining factors?

4- How to validate a research framework for the adoption of CC in SHCIs?

Table 1.1: Mapping the Research Objectives with the Research Questions

Research Objective	Research Question
1. To investigate the CC adoption in the SHCIs.	**1.** What is the status of CC adoption in SHCIs?
2. To determine the factors that influence the CC adoption in selected SHCIs.	**2.** What are the factors that influence CC adoption in SHCIs?
3. To develop a theoretical framework for the deployment of CC adoption in selected HCIs based on factors determined earlier.	**3.** How would the theoretical framework be developed for the deployment of CC adoption in selected HCIs based on determining factors?
4. To validate a research framework for the adoption of CC in SHCIs	**4.** How to validate a research framework for the adoption of CC in SHCIs?

1.5 Research Rationale

The importance of investigating the CC in the context of health-care has related to the formal severity of the financial situation in KSA. The KSA derives the bulk of its finances from oil, oil fee volatility has created an unsustainable budgeting state of affairs for the Saudi government (Al Mustanyir, 2019). Besides, the KSA has incurred significant budget deficits because of military intervention in Yemen.

Furthermore, investigating CC within the health-care context is vital because of the sharp and unsustainable increase in the "MoH" budgets, which notwithstanding the parlous fiscal scenario outlined above, more than trebled between "2006 and 2015" at an average charge faster than that of the entire country budget. This sustained stage of public spending on the health-care manner that KSA is ranked one of the highest among Gulf Cooperation Council (GCC), Organization of the Petroleum Exporting Countries (OPEC), Middle East, Arab, and Asian countries.

This research seeks to apply "Saudi Vision 2030" to the health-care sector. In the KSA, the CC sector is expected to grow further due to low oil prices and the advantages of future cost savings (Elsheikh et al., 2018; Nurunnabi, 2017). The KSA Government established the Vision 2030 initiative to support transfer from an oil-based economy to a non-oil economy. As part of this initiative, the National Transformation Program 2020 (NTP) was announced (Khan et al., 2020; Al Mustanyir, 2019). This program aims to support digital transformation efforts and improve government institutions' efficiency (Khan et al., 2020). However, the KSA has not yet conducted a national CC initiative that could encourage the increase of CC deployment. Additionally, health-care compared to other industries, late to accepted IT services (Alharbi et al., 2017b; Almubarak, 2017; Lee, 2015; Lian et al., 2014; Tweel, 2012). Underlying this is a complicated web of interrelated social and technical issues situated within a full institution environment

(Johnson & Turley, 2006). There is increasing appreciation that introducing technology within hard institutions systems such as health-care is not a straightforward linear process. Instead, it is dynamic, often involving various cycles of iteration as technological, social, and organizational dimensions gradually align (or not) over time (Alharbi et al., 2017b; Almubarak, 2017; Karim et al., 2017; Alsanea, 2015; Cresswell & Sheikh, 2013). In a nutshell, despite its enormous potential, HISs as a CC model has not been covered extensively in the recent academic studies in KSA. There are lacking frameworks that encompass all viable schemes and interrelationships between HISs and CC. Therefore, analysing and comparing such schemes' effectiveness is necessary (Almubarak, 2017; Alharbi et al., 2016; Abbas & Khan, 2014; AbuKhousa et al., 2012). Besides, when considering a transfer to use CC, health-care consumers must have a clear understanding of the unique benefits and risks associated with CC and set realistic expectations with their cloud provider. Besides, there is a need for more studies to understand the HCIs in KSA and the best way to apply HIS to develop the successful implementation rate. Additionally, the recent studies (Alharbi & Ali, 2018; O'Donnell et al., 2018; Almubarak, 2017) refer to a lack of inter-coordination, collaboration, and planning affect to low adoption of modern technology.

1.6 Study Scope and Delimitations

This study's primary delimitation was related to the use of sampling questionnaire participants from the target audience by health-care staff only from the selected SHCIs. This study's results cannot be generalized globally, considering that the questionnaire was bound to respondents with these specific characteristics.

The second delimitation was predicted by eighteen (18) of determining factors that influence the adoption of CC by SHCIs based on the findings of the literature review as the attitude towards change, compatibility, complexity, service quality, infrastructure readiness, relative advantage, sharing & collaboration, security and privacy, technology readiness, top management support, trust, government support, regulation compliance, external support, mobile access, hard financial analysis, soft financial analysis, ease of use. The research boundaries as a result of this definition were pivotal in purposively focusing on the research problem. Despite these limitations, the findings of the study help improve and understand CC adoption in HCIs. Academics can use this study to understand CC adoption better and apply new theories in HCIs.

1.7 Organization of Thesis

The thesis structure follows the "Lead-in, Core, Lead-out" format suggested by (Dunleavy, 2003) as shown in Figure 1.6, and the thesis contains six chapters, as shown in Figure 1.5.

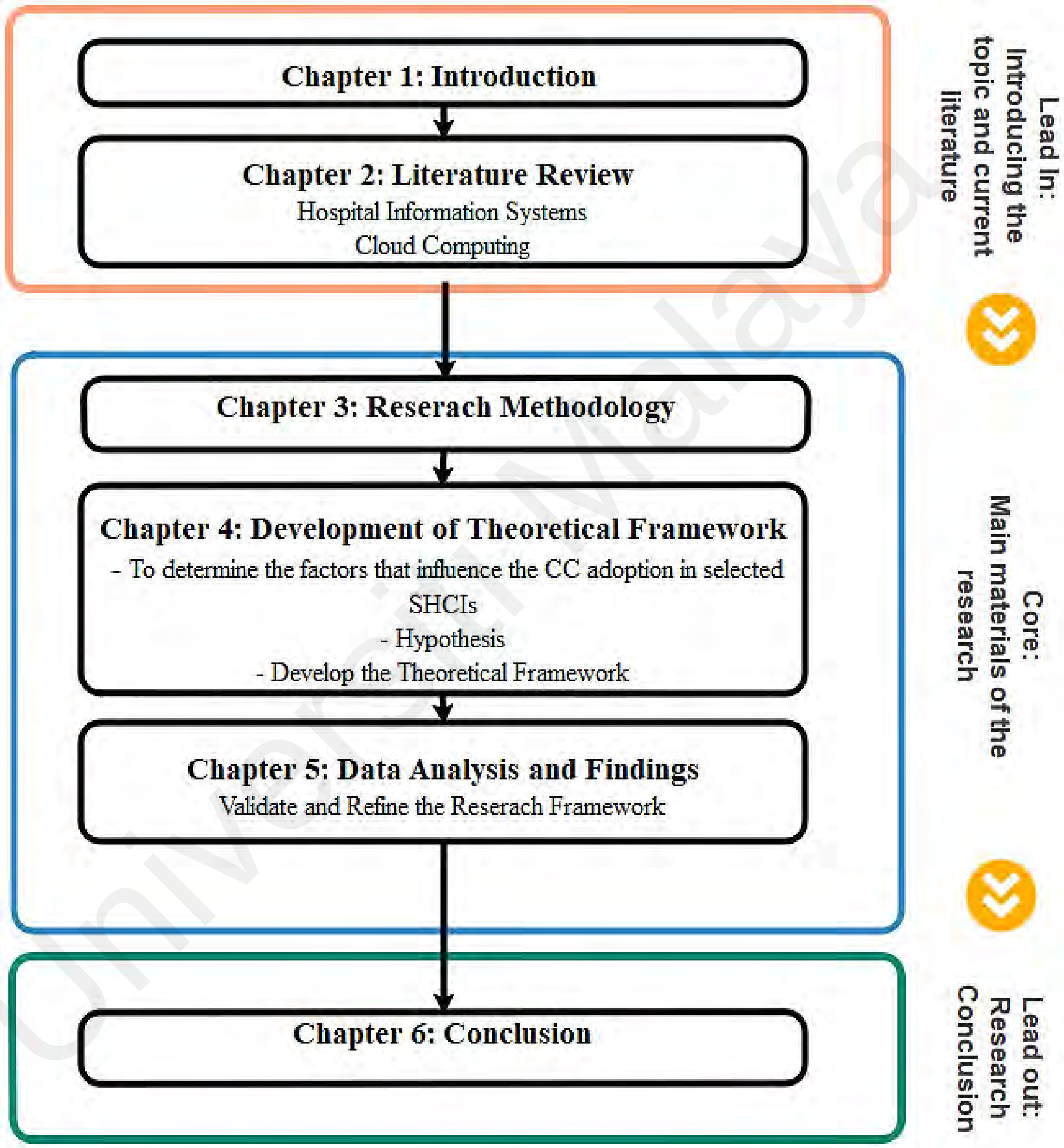

Figure 1.4: Thesis Structure

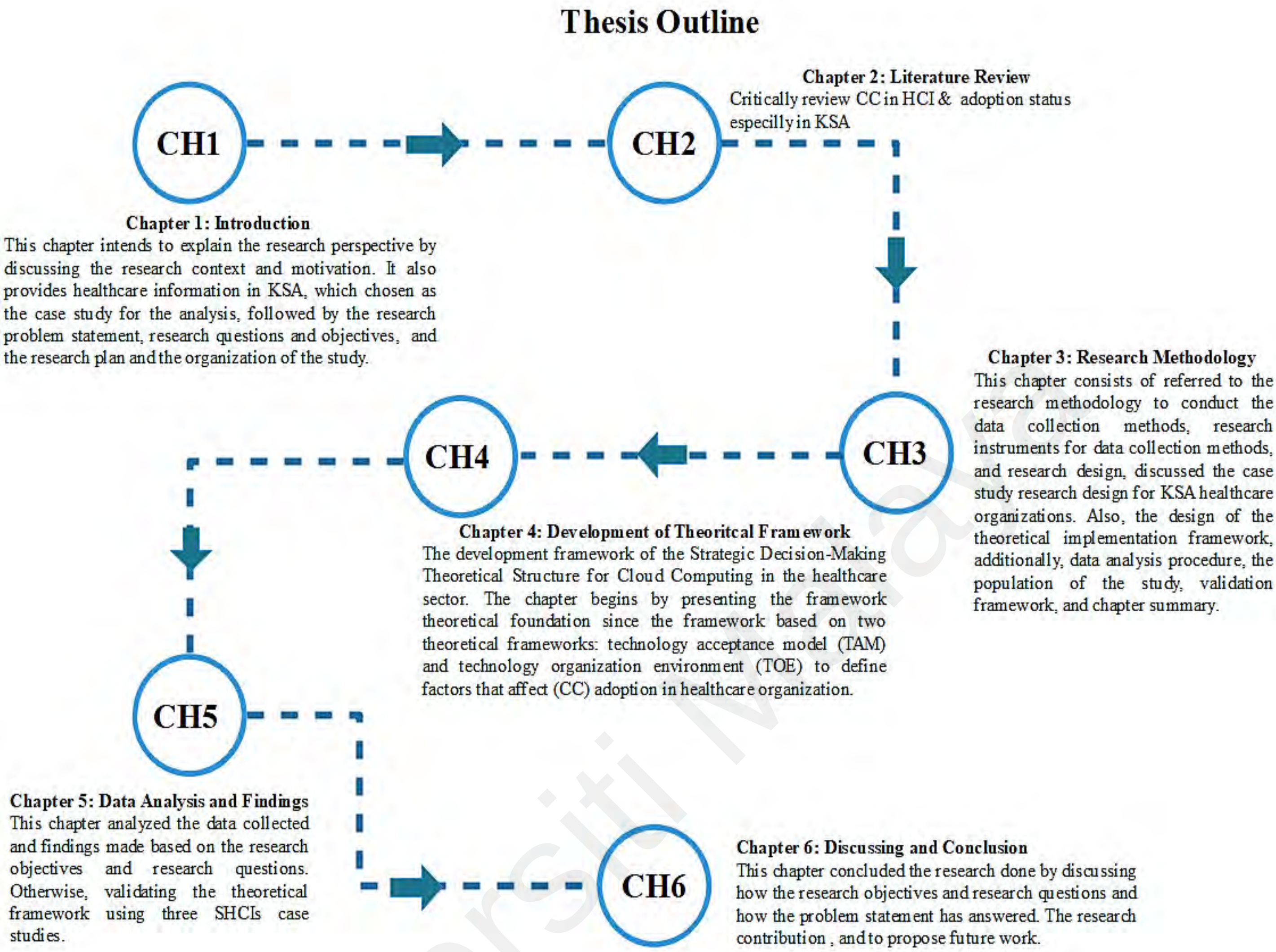

Figure 1.5: Thesis Organization

1.8 Summary

However, this chapter offered a study describing the research context and the reasons for carrying out this research. Moreover, also followed by defining research aims and objectives and the importance of the information it provides. Finally, a thesis outline and a summary of each chapter are provided in the current chapter. Additionally, the next chapter will deliberate the background of existing research, which is CC.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The design of this chapter provides an answer to the first study question (RQ1) on investigating cloud computing adoption in "Saudi Health-Care Institutions (SHCIs)". The review of the existing literature helped in exploring the scope of the thematic research conducted. Besides, the sort of analysis facilitated the researcher's description of the research problem. The Review approach additionally yielded new appropriate ideas and terminology for the study.

2.2 Technology in HCIs: Introduction

Improving the health-care system is one of the essential ultimate targets for many governments and institutions, and many challenges are met with the conventional health-care system. The rise of a lifetime is a problem for the traditional health-care system, e.g., "life expectancy in Canada is 82 years, 75 years in the KSA, 80 years in the UK, and 79 years in the USA" (Almekhlafi, 2016). Geography is another barrier to the development of the health-care system for many nations; for example, "Canada covers an area of 10 million square kilometres with a population of approximately 30 million, compared with 2.2 million square kilometres KSA and a population of 27 million both countries with remote sparsely populated areas" (Al Mustanyir, 2019).

Health-care providing for all nations of the same quality, particularly in rural areas as in KSA, leads to challenges for traditional HCIs (Al Asmri et al., 2019). The lack of health-care professionals, such as physicians, nurses, and pharmacists, together with the increase in chronic diseases such as diabetes, hypertension, and heart disease, contribute to the problems of health-care systems, and these factors contribute to the higher operational costs of the provision of health-care services in KSA. The "Saudi Ministry of Health budgets showed a sharp continuous rise in the period from 2006 to 2015", putting high burdens on the government when the economy experienced slow growth due to the fall in oil prices (Al Mustanyir, 2019).

Total health expenditure in KSA is increasing; Table 2.1 shows the archive of the Saudi Ministry of Health (2007-2018) (in thousands of riyals) for previous years, compared to the state budget. (Health, 2020).

Table 2.1: The MoH Budget Archive (Health, 2020)

Appropriation for the (MoH)							
Hijri Year	**Gregorian Year**	**Total of the State Budget**	**Total Budget**	**Rate %**	**Chapter I (Compensation of Employees)**	**Chapter II (Commodities and Services)**	**Chapter III (Program E xpenditure)**
1427/1428H	2007	380.000.000	22.808.200	6.0%	11.527.200	3.781.000	5.200.000
1428/1429H	2008	450.000.000	25.220.000	5.6%	12.392.000	4.228.000	6.000.000
1430/1431H	2009	475.000.000	29.518.700	6.2%	14.391.400	4.527.300	7.760.000
1431/1432H	2010	540.000.000	35.063.200	6.5%	17.150.000	5.213.200	9.560.000
1432/1433H	2011	580.000.000	35.063.200	6.9%	19.207.000	5.903.200	11.210.000
1433/1434H	2012	690.000.000	47.076.447	6.80%	22.594.000	6.850.100	13.291.755
1434/1435H	2013	820.000.000	54.350.355	7.00%	25.200.000	7.758.600	16.391.755
1435/1436H	2014	855.000.000	59.985.360	7.02%	26.087.630	8.492.000	20.404.543
1436/1437H	2015	860.000.000	62.342.539	7.20%	26.666.810	8.725.303	21.898.239
1437/1438H	2016	840.000.000	58,899,190	7.01%	26,103,790	8,002,551	22,992,849
1438/1439H	2017	890.000.000	67,758,793	7.61%	27,412,949	8,647,051	27,507,479
1439/1440H	2018	978.000.000	64.297.264	6.60%	30.896.385	8.046.618	23.740.788

Additionally, the implementation of modern technology in health-care institutions is significant. Many initiatives have been put in place to address these issues and find solutions to improve health-care systems, for instance, the privatization of health-care services and the movement towards preventive health-care. Additional initiative in HCIs is IT uses to deliver health-care with better efficiency and effectively (Mamlin & Tierney, 2016; Alharbi et al., 2014).

The term eHealth subsumes this shift towards applying IT in health-care systems. According to Hu and Bai (2014), eHealth is described as the cost-effective and safe use of IT in support of health-care fields, including health-care services, health-care monitoring, and health-care education information and study (Hu & Bai, 2014).

eHealth aims to improve health-care cooperation and coordination to improve the quality of health-care and, in parallel, reduce the cost of care (Schiza et al., 2018). Internationally, Hospital Information Systems (Plakosh et al., 1999) are increasingly being used to increase health-care institutions' performance. Patient-care quality as the following: (1) HIS enables health-care providers to availability patient information report to provide efficient and improved health-care services (2) By using HIS such as Electronic Medical Records (Abdulaziz et al., 2019), Computer-Based Patient Records (CBPR), HCIs achieve these results; Computerized Health-care Records (CHR) and Electronic Patient Records (EPR) all allowing for electronic recording of patient information (Hasanain et al., 2014; Jabali, 2017). Throughout this context, HIS is regarded as positional strategies for achieving health-care delivery efficiency and physician performance in the HCIs. The term of HIS, such as EMR, has been defined as a computerized record-keeping of health-related patient data (Hasanain, 2015).

EMR was used and obtained only by approved personnel to provide timely and efficient health-care services to multiple health-care facilities and prevent potential frequently identified mistakes by using a paper-based medical record. (Hasanain, 2015). Implementing health-care technology is as relevant as it is in a variety of other fields. Governments, physicians, and hospital managers realize the value of using and improving health-care technologies. As health-care services cost increases and health-care practitioners are limited and difficult to locate, it is inevitable for health-care institutions to start implementing HISs.

The HIS also enables health-care institutions to facilitate many of their tasks and provide services more efficiently and cost-effectively, for example, by transforming eHealth services in the way health care is obtained and delivered (Alkathiri, 2016; Li et al., 2015). The application of IT has become necessary in health-care institutions in this context. The rapid and significant advances in IT, in addition to infrastructure, have undoubtedly provided countries and organizations with benefits and opportunities, especially in the HCIs (Sarwar et al., 2018). HCIs such as hospitals consist of individual centres.

The hospital technology is supported by autonomous HIS (Poenaru et al., 2017). Where the HIS uses efficient processes to provide departmental needs in providing health-care information to health-care personnel (Sarwar et al., 2018; Sadreddini, 2012), the HIS has first proposed three decades ago in hospitals to support the medical staff with their everyday work (Beerepoot et al., 2019). The HCIs have consistently depended on technology. Technology is the heart of the health-care services provided to prevent diagnosis and treatment of disease (Sarwar et al., 2018). The HIS is a union of three fields: health-care management, organizational management, and information management and recognizes that HIS is only partially based on the application to the health-care of concepts of management information system (Abdulnabi et al., 2017).

HIS is a useful tool, which provides an opportunity for health-care delivery to be more efficient and effective (Rejeb et al., 2018). Also, the HIS comprises several sets of software that provide the needs of health-care institutions, health-care professionals, consumers, and policymakers (Wen et al., 2017). Santoso and Nisa (Group, 2017) noted that HIS aims to enhance patient care quality and increase team member productivity and effectiveness (Santoso et al., 2017).

The HIS also reduces paper-work by removing the need for paper files and enhancing administrative efficiency (Gewald & Gewald, 2020). The HIS improving health-care by reducing the number of health-care errors and ensuring that all health-care providers are given the right and timely information (Ahmadian et al., 2015). HIS is already enormously and among the technology to improve the aggregate quality, safety, and efficiency of the health-care system (Santoso et al., 2017). The primary aim of HIS in health-care is to provide optimum analytical support for quality decision-making, care, and treatment to health-care practitioners, administrators, and policymakers. The HIS is highly safe, cost-efficient, easy to use, and always available (Sarwar et al., 2018; Devine et al., 2017). Improving the acceptance of HIS, such as EHR, and advances in health-care delivery have achieved unparalleled levels in achieving these goals (Abbas et al., 2019).

Several investigations on the benefits of HISs have been conducted in the health-care field. These studies determined their positive effect on health-care outcomes, including quality, efficiency, and provider satisfaction. Three systematic reviews of peer-reviewed studies about the advantages of adopting HIS in health-care institutions have been conducted and covered from 1994 to 2010 (D'Andreamatteo et al., 2015). These investigations indicate that (92% percent) of recent health IT articles generally reached positive conclusions. Also, they found that the advantages of this technology were starting to appear in smaller activities and organizations as well as in primary early adopters. According to Hasanain (2014), despite the positive effects of HIS in health-care practices, the adoption rate of such systems is still low and meets resistance from health-care professionals.

Barriers come up when they approach the implementation of systems (Hasanain et al., 2014). Dissatisfaction with EMR, however, has continued to hinder the potential of HIS among some providers. These complexities strengthen the need for research findings that document the challenging aspects of organizational health IT, deployment, and how to address these challenges. This study is about HIS in KSA. In this perspective, the next subdivisions of the literature review contain the complexity of the health-care environment. This review aims to identify the current status and availability of HIS in KSA based on recent studies.

2.3 Saudi Health-Care System

The “KSA” is one of the developing-country that seeks to adjust to the worldwide evolution to enhance its community members' health-care. The KSA government has been developing national services while focusing on strengthening Saudi health-care systems over the last several decades. In KSA, there are two hundred and forty-four (244) hospitals with over thirty-three thousand two hundred and seventy-seven (33, 277) beds and two thousand and thirty-seven (2037) primary health-care centres (Alharbi, 2018; Hasanain, 2015; Alsahafi, 2012). Approximately 60% of these are public hospitals that fall under the jurisdiction of the Saudi MoH. At the same time, the remaining care is provided by either the private sector, university hospitals. The MoH public hospitals provide health-care services” at primary, secondary, and tertiary levels to all citizens free of charge. Other independent health-care providers also belong to other governmental bodies (Musaed Ali Alharbi, 2018). The Saudi MoH budget in 2007 was 5.6% of the total governmental budget, with $277 US dollars expenditure per capita per year (Hasanain et al., 2015). In the 1980s, an integrated Electronic Health Record (EHR) system was first developed and was capable of sharing health-care information across different health-care institutions. Saudi health-care systems are depicted in Figure 2.1. Unfortunately, because of its large geographical size, the country has a shortage of medical care in rural areas. A study by “Alharbi (2018)” stated many challenges were facing the health-care systems in KSA, such as the high demand for health services, the poor accessibility to some health-care facilities, the lack of adopting a national HIS, and utilization of potential electronic health strategies. Besides, poor HIS infrastructure in KSA has exacerbated problems and retarded the adoption of electronic health-care practices (Alharbi, 2018). One of the main issues is the long wait and disorganized referral system for patients who have to travel back and forth to the major cities where the hospitals were located, particularly those living in remote areas (Aloufi et al., 2016).

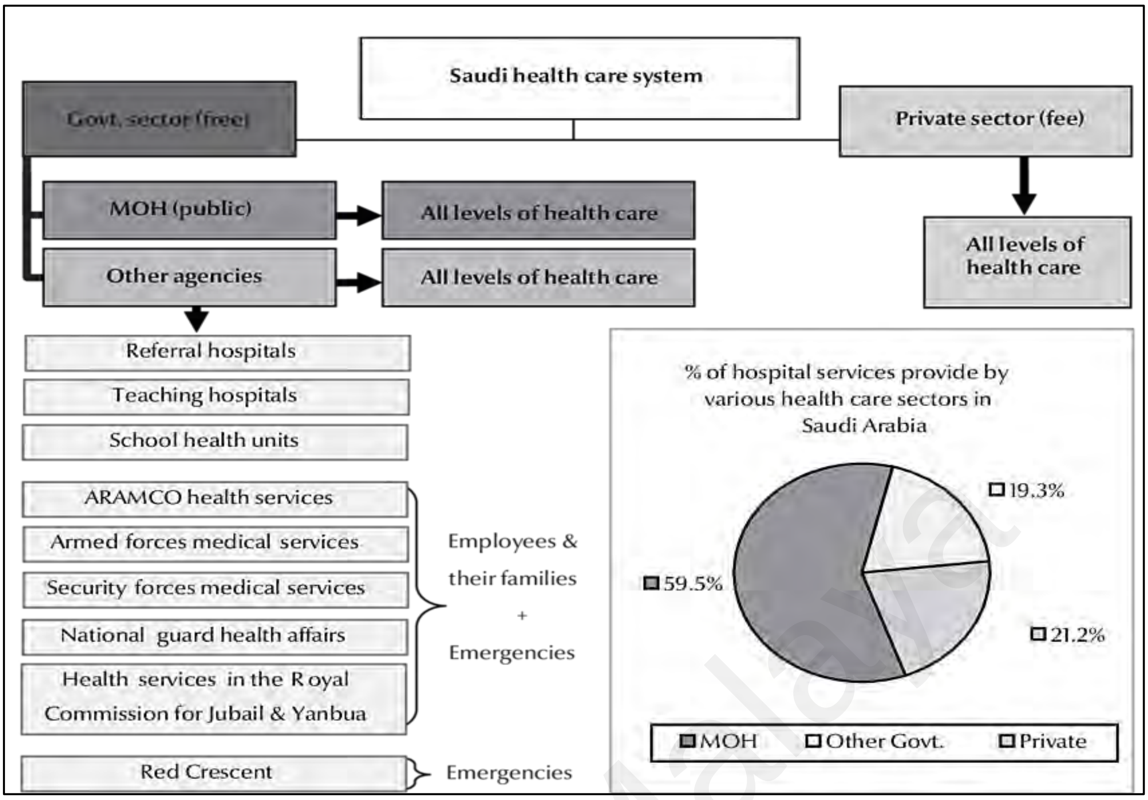

Figure 2.1: Saudi Health-Care System (Alomeer, 2016)

The “KSA health-care system” is known worldwide for having achieved several highly regarded achievements. “Historically, KSA's health services began in 1926 with the establishment of the Health Department”, which tasked with providing health care to KSA citizens (Alharbi, 2018). The Saudi government created the MoH in 1954. Saudi Arabia is regarded as the world's largest oil exporter, and 90% of all Saudi exports are oil. It has been the mainstay of the Saudi economy since the oil discovery in Saudi Arabia in 1970. The oil wealth has created an incentive for the Saudi Government to develop health services (Alharbi, 2018). The National Guard Health Affairs (NGHA) was awarded the Excellence Award in Electronic Health Records at the Arab Health Conference Middle East in 2014 (Meshal et al., 2015). However, the recent research studies indicated that most HCIs, as public hospitals in KSA, are still using a paper-based health record system (Hasanain et al., 2015; Hasanain & Cooper, 2014).

In terms of strategy, the slow rate of HIS adoption permeates KSA despite widespread hospital steps in all health-care sectors to upgrade their infrastructure, including HIS (Alharbi, 2018). A lack of defining challenges and designing solutions has had an accumulative effect. Some researchers have analysed the obstructing factors HIS, infrastructure improvements, especially in public hospitals (Hasanain, 2015). At the same time, the national conversation on strategies for improving "SHCIs" continues. Much research over the past decade has highlighted the minimal use of HIS recognizing that inadequate HIS infrastructure poses a challenge to all improvements in HCIs (Alharbi & Ali, 2018; Almuayqil et al., 2015).

However, according to Hasanain et al. (2015) and Alkathiri (2016), various targeting initiatives HIS such as EMR have not been coordinated or co-operated with the implementation and improvements, (2) have increased the number of patients treated in the hospital, (3) as well as the doctor's long working hours and insufficient time to use the system, which explains the weak EMR dependence, (4) Hospital systems where 84.21% (16 out of 19) of the surveyed hospitals did not implement any EMR. In contrast, EMR (5) successful HIS as EMR implementation requires data security, central agency role, and implementation coordination (Alkathiri, 2016; Hasanain et al., 2015). These studies have described the adoption of HIS in KSA. The research attempted to identify the factors that hindered and become IT barriers as the HIS implementation in SHCIs. Figure 2.2 shows that the country is divided into health regions by the "MoH" (Alharthi, 2018).

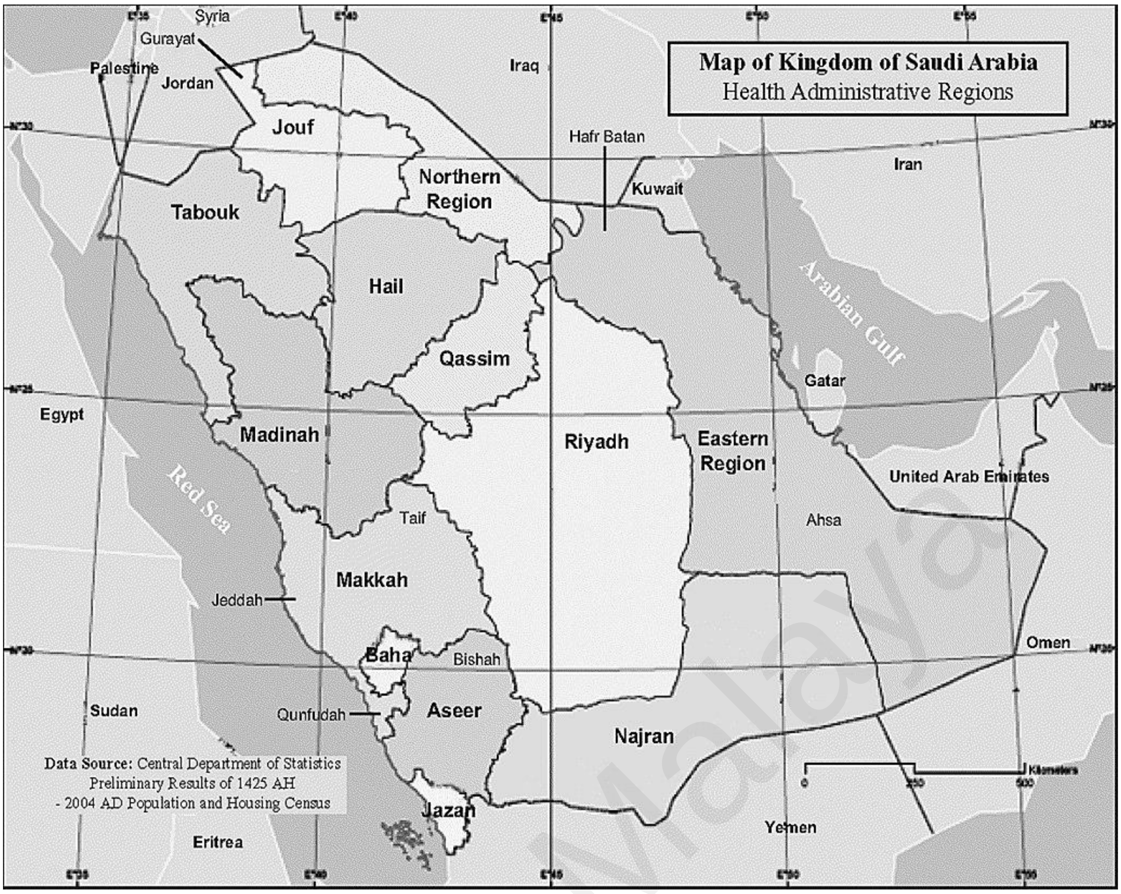

Figure 2.2: The Health Regions in the KSA

2.4 Technology Status in Saudi Health-Care Institutions

The introduction of information technology into Saudi Arabia's health centres and hospitals dates back to the 1970s. The “King Faisal Specialized Hospital” was the first hospital in the early 1970s where a HIS implemented. In 1988 IT infrastructure in the health sector was supported by adopting a national plan to develop IT in the health sector. Also responsible for Health Information Technology (HIT) was the IT Department within the “Ministry of Health (MoH)”. Subsequently, in 2000, “Saudi Arabia 's government” formed a health reform and improvement committee to assess the health-care system. The committee reported that one of the weak points in the existing health-care system is that no proper program and application is dealing with the health information technology sector (Alharbi et al., 2019; Al Otaibi, 2017). Also responsible for HIT was the IT

Department within the MoH. Subsequently, in 2000, Saudi Arabia's government formed a health reform and improvement committee to assess the health-care system.

The committee reported that one of the weak points in the existing health-care system is that no proper program and application is dealing with the health information technology sector (Alharbi et al., 2019; Al Otaibi, 2017). In 2002, this committee organized a particular group on the compilation of the HIT strategic plan, the primary purpose of which was to establish a national Search Results (Web results), Electronic Health Records (EHR). By assembling the curriculum, a Master's Degree in Health Informatics and Health Informatics Association was established. Some hospitals in the country have lacked mechanized information systems until 2005, and most hospitals have used specific information systems (Al Otaibi, 2017).

Therefore, until 2005, there was no link between hospitals and health-care centres. In 2006 and 2008, eHealth conferences were held that expressed HISs is a vital topic. The Government, therefore, began the operational phase of the national eHealth plan in 2008. Saudi Arabia's eHealth project divided into 100 sub-projects, one of the essential sub-projects was the HIS program entitled HIS strategy (Al Otaibi, 2017). The new HIS plan described all of the state's hospitals in terms of their beds and HISs. Some ranked HIS as a complete and comprehensive enterprise. Some with partial mechanization and some without computerized systems of knowledge. Three HISs vendors were approved at the national level by HIS requirements given by the MOH.

It is also expected that these three HIS would be set up in the country by the end of the sixth year during a ten-year "e-health" project to connect with other health centres and the Ministry of Health's data centre. Siemens, Health-care Information and Management Systems Society (HIMSS), and (I-clinic) are some of the HISs businesses active in this country (Al Otaibi, 2017). Additionally, HIMSS, in cooperation with a local partner

(Computer and Electronics Equipment Company) (Al-Qurashi, 2017), has launched its HIS software in 30 hospitals over 24 months since 2008. Connecting between these systems was considered one of these company's essential activities from 2010 to 2020. Now, HIS is being introduced in most hospitals (more than 200 hospitals and clinics), having interconnected a few sections (Noor, 2019; Al Otaibi, 2017).

2.5 Hospital Information Systems

The Hospital Information System (Plakosh et al., 1999) is an interoperable information system used for internal operations such as planning and patient care information requirements (Chen, 2019). In other words, HIS is a system that can assist all hospital activities, including administrative, clinical, and financial activities (Higman et al., 2019). Initial HISs devoted more attention to hospital economic and organizational problems. However, due to changes in the health care system, including changes in hospital insurance coverage systems, clinical difficulties for the patient were considered in HIS's design in the 1980s. Therefore, the systems' designers started to push towards Electronic Patient Record (EPR) (Chen, 2019).

However, because of hospitals' information-oriented existence, technology like HIS is unavoidable for them (Nichols, 2017). It is complicated to envision how health-care services without computerized information systems are provided to outpatients and inpatients. Even temporary inactivity of a hospital's information network can cause bustle and disarray, which will significantly affect hospital management. Furthermore, HIS plays an essential part in the hospital budget. Approximately 2–5% of the hospital operating budget is usually devoted to HIS (Yaman et al., 2016). Research also shows that hospital staff spends much of their time sharing information and recording administrative take-ups, but their time is spent on clinical tasks (Tai-Seale et al., 2017).

Since HIS influences all hospital sectors and facilities, comprehensive planning and efficient design can produce satisfactory HIS implementation results (Liang et al., 2017). The rapid growth of IT, especially in health-care and HIS, has led to the transformation of the health-care delivery system in developing countries of the Arab states (Al-Radaideh & Alazzam, 2020). According to Vallmuur et al. (2014) and Alharbi (2018), such systems' adoption rate is still low despite the positive effects of the HIS in HCIs and meets healthcare professionals' resistance. Barriers come up as they approach policies' implementation (Alharbi, 2018; Hasanain et al., 2014). Alharbi 's study (2018) reported that while HIS used as Electronic Health Records (EHR) in a few hospitals in KSA. These hospitals still face challenges when the implementation process is completed, mainly related to dedicated budgets and technological and administrative barriers (Alharbi, 2018; Hasanain & Cooper, 2014). Although technological problems pose challenges to Saudi health care, they pose a specific threat to the implementation of the EHR. Health-care researchers typically express concern about the extent of current HIS that stifles progress in health-care. Another study by Alharbi (2018), exposed that HIS infrastructure and social challenges in "Saudi Arabia" are considered the most significant barriers to EHR implementation (Alharbi, 2018). This study (Alharbi & Ali, 2018) recommended that further investigation and planning on the value of EHR was needed to overcome these barriers, particularly in improving knowledge among health-care professionals who handle patient records. Given the study by Alharbi (2018), found that most Saudi health-care institutions were totally dependent on conventional manual paper methods for tracking patients, or using non-integrated software tools, such as software for patient admissions (Alharbi, 2018).

The study found that most SHCIs were dependent on traditional manual paper methods of patient recording keeping or used non-integrated software tools, such as patient admissions software. The author, Alharbi, revealed that of nineteen public hospitals in the Eastern Province of Saudi Arabia participating in their comparative study, only three used HIS as EHR, representing 15.8 % of the study sites. These three hospitals implemented standardized EHR with success. In implementing EHR, they identified the major challenge facing these hospitals as a lack of interaction between physicians and nurses (Alharbi, 2018).

The research by Alharbi et al. (2016a) stated concluded that the presence of electronic health-care is vital in KSA for the following reasons (Alharbi et al., 2016a): (1) the majority of HCIs and hospitals are still using patient information on paper; (2) the amount of health-related information has increased significantly; however, incompatible systems, with little to no interoperability, accumulate disconnected lakes of information in various health sectors and hospitals; (3) The majority of current information systems are of an administrative nature, rather than patient-focused life. Saudi health-care systems are based on the organization rather than patient-oriented. Additionally, recently, researchers focused on the problems facing the project activities of EHR in KSA public hospitals. Mahalli 's study (2015) discussed the barriers nurses face using EHR at three public hospitals in KSA's Eastern Province, where the system had already been implemented.

The study found that loss of to access HIS was considered the most common barrier in the case of a computer or power failure. Additional obstacles listed included a lack of quality training and support for staff in hospitals dealing with IT. That indicates a lack of awareness of nursing staff's care needs in the management and administrative sectors. The study recommended creating an EHR committee to highlight employees' problems using EHR (Mahalli, 2015). According to Alharbi (2018), the lower HIT public hospital infrastructure in Saudi Arabia compared to other government hospitals impeded HIS and EHR adoption.

Although the noted that some other government hospitals ultimately introduced the "Integrated Hospital EHR," there was a significant delay in overcoming obstacles facing the implementation phase in MoH hospitals. The results recommend that the MoH improve health-care services needed to overcome specific individual challenges. Which included a shortage of workers, a lack of an integrated program, and a generally negative attitude towards implementing EHR from doctors. (Alharbi, 2018). In 2009, under the Saudi Health Council's governance, the MoH launched a national plan to remove such stumbling blocks. The eHealth Strategy is another strategy implemented by the MoH to improve the quality of health care services (Alharbi, 2018).

According to Alqahani, Crowder, and Wills stated, doctors' expectations on the introduction of EHR were already surveyed in SHCIs (Alqahtani et al., 2017; Group, 2017). The study results also mentioned resistance from hospital directors and health decision-makers to the implementation phase and technical and training issues. Nevertheless, both earlier and later studies indicate that EHR is still in the early stages of KSA implementation. Hasanain and Vallmuur (2015) contended that lack of knowledge formed the basis for resistance of health care professionals and doctors to HISs as EHR. Also, the HISs are one of the most critical information systems in the health-care sector; on the other hand, there is limited information on the situation of HISs in Arab countries. Therefore, this research aimed to highlight the position and interventions of HISs in KSA, a case study to represent the strategies and activities undertaken in this case.

2.6 Migration from Hospital Information Systems to eHealth

eHealth includes various programs, frameworks, and services. Every plan has different functions and different viewpoints of the stakeholders. eHealth or HIT offers multiple benefits for patients and HCIs. It facilitates the sharing of information between patients, doctors, and other clinicians. The HIT implementation in hospitals improves health care quality and safety (Cunningham et al., 2014). eHealth also eliminates errors in medical procedures in humans. Many eHealth apps have been used as a tool for patients and doctors to inform and improve their behaviours' (Cunningham et al., 2014). Throughout this context, eHealth applications are also the technology and services that manage, transmit, store or record information used in the delivery, payment, or record-keeping of health-care treatments (Ross et al., 2016). "eHealth" applications typically use the internet to transmit and store patient data either to a provider or payer. Whereas those applications such as HIT, HIS, and EMR. These HISs are used under different names in different departments of a hospital and with varying services of health-care —several examples of hospital medical (IS include IS, RIS, LIS, and PACS).

1. These systems use efficient processes to meet departmental needs in providing health-care information to medical personnel (Peck, 2017). World Health Organization describes eHealth as an integrated use of electronic communication and information technology (Nwaomah, 2017). eHealth is the electronic transfer of health services and health care. Improved access to health-care information via the Internet and telecommunications to health professionals and health consumers (Baniode & Hamdan, 2014).
2. We are using the power of IT and e-commerce to improve public health services, for example, through the training and education of health workers.
3. To use e-commerce and e-business practices in the management of health-care systems.

eHealth offers a new way of using health resources-such as information, money, and medicines-and should help improve the efficient use of these resources in time. The Internet also provides a new medium for disseminating information, interaction, and collaboration between institutions, health professionals, health-care providers, and the public (Baniode & Hamdan, 2014). In many ways, eHealth has been defined, but there is still no consensus on a specific definition. That is due to its omnipresent and dynamic nature-information about eHealth commonly used with various meanings and intentions. However, according to Hu and Bai (2014), eHealth has been described as "the cost-effective and safe use of information and communication technologies to support health and health-related areas, including health services, health surveillance, health education, awareness, and research" (Hu & Bai, 2014). The purpose of eHealth is to improve health-care cooperation and coordination to improve the quality of care and, at the same time, reducing care costs.

While technology contributes to the organizational structure and progress of hospital health-care, the resistance against the use of new technologies makes people unable to adopt the technology. The adoption of technology has created many problems (Al Mustanyir, 2019; Alharbi, 2018; Alharbi et al., 2017a; Alomeer, 2016; Hasanain, 2015). Health-care providers in hospitals cannot necessarily embrace new health-care technologies that modify their traditional concepts of operation. Appropriate evidence supports the hypothesis that health care practitioners cannot consider and use clinical IT, which interferes with their everyday work activities (Alharbi, 2018). Adoption is the process that "involves the multitude of activities, decisions, and assessments that encompass the broad effort to successfully integrate an innovation such as technology into a formal organization's functional structure" (Hall GE, 1973). A model of adoption provides a simplistic and restricted description of the dynamic integration process over time.

Includes the dynamic socio-technical aspects of information systems that occur over time, from initial implementation to incorporation into action. Adoption models should have several standard features considered an adoption model, although they can be quite different. These are: (a) they describe many dimensions associated with adoption; (b) they are intended for a specific audience; (c) they allow variability in the assessment. Hold the promise to transform health care in this context HIS; however, they challenged adoption and acceptance. The HIS identified one of the main instruments for transforming and improving the quality of our health-care systems. However, the potential of such transformational methods has not been consistently seen, and significant acceptance remains weak in many jurisdictions.

HIS implementation has met with an extensive range of results, ranging from benchmark achievements leading to treatment changes, never being applied in a clinical setting. HIS's adoption has become a significant and growing issue in health-care and a considerable challenge to be addressed. Approaches open to the people designing and implementing these programs need to be better explained and understood. In this situation, “Nilashi and Ibrahim (2015)” stated that the organizational issues surrounding the implementation of technology in health-care settings are critical but have not yet received adequate research attention (Ahmadi, Nilashi, et al., 2015). “Hasanain and Cooper (2014)” discovered social factors such as language and opposition to the use of modern technologies in Saudi hospitals impaired EMR implementation.

We also listed other technological obstacles, such as instability of EMR, vendors, and a lack of staff devices. The deployment of eHealth services in KSA is still experiencing difficulties as a result of these barriers. However, some success stories, such as the King Faisal Specialist Hospital and Research Centre (KFSH&RC), have introduced a program EMR almost absolutely (Hasanain & Cooper, 2014). Notwithstanding the many such impediments, Saudi Arabia's health-care providers expressed a willingness to the appliance and enhance eHealth services (AlBar et al., 2019). It creates a basis for using new technologies and models that can advance them, such as adopting cloud computing.

Furthermore, though it is one of the policymakers' main significances, seeking to enhance the health-care system; however, many concerns face traditional HCIs, such as increasing human life expectancy. Saudi Arabia's life expectancy in the KSA is 75.22 years in 2020 and 74.65 years in 2015. Although it is 81.4 years in 2020 in the UK and 81.2 years in 2015 and 80.3 years in 2020 in Qatar, and 79.76 years in 2015. “Also, in the USA, it is recorded 78.93 years in 2015 is 79.3 years in 2020, whereas the UAE was registered 78.03 years in 2020 and 74.28 years in 2015”, respectively Figure 2.3 shows a contrast between the life expectancy for the years 2015 and 2020 in the five countries (Scherbov et al., 2020).

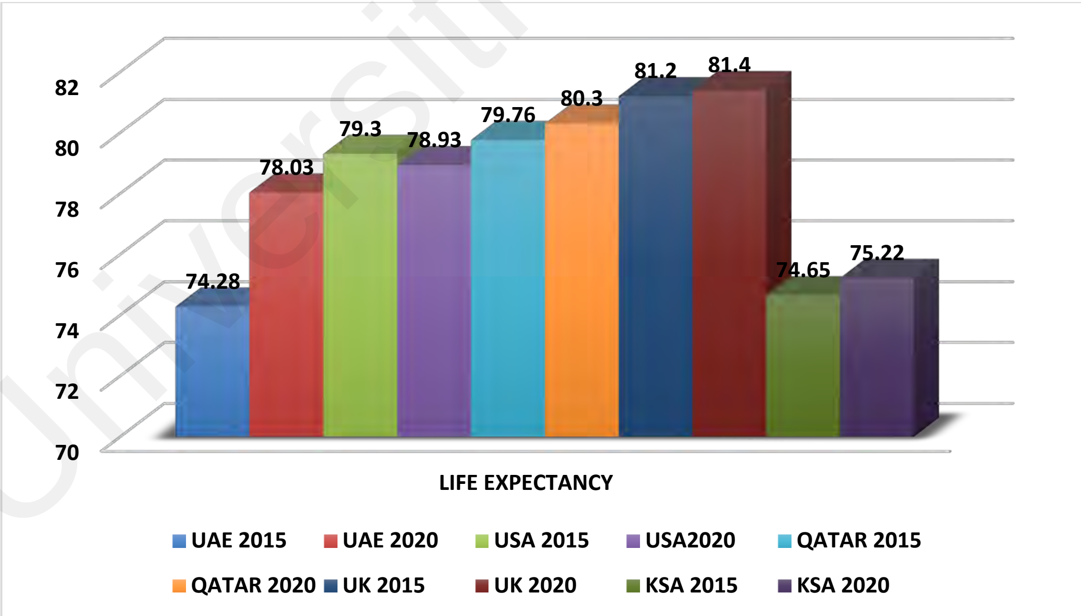

Figure 2.3: Comparative Analysis of Life Expectancies in 5 Countries bet. 2015 -2020 (Scherbov et al., 2020)

Several measures have been put in motion to tackle these issues and find ways to improve the health-care system, such as privatizing health-care systems and moving towards preventive health-care. Some other program uses information and communication technologies to offer health-care additional efficiently and effectively within HCIs. The term eHealth refers to this movement toward the application of IT in health-care systems (Sneha & Straub, 2017). eHealth, when "a growing field in the interplay of medical informatics, public health, and business, responding to health services and information provided or significantly improved via the Internet and related technologies (Øvrelid et al., 2017). In the broader sense, the term characterizes not only a technical development but also a state of mind, a way of thinking, a behaviour, and a commitment to networked, global thinking to improve health-care regionally, locally, and worldwide through the use of information and communication technology (Casanovas et al., 2017). In this study, this concept is preferred since it takes eHealth beyond the technical dimension. It includes many topics, such as corporate and organizational problems, that can impact health-care. Although a new technology such as cloud computing adoption is presented in this definition also fits well in eHealth (Senyo et al., 2018).

Also, eHealth covers multiple technologies, programs, and facilities, and its scope includes the use of IT in the health system. Furthermore, the “Health Information Technology (HIT), Economic and Clinical Health (HITECH),” and “health information technology” defined as “hardware, software, integrated technologies or related licenses, intellectual property, upgrades” (Kruse et al., 2016) or integrated solutions provided as services designed or assisted for the electronic development, management, access or sharing of health information by HCIs or patients”. Although the HIT, in many ways, intersects with eHealth such that the words eHealth and HIT can be used exchangeable in science (Sittig & Singh, 2015). Different eHealth systems have different roles and viewpoints of various stakeholders (Ross et al., 2016). Finally, Figure 2.4 shows that detailed insight into various eHealth systems and applications have provided, and Table 2.2 provides eHealth systems description.

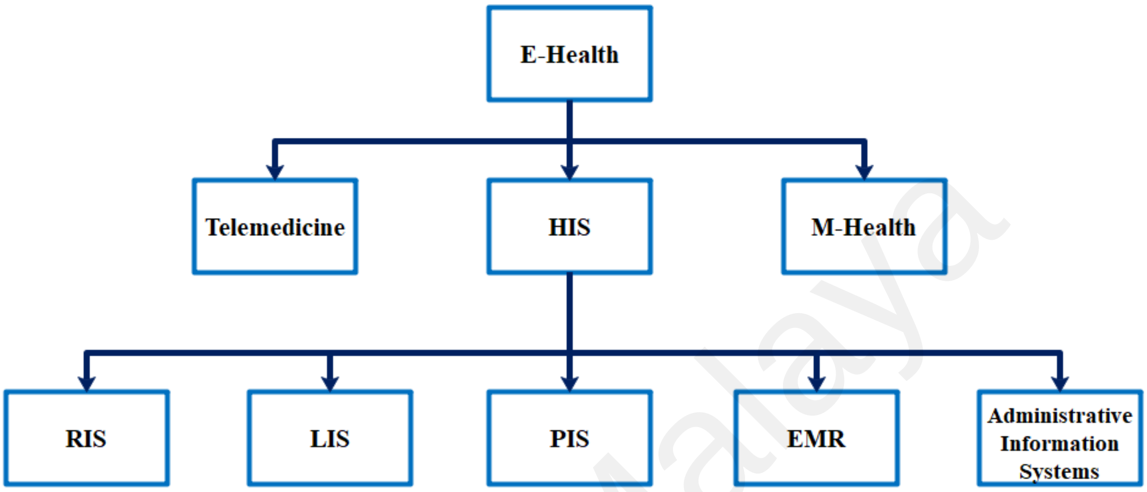

Figure 2.4: Overview of Different eHealth Systems and Applications

Table 2.2: HIS Related Studies

Types	Description	References
Information Systems	It is centered on patients that are digital forms for patient information like "Electronic Medical Record (Abdulaziz et al., 2019) and Electronic Health Record (EHR)."	(Morrow et al., 2017)
Managerial Information Systems	That supports the organizational duties like admission, discharge, and scheduling of patients within health-care institutions. The systems may also handle many processes associated with economic processes like billing, filing, hiring, employees, and other management features.	(Wager et al., 2017)
Radiology Information System (RIS),	Which supports the administration and loading of "radiological" desires, as well as organizational processes, are connecting to the "radiology department".	(Sołtysik, 2016)
Laboratory Information System (LIS)	That maintains samples and laboratory tests, records, and stores them.	(Kebede, 2017)
Pharmacy Information System (Pişirir et al.)	That also accomplishes and optimizes medicines' prescribing and calls doctors to any prescribed medication's adverse effects.	(Bayati et al., 2017)

Types	Description	References
Clinical Decision Support System (CDSS)	Mostly analyses assess the patients' information' to provide clinical decision-making.	(Butler et al., 2015)
Hospital Information System	Incorporates numerous systems to provide complete information of the hospital' to meet all the hospital requirements, including clinical and non-clinical information.	(Hertin & Al-Sanjary, 2018)
Mobile Health (M-health),	It refers to the provision of mobile-based health-care services. M-health applications may be part of the (HIS) or be separate applications such as applications for tracking physical activity, diet applications, and smoking cessation applications.	(Alaiad et al., 2019)
Telemedicine	The use of information technologies for the exchange of health information and the provision of distant health services.	(Omboni et al., 2016)

2.6.1 eHealth Advantage

eHealth offers numerous advantages to HCIs and patients (Yusif et al., 2017), as described below:

- **Enhancing Information Sharing:** eHealth enables novel ways of sharing and managing information of patients among HCIs. The use of EHR allows patient information to be transferred immediately, minimizing the long waiting times associated with traditional methods (Ross et al., 2016). It also enables patients to monitor their online laboratory and other findings and recordings and information on a new treatment, allowing them to update their health-care. eHealth services such as monitoring systems may help control chronic diseases and assist an older consumer with health-care issues without the need for frequent HCIs visits (Andrès et al., 2015).

- **Enhancing Health-Care Quality:** eHealth can improve health-care excellence by giving health care specialists relevant information (Leslie et al., 2018). The clinical decision support system increases access for health-care practitioners to correct clinical information based on a registry of clinical knowledge, thereby enhancing clinical decision-making (Haff & Choudhry, 2018). Furthermore, where the EHR, the system improves health-care quality by eliminating dual efforts, as the patient is not expected to perform the same examination in different health-care facilities for the same health problems (Miotto et al., 2016).
- **Enhancing Health-Care Safety:** eHealth can enhance patient-safety in many methods (Nemeth, 2017). The E-prescribing system gives physicians true-time warnings about potential adverse drug interactions and reduces medication errors, usually resulting from manual prescriptions (Kellogg et al., 2017).
- **Medium for Education and Behaviour Change:** a lot of eHealth implementation has been applied as a medium for both patients and doctors to educate and change their behaviour (Sheeran et al., 2017). These technologies were used as influential media to promote the transition to a patient-centred health-care system that emphasizes patient involvement in their health-care and increased preventive care delivery (Carman & Workman, 2017). For example, mobile applications are deployed to provide alert messages to patients or even monitor behavioural changes towards particular issues (e.g., diet, fitness) (Asarnow et al., 2017).

2.6.2 eHealth Challenges

Several problems are facing existing eHealth activities, from innovation to implementation. As presented in Figure 2.5, eHealth programs' challenges can be classified into five general categories: “Economic, Technological, Organizational, Behavioural and Environmental” (Hoque et al., 2016).

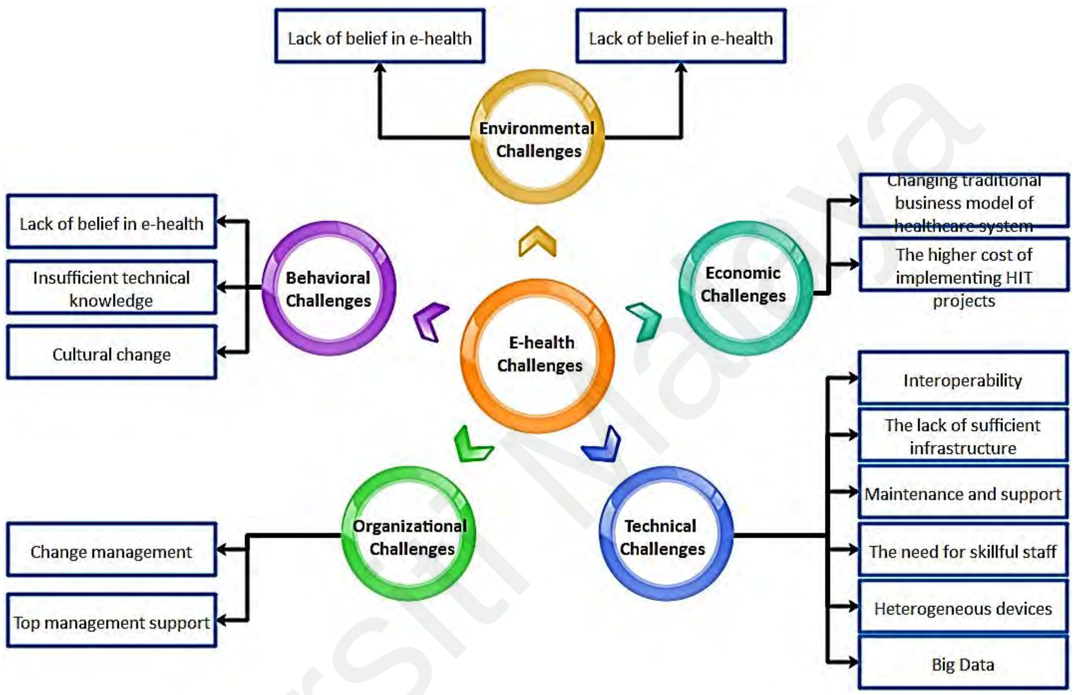

Figure 2.5: Overview of the Challenges for eHealth

2.6.2.1 Economic Challenges

The transform from the health-care system's traditional business model is a critical challenge facing eHealth (Alharbi et al., 2015). The present health-care system is doctor-centred, reactive, and concerned about the disease; it should change to patient-centred, first, and preventive and concentrate on the quality of life and wellness. HIS is a vital component of the system of health-care (Shahmoradi, 2016). These devices have been in use worldwide for decades, particularly in the Middle East, for several years now (Uluç & Çiğdem, 2016). Many hospitals have started implementing HISs in KSA but are still facing several challenges. The operational, financial, and regulatory issues added to the problem (Kimble, 2015).

Because of the higher cost in terms of capital spending (CAPEX) and operational expenditure (OPEX), it is costly to use IT systems in health-care services (Bygstad & Hanseth, 2016). Capital spending includes acquisitions of equipment, construction IT, facilities, training, and program implementations (Cheruiyot, 2018). OPEX includes maintenance, software, system upgrades, storage, and data licensing (Zineldin & Vasicheva, 2017). Costs are higher in rural areas where the infrastructure to sustain small and medium-sized health centres is inadequate (Alharbi et al., 2015).

2.6.2.2 Technical Challenges

eHealth typically includes several health information forms (Gutierrez et al., 2017). The systems have to communicate throughout the organization or through various health-care providers (Barrett & Stephens, 2017). The provision of interoperability among sets systems is thus a significant problem for eHealth. For some areas, the lack of appropriate infrastructure is a challenge to eHealth services, especially in rural areas. Installation, maintenance, and replacement of IT. HCIs programs are challenging and demand additional effort (Gutierrez et al., 2017). For example, the existence of heterogeneous devices, “smartphones, laptops, and other mobile internet devices,” can also give eHealth applications complexity (Adler-Milstein & Jha, 2017). Big data is also a critical technological issue for health-care institutions, as the use of EHR systems and digital images, and another technology has created massive amounts of data (Hemingway et al., 2018). Big data is a significant problem for HCIs as it is challenging to store, protect, and evaluate massive amounts of data (C. Kruse et al., 2016).

2.6.2.3 Organizational Challenges

Adopting eHealth systems requires various change processes for professionals and patients at the user level and HCIs at the organizational level (Hennemann et al., 2017). They suggested that developing a robust, standard, and patriarchal health-care system could significantly affect eHealth adoption (Sharma & Mishra, 2017). Respectably established health-care organizations require a comprehensive review process before implementing any improvements due to patient safety issues, which can complicate the implementation of some eHealth projects (Ross et al., 2016). Health-care institutions need to re-engineer the patriarchal health-care system to facilitate the successful implementation of eHealth (Romanelli, 2016). Changes will also occur to health-care providers' working practices and routines, which will impact health-care services and related administrative processes (Alsadi & Saleh, 2019). Researchers, however, have avoided this issue. Assistance from senior management is also crucial to the general implementation of e-health, and this help can be delayed due to the high costs and other risks associated with HIT projects (González et al., 2018).

2.6.2.4 Behavioural Challenges

Using eHealth might affect several various people, including physicians, patients, IT, and administrative staff (De Grood et al., 2016). Lack of interest in eHealth's advantages may be a significant problem in its acceptance, and this uncertainty can result from neglect to consider relative benefits (Aardoom et al., 2016). Another obstacle to eHealth can be regarded as doctors with sophisticated technical information (Zayyad & Toycan, 2018). Besides, health-care professionals may be apprehensive about their competition intensifies, and this major worry could affect HIT implementation. Social changes such as changing the face-to-face communication between patient and health-care providers to a new form, using electronic communication (Ayers, 2018), can also be seen as an obstacle to the adoption of eHealth (Horton et al., 2018).

2.6.2.5 Environmental Challenges

Health-care providers, such as suppliers, insurance providers, patients, and government departments, have a tradition of collaborating with other stakeholders in the health-care sector (Luk, 2018). Therefore, eHealth's use will be affected by the various parties' relationship (Andersen et al., 2018). For example, health-care professionals may be worried that manufacturers will not be ready to provide a quality service in due time. Privacy and security are often seen as critical issues in the health-care sector for many stakeholders (Pussewalage & Oleshchuk, 2016).

2.7 eHealth in the Kingdom of Saudi Arabia (KSA)

The Government of Saudi Arabia acknowledges the importance of using IT to continue providing high-quality Saudi nationals services. As a result, 2005 involves the beginning of the first national E-government policy. As a result, many health-care providers have implemented particularly IT approaches within their facilities. The MoH initiated the National eHealth Plan in 2011 to support the primary business targets (Alharbi, Atkins, & Stanier, 2016b; MoH, 2011). However, the implementation of HIT is still reasonably small in SHCIs for several reasons (Juris Bennett et al., 2015). Implementation of IT in HCIs from the viewpoint of the physicians.

The researcher described the reasons as weak leadership, the deterioration of the infrastructure and technical support for the information system, and the lack of an implementation strategy (Aldosari, 2017a). The main barriers that impede the effective implementation of Electronic Medical Records (Abdulaziz et al., 2019) in KSA are factors related to human dimensions, such as a shortage of health informatics specialists (Alshahrani et al., 2019). Moreover, a lack of expertise in using computer applications and a lack of experience and knowledge in using EMR. The studies also mentioned that the second category of barriers that challenge EMR usage in Saudi hospitals is financial barriers, such as the high initial cost of introducing EMR and their high operational and maintenance costs (Aldosari, 2017b). They investigated challenges to Saudi Arabia's adoption of health data standards.

In addition to the hurdles, it may mean that issues related to the technology context such as complexity, accessibility, the complexity of the system, and insufficient IT infrastructure may impede the implementation of health data standards (Aldosari et al., 2018). That social factors such as language and opposition to the use of new systems in Saudi hospitals influenced the implementation of EMR (Al-Barnawi et al., 2019). They also listed some technological and environmental obstacles, such as EMR uncertainty, providers, and lack of staff computers. As a result of these barriers, Saudi Arabia's implementation of eHealth services still faces difficulties, and “75%” of the country's health-care IT projects have failed or are considered unfinished (Neamah et al., 2018). However, a few positive outcomes, such as the KFSH&RC that has introduced an EMR system almost entirely (Alfarra, 2015). Figure 2.6 illustrates Saudi Arabia's eHealth issues and highlights the five viewpoints that need to addressed when introducing emerging technologies in health-care institutions (Alsulame et al., 2016). Despite the challenges, however, Saudi Arabia's health-care professionals have shown an ability to implement and enhance eHealth services (Albar & Hoque, 2019b).

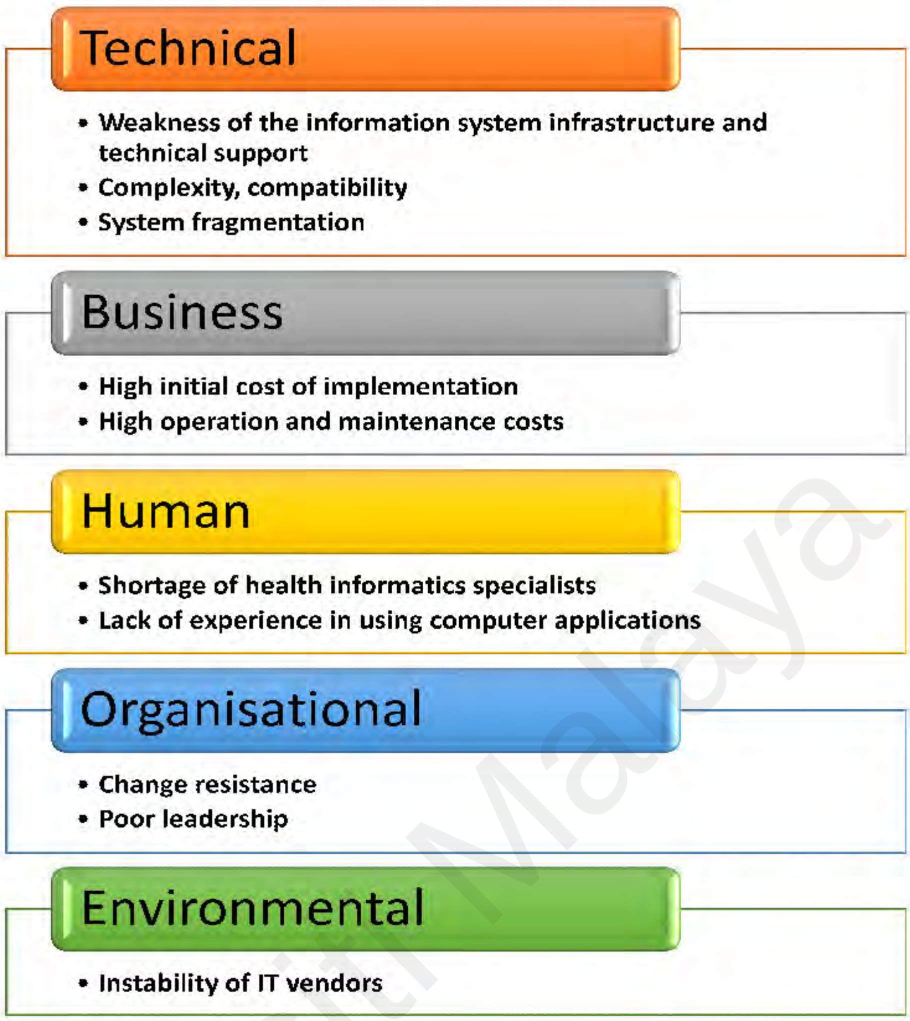

Figure 2.6: The Challenges in KSA Regarding eHealth

The KSA updated the digital health plan and was also developed by the "Ministry of Health (MoH)" to support Vision 2030 for the health-care sector. It was created to reflect: an update to the eHealth Strategy for 2017 (MoH, 2018). The goals are as follows:

A. Implementation of Vision 2030.

B. MoH 2.0 and Cluster autonomy.

C. The need for digital reinvention.

D. Rapid digital change.

2.7.1 Related Works for the CC Based on eHealth

Much research has addressed the decision-making processes for cloud computing in health-care and suggested four things that should be considered when implementing cloud computing for e-health: management, infrastructure, security, and legal (Chikhaoui et al., 2017). Nevertheless, the decision-making process had not focused on that model. Furthermore, the author (Gao et al., 2016a) suggested a technique for evaluating CC services' adoption based on the HOT-fit model in Chinese hospitals.

The literature and interviews formed the framework by Gao et al. However, when implementing CC, their framework was designed to test the degree of collaboration between health-care institutions and lacks certain facets of the decision-making process. The author (Harfoushi, 2016) applied the “TOE” method to research the factors influencing CC's adoption in Jordanian-hospitals. Moreover, all three viewpoints (i.e., technology, organization, and environment) changed CC's adoption.

However, their results unexamined how these variables affected the result to adopt CC and did not read the sub-factors of each perspective. Additionally, another author (Osman, 2016) analysed the factors affecting USA 9-1-1 Dispatch Centre Embracing Cloud Computing and found that competitive advantage, management support, funding, and firm size are CC adoption factors. Nevertheless, neglect human and environmental aspects. The author (Lian, 2017) investigated the quality-related factors affecting cloud computing's formal approval in Taiwanese hospitals based on the information systems' performance model.

The author found that knowledge consistency, the system's consistency, and trust influenced satisfaction using CC in hospitals. However, Lian's (2017) analysis concentrated only on factors related to quality and did not consider the decision-making activities. Some researchers suggest that CC is still in its early prototype stages in general and eHealth, mainly, and requires further work (Griebel et al., 2015; Lian, 2017). While there is much research in the health-care sector on CC, many of them focus on the operational level. Effective implementation of cloud computing in the health sector needs strategic planning to get the full benefits of this new paradigm (Alharbi et al., 2015).

2.7.2 Cloud Computing Based on eHealth in KSA

This section addressed CC in KSA, a context on which health-care applications in the country focused mainly.

2.7.2.1 Cloud Computing General View in KSA

The KSA is one of the most important IT Middle East markets, and the total IT investment in the country is forecast to reach $33.8 billion in 2017 (IDC, 2017). The KSA, the CC market, is projected to rise to $70 million in 2017 (Buller, 2016) and is forecast to reach $126.9 million in 2019 (Group, 2017). Figure 2.7 presented IT and CC's total KSA market for over four years (Group, 2017; Al-Helayyil et al., 2016). A reasonable reason indicates the extent between 2017 and 2019 refers to reducing the KSA government's budget due to the drop in oil prices. This budget may return to normal 2019 expenditure caused by government developers such as the Transformation Program 2020 (Vision, 2018).

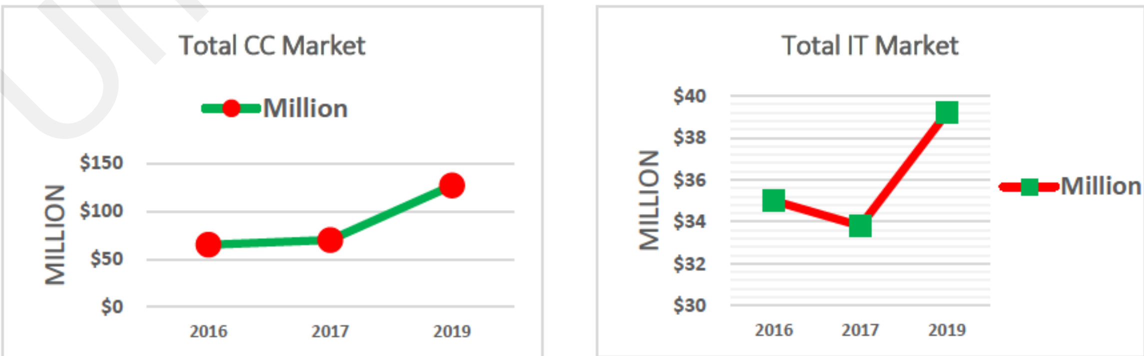

Figure 2.7: The Total Marketing of IT and CC in 4 Years at KSA (Al-Helayyil et al., 2016; Group, 2017)

In the KSA, the cloud computing sector is expected to grow further, reflecting Saudi government efforts to cut spending due to low oil prices and the advantages of future cost savings (IDC, 2017). The KSA Government established the Vision 2030 initiative to support transfer from an oil-based economy to a non-oil economy. As part of this initiative, the National Transformation Program 2020 (NTP) was announced Vision 2030 in 2016. The NTP aims to support digital transformation efforts and improve the efficiency of public sector organizations (Vision, 2018).

Moreover, IT innovations will play an essential role in fostering this transition by encouraging creative, cost-effective approaches (ALMutairi & Thuwaini, 2015). In particular, CC solutions can support policy programs by improving intergovernmental partnerships and offering other CC advantages. The KSA, however, has not yet undertaken a national CC initiative that could support the growth of CC.

2.7.2.2 The State of CC in KSA

Recent studies highlighted the lack of academic research on cloud computing CC in developing-country like the KSA, indicating the need for more research effort in this field. Some of the studies on CC in KSA shows in Table 2.3.

Table 2.3: CC Studies in KSA

Studies	Description	References
1	Study the factors that influence the adoption by higher education institutions based on Technology, Organization, and Environment model where three factors found to be significant: Relative Advantage, Data Privacy, and Complexity	(Tashkandi & Al-Jabri, 2015)
2	Cloud computing adoption by higher education institutions in Saudi Arabia: Analysis based on (TOE).	(Tashkandi & Al-Jabri, 2015)
3	A framework for the implementation of a private government cloud in KSA.	(Alkhlewi, 2018)
4	Critical issues for embracing cloud computing adopt a digital transformation: A study of the (KSA) public sector.	(Al-Ruithe et al., 2018)
5	Develop and assess a holistic framework and precocity evaluation tools for governance data based on the cloud computing system.	(Al-Ruithe, 2018)
6	Factors Affecting the Adoption of (HER), by Primary Health-care Physicians in Saudi Arabia: An Integrated Theoretical Framework.	(AlJarullah et al., 2018)
7	The Factors affecting (ERP), cloud computing adoption in (KSA): An empirical study.	(AlBar & Hoque, 2019a)

In sum, the previous studies have mainly looked into human and technology issues in general. This research looked at the collaborative effort by improvising the design of the present HISs using CC architecture (Alharbi et al., 2016a). The research results of recent studies show that cloud computing CC in KSA has received little attention, and little academic research has conducted a country-wide survey of CC implementation and, in particular, none in the context of Saudi health-care. In short, further work is required to study the CC adoption in KSA in wide-ranging in the HCIs in specific nowadays.

2.8 Cloud Computing

The ongoing development and advancement of IT have changed the way organizations conduct business. The IT sector has been going through many stages, beginning with mainframe computing and CC. While cloud computing is a new trend changing the information technology sector, the concept of overdue goes rear to the 1960s. John McCarthy had suggested the succeeding in 1961. Whereas computers like the ones encouraged are the computers of the future, then someday computing can be organized as a public utility just like the telephone system is a public service. The computer utility might become the foundation of a new and essential industry (Hosseinian et al., 2018; McCarthy, 1961). CC may be a model developed from previous paradigms in computing. According to Mosco (2015), the study indicated that computing development requires six distinct stages (Mosco, 2015), as shown in Figure 2.8.

1. Mainframe computing is the first step, where multiple users share a CPU through several terminals.
2. The second step is self-contained personal computers, where each user operates alone.
3. Personal computers are linked to individually other in step 3; this is named networking.

4. The networking activity is the fourth step of the Internet or network of networks.
5. The fifth step is network computing, where growing computing properties work together to accomplish different objectives.
6. The sixth, present, and evolving phase of computing is cloud computing, which is an advancement of grid computing (Botto-Tobar et al., 2017; Wang et al., 2016).

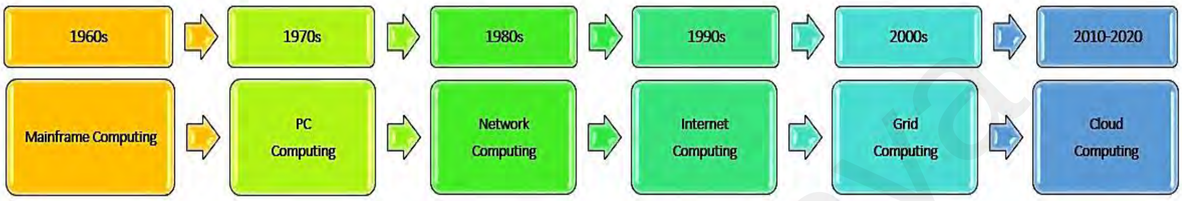

Figure 2.8: The Paradigm Shift for Computing

2.8.1 Cloud Computing: Definitions

Whereas there is no widely accepted definition of CC, some well-recognized descriptions for this are available. Cloud Computing at the US Department of Commerce has been defined by the National Institute of Standards and Technology (NIST). A model enables a common lake of configurable computing resources such as networks, servers, software, storage, and facilities to have universal, open, on-mandate network communication. That can effectively distribute and release minimal effort or commitment to management among service providers (Lynn et al., 2017). The interpretation, a NIST Definition of NIST Cloud Computing Special Publication (SP) 500-325 (Health, 2018), was published. However, the NIST concept considers only the technical viewpoint, ignoring a significant aspect of cloud computing, the business side (Iorga et al., 2017). Computing is the side of the business. (Wang et al., 2017), offered a Cloud Computing definition encompassing all the cloud features, defining it as A vast pool of virtualized tools, which are easy to use and usable (such as hardware, development platforms, and services). Such services can be dynamically re-configured to respond to a variable load (scale), allowing optimal services.

By reviewing Cloud Computing's definitions above, one can see that similar aspects are emphasized (Kaushik & Kumar, 2016; S. Liu et al., 2018). First, cloud computing is a model for IT infrastructure and resource delivery, not just modern technology. Secondly, computing resources are generated automatically and with a minimum of human interaction. Third, connectivity to the vast resource pool is over a network. Fourthly, the IT infrastructure and resources with dynamic optimization and elasticity are also available on demand. This research also illustrates how important it is to apply a holistic approach when addressing cloud computing problems, as this paradigm incorporates viewpoints besides technology.

Although no specific accepted CC definition, most of the descriptions emphasized similar aspects that CC provides IT services and resource delivery, minimizing users' interaction as cloud services are outsourced services and solutions (Hassan & Technology, 2020). Additionally, its dynamic scalability and elasticity, ubiquity, and flexible access model enabled minimum effort to manage the system or interact with the cloud service providers (CSPs) (Griebel et al., 2015). CC gained popularity replacing individual personal computers (Hripcsak et al.) with CC services having extensive IT infrastructure (Wang et al., 2016). Furthermore, the following subsections discussed cloud computing technologies.

2.8.2 Cloud Computing Technologies

CC is not just a stand-alone trend in the IT sector, and thus certain vital technologies should be clarified to promote CC understanding. This section offers an overview of the CC supporting technologies, as shown in Figure 2.9.

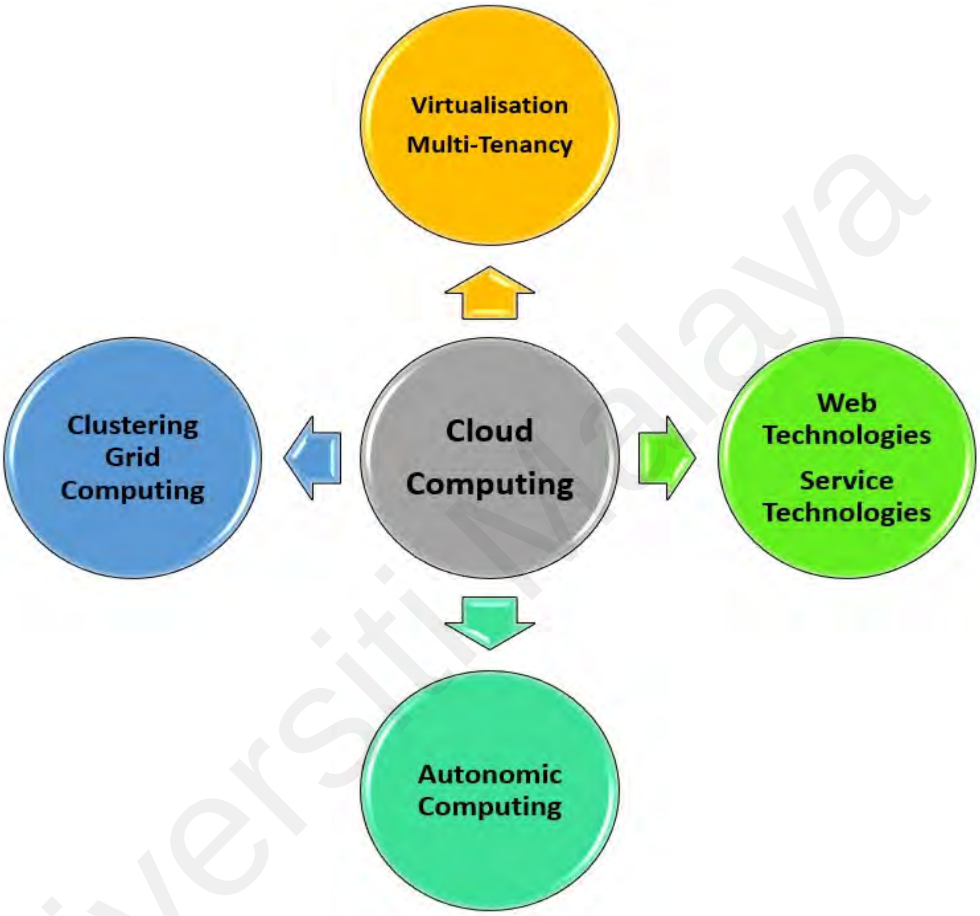

Figure 2.9: Empowerment Cloud Computing Technologies

Furthermore, CC technology has always been related to other technologies as listed below:

1. **Virtualization:** Virtualization is a crucial technology that motivates many of the features and frameworks of cloud computing. It functions as a mask that masks computing resources' physical characteristics to improve the usability of other devices, software, or end-users interacting with those resources. Moreover, IT means

multiple logical IT services. This technology provides many benefits, such as cost efficiency, elasticity, scalability, hardware independence, and customization. Several mental types of IT properties, like network, storage, servers, system, network, can be virtualized (Botta et al., 2016).

2. **Multi-Tenancy:** Multi-tenancy relates to a concept where a single instance of a particular piece of software runs on a server and can serve several customers (tenants) at once. CC is an essential part of this technology. It provides cost-effectiveness as it reduces maintenance and upgrade costs and facilitates personalized services for customers (Hajlaoui et al., 2017).
3. **Web Technologies:** Web technology is typically used to provide cloud services with management resources and a platform. Since these services are delivered via a Web browser over the network, the Standard Resource Identifiers (SRIs), Hypertext Transfer Protocol Protected (HTTPS), and Extensible Mark-up Language (XML) are some examples of necessary web technologies (Vitolo et al., 2015).
4. **Service Technologies:** CC's principal concept is to offer IT as services. Therefore, service technologies are vital to CC because it has provided a standard mechanism for service delivery (Marinescu, 2017). A web service is defined as a software system designed to support interoperable interaction between machines and machines over a network (Chen et al., 2017). Where, the Representational State Transfer (REST) and Simple Object Access Protocol (SOAP) are two examples of Web-based services (Razzaque et al., 2015). One type of related technology is the application programming interface (API), which relates to the communication between software and software (Kaplinger et al., 2018). Mashups are essential for CC, where data from multi-web providers are merged (Wang et al., 2018). The Google Maps application is an example of a mashup tool used to add location information to other applications

(Heath, 2018). CC service technologies are also essential since they provide interoperability (Ghahramani et al., 2017).

5. **Clustering:** A cluster is a group of independent IT resources connected to function as a single device (Messerli et al., 2017). This technology decreases device failure rates while increasing flexibility and readability, and cloud systems have these advantages at their core (Tarafdar et al., 2017).

6. **Grid Computing:** Most computing resources cooperate in grid computing to accomplish different goals, typically to solve computationally complex problems such as advanced scientific research problems (Hu et al., 2017). Besides, grid computing uses middleware software responsible for load balancing, monitoring, and handling configurations (Farahzadi et al., 2018; Hallawi et al., 2018). While cloud computing is recognized as a grid computing descendant, there are significant differences (Banditwattanawong et al., 2016). Although grid computing focuses mostly on multi-scientific concerns, ordinary small to medium business criteria drive cloud computing (Alharbi, 2017). Also, grid computing often aims to reach optimum processing power when Cloud Computing focuses on on-demand services where user-based scalability is up or down (Kansal & Chana, 2016).

7. **Autonomic Computing:** Autonomic computing aims at minimizing human contact with systems so that systems can work with minimal guidance from humans (de Visser et al., 2018). Autonomous computing principles may remove some cloud computing issues, such as privacy and protection (Parashar & Hariri, 2018). This technology would allow for the self-supply of resources, one of the (CC) key features (Abeywickrama & Ovaska, 2017).

2.8.3 Cloud Computing Components

CC provides information technology services by getting new operations that connect innovative technologies to offer organizations as users with information solutions using an attractive payment model. The components of CC shown in Table 2.4, according to the author (Masrom & Rahimli, 2015):

Table 2.4: The Components of Cloud Computing

Components	Description
Virtualization	Using the concept of partitioned and scalable infrastructure is provided for applications with virtualization
Computation	Included distributed computing and grid computing.
Connectivity	Spanned the Web.2 framework and application Service Level Agreement (SLA).
Architecture	Covered the Service-Oriented Architecture (SOA) implemented user application. CC provided services regularly in the form of web services.
Services	Whereas this term is defined as; infrastructure as service (IaaS), Platform as service (PaaS), and Software as service (SaaS). Cloud interacted with user applications and services through APIs.

The services provided by CC include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as Service (SaaS). Different users have different subschema views and resources, depending on the services chosen and payment model (Buyya et al., 2015; Sultan, 2014). Figure 2.10 shows the CC components.

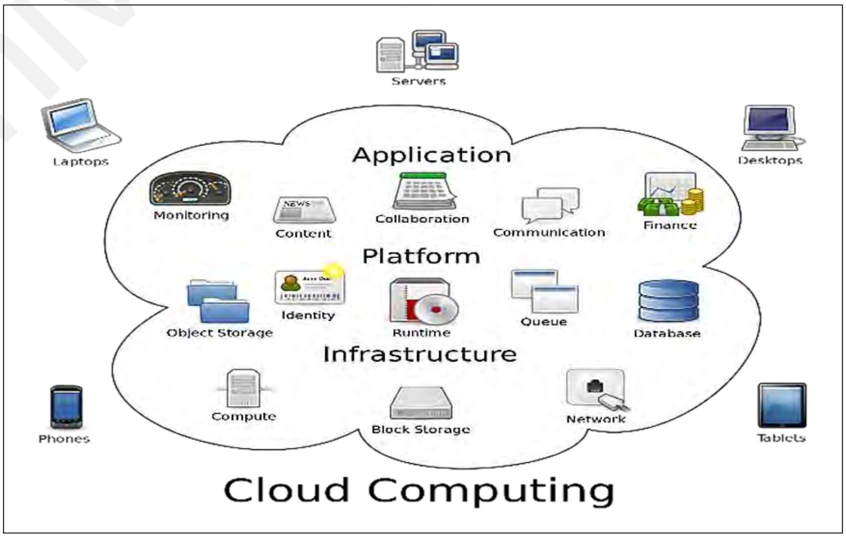

Figure 2.10: Cloud Computing Components (Nazir et al., 2015)

2.8.4 Cloud Computing: Deployment Models

There are four model types based on the classification of the NIST. CC deployment model, as shown in Figure 2.11, and the points below defined the phases as follows:

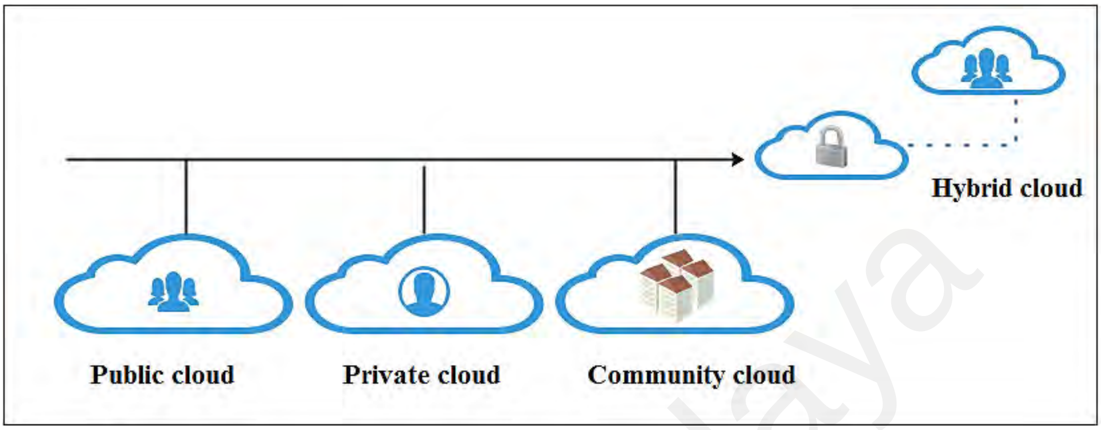

Figure 2.11: Cloud Computing Deployment Models

1. **Private Cloud:** Designed for private access, and its services are located on or off the organization's premises, often known as Internally Cloud.
2. **Public cloud:** The term is defined as a designed for public use and services located in the cloud provider's premises, also known as the external cloud.
3. **Hybrid Cloud:** this term is also defined as designed with various private, public, or community-based cloud infrastructures, also known as Virtual Private Cloud.
4. **Community Cloud:** This term can also run by third parties designed to use users in the community with the service facilities.

2.8.5 Cloud Computing: Service Models

1. **Infrastructure as a Service (IaaS):** allows users to use computing resources based on the virtualization concept. However, the users' underlying cloud infrastructure is prohibited (Buyya et al., 2015; Ghanghs & Sharma, 2016). IaaS examples include storage services provided by AmazonS3, Amazon EBS. Computation services: AmazonEC2 and Layered tech.
2. **Platform as a Service (PaaS):** an environment where users can use the available platform's applications and having user-cloud interaction. However, users are prohibited from the fundamental infrastructure, such as the servers, networks, or operating systems. However, (PaaS) is a term that included a service model dedicated to application developers, testers, developers, and administrators (Buyya et al., 2015; Ghanghs & Sharma, 2016). In contrast, used for software development, testing, and deployments such as Google App Engine (Salam et al.), Microsoft Azure, IBM Smart Cloud, Amazon EC2, salesforce.com, and jelastic.com.
3. **Software as a Service (SaaS):** users could use the provided available software applications and access using different client devices or a web browser such as a web-based email like Gmail. Figure 2.12 presents the CC service models.

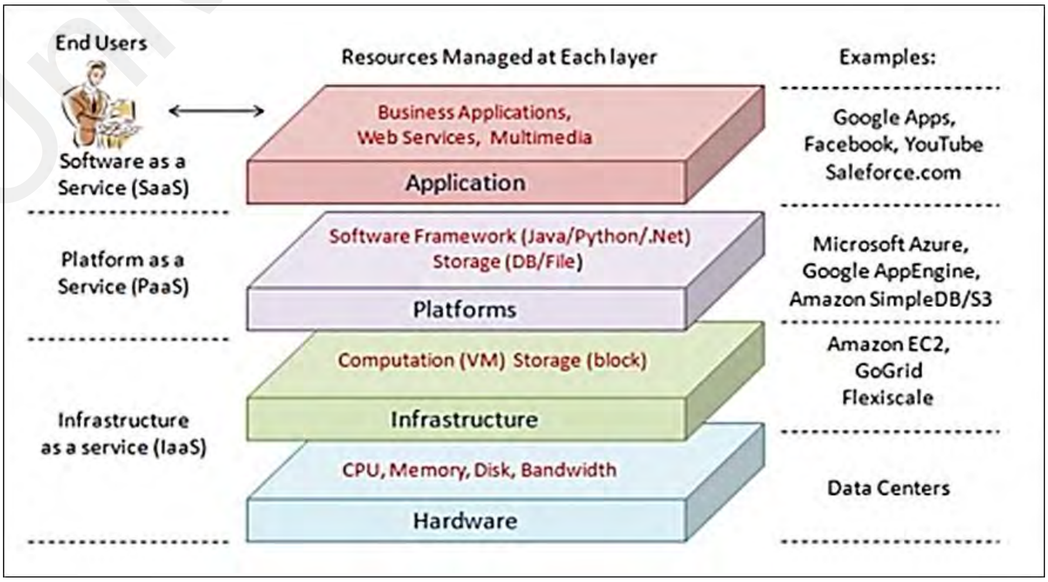

Figure 2.12: Cloud Computing Service Models

2.8.6 Key Characteristics of Cloud Computing

Cloud manufacturing is evolving as a modern development strategy and an advanced technology that aims to develop today's manufacturing industry into a service-oriented, highly collaborative, and creative manufacturing industry in the future. To get a deeper understanding of cloud efficiency (Ren et al., 2017). Moreover, the cloud contains a continually growing variety of tools and techniques, but cloud computing's key characteristics have always maintained the same (Chiregi & Navimipour, 2017).

Today's cloud computing ranges from IaaS to SaaS and so much more, including AI, servers, server-less databases, IoT, dedicated networking, analytics, business apps, and more (Branco et al., 2017). Increasing subset has its advantages and challenges; however, some key features are underpinning it all. Explore these 11 key cloud computing characteristics that help clarify why it is the go-to destination to develop and host innovative applications (TEAM, 2019; Velte & Velte, 2019). Furthermore, the key characteristics are listed as follows:

1. **On-demand self-service:** this term defined the accessing and manipulating of data without CSPs interaction where service will be adjusted automatically to meet these needs.
2. **Broad network access:** however, this term defined the accessing services through any Internet-capable device over the network. For instance, a cloud-based email user is assessing inbox mail using a smartphone to receive updated emails.
3. **Shared resource pooling:** Also, this term defined the sharing of storage, processing, and network bandwidth capabilities among customers.
4. **Rapid elasticity:** additionally, this term illustrated the resource allocation adjustment based on customers' needs.

5. **Measured services:** resources are measured by monitoring, controlling, and reporting their usage. Users pay based on the resources used.
6. **Multi-tenancy:** a tenant environment includes all or some selected enterprise architecture layers, from storage to user interface.
7. **Geo-distribution and ubiquitous network access:** allowing any Internet-connected device to access cloud services leveraging on geo-diversity.
8. **Service-oriented:** service-driven operating model where (IaaS, PaaS, and SaaS) are provided based on the SLA negotiation.
9. **Meanwhile, dynamic resource provisioning is** acquiring the resources based on the demand that allows minimizing operating cost.
10. **Self-organizing:** management using automated consumption of resources to address rapid demand due to flash crowd effect.
11. **Pricing based on utility use:** otherwise, the pricing is based on the pay-per-use model but may vary based on services and the number of clients it serves, allowing for better cost management.

Whereas CC seems to address economic and technological barriers (Hashem et al., 2015). In terms of system complexity, CC provided total cost ownership, flexibility, and availability of resources, allowing organizations with hassle-free technical issues, enabling them to pay attention to their core business (Shah & Gregar, 2019). Additionally, the medical experiments can do with the CC utility model's help and the available computation capabilities.

Furthermore, CC compelling adoption features in necessary dynamic resources and business environment due to (1) the power of storage capacities and ubiquitous access to resources at any time any place, (2) high flexibility, (3) resources scalability, (4) parallel processing, (5) security, (6) integration of data service with scalable data storage, (7) efficient management and minimization of costs like infrastructure maintenance cost and automation restriction and (8) user easy access (Griebel et al., 2015; Hashem et al., 2015; Armbrust et al., 2009). Figure 2.13 depicts the CC environment.

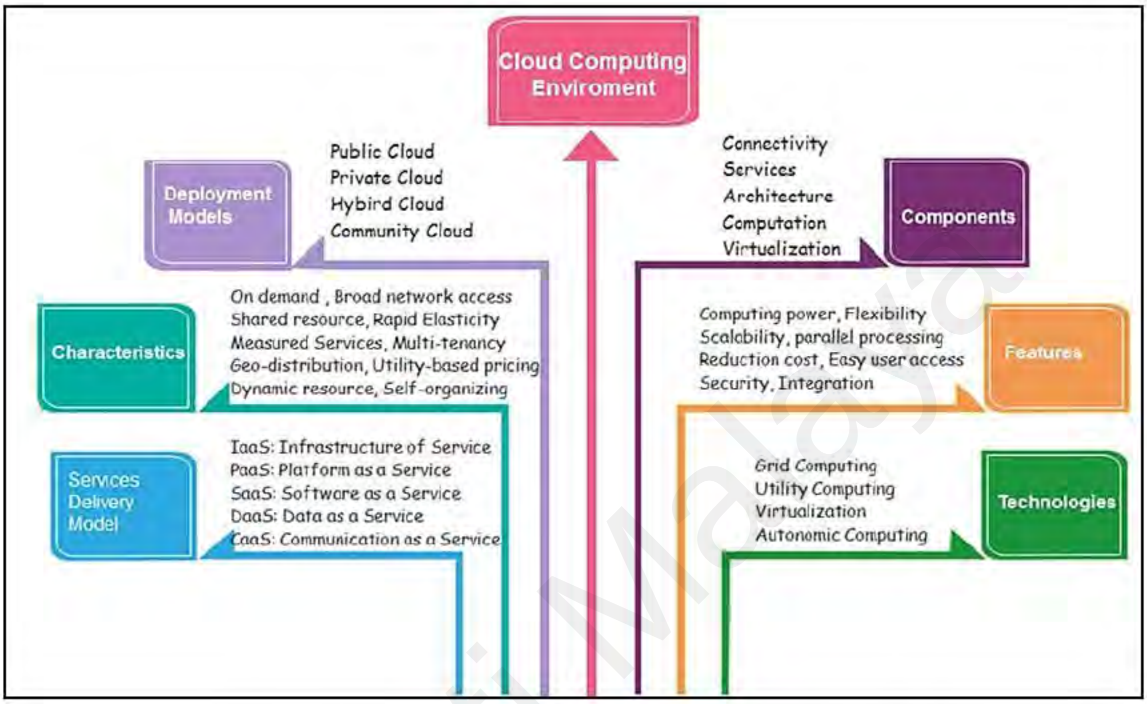

Figure 2.13: The Cloud Computing Environment

2.9 Studies of Adoption of Cloud Computing in Health-Care Institutions

CC responds to efficient data management using a versatile, scalable, and affordable platform that enabled data exchange between different systems to improve organizations' efficiency and productivity while minimizing costs (Youssef & Mostafa, 2019). However, despite CC's tremendous benefits (Masrom & Rahimli, 2015), the adoption rate is still low, with data security and privacy as the main issues. Therefore, the objective of this research was to investigate factors affecting the adoption of CC.

It is carried out using Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. Thus, it reported that health-care, based on CC, reached above the $5.4 billion U.S. dollars in 2016. The opportunities and advantages provide improved patient care, reduced cost, and enhanced research support (Alharbi et al., 2016a) even though privacy, security, data ownership, legislation, and standards are still problematic issues. The HCIs, therefore, requires a robust information network to remain cost-effective, efficient, and able to provide consistent and quality service. It can develop a creative health care information system using the CC architecture (Alharbi et al., 2016a). Also, the CC technology implementation desired to improve performance, as it provides information procurement and delivery services (Calabrese & Cannataro, 2015). Furthermore, that helps to minimize system complexity (Alharbi et al., 2016a). Therefore, these points are mentioned below as proof that the use of CC technology in the health-care information system supports the development service for the organization as follows (Meri et al., 2017):

1- Solves financial issues as it offers economic savings by outsourcing services (Alharbi et al., 2016a).

2- Reduces IT and health informatics staff (like technicians) shortage by having CC outsource services (Kadhum & Hasan, 2017).

3- Supports health-care staff to focus more on providing quality patients care (Wang et al., 2018)

4- Enables better management of HISs, allowing medical data integration and exchange across multiple organizations more accessible (Calabrese & Cannataro, 2015).

5- Facilitates enough adequate computing resources and handling massive eHealth data allowing collaborations of the departments (Weber et al., 2016).

6- It allows collaborations of technologies like the internet of things (IoT), m-Health, and big data; it suits and demands improved HIS. In comparison, the KSA population is expected to increase from (30 to 37 million) by 2030 (Denver, 2016; Iqbal et al., 2016).

7- Enhances of health-care information processing capabilities and capacity are using outsourced services (Alharbi et al., 2016a).

8- Facilitates real-time health-care information data analytics processing (Chakraborty & Ghosh, 2015).

CC minimized health-care information fragmentation and isolation problem in an environment of multi-stakeholders, technologies, and applications. Cloud computing elasticity enabled the scaling of IT services dynamically and rapidly during the Hajj seasons (Alharbi et al., 2016a). Hence, cloud computing services are deemed relevant to meet Saudi health-care demands (Al Otaibi, 2019; Alassafi et al., 2019). Cloud computing technologies enabled patients' quality of service to be improved and allowed staff collaboration (Almubarak, 2017). Where the association among medical staff can establish if there is an efficient communication system, and one of the factors for poor collaboration is weak computerized information systems (Reeves et al., 2017; Lancaster et al., 2015). Other factors causing poor collaboration initiatives are:

1- Decentralization of autonomous units and a lack of shared goals are due to health-care systems' fragmented nature (Petratos, 2018).

2- Poor system connections among HCIs are also issuing for these related work (Wager et al., 2017).

3- The traditional method of keeping information using paper-based systems is still being used in HCIs (Hasanain, 2015).

4- Nature of working style where medical staff work individually due to too many patients (Evans & Stoddart, 2017).

5- Socio-technical is the challenge faced by the staff (Soliman et al., 2018).

6- Resistance from the staff is causing reduced adoption rates of health-care information systems (Haddara & Staaby, 2018).

7- Also, the different terms are the complexity of the health-care environment (Braithwaite et al., 2017).

8- Weak health-care information systems and infrastructure are unable to cater to a massive amount of data generated from various systems (Lee et al., 2017).

9- High costs for developing and maintaining the health-care system led to weak, ineffective collaborative initiatives and a lack of technology adoption in a health-care environment (Gao et al., 2016b).

10- Privacy issues are the term, for example, trust, security, and privacy (Rashid & Yasin, 2015).

Many of these factors have caused weak collaboration efforts and a low adoption system rate. This research intends to add strategic values to the present existing health-care information system by improvising the current systems using CC architecture (Alharbi et al., 2016). HCIs can take advantage of CC evolution by strategically adopting the CC services model (Alharbi et al., 2016). A recent study (75% percent) of the chief information officers considered using CC in the future (Alharbi et al., 2016a).

2.9.1 Cloud Computing Adoption Challenges

CC innovation in IT contributes to improving health-care service quality in institutions like hospitals (Darwish et al., 2019). However, many barriers and challenges exist in the implementation and adoption of CC, which caused the low adoption rate of CC. These challenges include:

1- Providing automated service: minimizing its operational cost using resources based on on-demand capability but still satisfying the service level objectives (SLOs) (Patros et al., 2017).

2- Virtual Machine (VM) migration: allowing load balancing enabling robust and highly responsive provisioning across the data centre (Alsadie et al., 2017).

3- **Server consolidation:** this term involved maximizing resource utilization and minimizing energy consumption effectively (Abd et al., 2017).

4- **Energy management:** efficient energy management helps lower data centres' operating costs to meet the government's environmental standards and regulations (Schaltegger & Burritt, 2017).

5- **Management and analysis of traffic:** an essential aspect of the data centres that maximize customer experiences by having proper traffic management, analysis, and planning decisions (Fu et al., 2015).

6- **Privacy and security challenges:** issues of data and information that is private or confidential to avoid being misused, especially in an outsource environment like CC where there is uncertain security at all levels at network, host, application, and data levels (Mukherjee et al., 2017).

7- **Technologies storage and data management:** different file systems in the storage structure and data management in the CC environment instead of present HISs used. Storage structure, access pattern, and application programming interfaces such as in software frameworks like Map-Reduce and implementations like Hadoop and Dryad designed for distributed processing of data-intensive tasks operate on Internet-scale file systems as Google File System (GFS). Hadoop Distributed File System (HDFS) is different from the hospitals' method (Celesti et al., 2017).

8- **Novel cloud architectures:** most CC are currently operated centrally in large data centres; however, smaller data centres size can benefit from reducing costs by using less power, less expensive, and well distributed geographically. However, low data centre design and management can be challenging (Munir et al., 2017).

9- **Economic value:** also, this term illustrated the need to realized return on investment (ROI) on CC, indicating savings by minimizing costs and improving profits (Maresova et al., 2017).

10- **Quality of service:** needs improvement in delivering quality services by the CC service providers, especially concerning availability, performance, and scalability (Jelassi et al., 2017).

11- **Performance / Insufficient responsiveness over network:** suffers when the network bandwidth is insufficient as cloud services are still too bandwidth-intensive (Parajuli et al., 2017).

12- **Interoperability and integration:** need to improve systems integration as many CC applications have integration complexity with other cloud services. Application integration must be made simple, quick, and cost-effective (Shaashua & Shaashua, 2017).

13- **Reliability and Availability of Service:** systems must be readily available and contingency plans in place in disastrous or catastrophic failure, ensuring reliable services (Nazir et al., 2015).

14- **Political issues and global boundaries:** effects of physical data reside and may apply different privacy rules, regulation, and political view (Schotter et al., 2017).

15- **Data portability:** otherwise, this term defined the data transition ability between different clouds and vendors without interrupting the operations even if the vendor services have been terminated (Janal, 2017).

2.9.2 Issues About the Adoption of Cloud Computing

There are various CC adoption issues, especially relating to environmental, technical, and organizational issues (Alsanea, 2015). Some of the adoption issues discussed below:

2.9.2.1 Cost

CC the adoption must be cost-effective (Alsanea, 2015) in terms of money spend, space used, the number of staff employed, and maintenance cost. As a service that can be outsourced, CC services provide low cost but vast scale commodity resources; however, the cost can increase if hidden costs are causing possible reasons for rejecting CC adoption. High investment can also be the reason to use low adoption of CC services.

2.9.2.2 Reliability

Whereas, the system that can be dependable and experiencing less downtime is said to be reliable. The reliability of CC can be increase by minimizing the risk (Alsanea, 2015) such as software malware, bugs, and technical problems.

2.9.2.3 Security Concerns

In CC, security concerns can be found in the data and network itself, such as data access, data segregation, privacy, availability, and integrity. Cryptography techniques usually are used to solve cloud security issues (Ghanghs & Sharma, 2016) in addition to using the multi-core system. Staff training helps minimize security risks (Alsanea, 2015), such as a safe remote login.

2.9.2.4 Privacy Risk

The main concern of privacy risk is security holes that cause data blockage and manipulation, access of personal data and critical information without consent, and regulations and laws not met primarily when localizing cross border data (Ghanghs & Sharma, 2016; Rittinghouse & Ransome, 2016; Alsanea, 2015; Sen, 2015).

2.9.2.5 Availability

CC services need to be available and minimize downtime to attract more organizations into adopting its services. Reduced availability makes the systems less reliable service (Aldossary & Allen, 2016). Where significant improvement (Aldossary & Allen, 2016; Alsanea, 2015) needs to be made to avoid service failure (Somani et al., 2017).

2.9.2.6 Organization Size

Prior studies had shown that an organization's size has a negative relationship to cloud service due to its high structural inertia (Schneider & Sunyaev, 2016).

2.9.2.7 Trust

Trust between users and CC services improves CC adoption (Sharma et al., 2016).

2.9.2.8 Regulatory Concerns

CC vendors offer shared services to their users and are regulated to conform to the regulations and law (Alsanea, 2015).

2.9.3 Strengths, Weakness, Opportunities, And Threats (SWOT), Analysis

SWOT examination is a beneficial making plan method for assessing the strength, weaknesses, opportunities, and threats that the study involves. Identify the related factors which can be a positive or negative effect, which can be to reaching the goal according to the study objective. SWOT's primary mission is to contribute full information on all factors that can affect strategic planning and decision-making. This objective can extend to most areas of the industry. Health-care is preparing to migrate into the cloud computing world nowadays, so before entering into the health-care field, we need to understand the strengths, limitations, opportunities, and challenges of cloud computing services. The SWOT analysis might deliver some justifications for enhancing implementation and taking full advantage of success chances to the maximum. Table 2.5 shows the results of SWOT analysis for health-care CC solutions.

2.9.3.1 Strengths

CC solutions strengths in the health-care context are growing as indicated in recent studies (Doarn, 2019; Devadass et al., 2017; Devadass & Sekaran, 2017; Alharbi et al., 2016a; Alsanea, 2015; Masrom & Rahimli, 2015) involve: “cost efficiency, innovative and flexible, cost and consumption model simplification, enabled facilities, flexible and resilient disaster recovery, cost reduction of maintenance, convenient accessibility level, Improved resource control, independence of time and location, energy saving, environmental protection, friendly use, and expandability." Whereas two of the strengths are basic and essential as below:

- The use of CC solutions in health-care leads to a charge decrease because expenditure does not need to start. Health-care confronting a lack of adequate funding and the high costs cannot be sustainable either. Cloud computing can provide all of them.
- Convenient access to medical information anywhere contributes to improved communication between doctors and patients, thus raising patient service quality.

2.9.3.2 Weaknesses

The lack of particular strengths can see the weaknesses. Thus, the shortcomings of CC solutions in the health-care context as indicated in the recent studies (Doarn, 2019; Azeez & Vyver, 2019; Devadass et al., 2017; Devadass & Sekaran, 2017; Alharbi et al., 2016a; Alsanea, 2015; Masrom & Rahimli, 2015) contain: training requirement, high-speed internet access requirement, combined with local applications is extremely difficult. Lack of physical data control, lack of commitment to monitoring service quality and availability. Development of applications and increased dependency. Questions on protection and privacy. Although the vital drawback of CC solutions in the health-care context is as follows: implementing CC solutions within the health-care context is not a simple undertaking because there are many factors concerned in adopting and imposing them. They often rely more on the cloud service provider.

2.9.3.3 Opportunities

CC opportunities in the health-care context, as set out in recent studies (Mourya & Idrees, 2020; Doarn, 2019; Devadass & Sekaran, 2017; Alharbi et al., 2016a; Alsanea, 2015; Masrom & Rahimli, 2015), usually involve: consumer can use state-of-the-art technology, deliver innovative customer support, efficient and fast problem-solving, good for the health-care sector as they handle change with incremental investment, standardize the procedure, adjust to future needs. Two primary and vital opportunities in the health-care context to use CC as below:

- Using CC solutions in the health-care context can provide opportunities for people in the health-care sector to discover modern technology.
- CC is a one-third party; the cloud provider specialist can have a fast solution without interrupting hospital service if any issues arise.

2.9.3.4 Threats

CC risks in the health-care field, as shown in recent studies (Doarn, 2019; Devadass & Sekaran, 2017; Alharbi et al., 2016a; Alsanea, 2015; Masrom & Rahimli, 2015) Involve: data confidential, miss of interconnection, implementation with some other system is complicated, hidden costs including backup, recovery and solving problems, absence of specific model regulation (worldwide), a decrease of compatibility reliability and effectiveness of health-care personnel are vast concerns.

The significant challenges for adopting CC solutions in the health context. Also, data confidentiality because the patient information that is kept and processed in the cloud is compassionate and essential, so cloud security is a primary concern and its most significant obstacle to cloud computing in the health-care context.

Table 2.5: SWOT Analysis for Cloud Computing in Health-Care Institutions

SWOT	Factors	Finding	References
Cloud Computing Strengths of Health-Care Institutions	Effectiveness, Flexible, Reduce Cost (Development and Maintenance), Compliant, Recovery, Accessibility (Any Time and Any Place), Better Control of Resource, Energy Saving, Protection of Environment, Friendly Usage, Ability to Expand.	1- A usage, cloud computing in health-care leads to cost reduction because it does not need start-up expenditure. 2- Easy access to the patient's records anytime and anywhere leads to increased collaboration among specialists and patients, so patients' quality of services will improve.	(Griebel et al., 2015; Masrom & Rahimli, 2015)
Cloud Computing Weakness in Health-Care Institutions	Training Requirement, High-Speed Internet Connection, Integrated with Local Software Is Very Hard, Lack of The Physical Controlling of Data, Lack of Commitment to Control Quality of Service and Availability, Application Development and Increased Dependence.	1- Implementing cloud computing in the health-care sector is no easy task because they are many factors involved with adopting and implementing and more dependent on the cloud services provider. Many hospitals do not have an even internet connection to connect to the cloud, so in this case, it is tough to implementing cloud computing.	(Darwish et al., 2019; Devadass et al., 2017; Masrom & Rahimli, 2015)
Cloud Computing Opportunities in Health-Care Institutions	Offer current service for users, Modern and quick solutions for problems, Reduce cost and increased service quality, Standardize Process, Adaptive to Future Requirements.	1- Medical staff can get opportunities to learn new technology. 2- Quick maintenance by (CC), provider without interruption service.	(Alharbi et al., 2016b; Darwish et al., 2019)
Cloud Computing Threats in Health-Care Institutions	Security and Privacy Concerns, Loss of Connectivity, Integration to Another Platform is Hard, Hidden Cost that Includes: Backup, Recover, and Problem Solution, Lack of the Specific Standard Regulation (Local, National, and International), Reduction of Compatibility, Quality and Performance of Health-Care.	1- Data security and privacy concerns are the main barriers to adopting cloud computing in the health-care sector.	(Kruse et al., 2017; Masrom & Rahimli, 2015; Mehraeen et al., 2017)

2.10 Theories and Models of the Adoption Innovations

Health-care advances in hospitals are due to the use of HIS implementation; nevertheless, technology change resistance when using CC based information systems has caused impediments to the adoption of new technology. Therefore, consumers' acceptance of the technology needs to be answered rapidly (Mata et al., 2019; Kyalo, 2018; Chamney, 2015). By recognizing the cause of these difficulties, the organization helps consumers strategically prepare for embracing the new technology because it created complexity (Nguyen et al., 2016). Cloud-based electronic health (eHealth) systems provide significant benefits to health-care institutions but still have limited adoption rates in available technology-based systems (Al Nuaimi et al., 2015), as implementation can be challenging and therefore too technical for regular consumers (Zaied et al., 2015). In particular, teamwork and group efforts are caused by variations like work in health-care institutions, while some staff works with complete independence and autonomy (Slemp et al., 2018). If this occurs, it is then mentioned that systems are inefficient and ineffective for the organizational purpose (Ginter et al., 2018).

According to Oliveira and Martins (2011), the most used technology adoption theories are the Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Unified Theory Of Acceptance And Use Of Technology (UTAUT), Diffusion Of Innovations (DOI), and Technology-Organization-Environment (TOE) Framework. DOI and TOE Framework are at the organization's level. The TAM, TPB, and UTAUT are at the individual level (Sana'a, 2016; Oliveira & Martins, 2011). According to Al-Mamary (2015a), many theories accept the technology, such as TAM, IS success model, computer usage model, and personal computing acceptance model (Al-Mamary et al., 2015).

Recently, several researchers have been investigating the adoption and sharing of information of international and global organizational systems (Vaubel & Willett, 2019), including the adoption of technology factors using theoretical frameworks (Khong et al., 2015) and other types of frameworks to recognize the acceptance of the adoption, innovation, and diffusion of systems (Alsanea et al., 2015; Downs Jr & Mohr, 1976). Therefore, a holistic approach is required to design an integrated health-care information system (Hussey & Kennedy, 2016), which unique identifier, collaboration, and encourages better decision-making. The current study is using the "Technology Acceptance Model (TAM)" to evaluate how "technology, organization, and environment (TOE)" adoption occurs typically.

2.10.1 Technology-Organization-Environment (TOE) Framework

Tornatzky and Fleischer designed that framework in 1990 (Chandra & Kumar, 2018; Tornatzky et al., 1990). It describes the components of an enterprise that continue to affect the acceptance and application of technological innovations defined as the context of technology, organization, and environment, as shown in Figure 2.14. That discusses the frameworks and theories used in previous research. The first approach adopted the technological concerns involved with an organization like the IT, infrastructure, hardware, software, and technical problems. The second applies to an organization's internal and external challenges, including particular competition in the market, policies, and regulations. Whereas the third defines the nature, scale, and management structure of an organization (Manring et al., 2003; Dessler & Phillips, 1980).

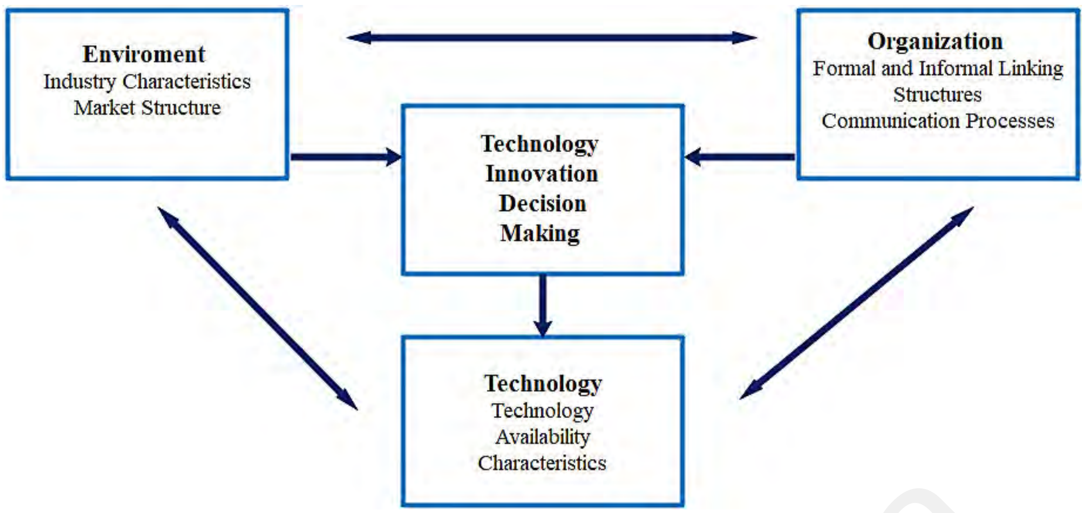

Figure 2.14: Technology-Organization-Environment (Chandra & Kumar, 2018; Tornatzky et al., 1990)

The following Table 2.6 present the obtainable conclusions from current research demonstrating the lack of a framework for cloud computing architecture-based health-care information system design. It also addresses practical information on CC adoption and dissemination in health-care institutions in developing countries such as the KSA. The researchers indicate a research gap because there is a need for an architecture-based-on CC analysis of the health-care information system. This research used TAM and TOE theories in this context, as these theories are robust and can contribute to understanding technology acceptance easier and more meaningful in the context of organization and environment (Christensen et al., 2020). It allows this research to apply scales developed and empirically validated on the TAM and TOE constructs. Many contexts as government Sector, higher educations, Enterprise, Commerce, and Industry have confirmed the validity of the TOE Framework (Shukur et al., 2018a; Tarhini, 2018; Harfoushi, 2016; Alsanea, 2015; Alhammadi et al., 2015; Tashkandi & Al-Jabri, 2015), including in the healthcare field (Mohammadhiwa et al., 2019; Alharbi et al., 2017a; Harfoushi, 2016).

Table 2.6: Summarizes the Factors and Construction Workers Identified in the CC Empirical Studies

Studies	Theory	Factors/Constructors	Sector	Methods
(Alsanea, 2015)	TOE	*Service Quality, *Usefulness, *Security Concern, *Complexity, *Cost, *IT Infrastructure Readiness, *Feasibility, *Trust, *Organization Culture, *Organization Structure, *Privacy Risk, *Government Support, *Regulatory Concern, *External Pressure, *Culture, *Industry Type, *Direct Benefits, *Indirect Benefits	Government Sector in KSA	Questionnaire
(Tashkandi & Al-Jabri, 2015)	TOE	*Relative Advantage, *Complexity, Compatibility, Top Management Support, Vendor Lock-in, *Data Concern, Government Regulations, Peer Pressure	Higher Educational Institutes in KSA	Questionnaire
(Alhammadi et al., 2015)	DOI & TOE	Technology Readiness, *Security Concerns, Technology Barriers, Organizational Readiness, *Firm Size, *Firm Status, Industry Sector, Top Management Support, *Competitive Pressure, External Support, *Government Support, Relative Advantage, Compatibility, *Complexity	Enterprises in KSA	Questionnaire
(Gangwar et al., 2015a)	TAM & TOE	*Relative Advantage, *Compatibility, Complexity, Organizational Competency, *Top Management Support, *Training and Education, Competitive Pressure, Trading Partner Support, *Perceived PEOU, *PU, Adoption Intention	Commerce and Industry of India	Questionnaire
(Harfoushi, 2016)	TOE	*Technology factors, *Organizational factors, *Environmental factors	Jordanian Hospitals	Questionnaire
(Lian, 2017)	IS Success Model	*Information Quality, *System Quality, Service Quality, *Trust	Taiwanese Hospitals	Questionnaire
(Alharbi et al., 2017a)	TOE, HOT-Fit & ISS	Technology, Organizational, Environmental, Human, and Business	Hospitals in KSA	Questionnaire
(Palos-Sanchez et al., 2017)	TAM	PU, PEOU, ATT, BI, Top Management Support, Training, Communication, Technological Complexity, Organization Size	Firms Spain	Questionnaire
(Tarhini, 2018)	TOE	*BI, *Top Management Support, *Relative Advantage, *Attitudes Towards Change, *Technology Readiness, *Complexity, *Government Regulation, *Peer Pressure, *Data Concerns, Compatibility, Vendor Lock-in, External Expertise	Higher Educational in Oman	Questionnaire

Table 2.6: Continued

Studies	Theory	Factors/Constructors	Sector	Methods
(Shukur et al., 2018a)	TAM & TOE	Cost Saving, Flexibility, Scalability, Compatibility, Complexity, Security, Privacy, Resource Utilization, Top Management Support, Reliability, Availability, Ownership, Mobile Access, Internet Connection, PEOU, Legal Issue,	Government Sector in Iraq	Questionnaire
(Kamal et al., 2020)	TAM	PEOU, PU, Social Influence, and Facilitating Conditions	Hospital in Pakistan	Questionnaire
(Dhaggara et al., 2020)	TAM	Perceived Usefulness, Perceived Ease of Use, Trust, And Privacy Concern	health centres in New Delhi, India	Questionnaire
(Zhou et al., 2019)	TAM	Medical Service Satisfaction, Ease of Use, Information Quality, Acceptance	Telehealth in China	Questionnaire
(Safdari et al., 2017)	TAM	Human Factors, Structural and Technical Factors, Monitoring and Management Factors, And Organization Strategies	Hospital in Iran	Interview
(Mohammadhiwa et al., 2019)	TOE &TAM	Perceived Ease of Use, Perceived Usefulness, Technological, Context, Organization Context, And Environmental Context	Teaching hospitals of Tehran	Questionnaire
(Al-nassar et al., 2016)	TAM	Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Behavioral Intention (BI) To Use, And Usage of CPOE Adoption (UA)	Jordanian Hospitals	Questionnaire
(Özdemir et al., 2019)	TAM	Subjective Norm, Job Relevance, Social Image, Output Quality, Result Demonstrability, Computer Self-Efficacy, Perceptions of External Controls and Computer Anxiety Which Affect Perceived Usefulness and Computer Self-Efficacy, Perceptions of External Control Which Affect Perceived Ease of Use.	Hospitals of the Turkish Ministry of Health	Questionnaire
(Okediran et al., 2020)	TAM	Subjective Norm, Social Influence, Demonstrability, Computer Self Efficacy, System Quality	Health-care Delivery Institutions in Oyo State, Nigeria	Questionnaire

2.10.2 Theory of the Diffusion of Innovation (DOI)

Studies regarding the adoption of innovations in information technology have been well documented in the literature. The theory of innovation diffusion by (Balas & Chapman, 2018; Rogers et al., 1983) is beneficial for studying factors that support or prevent technology adoption. DOI inducts that the evaluation at which an innovation is adopted and easy to implement depends on five general attributes: relative advantage, observability, complexity, compatibility, and trial-ability (Mohammadi et al., 2018; Rogers et al., 1983). Rogers' theory of diffusion is useful in examining the different factors that can ease or impede technology adoption. These attributes help understand an organization's prospects for adopting or refusing innovation (Cassel et al., 2018; Rogers et al., 1983). In terms of DOI theory, the rate at which new technologies and ideas are transferred from one culture to another and how and why they are used individually and cumulatively can be understood (Taherdoost, 2018). Figure 2.15 shown the theory of DOI at the firm level.

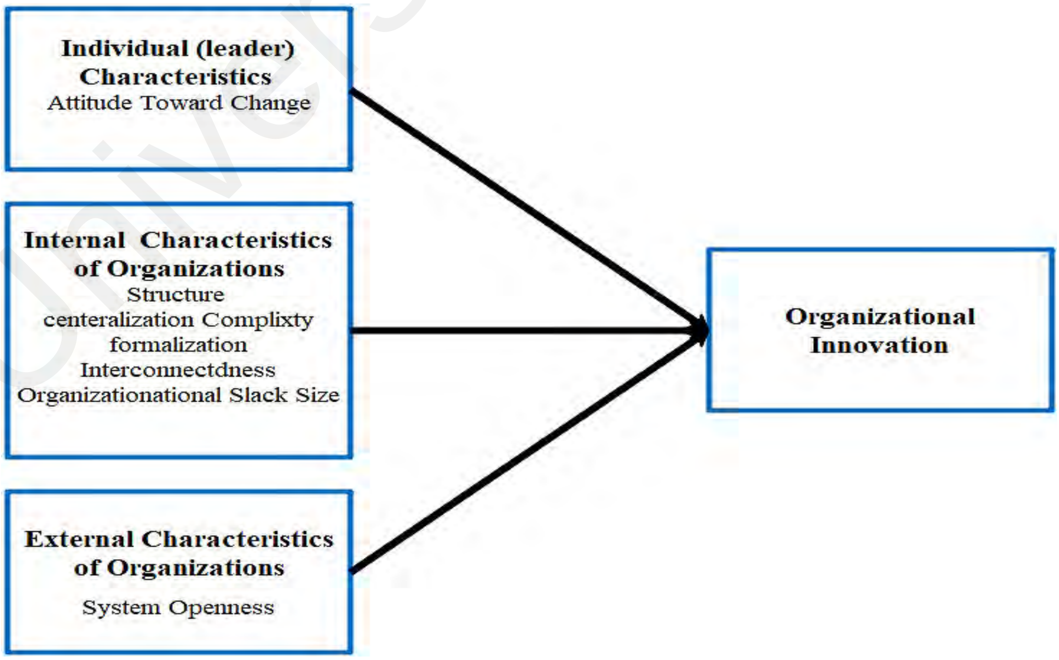

Figure 2.15: Innovations Diffusion (Dearing & Cox, 2018; Rogers, 1995)

2.10.3 Institutional Theory

The organization's events can be explained by institutional theory with entirely different perspectives (Manning, 2017). Through this theory, the methods, regulations, norms, and usual tasks develop for social behaviour. Relevant details about how this constitutes communication and embraces the routine and expectations over time and space. This theory also helps obtain information on how one unit within a group mirrors the module that struggles out of the same environmental issues (Bourdieu et al., 2019; Butcher et al., 2019; Lane, 2019). The institutional theory focuses primarily on the institutional environment that also plays a significant role in associating its structure and actions (Christensen et al., 2020; Zhang, 2020; Scott & Christensen, 1995). Effects depend not only on the organization's decisions but also on the operating performance and the legal, environmental conditions under which it operates. Cultures, processes, and procedures operating at different levels assist in the organization's development. As per the theory (Ndlovu & Msweli, 2016; DiMaggio & Powell, 1983), the need to function lawfully and isomorphic pressure outcomes in the establishment of homogenous firms. It excites the companies to pursue industry trends because of the business competition. Under specific research, the technological, organizational framework is coordinated with an institutional theory (Bourdieu et al., 2019). This constraint of the framework's environmental context externally. This, in turn, entails the influence exerted by trading partners and adversaries.

2.10.4 Technology Acceptance Model (TAM)

The TAM theory (1989) is based on principles adopted by the TRA (1975), which designed it accurately to model user acceptance of the information systems (IS). The model suggests that when users are presented with new technology, many factors influence their decision to use it (Silva, 2015). The two main factors are perceived usefulness (PU) and perceived ease of use (PEOU). The defined PU is the degree to which a person believes that his job performance would be enhanced by using a particular system. The PEOU is operationally defined as the extent to which a person believes that using a specific system would be effortless (Silva, 2015). In other words, PU and PEOU are capable of predicting the acceptable behaviour of computer systems users (Shiau & Chau, 2016). The TAM asserts that user beliefs and attitudes mediate the influence of external variables on user behaviour.

These factors can be addressed during the system development stage to solve users' acceptance problems (Lin & Kim, 2016). These factors determine behavioural intention, which has been examined by many studies, as a better predictor of actual system usage (Mayeh et al., 2016). Intention to use new IT is defined as the willingness of the user to use the latest IT. Figure 2.16 shows the proposed TAM by Davis (1989) (Silva, 2015).

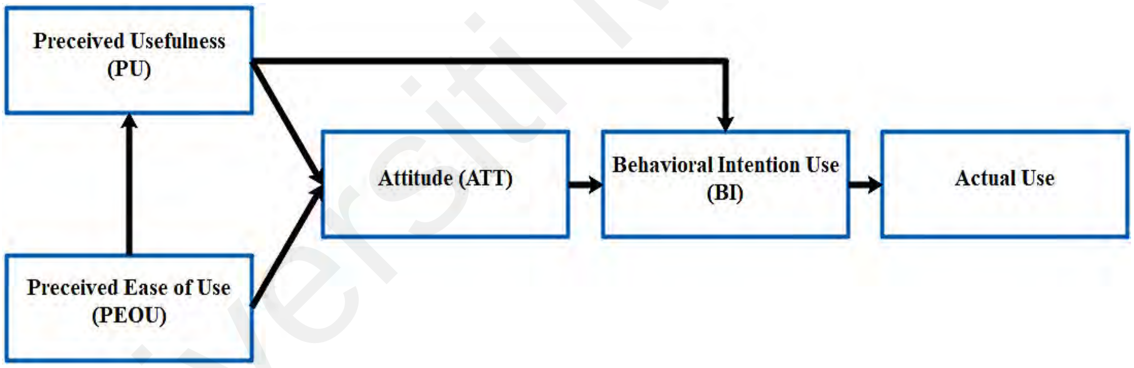

Figure 2.16: Technology Acceptance Model (1989)

In sum, the available evidence suggests that TAM is appropriate for use in the health-care field. Whereas, precisely, perceived usefulness consistently predicted the adoption and use of health information technology by health-care professionals. Moreover, perceived ease of use correlated with perceived value in most studies. However, inconsistent results were obtained between PEOU and IT acceptance, possibly due to differences in intelligence, competence, and adaptability to new technologies and the nature of the work between physicians and the general workforce (Abdullah et al., 2016).

The literature review in this section covers many relevant technology acceptance issues in the health-care field, such as in hospitals. Finally, this section's related literature findings identify the evidence that the TAM theory is the appropriate acceptance theory for the health-care field. This review of relevant literature proves that user acceptance is the key indicator of any health IT application's success or failure in the health-care field. Also, TAM is a well-respected theory of technology acceptance and use widely studied outside of health care and has recently become a vital theoretical resource for health IT research and development. Projects are regularly advised to use the TAM to assist in the design or procurement process, training and awareness sessions, implementation, and other activities. They can be strong levers for acceptance and use to the extent that the factors predicting acceptance are controllable. TAM has good track records in many industries (Ammenwerth, 2019; Özdemir-Güngör et al., 2020).

The recent study is linked to TAM; empirical evidence as a theoretical method would be advantageous in health care. In this sense, use in health-care on the day of an analysis of TAM (Ammenwerth, 2019), It was found that TAM could predict (30-70%) the variance of "Behavioural Intention" to use, which could be considered reasonably high. According to the review study (Marangunić & Granić, 2015) conducted from 1986 to 2013. TAM, the theory of technology acceptance and use, has gained significant attention in the field of technology, providing a method and is recognized to be a "primary model" or "gold standard" in understanding predictors for IT acceptability (Marangunić & Granić, 2015).

TAM is also among the most significant influences and widely applied theories to describe the acceptance of an individual's information systems (Durodolu, 2016). (Shim & Kim, 2018), Certain values of PU and PEOU dominated direct relations with the attitudes deciding the use of technology were observed (Shim et al., 2018a). PU, as seen from (Teo & Zhou, 2017), along with (Teo, 2019), As a particular philosophy, some application systems which have a positive effect on productivity performance improve the productivity of jobs in organizations (Zhou et al., 2017). An important future direction for TAM is appropriate to specifically adapt the model to the context of health care, using methods of elicitation beliefs.

According to Ketikidis, et al. (2012), several researchers have adopted either the TAM or descendants of the TAM to predict intentions and the actual use of technology in several domains (Ketikidis et al., 2012). However, a common feature of most of these studies is that they do not use the same measures of TAM or descendants of the TAM variables exactly; in some cases, the predictors of technology acceptance differ from the ones initially proposed in the respective models (Holden & Karsh, 2010; Rahimi et al., 2018a). Therefore, the TAM approach provides the general framework, but new variables can be added as long as they are theoretically relevant and their addition reflects a decision based on evidence and not a haphazard choice (Rashid, 2014; Ketikidis et al., 2012). In recent years, the legacy of technology acceptance literature included alternative models for UTAUT (Venkatesh et al., 2003), which has many similarities to the initial TAM approaches but differs in the content and number of intentions predictors and actual use of technology (Abbas et al., 2018; Holden & Karsh, 2010). The TAM is the most popular UTAUT is a relatively newer model and has the least number of implementations. According to idoga et al. (2018), UTAUT2 has been used as a technology acceptance model to model users' behavioural intention in the context of health-care (Idoga et al., 2018). The recent studies stated that many contexts as Commerce, industry, Firms, and government sector (Shukur et al., 2018a; Palos-Sanchez et al., 2017; Gangwar et al., 2015a) have confirmed the validity of the TAM model, including in the healthcare field (Dhaggara et al., 2020; Okediran et al., 2020; Mohammadhiwa et al., 2019; Özdemir et al., 2019; Al-nassar et al., 2016).

In comparison, TAM and UTAUT are individual-level adoption models. The TAM and UTAUT can also be categorized as belonging to the stream of thought based on usage intention as the dependent variable. The categorization indicates an overlap of theoretical foundations in the TAM and the UTAUT (Gücin et al., 2015; Khan & Woosley, 2011; Venkatesh et al., 2003).

TAM has been studied in different contexts with different technologies (e-mail, world wide web, hospital information systems, and others) (Dhaggara et al., 2020). It has been applied with different control factors such as organizational size, type, gender, etc., on different subjects such as undergraduate students, MBAs, and knowledge workers, resulting in robustness among its proponents. TAM has received enormous empirical support in elucidation and prediction of technology acceptance and uses in various settings (Dabholkar & Bagozzi, 2002; Yan et al., 2016). Divergent external factors such as training, compatibility, anxiety, computing support, experience, relevance, personal innovativeness, etc., have been studied in the context of TAM (Lee et al., 2003). TAM has also been applied to study various aspects of health-care services. Online disability evaluation systems, the personal digital assistant for health-care, telemedicine technology, electronic health records (EHR), and mobile applications are a few of them. Adoption of e-health monitoring using smart wearable health-care devices has been one of the recent contributions to extant research literature (Li et al., 2016; Rahimi et al., 2018b; Zhou et al., 2019) employing a systematic literature review approach identified three ICT application areas namely, telemedicine, electronic health records, and mobile application for TAM in health-care service delivery. The literature review also reported a few studies wherein the mediating role of behavioural aspects in conjunction with other factors such as mobile health, etc., were investigated.

2.10.5 Iacovou Model

Examined inter-organizational system (IOS) variables that induce organizations to adopt IT (Bergman et al., 2019; Iacovou et al., 1995), compliance (EDI) processes, and implementation. The model is based on three concepts: perceived advantages, readiness for an organization, and external factors, as shown in Figure 2.17. A framework is well designed to describe an implementing IOS. IT resources are identical to the technology framework, and economic means are identical to the organizational framework. The external factors throughout the (Iacovou et al., 1995; Mackert et al., 2016) model have included business associates to the TOE external environmental task framework as an integral key to IOS implementation. Therefore, the expected advantage is a different mechanism from the TOE, while organizational readiness, on the other hand, is a variation of technology and organizational factors within the TOE.

The condition emerges from the structure TOE. External factors emerge through perceived benefits from the model (Iacovou et al., 1995; Wang & Lo, 2016). (Ilin et al., 2017) adopted the TOE framework and the model (Iacovou et al., 1995) to adopt e-business by organizations in the European Union (EU) countries, comparing the effect between two sectors, namely tourism telecommunication. The expected benefits come from the paradigm (Iacovou et al., 1995; Shim et al., 2018b). Technology and organizational preparation are a partnership of TOE emerging from the (Iacovou et al., 1995; Verma & Bhattacharyya, 2017) model system (Chege & Wang, 2020; Tornatzky et al., 1990) and organizational acceptance. The external pressure and environmental results from the previous studies collaborating. This designed model incorporates the three factors of organizational readiness, technology, and perceived external and environmental pressure advantages, as shown in Figure 2.17 (Hassan, 2020).

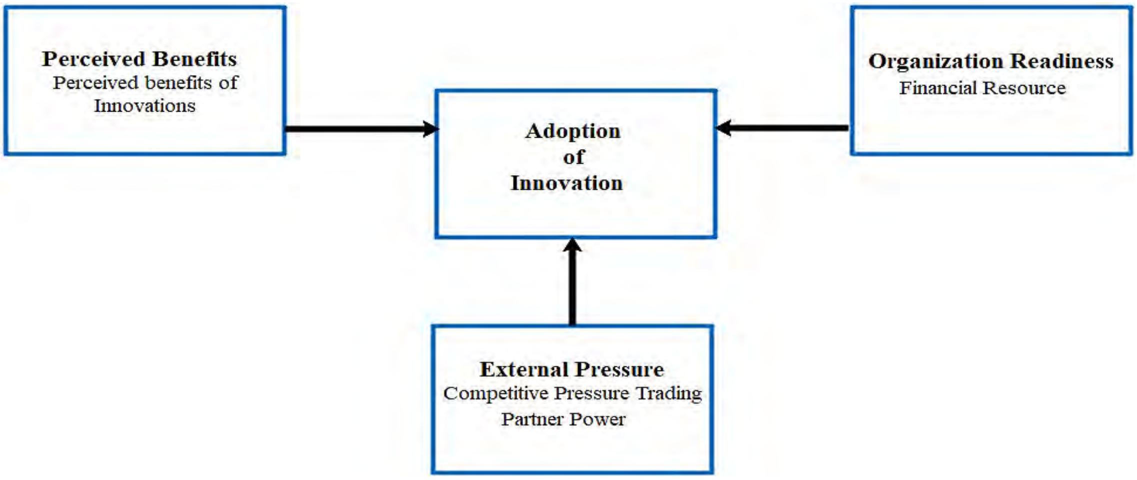

Figure 2.17: The Iacovou Model, (Iacovou et al., 1995)

2.10.6 Theory of Planned Behaviour (TPB)

The TPB indicates that behavioural intentions depend on an individual reaction. Behavioural motives are the quality of an individual's response to behaviours; the prejudiced paradigm supports the delivery of acts' and the understanding of the individual's ease with which reaction will occur (behavioural limitation). It was effectively implemented to interpret substantial approval of different technologies (Prasanna & Huggins, 2016). Its behavioural reaction is explained as the constructive or destructive emotions of the individual regarding the behavioural reaction. Personal standards are defined as a person's definition, as if a person is important from a personal viewpoint, there should be a delivery of behaviour. Behavioural weaknesses consist of an understanding by two persons of the ease or difficulty of producing the behaviour involved (Thombs & Osborn, 2019). The research by Prasanna and Huggins (2016) stated applied the TPB system to define and determine the implementation of IS personal judgment of the small-scale business supervisor (Prasanna & Huggins, 2016).

Figure 2.18 indicated support for an evaluation assignment, depending on the reaction (perceived constructive and destructive situations in the business), behavioural intention (social predictions), and perception constraint (helps to fight difficulties) of IS implementation of systems. The planned reaction theory was developed and implemented to realize behavioural and purpose reactions to different circumstances, such as applying the newest software function (Bailey & Burch, 2017). TPB requires an outstanding procedure under different circumstances to be carried out (Ibrahim et al., 2017). Besides, (Ibrahim et al., 2017) debating that TPB is not definite to IS custom and is not economical than TAM.

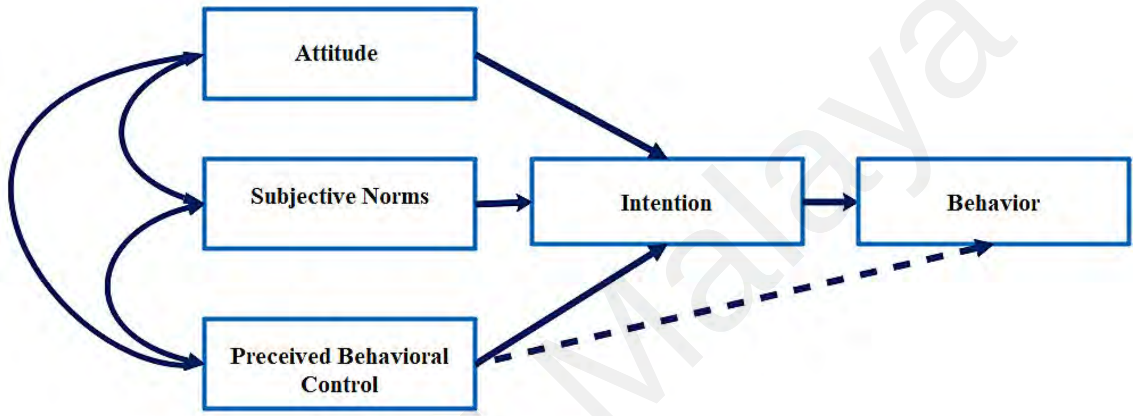

Figure 2.18: Theory of Planned Behaviour (TPB) (Ajzen, 1985)

2.10.7 Human, Organization, and Technology-Fit (HOT-Fit) Framework

In 2006, Yusof et al. developed a framework that combined the concept of the DeLone and McLean IS Success Model (ISSM)" and the IT Organizational Fit Model. According to Yusof et al. (2006), the HIS evaluation framework shall consider humans and organizations (Erlirianto et al., 2015; Yusof et al., 2008). Besides that, the health information system also needs to be supported and equipped with the technology. Organizations in the health-care sector must have the ability to prepare workers or staff to adapt to new technology or changes. The HOT-Fit has three aspects and different dimensions in every aspect. In technology, organization, and environment. Those dimensions are used to measure the net benefits (see Figure 2.19) (Yusof et al., 2008). Lian et al. Study (2014) develop a framework based on the integration of HOT-fit and

TOE has been implemented in a study on the adoption of CC in hospitals in Taiwan (Lian et al., 2014).

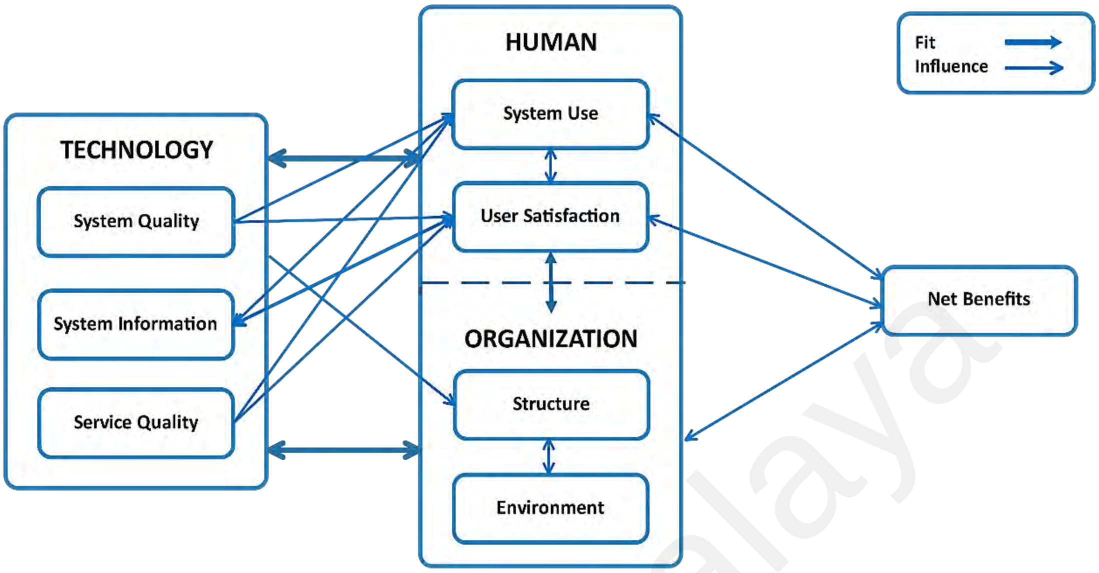

Figure 2.19: HOT-Fit Evaluation Framework (Yusof et al., 2008)

In sum, information systems (IS) as the health information systems (HIS) constitute a crucial part of medical and health studies in the literature, and the development of health technologies has expanded the HIS studies as CC technology.

Research within the new technology in the domain has produced several information systems theories, some of which have been used to explain and predict end-user use of technologies.

In this context, the following Table 2.7 provides a comprehensive overview of the information systems theories in the HCI, as stated in the recent studies.

Table 2.7: Related Studies: Overview of The Information Systems Theories in HCI

N	Study	Title	Theory	Sector	Purpose
1	(Cheng, 2020)	Quality Antecedents and Performance Outcome of Cloud-Based Hospital Information System Continuance Intention	Expectation-Confirmation Model (ECM), Task-Technology Fit (TTF) Model, and Updated Delone and Mclean Information System (IS) Success Model	Taiwan's Hospital Industry	This study's purpose is to propose an integrated model based on expectation-confirmation model (ECM), task-technology fit (TTF) model, and updated DeLone and McLean information system (IS) success model to examine whether quality factors and TTF as antecedents to physician beliefs can affect physicians' continuance intention of the cloud-based hospital information system (HIS) and performance impact.
2	(Green, 2020)	Cloud Computing in Healthcare: Understanding User Perception, Organizational Operations, and IT Cost to be Successful in the Cloud	TAM &TOE	Health-care Organizations	The basis of this study was to understand the impact of cloud computing from a user's perspective and the impact cloud computing has on organizational operations. The research problem was healthcare organizations that were considering adopting cloud computing lack of understanding of how the adoption of cloud computing impacted its users and the operations and IT costs pre- and post-adoption of cloud computing.
3	(Meri et al., 2019)	Modelling the Utilization of Cloud Health Information Systems in The Iraqi Public Healthcare Sector	Organizational Theory, Diffusion of Innovation Theory, and the Theory of Reasoned Action	Iraqi Hospital Industry	This study proposed a model by defining the critical success factors influencing physicians' confirmation and behavioural control toward utilizing cloud health information systems in Iraqi hospitals.
4	(Özdemir & Kabakuş, 2019)	User Acceptance of Cloud-Based Hospital Information System	TAM	Hospitals of the Turkish Ministry of Health	This study aimed to determine the factors that affect the system use of IT specialists. Accordingly, it is aimed to analyse through the web-based survey and Technology Acceptance Model the factors that influence the cloud-based system usage of the 150 IT specialists who work for state hospitals.
5	(Alharbi et al., 2017)	Holistic Approach Framework for Cloud Computing Strategic Decision-Making in The Healthcare Sector (HAF-CCS)	TOE & HOT-FIT	Saudi Health-care Organisations	This paper aims to apply the Holistic Approach Framework for Cloud Computing Strategic Decision-Making in the Health-Care Sector (HAF-CCS) to provide a systematic approach that considers different perspectives.

N	Study	Title	Theory	Sector	Purpose
6	(Almubarak, 2017)	Factors Influencing the Adoption of Cloud Computing by Saudi University Hospitals	TOE & DOI	Saudi University Hospitals	This study aims to evaluate the adoption of Cloud Computing in Saudi university hospitals and to investigate the factors that impact the adoption. This study integrates the Technological, Organizational, Environmental (TOE) framework and the Diffusion of Innovation (DOI) theory, and adds the decision maker context to the original model.
7	(Lian, 2017)	Establishing a Cloud Computing Success Model for Hospitals in Taiwan	Information Systems Success Model	Taiwan's Hospital Industry	The purpose of this study is to understand the critical quality-related factors that affect cloud computing success of hospitals in Taiwan.
8	(Meri et al., 2017)	Towards Utilizing Cloud Health Information Systems: A Proposed Model	Organizational Theory, Diffusion of Innovation Theory, and the Theory of Reasoned Action	Iraqi Hospital Industry	This research proposed a model of utilizing cloud health information systems in Iraq. The organizational structure and system factors have been investigated as the main antecedents that may affect the perception of the healthcare professionals (individuals) towards utilizing cloud services in their hospitals.
9	(Harfoushi, 2016)	Factors Affecting the Intention of Adopting Cloud Computing in Jordanian Hospitals	TOE	Jordanian Hospitals	The purpose of this study is to examine the different factors that are expected to influence the intention of hospitals to adopt cloud computing in Jordan.
10	(Hsieh, 2016)	An empirical investigation of patients' acceptance and resistance toward the health cloud: The dual factor perspective	Integrated UTAUT and The Status Quo Bias (SQB)	Taiwan's Hospital Industry	This research presents the integrated UTAUT and SQB theory to develop a model of intention to use and resist cloud health services among patients in Taiwan. the author found that the main cause of resistance was sunk costs, inertia, perceived value, transition costs, and uncertainty. Performance expectancy, effort expectancy, social influence, and facilitating conditions were shown to have positive and direct effects on patients' intention to use the health cloud. The study showed the importance of incorporating user resistance in technology acceptance studies in general and health technology usage studies in particular.

N	Study	Title	Theory	Sector	Purpose
11	(Lai, 2015)	Explaining Physicians' acceptance And Resistance to the Nhi Pharmacloud: A Theoretical Model and Empirical Test	Delone & Mclean's IS Success Model and SQB	Taiwan's Hospital Industry	The PharmaCloud allows physicians to streamline many of their healthcare processes and ensure patient safety in a more efficient and cost-effective manner. Despite its great potential, however, there are gaps in our understanding of how physicians evaluate change in relation to the PharmaCloud and why they decide to resist it. Thus, this study develops an integrated model to explain physicians' intention to use the PharmaCloud and their intention to resist it. A field survey was conducted in Taiwan to collect data from physicians.
12	(Lian, et al., 2014)	An Exploratory Study to Understand the Critical Factors Affecting the Decision to Adopt Cloud Computing in Taiwan Hospital	TOE & HOT-FIT	Taiwan's Hospital Industry	The purpose of this study is to investigate the critical factors that will affect the decision to adopt cloud computing technology in developing countries, specifically in Taiwan's hospital industry. This study mainly integrates the TOE (Technology-Organization-Environment) framework and HOT-FIT (Human-Organization-Technology fit) model to understand this issue.

2.11 Analysing Differences

This section presents the answer to the first research question (RQ1) on measuring cloud computing adoption in Saudi health-care institutions. In this context, this study investigated the adoption of CC, such as the HIS in the SHCIs, and gave insight into HIS adoption processes and, ultimately, HIS's effectiveness and efficiency in HCIs. Recent studies on the adoption rate and decisive implementation of the HISs are weak in the SHCIs in this context (Al Mustanyir, 2019; Alharbi et al., 2017a; Alharbi, 2018; Alomeer, 2016; Hasanain, 2015). There are several reasons for the low adoption of HIS. However, they are reported in recent studies in terms of low HIS. Whereas the infrastructure in SHCIs has exacerbated problems and delayed the adoption of electronic health-care practices. Meanwhile, it suffered a decrease in technical project resources, primarily due to high costs. These challenges are not only in the KSA. It is also regionally and globally (Alharbi, 2018; Alkraiji et al., 2016; Alharbi et al., 2014;).

Also, HIS practices in public hospitals in the KSA have reduced HIS specialists, training, approach taken, and poor management (Alharbi, 2018; Alkraiji et al., 2016). Simultaneously, hospitals in all HCIs have taken comprehensive steps to upgrade their infrastructure, including HIS (Alharbi, 2018). A lack of defining challenges and designing solutions has had an accumulative effect. Many researchers have analysed factors that obstruct improvements in HIS infrastructure, particularly in public hospitals (Hasanain, 2015). Whereas the debate on Saudi health-care improvement strategies continues, much research over the past decade has pointed to a minimal use of HIS and recognized that inadequate HIS infrastructure poses a challenge to all improvements in HCIs, health-care. (Alharbi, 2018; Almuayqil et al., 2015).

Besides, there is a need for more studies to understand HCIs in KSA and the best way to apply HISs to improve the successful implementation rate. Besides, a lack of inter-

HCIs coordination, collaboration, and planning affect to low adoption of HIS (Alharbi, 2018; Alkathiri, 2016; O'Donnell et al., 2018). As mentioned early, health-care services face many difficulties in KSA, together with the shortages of health-care professionals, the increase of continual diseases, and the high charge of health-care services (Alharbi et al., 2014). As a result, many HCIs have carried out IT, including eHealth solutions, in their structures to provide higher patient care, enhance efficiency, and apply their economic sources effectively. However, IT adoption as eHealth in Saudi HCIs is still tremendously low for plenty of reasons, as cited earlier (Alharbi, 2018). The lacking of health informatics and IT professionals are another barrier to eHealth projects. The implementation of eHealth answers may also encounter technical difficulties and complexity, compatibility, and insufficient IT infrastructure (Alharbi, 2018). According to Alharbi (2018), these systems' adoption rates are still low, given the HIS's positive results, and face resistance from health-care professionals. Barriers come up as they approach the implementation of systems (Alharbi, 2018).

These HCIs still face challenges when the development process is completed, mainly related to dedicated budgets, in addition to technological and administrative barriers (Alharbi, 2018). While technical problems pose a challenge to overall Saudi health-care, they present a specific threat to the development EHRs. On the other hand, to overcome these barriers, further investigation and planning on the value of EHR were needed, particularly in improving knowledge among health-care professionals who handle patient records. Also, hospital directors confront and health toward the decision-makers to the implementation process and technical and training problems. However, both earlier and later studies indicate that EHR implementation in KSA is still at very early stages (Alharbi, 2018). These intervention strategies have to evaluate, and the significance of comprehensive theoretical investigations of these technological innovations has also been highlighted repetitively to achieve the implementation's maximum success. The fundamental premise behind IT is employment in health-care because knowledge flow changes would result in a better quality of treatment. Because of KSA's recent MoH National eHealth initiative, updating the state of knowledge about HIS status and identifying barriers are critical to policymaker's quality of patient health informatics professionals, academics, clinicians, and HIS vendors. By using a systematic review of literature, this study identified those barriers. The findings of recent studies the adoption of HIS such as eHealth in Saudi health-care organizations is still low for many factors as shown in Table 2.8 following (Alharbi et al., 2016a; Alomeer, 2016; Alqahtani et al., 2017; Meshal et al., 2015).

Table 2.8: HIS Barriers

Barriers	Descriptions
Human Barriers	That is related to the beliefs, behaviours, and attitudes.
Professional Barriers:	This term is related to the nature of health-care jobs.
Technical Barriers	This term is related to computers and IT.
Organizational Barriers	This term is related to hospital management.
Financial Barriers	This term is related to money and funding.
Legal and Regulatory Barriers	This term is related to laws, regulations, and legislation. The six categories of barriers were validated with the participants of the pilot sample.

Despite its great potential, HIS, like the CC, has not been extensively addressed in the literature. There are no apparent frameworks that encompass all viable schemes and interrelationships between HIS and CC. Therefore, it is essential to analyse and compare those schemes' effectiveness (Alharbi et al., 2016). Also, health-care customers need to have a clear understanding of the potential benefits and risks associated with cloud computing when deciding to use cloud computing and set reasonable goals for their cloud provider. The various service delivery models must remember, as each model carries its specific requirements and responsibilities. Cloud deployment models (private, public, and hybrid) will also heavily weigh in strategic decision-making.

However, health-care is, compared to other industries, slow to adopt the technology (Alharbi et al., 2017b). Underlying this is a complex web of inter-related social and technical issues situated within a fuller organizational environment. There is increasing appreciation that introducing technology within complex corporate systems such as health-care is not a straightforward linear process. Instead, it is dynamic, often involving various cycles of iteration as technological, social, and organizational dimensions gradually align (or not) over time (Alharbi et al., 2017b; Alsanea, 2015; Karim et al., 2017). In KSA, the cloud computing sector is expected to grow further, reflecting Saudi government efforts to cut spending due to low oil prices and the advantages of future cost savings (IDC, 2017).

The KSA Government established the Vision 2030 initiative to support migration from an oil-based economy to a non-oil economy. As part of this initiative, the National Transformation Program 2020 (NTP) was announced (Vision 2030, 2016). The (NTP) aims to support digital transformation efforts and improve the efficiency of public sector organizations (Vision, 2018). Moreover, IT innovations will play an essential role in fostering this transition by encouraging creative, cost-effective approaches (ALMutairi & Thuwaini, 2015). In particular, cloud computing solutions can support policy programs by improving intergovernmental partnerships and offering other CC advantages. The KSA, however, has not yet undertaken a national CC initiative that could encourage the growth of CC.

2.12 Summary

The chapter presented a literature review on cloud computing. A crucial discussion was also presented on different deployment models. The key drivers of the adoption of cloud computing were discussed. Problems related to the implementation of cloud computing solutions were studied and illustrated from a different perspective.

Finally, a critical review of the current CC solutions adoption Frameworks performed. The evaluation confirmed that while this field is an active study area, there may be a want for a comprehensive framework to assist decision-makers in making decisions on CC, especially in developing-country, including KSA. Thus, the next chapter will discuss the development of a theoretical framework and look at the use of cloud computing in KSA's health-care context.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The design of this chapter provides the research methodology employed to achieve the study's objectives. As shown in Figure 3.1, this approach divided into three phases: Phase-1: problem identification and gap analysis, based on literature review; Phase-2: involving data collection development and implementation, this phase covered research framework, research strategy, research theories, research methods, research design, case study; and finally Phase-3: a framework developing and validating, this phase covered data preparation, method of data analysis, hypothesis testing and building and framework assessment theoretical framework.

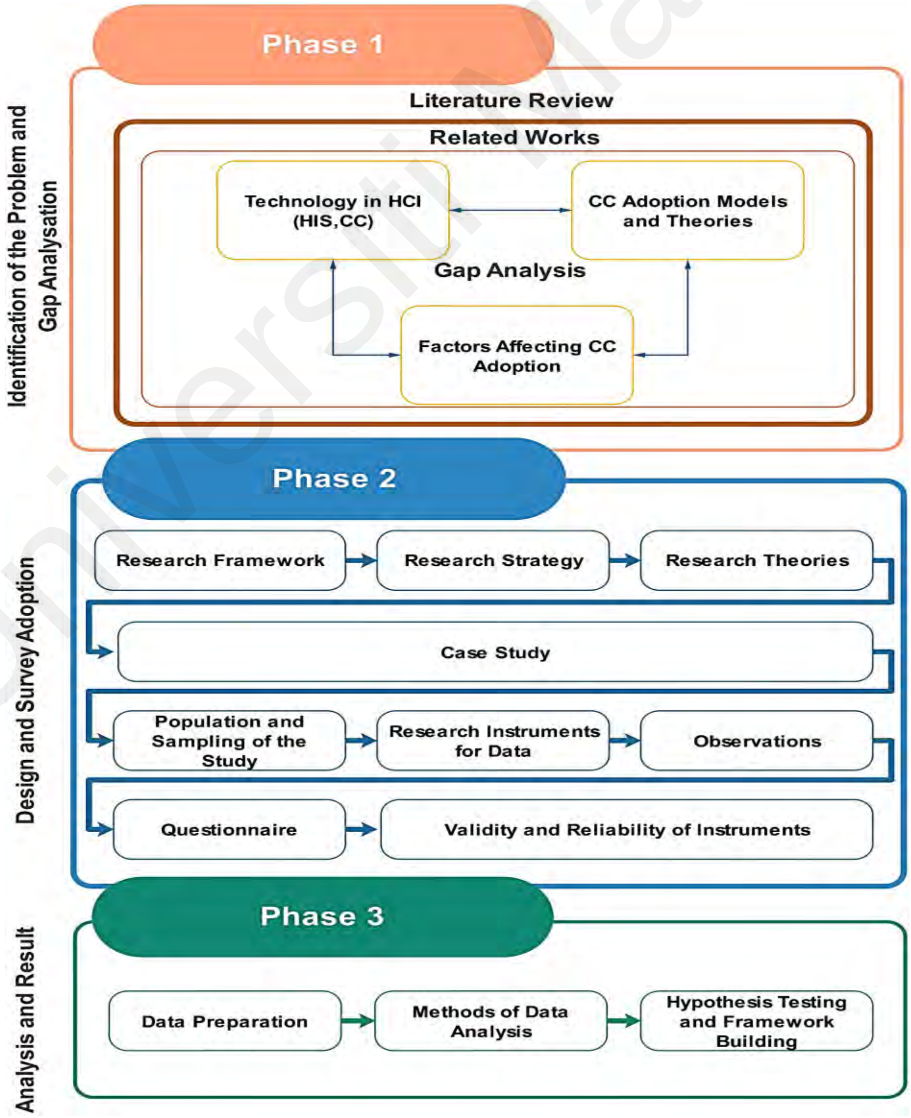

Figure 3.1: Phases of Methodology Research

3.2 Phase I: Identification of the Problem and Gap Analysis

Phase 1 showing the identification of the problem and analysis of the gap. The review of the literature was performed based on the content analysis of recent related studies. The five steps in this process of evaluating research literature are as follows:

3.2.1 Information Sources

Four main methods were selected to browse for specified articles: (1) the database offering access to technical and scientific research papers Science-direct; (2) the philosophical literature in the technology and engineering library IEEE Xplore; (3) Elsevier's Scopus, peer-reviewed literature is greatest abstract and citation database. Science, Technology, Medicine science and access science, and (4) the humanities, social sciences Web of Science (WoS) service indexing cross-disciplinary research in sciences. To get credible sources that are widely cited to support this research. Both science, social and technological literature discussed to provide a broader perspective of the contributions of researchers in a comprehensive, however significant, variety of disciplines.

3.2.2 Study Selection

The analysis's selection process consists of searching the literature sources, followed by two tests and filtering iterations. The first iterative process by verifying the titles and abstracts excluded multiple copies and unimportant publications. In contrast, the second instalment filtered the advertisements from the first step after a thorough reading of the selected “publications papers” in full text. Both versions applied the same criteria of eligibility adopted by the author, who did the evaluation and analysis.

3.2.3 Search

The review performed in previous research, in which this research evaluates these studies and develops innovations that will utilize the case study to assess and improve cloud computing adoption in the health-care sector. In ScienceDirect, IEEE Xplore, Scopus, and WoS databases via their search boxes, unless it accomplished in previous studies. The researcher used a mix of keywords that contained CC adoption in HIS as health-care institutions' CC competence and CC acceptance in different variations, combined by the health-care organization. The article selection technique, as shown in Figure 3.2. Different choices are used in each search engine to search for related literature and exclude book chapters and certain forms of publications other than journal and conference papers, as the researcher found these two places to be the most likely to contain up-to-date and acceptable scientific work.

3.2.4 Eligibility Criteria

This research included an article that met the requirements set out in Figure 3.2. The study set an initial goal of mapping the space of cloud computing research into health-care organizations and a general and course it matters-grained four-category categorization. Such categories were extracted from an unconstrained pre-survey of the literature (Google Scholar was used for getting the first impression of the environment and guidance in the literature). In both assessment and filtering iterations, articles were excluded after the duplicates' initial removal if they did not meet the eligibility criteria. Case studies of exclusion reasons include: (1) the article is non-English; (2) the focus is not on the adoption of cloud computing; and (3) the objective is specifically technology and the theoretical framework and development instead of CC.

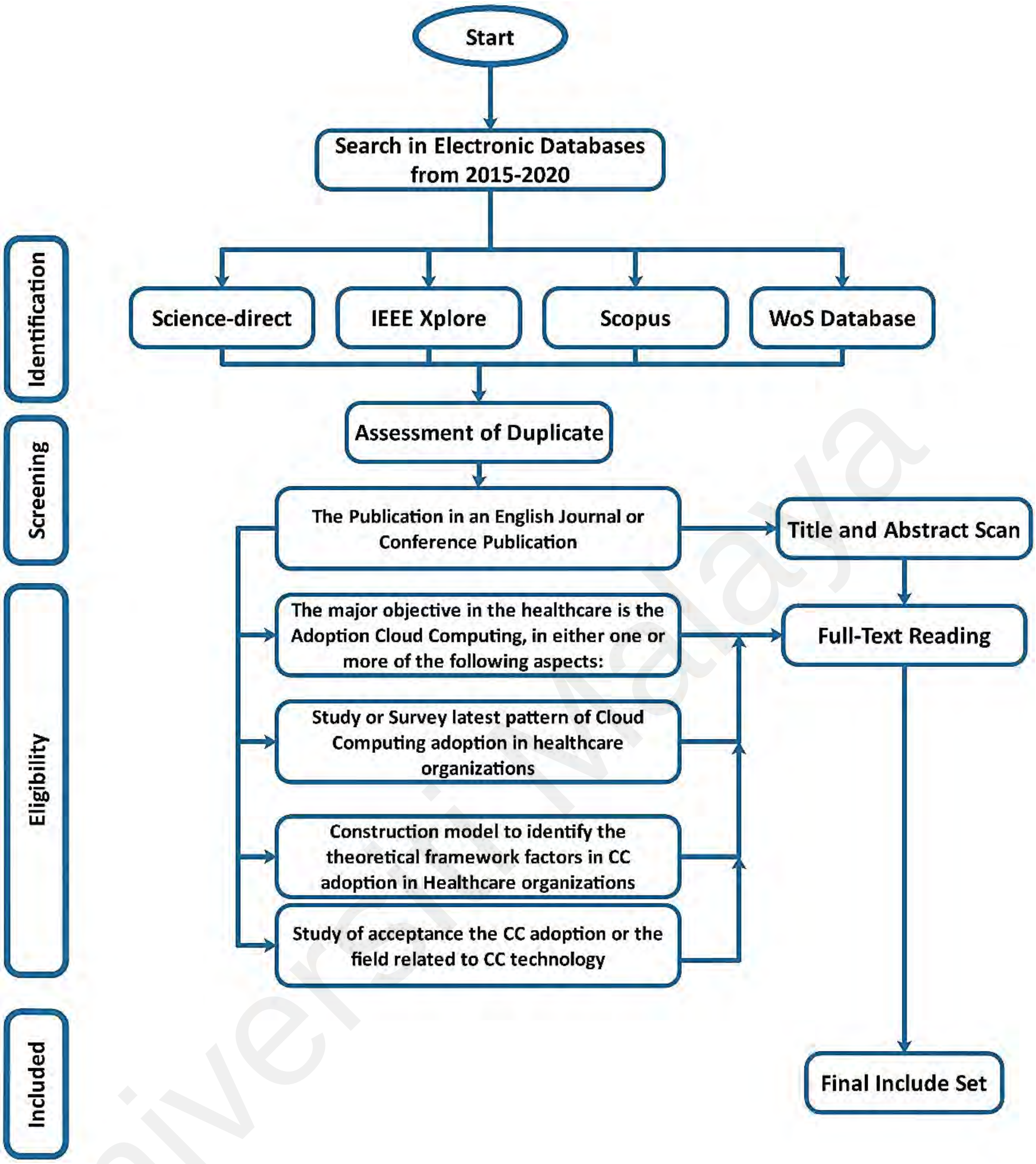

Figure 3.2: Articles Selection Technique

3.2.5 Results of Analysis of Studies Selection

Although CC adoption has been an exciting subject since the turn of the century, this preliminary query quest from ScienceDirect, IEEE Xplore, Scopus, and WoS literature from the 2015-2020 period, scanning the titles and abstracts, omitted further articles, papers. Publications were removed from full-text reading, leaving writings in the final included set. Those publications were read in detail and care to find a general map on this emerging topic for the research conducted.

After completing the literature review process, some trends were found for the analysis of the publications researched. Secondly, it found that the published papers usually included exploratory work. First, most publications defined the presence of studies/researches on cloud computing adoption. Since that, the next most significant proportion of publications identified and during literature review found to perform different studies on cloud computing adoption such as e-health, m-health, and specific CC following implanting theoretical framework. In reality, quite a few research studies found to relocate further in creating it using the framework in the initiative or sharing their experiences. Finally, even a small proportion of studies included frameworks or model inventions that addressed particular purposes' acceptance.

In short, despite the enormous potential of HIS as a CC, the model has not been extensively addressed in the literature. There are no apparent structures that explicitly cover all feasible schemes and interrelationships within HIS and CC. Thus, it is essential to evaluate and compare these schemes' effectiveness (Alharbi, Atkins, Stanier, & Al-Buti, 2016; Devadass & Sekaran, 2017). Also, health-care consumers need to have a clear understanding of the potential advantages and risks associated with cloud computing when making a move to use cloud computing and set reasonable goals with their CSPs. The various service delivery models must address each model with its specific responsibilities and requirements duties. CC services (private, public, and hybrid) would also heavily weigh in strategic decision-making. Whereas, the phase 1 process configuration provided in Figure 3.3.

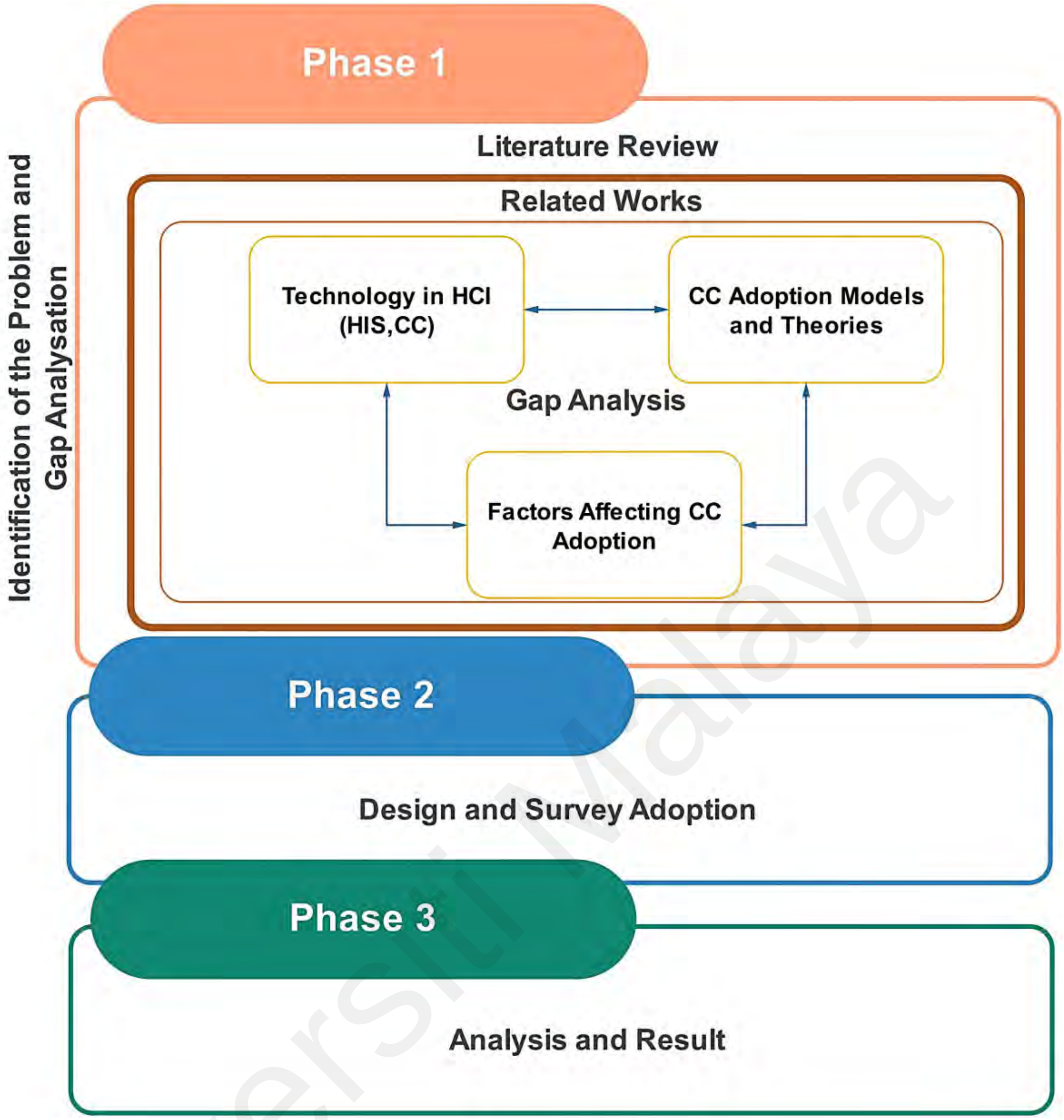

Figure 3.3: The Process of Phase-1

3.3 Phase II: Design, Development, and Implementation of Data Collection

Analysis of the relevant prior studies and literature theoretically done in Chapter 2 provides the ground for constructing a theoretical framework for the improvised system using CC architecture. Besides, TAM and TOE were also discussed in Chapter 2. The proposed conceptual framework acted as guidance in doing and completing the research.

3.3.1 Research Framework

Research can even be experimental or non-experimental based on how the expected variables are approached (Johnson & Christensen, 2019). The goal of this concise research is to review the existence of cloud computing in HCIs critically. Moreover, develop the theoretical framework to implement and report on CC's use in the health-care sector from the situation (what does exist). Description of creative exploration originated as research findings that can then be tested and validated.

A research study aimed at providing statistical description and interpretation of the phenomenon or variables studied (Becker et al., 2016). Variables are analysed, and inferences on the relationship of variables are made (Adelson et al., 2017). The survey approach was chosen in this research as it appears to be the most important and effective method for collecting data in identifying factors influencing cloud computing adoption in the health-care sector. The survey used best for standardized and systematic group conduct study (Tremblay et al., 2017). An increasingly common questionnaire, observation, and paper-based questionnaire survey (Moser & Kalton, 2017). In particular, research is structured, permitted to generalize, systematic questionnaires, accessibility of the pre-determined model to be checked, using average responses with high reliability, provided as the best research background because it was done quickly to use the data collection format (Wu et al., 2017).

3.3.2 Research Strategy

The research design strategy consists of procedures or methods used in the research. Whereas the quantitative, qualitative, and mixed methods research strategies are widely used (Creswell & Creswell, 2017). It is also based on the underlying paradigms as a broad view or perspective (Leavy, 2017). Moreover, philosophical assumptions guide the research and identify the appropriate research methods (Maxwell et al., 2017). Positivist, post-positivist, interpretive, and critical social theory are conventional paradigms (Davies & Fisher, 2018). Figure 3.4 depicts the proposed theoretical framework components interconnection (2009).

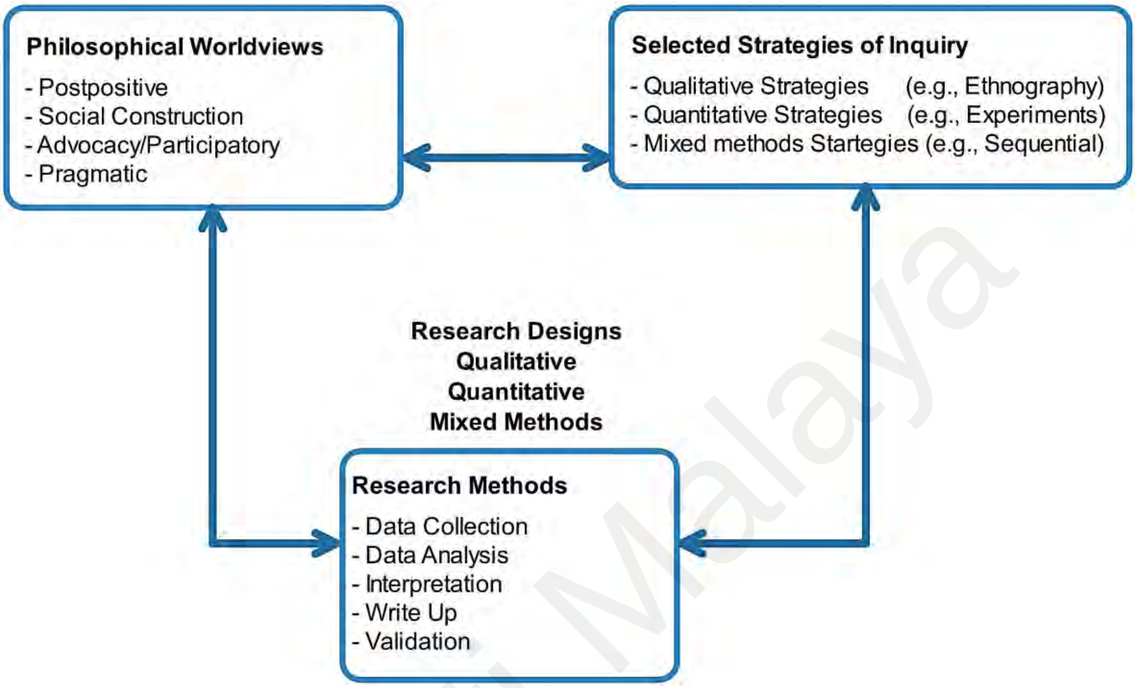

Figure 3.4: Framework for Design: The Interconnection of Worldviews, Strategies of Inquiry, and Research Methods (Creswell & Poth, 2016)

Empiricism positivism was commonly used for the formal, objective, and deductive problem-solving classification, evaluating, and analysing cause and effect relationships using a deductive knowledge achievement mechanism. Based on numerical or statistical data concentrating on counting, scaling and abstract reasoning, and using experiments to evaluate independent variable and dependent or outcome variable. (Brauer & Curtin, 2018; Maxwell et al., 2017). The data collection instruments are surveys, content analyses, and statistics (Patridge & Bardyn, 2018).

The scientific inquiry qualitative research has various approaches to understanding social processes complexity and phenomenon (Mohajan, 2018). From the research perspective, participants understand behaviours exploratory in nature and seek to generate novel insights that illuminate the organizational context and health-care services (Åkerblad, 2017). Also, the influencing organizational performance and the quality of care using various qualitative approaches such as in-depth, direct observation, and written documents (Tracy, 2019).

Insights and explanations from the respondents with research strategies include grounded theory, ethnography, case study, and phenomenology (Carmichael & Cunningham, 2017). A mixed methods research strategy combines quantitative and qualitative methods. The data collection and analysis are carried out in a single study in which the data are collected concurrently or sequentially as a complementary method to make findings (Palinkas et al., 2015). Generate additional complete data and enhance the obtained insights (Schoonenboom & Johnson, 2017). This research used a mixed-method approach in data collection as it helped collect relevant and data needed to answer the research objectives and research questions (Almeida, 2018).

3.3.3 Research Theories

HISs provides benefit for patients' treatment and scientific research, making patient care efficient. This research proposed a theoretical framework for cloud computing adoption in HCI, as stated in chapter 4. This research used TAM and TOE theories to investigate technology acceptance of the proposed health-care information system designed using cloud computing CC adoption. These theories helped to identify user attitudes, behaviour intention, and ease of use in the context of technology, organization, and environment when using the system that determined to accept (or reject) the technology used. Various fields have used TAM to investigate technology acceptance like computer acceptance, applications of business processes, systems for communication and collaboration, software, internet, and application systems.

In this research, TOE, the theory was the appropriate framework used to study the innovation decision-making in adopting CC at a firm-level based on technological, organizational, and environmental context. Many studies have been done on TOE's technology innovation, a framework like RFID adoption in the health-care environment (Winston et al., 2016). Knowledge management systems adoption (Tsai & Hung, 2016). Web-site development, in e-commerce, education (Muda & Yusof, 2015; Tashkandi & Al-Jabri, 2015), CC adoption by SME (Senarathna et al., 2016), and CC adoption in HCIs (Ahmadi, Ibrahim, et al., 2015; Alharbi et al., 2016a).

3.3.4 Research Methods

A research method plans how to collect data to answer research questions and objectives where a combination of methodologies strengthens the research method as it provides complementary types of information. This research adopted the mixed methods approach to achieve the research's objectives because it supported the completeness of data outcomes and compensated for some of the particular techniques' inherent weaknesses when applied alone. This case study was done in three (3) hospitals using a mixed-method to capture essential aspects from the participants' perspective. The conceptualized the priority-sequence model, as shown in Figure 3.5. Note: The capital letters denote the dominant method (QUAN, QUAL), while lowercase capital letters denote complementary approach (quan, qual); + = simultaneous design; → = sequential design.

		IMPLEMENTATION	
		Simultaneous	Sequential
PRIORITY	Equal	QUAL + QUAN	QUAL → QUAN QUAL → QUAN
	Different	QUAL + quan QUAN + qual	qual → QUAN QUAL → quan quan → QUAL QUAN → qual

Figure 3.5: The Types of Mixed Methods Designs (Morgan, 1998)

Figure 3.5 indicates a mixed-methods approach process in determining priority for this research, where the quantitative approach selected as the principal data collection method followed with the different complementary qualitative ways to strengthen research design to meet the research objectives. The study's primary goal is to maximize the value of data collected; thus, the complementary method used in this data collection process. Therefore, the (QUANT→qual) sequence model is shown in Figure 3.5, guided the data collection process, data analysis, and discussion of the findings.

3.3.5 Research Design

Any successful shifting to the adoption of IT into existing organizational structures must begin with evaluating the organization's current status, followed by a plan for improvement (Govender, 2006). Research design is the plan to conduct the research (Lune & Berg, 2017).

This research performed a case study using quantitative and qualitative mixed-methods as strategies for data collection. In this study, questionnaires and observations were used to complement each other as research instruments, as shown in Figure 3.6. Questionnaires were used and evaluated. The set of empirical data sequentially is used in a coordinated manner. This research aims to evaluate cloud computing adoption in SHCIs. Also, describe the factors influencing CC adoption in SHCIs. The outcome of previous goals will help determine the best way to apply CC to increase the sufficient implementation step.

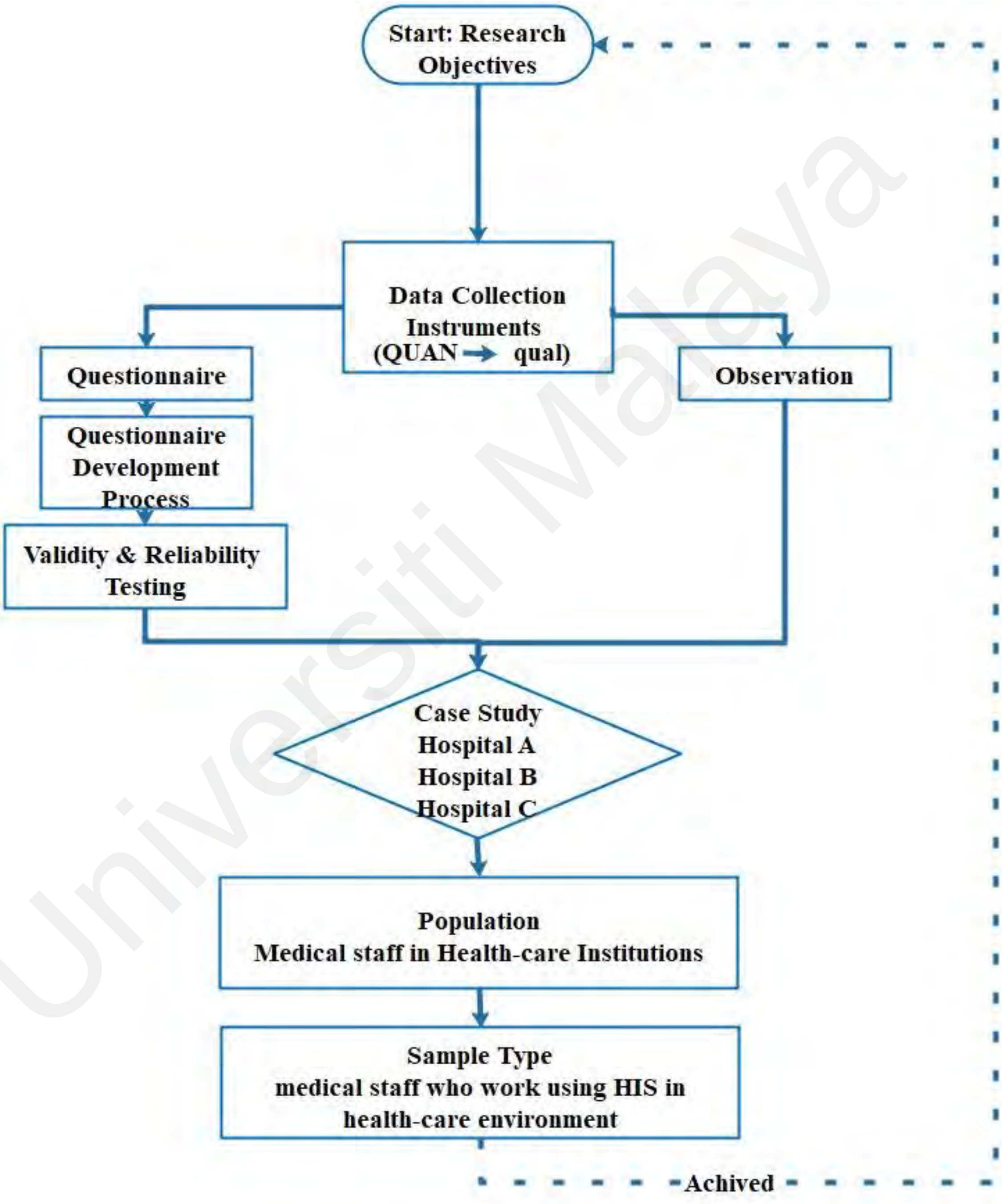

Figure 3.6: Research Methodology Design

According to Hevner and Chatterjee (2010), The design science studies paradigm is mostly applicable to IS studies as it immediately addresses the critical thing troubles of the discipline (Hevner & Chatterjee, 2010).

As conceptualized by Simon (1969), design science assists a pragmatic studies paradigm that calls for innovative artefacts to resolve real problems (Simon, 1969). Thus, design science research focuses on the IT artefact with a high priority on relevance in the application domain. Design science research in IS addresses what are considered to be wicked problems (Hevner & Chatterjee, 2010). Figure 3.7 shown the research science design framework.

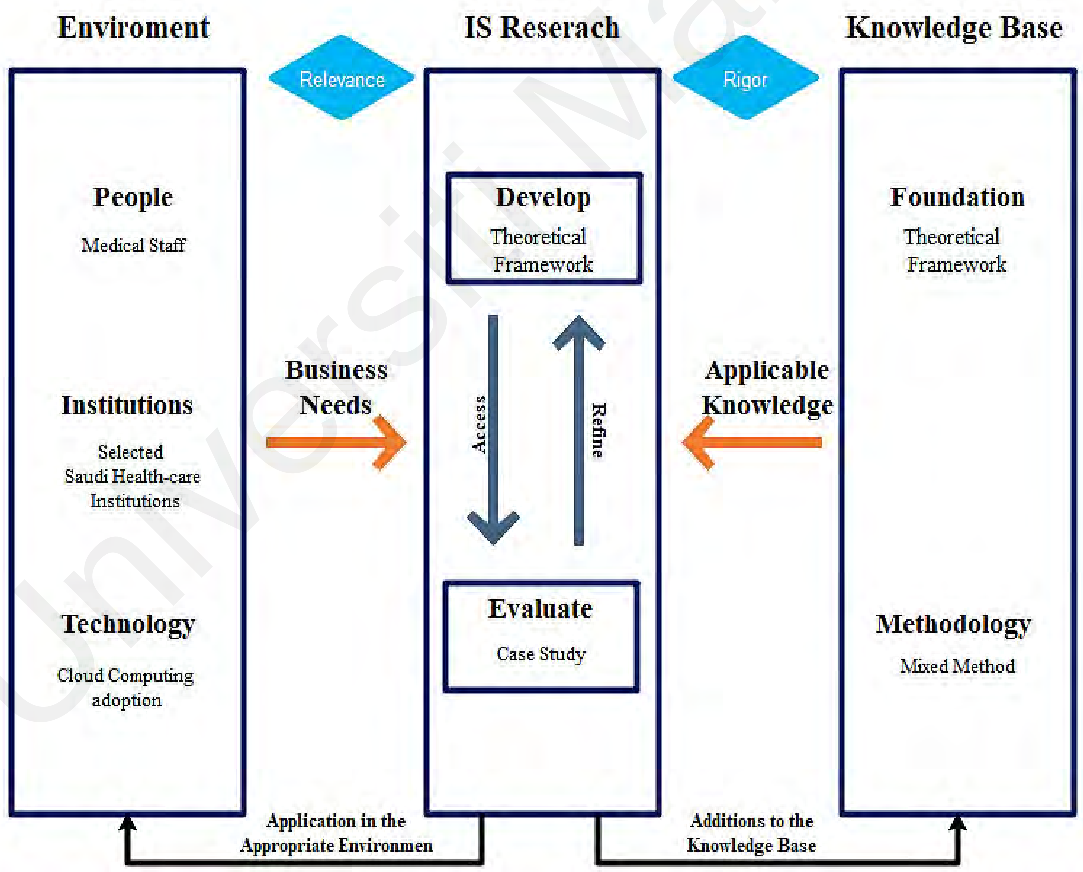

Figure 3.7: Research Science Design Framework

3.3.6 Case Study

Case study research is a standard qualitative method used to study information systems as an empirical inquiry investigating a phenomenon within its real-life context. Especially in unclear aspects and context boundaries, learning and analysing the real situation and applying theoretical concepts, experience, and observation by focusing on the case study's conceptual issues to develop a solution to the research involving the detailed and holistic investigation of the unit of analysis over the time. However, one main weakness of the case study is limited insights into relevant subjects, and the results are unable to be generalized. The case study in this research involved three (3) hospitals located in the western region of KSA were, chosen based on their diversity in terms of organization size (large, medium, and small-sized hospitals), total bed capacity (Hasanain, 2015), hospitals' functions and specializations such as general hospitals, maternity and paediatric hospitals and number of staffs. The surveys were sent to the hospitals, completed, and returned by the hospitals' staff as research respondents. Details of the hospitals are presented in Table 3.1.

Table 3.1: Number of Surveys Distributed in the Participant Hospitals

Location	Hospital	Hospital Bed Capacity	No. of Surveys Distributed
Western Region of KSA	Hospital A	500	90
	Hospital B	454	80
	Hospital C	300	60
			Total of 230

The selection of these hospitals is based on three inclusion criteria. Firstly, public hospitals under the Saudi MoH authority facilitated and expedited obtaining approval to conduct this research. Secondly, these hospitals were situated within cities in the selected geographic area and most densely populated region (the western region of KSA), thus assisting the study's feasibility.

These hospitals were located within driving distance, and it helped facilitate timely data collection to manage the distribution and selection of the survey questionnaires. Table 3.2 shows the number of questionnaires distributed to each of the hospitals that participated in this research, together with associated response rates according to hospital size.

Table 3.2: Response Rates, Hospital Location, and Size

<table>
<tr><th>Location</th><th>Hospital</th><th>Hospital Bed Capacity</th><th>Distributed Questionnaires</th><th colspan="2">Respondents</th></tr>
<tr><td rowspan="4">Western Region of KSA</td><td>Hospital A</td><td>500</td><td>90</td><td colspan="2">80</td></tr>
<tr><td>Hospital B</td><td>454</td><td>80</td><td colspan="2">70</td></tr>
<tr><td>Hospital C</td><td>300</td><td>60</td><td colspan="2">50</td></tr>
<tr><td colspan="2">Total</td><td>230</td><td>200</td><td>Percentage 86.9%</td></tr>
</table>

Participants in the research include hospital staff who were end-users of the HIS, such as physicians, nurses, laboratory staff, pharmacists, and administrative staff, and more details will be found in section 3.3.7.

3.3.6.1 Case Study 1 (Hospital A)

This case study conducted in “Hospital A” attempts to understand the factors causing HIS's slow adoption rate. The HIS used in Hospital A focused on the methods used for managing and controlling health-care information, such as information on patients and medical staff. Hospital A, located in (Jeddah city of KSA), is an educational hospital with a bed capacity of (500) and annual admissions of (18000 to 19000) patients. It was founded by Royal Highness Prince Talal bin Abdul Aziz in (1955 on a 31900 meter-land). It was also the first educational hospital in KSA and one of the university hospitals affiliated with the College of Medicine at King Abdulaziz University.

This hospital had a combining group of distinct medical qualifications staff such as consultants, physicians, and technicians with various specialities and international expertise. The existing knowledge helped to developed modern technology in Hospital A. Since then, Hospital A had offered the best medical services to patients without any charges (Medicine & Hospital, 2017). Having well-trained experts as the staff helped encourage and support scientific research related to medical services and attracted well-trained experts to train doctors and students in the College of Medicine and other colleges in the university and staff from governmental bodies. Where (Hospital A) offered specialized medical services supervised by the best cadres and clinical support services under high-quality administrative supervision. Also, it had several specialized departments like ophthalmology, ENT, diabetic centre, specialized clinics, general clinics, and clinical support services. It had the vision to become a leading medical school and health-care provider that significantly impacted SHCIs and contributed significantly to the science and practice of medicine worldwide (Medicine & Hospital, 2017).

3.3.6.2 Case Study 2 (Hospital B)

The second case study conducted in "Hospital B", focusing on the HIS used to manage and control patient care and medical information. Hospital B was located in the Holy Capital of Makkah, the western region of KSA, and is considered the oldest hospital in Makkah. It provides services for patients with disease cases and provided health-care for them. The hospital offered ambulatory services around the clock for emergency or accident cases, where the hospital was equipped with 454 clinical beds (Makkah, 2017).

It consists of administrative and medical departments with staff, including technicians, administrative and medical teams like physicians, pharmacists, and nursing. Whereas general surgery, kidney, urology, plastic surgery, orthopaedics, cardiology, and ear-nose-throat (ENT). "Ophthalmology", internal medicine, "pulmonology", anaesthetics, digestive system, and fever clinics, and there are 17 specialist clinics and six (6) dental clinics. The dental clinics include oral and maxillofacial surgery, root canal and nerve treatment, and conservative dentistry clinics (Makkah, 2017). Outpatient clinics received the patients from the primary health-care centres located in the residential sector that the hospital served to have (19) health centres. They also received cases referred from other authorities. They were also the school health units, Umm Al-Qura University's medical management, medical management of the General Security Hospital, the medical unit of National Guard Presidency, and other governmental administrations in the Holy Capital (Makkah, 2017).

This hospital had an isolation ward containing 41 beds meant for epidemiological and infectious diseases such as tuberculosis: Acquired Immune Deficiency Syndrome (AIDS) disease, dengue fever, chickenpox, measles, and meningitis. This ward's role became significant during the Hajj season when receiving pilgrims’ cases suspected of having these infectious diseases. Kidney Diseases Centre conducted blood dialysis for dialysis patients. This centre contained (Group, 2017) blood dialysis machines in addition to the X-ray section, equipped with three (3) sound waves devices, three (3) fixed X-ray machines, fluoroscopy machines, and (5) mobile X-ray machines, in addition to fully-fledged CT scan. Section of cardiology fitted with echocardiography devices (echo) and monitor Holter. Also, this section conducts the ECG stress tests and echocardiography tests through the oesophagus. (Hospital B), also had a fully-fledged gastrointestinal endoscopy unit and full-fledged endoscopy surgeries unit. Also, the “dermatological” section provides services through the “photodynamic therapy” unit for patients with “vitiligo and psoriasis”. There was also a full-fledged section for physical and rehabilitation treatments at the physical therapy section (Makkah, 2017).

3.3.6.3 Case Study 3 (Hospital C)

The third case study was done in “Hospital C” located in the City of Taif, KSA, and specialized in children's treatment by providing preventive and therapeutic health-related services for children, obstetrics, and gynaecology patients. The HIS was used for managing and controlling patient's and medical staffs’ information. It was a specialized hospital in (OB/GYN), diseases with a (300-bed), capacity enhanced with completed medical specializations and support with a (14-emergency bed), size, isolation, operation and ICU rooms at emergency department, (16 delivery rooms, 14 ICUs, 96 cutting-edge) incubators, and (120 baby beds), (health, 2017).

3.3.7 Population and Sampling of the Study

The research participants include hospital staff of the health care information system, such as physicians, nurses, laboratory staff, pharmacists, and administrative staff. That allowed them to participate in the research as anonymous participants to protect participants from perceived risks, such as fear of responding honestly or feelings of being coerced to participate. This staff was only identified based on their job category or profession to protect them from being anonymous and private. The research participants were chosen based on two parameters: representing the same categories of staff (Hasanain, 2015), and secondly, they were the primary users of the HIS (Hasanain, 2015). Table 3.3 shows the population distribution, as mentioned in the statistical yearbook by the Saudi MOH (2018) (Health, 2018).

Table 3.3: Population Distribution (Health, 2018)

Category	Hospital A	Hospital B	Hospital C
Physician	203	119	52
Nurses	29	8	10
Pharmacist	6	2	2
Allied health personnel	144	91	63
Total population	382	220	127

The sample of participants in this research consists of health-care personnel from three government health-care institutions located in the western region of KSA, such as physicians, nurses, laboratory staff, pharmacists, and administrative staff. Selection of staff based on purposeful sampling to describe participants included in the survey. The empirical data survey sample consisted of a total of 230 participants. In contrast, they have personally provided the quantitative data questionnaire. Overall, 200 accessible and completed questionnaires with a response rate of 86.9 % were accepted and analysed. A survey with a response rate above 60% is considered suitable for investigating the type of inquiry. Table 3.2 shows the respondent's profile.

3.3.8 Research Instrument for Data

The various data collection techniques and research instruments used in this research include (survey) questionnaires and observations for data collection. Also, where survey questionnaire was the quantitative research instrument used as a method. To efficiently collect quantitative data from respondents involving low costs of the data collection process (McGuirk & O'Neill, 2016), with minimum assistance and facilities and easy for respondents to answer given sufficient time for the respondents to provide thoughtful answers, look up records, or consult with others. Qualitative research methods (QRMs) are widely used to study IT applications in health-care (Deeks et al., 2019). The qualitative instrument used in this research includes observation (Denzin, 2018).

In this research, Appendix A contains an ethical approval to collect data obtained from the MoH in KSA and official permission obtained from the hospitals' managers.

The observation was used to efficiently collect qualitative data from respondents to record information as it occurs in the research site and examine behaviours that cannot manipulate.

Further, it is an interactive qualitative inquiry as an in-depth study where the face-to-face technique collects data from people in their natural settings (Tracy, 2019; Moser & Korstjens, 2018). The research began with conducting a thorough literature review as the conceptual foundations. Recent and relevant literature was reviewed, such as (Almuayqil et al., 2016; Hasanain, 2015), addressing eHealth CC adoption in HCIs. Prior research using the mixed method approach (Almuayqil et al., 2016; Almuayqil et al., 2015; Hasanain, 2015) also explored. Collecting and gathering the required information in this research was done carefully and thoroughly. For example, it was constructing the research instruments through a thorough, relevant literature review process (Fink, 2019; Galvan & Galvan, 2017; Johnston, 2017), consultation with experienced physicians' staff, and reflection of the knowledge experience by the other professional staffs. The following subsections describe the techniques used in this case study to collect data.

3.3.8.1 Observation

The observation of a data collection technique involves systematic nonverbal documentation of verbal behaviour and communication. It allows behaviour recording without relying on the respondents' reports by observing people and places at a research site to gather optional and first-hand information accurately but can be expensive and time-consuming. Moreover, the observation of document and record information for collecting qualitative data, having a distinctive feature, recording the flow of interaction, or behaviour dynamics. In this research, the observations involved observing the technology used, the organization's staff, and the hospital environment providing insight and understanding of the technology and systems used, organization structure and management, work nature, culture, and environment. The data collection took place in current research in 2019-2020, upon obtaining approval from hospital managers' MoH and approval. The data collection carried out using informal and formal observations as complementary data to the other data collected from the survey questionnaires.

3.3.8.2 Questionnaire

This research used a survey with a structured questionnaire to collect quantitative data suitable for information gathering from a large number of respondents to determine the factors that influence the CC adoption in selected SHCI. Appendix B contains a copy of the questionnaires. The questionnaires contain fifty-five (55) questions using (5), Likert-

☐ Strongly Disagree ☐ Generally Disagree ☐ Neutral ☐ Generally Agree ☐ Strongly Agree

The questionnaires segmented into four sections:

(a) Demographic and Background Information.

(b) Status of Cloud Computing (CC), Adoption.

(c) Intention to Adopt Cloud Computing (CC).

(d) Technology and Organizational Readiness.

(e) Environmental Context.

(f) Perceived Ease of Use (PEOU).

(g) Business Context.

Furthermore, were these factors affecting and level of sharing information in the hospital environment. And the suggestion, thoughts, solutions, issues, or opinions. An information sheet about the study was also enclosed together with the questionnaire. Appendix B contains a copy of the questionnaires. The English written questionnaire was also translated into Arabic and checked by a qualified translator. The questionnaire is divided into seven sections, as shown in Table 3.4:

Table 3.4: The Questionnaire Sections

No.	Section	No.: of Questions	Section Description
1	Demographic Characteristics of the Respondents	7	Section A required the respondents to tick (√) for relevant demographic information like gender, age group, English language level, educational level, name of the hospital currently working, and job category (e.g., nurse, doctor, pharmacist, administration officer).
2	Status of Cloud Computing Adoption, and use current HIS among medical staff within SHCIs	2	This section focuses on CC adoption status inside the Saudi health-care institutions.
3	Intention to Adopt Cloud Computing	1	This section focused on the intention of effective use of CC solutions in health-care institutions by health-care consumers.
4	Technology and Organizational Readiness	28	This section investigates the different dimensions that influence CC adoption in health-care institutions in KSA. The questions in this part were measured on a five-point Likert scale ranging from 'Strongly Agree' to 'Strongly Disagree.'
5	Environmental Context	9	
6	Perceived Ease of use (PEOU)	4	
7	Business Context	6	

Whereas the factors listed above about how this affects the adoption of cloud computing as dependent factors. Moreover, the participants could specify any other technical or social barriers based on their own experiences.

(a) Questionnaires Design

The first questionnaire objective is to help in the extraction of data from respondents. It acts as a standard guide for interviewers, whom each need to ask precisely the same questions. Without this standard, issues at the discretion of the individual would pose haphazardly. Questionnaires are also an essential part of the methodology used to collect data. They are the medium on which answers are documented to enable an analysis of results. However, the researcher adopted a part of the Alharbi study questionnaire (Alharbi et al., 2017a, 2017b) to conduct the current research (Sousa et al., 2017). Whereas Table 3.5 shows the measurement items for each construct.

Table 3.5: Measurement Items of Questionnaire

A. Technology and Organizational Readiness				
Construct	**Code**	**Items**	**Description**	**Studies**
Attitude Towards Change	ATT-1	The implementation of Cloud Computing will be accepted by IT staff in my organization.	The successful adoption of new technologies requires various changes to be made to the organizational structure; such changes may face resistance from physicians, administrative and IT staff	(Alharbi, 2017; Masana & Muriithi, 2016; Turan et al., 2014; Yeboah-Boateng et al., 2014)
	ATT-2	The implementation of Cloud Computing will be accepted by health-care professionals in my organization.		
Compatibility	COM-1	Cloud Computing services will be compatible with the current business strategy of my organization.	The cloud computing service fits with existing equipment, in line with the current system, and is not a problem when deployed.	(Alharbi, 2017; Amron et al., 2019a; Baral et al., 2019; Gangwar et al., 2015c; Ogunlolu, 2019; Youssif et al., 2017)
	COM-2	Cloud Computing technology is compatible with the current IT infrastructure (Hardware/Software) of my organization.		
	COM-3	Cloud Computing is compatible with health-care values and goals.		
Complexity	COX-1	Cloud Computing technology is complex for your organization.	The level of difficulty experienced by users to learn and use cloud computing services	(Alharbi, 2017; Amron et al., 2019a; Ayoobkhan & Asirvatham, 2017; Dash & Anusandhan, 2018; Gangwar et al., 2015c; Ogunlolu, 2019; Youssif et al., 2017)
	COX-2	Cloud Computing is challenging to be used, but it still is manageable.		
Service Quality	SEQ-1	Service quality is a critical issue that helps the organization to utilize Cloud Computing technology.	Cloud users are interested in the quality of service offered by Cloud Service Providers. While at the same time ensuring optimum use of resources.	(Abdulaziz et al., 2019; Alsanea, 2015; Lian et al., 2014; Mohammed, 2019; Odun-Ayo et al., 2018; ul Amin et al., 2017; Weng et al., 2016)
	SEQ-2	Cloud Computing technology is a crucial component in enabling our IT service delivery.		
IT Infrastructure Readiness	ITIR-1	The infrastructure is essential in order to adopt Cloud Computing.	Technology readiness could be an enabler factor in the decision of whether to adopt Cloud Computing.	(Alsanea, 2015; Hameed et al., 2015; Kuo, 2011; Ogunlolu, 2019; Sulaiman & Magaireah, 2014)
	ITIR-2	Your IT infrastructure at your organization is ready to adopt Cloud Computing technology.		
Relative Advantage	REA-1	Cloud Computing will allow my organization to accomplish specific tasks more quickly.	The extent to which organizations can enjoy the benefits and improved performance from the use of cloud computing.	(Alharbi, 2017; ALQarni & Barnawi; Amron et al., 2019b; Gangwar et al., 2015c; Ogunlolu, 2019; Ogwel, Otieno, & Odhiambo-Otieno, 2020)
	REA-2	The use of Cloud Computing will provide real benefits for the patients.		
	REA-3	Cloud Computing will increase the productivity of the organization's staff.		

A. Technology and Organizational Readiness (Continued)				
Sharing & Collaboration	SHC-1	Cloud collaboration technology will help and accelerate the adoption of Cloud Computing within your organization.	The option to share a document and more than one person can edit the same document at a time.	(Abdulaziz et al., 2019; Al-Sharafi et al., 2017; Alsmadi & Prybutok, 2018; Amron et al., 2019a; Pişirir et al., 2019)
	SHC-2	The ability to communicate and share via cloud computing can enhance the quality of work produced and decrease the amount of time it takes to complete tasks.		
Security & Privacy Concerns	SPC-1	The security concern is essential in order to adopt Cloud Computing technology within your organization.	Security and privacy issues in cloud computing are the primary concerns that overwhelm the benefits of this technology. However, safety is also a guarantee of the best service in cloud computing.	(Amron et al., 2019b; Ashtari et al., 2015; Rashid, 2018; Masana & Muriithi, 2019; Ogunlolu, 2019; Youssif et al., 2017)
	SPC-2	You think that Cloud Computing technology is not secured enough, and that might make your organization exposed.		
	SPC-3	You fully trust Cloud Computing technology, and you do not have any security concerns.		
	SPC-4	Cloud Computing technology will threaten your organization's privacy.		
	SPC-5	You think privacy is not a significant issue that prevents your organization from adopting Cloud Computing technology.		
Technology Readiness	TEC-1	My organization has provided internet access to all its members.	Technology readiness encloses infrastructure and IT human resources. Therefore, organizations with a higher degree of technology readiness are more prepared to adopt Cloud Computing.	(Alharbi, 2017; Ayoobkhan & Asirvatham, 2017; Gutierrez et al., 2015; Masana & Muriithi, 2019; Oliveira et al., 2014; Qusef et al., 2019)
	TEC-2	The IT infrastructure of my organization can support the adoption of Cloud Computing.		
	TEC-3	My organization makes fair use of IT to achieve its goals.		
Top Management Support	TMS-1	The organization's top management involves itself in the process when it comes to IS/IT projects.	The management team has a high level of involvement and interaction with employees towards adopting cloud computing services.	(Alharbi, 2017; Ayoobkhan & Asirvatham, 2017; Harfoushi et al., 2016; Lian et al., 2014; Ogunlolu, 2019; Yoo & Kim, 2018)
	TMS-2	The organization's top management supports the adoption of Cloud Computing.		
Trust	TRU-1	You trust the Cloud Computing technology and believe that it is a well-reliable technology.	The organization believes that cloud computing will facilitate its business and believe the service provider will assist it without harming the organization.	(Amron et al., 2019b; Gangwar et al., 2015a; Ogunlolu, 2019; Rahi et al., 2017; Sadoughi, 2019; Shahbaz et al., 2019)
	TRU-2	You think the trust in Cloud Computing technology will help your organization to adopt it.		

B. Environmental Context				
Construct	**Code**	**Items**	**Description**	**Studies**
Government Support	GOV-1	Your organization does not need government support in order to adopt Cloud Computing technology.	Rules and policies are set by the authorities to assist in the implementation of cloud computing.	(Al-Bajjari, 2017; Alharbi et al., 2016; Alsanea, 2015; Karim et al., 2017; Sadoughi, 2019)
	GOV-2	You think government support is enough to encourage your organization to adopt Cloud Computing technology.		
Regulation Compliance	REG-1	Government regulations in Saudi Arabia are sufficient to protect users from risks associated with Cloud Computing.	Government legislation and policies can affect the decisions of health-care organizations trying to adopt new technology.	(Alharbi, 2017; Amron et al., 2019b; Lian et al., 2014; Morgan & Conboy, 2013; Oliveira et al., 2014; Sadoughi, 2019)
	REG-2	There are Saudi laws regarding ownership and responsibility for patient data.		
	REG-3	The use of Cloud Computing allows sensitive data to be protected from unauthorized people.		
External Support	EXS-1	In KSA, there are many IT providers with experience in health-care systems.	The availability of external support for implementation and Cloud Computing will also be a positive factor supporting adoption.	(Alharbi, 2017; Sadoughi, 2019; Seddon et al., 2013; Sulaiman & Magaireah, 2014)
	EXS-2	In KSA, there are many IT providers with good credibility and reputation.		
Mobile Access	MOA-1	Mobile Access advantage in cloud computing has impacts on its adoption in a health-care institution.	The availability of mobile Access advantage for Cloud Computing will also be a positive factor supporting adoption.	(Amron et al., 2017b; Kavitha & Engineering, 2014; Roy et al., 2018; Shukur et al., 2018b)
	MOA-2	Mobile Access advantage in cloud computing has assisted in executing your tasks.		

C. Business Context				
Construct	**Code**	**Items**	**Description**	**Studies**
Hard Financial Analysis	HFA-1	Cloud Computing can reduce the operating cost of information technology in the health-care institution.	Hard financial analysis refers to financial analysis via the use of costing methods that utilize quantitative metrics.	(Alharbi, 2017; Alharbi et al., 2016a; Ayoobkhan & Asirvatham, 2017; Lian et al., 2014; Ogunlolu, 2019; Oliveira et al., 2014; Remondino, 2020)
	HFA-2	My health-care institution has sufficient financial resources to develop Cloud Computing technology.		
	HFA-3	The use of Cloud Computing will provide new opportunities for the health-care institution.		
Soft Financial Analysis	SFA-1	The use of Cloud Computing will allow the organization to provide services that could not be provided before.	Cloud Computing technologies could add strategic value to health-care organizations, which could be measured through a soft financial analysis of the Cloud Computing adoption decision such as customer satisfaction improvement.	(AbuKhousa et al., 2012; Alharbi, 2017; Elhoseny, 2017; Remondino, 2020; Zafar, 2014)
	SFA-2	The adoption of Cloud Computing will affect business processes in my health-care institution positively.		
	SFA-3	Cloud Computing will affect medical services in my health-care institution positively.		
D. Perceived Ease of Use (PEOU)				
Construct	**Code**	**Items**	**Description**	**Studies**
Perceived Ease of Use (PEOU)	PEOU-1	Interaction with cloud computing services is clear and easily understood.	This refers to the degree to which a person believes that using a particular system would be free of effort.	(Nassif, 2019; Ogwel et al., 2020; Palos-Sanchez et al., 2017; Sadoughi, 2019; Shukur et al., 2018a)
	PEOU-2	Working with cloud computing does not require much mental effort		
	PEOU-3	Cloud Computing services are easy to use.		
	PEOU-4	What you want to do can be easily found in Cloud Computing services.		

3.3.9 Validity and Reliability of Instruments

Validity and reliability establish research methods' trustworthiness in getting accurate findings done ethically (Nowell et al., 2017; Thomas, 2017). Reliability and validity tests on the research instrument for this research described in the subsequent sections.

3.3.9.1 Validity

The validity tests determine how the measurement can reliably assess the definition and the confidentiality of instruments, data, and findings (Cypress, 2017). The validity of the content measured or correctly constructed a detailed description (Proctor & Van Zandt, 2018). This analysis's research instruments were updated based on expert reviews and feedback during the adoption test (McInnes et al., 2018). The PLS model result analysis will also be based on the PLS model's validity for each factor. Table 3.6 shows expert feedback to validate the questionnaire.

Table 3.6: Expert Feedback to Validate the Questionnaire

Field of Expertise	No.	Organization/Institute	Feedback
Professor in Medical Informatics	1	Ain Shams University – Egypt	The experts' feedback as the following: 1. Question styles 2. Measurement Items for each construct. 3. Pilot Study *** The researcher updated the questionnaire questions-based n expert feedback.
Assistant professor in Information Systems	3	Taif University - KSA	
Assistant professor in Health-care Information Systems	1	Taibah University - KSA	

3.3.9.2 Reliability

It is essential to minimize errors in the qualitative data collected (Washington et al., 2020). It can do by using spell checkers for correct spelling, having complete data, and the exact transcribing process to ensure consistency for qualitative reliability (Selwyn, 2020). The reliability of quantitative research instruments directs to the consistency of a concept where a pilot test is used to determine the composite measure's validity and reliability (Rosas & Ridings, 2017; Swartz & Krull, 2018). The researcher personally administered the questionnaires' distribution and collection to ensure a 100% response rate (Ebert et al., 2018). The questionnaire's reliability measured the internal consistency between each construct's variables (Peters, 2018). Whereas, Figure 3.8 presents the process of Phase-2.

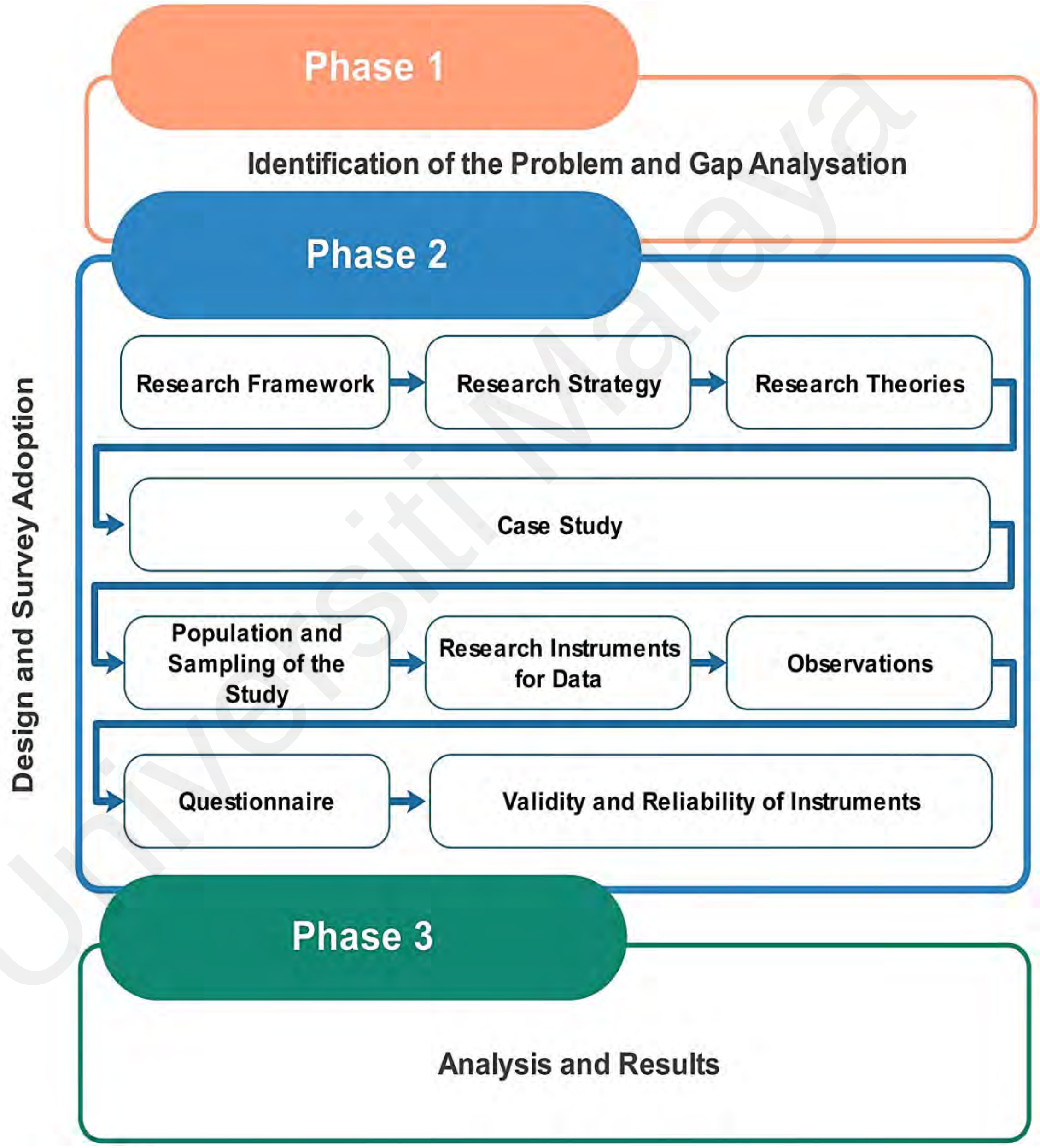

Figure 3.8: The Process of Phase -2

3.3.9.3 Validation of Instrument

(a) Translation Procedure

Since this study is cross-cultural research, the back-to-back translation technique used to elaborate differences between English and Arabic version questionnaires and ensure conceptual equivalence and comparability (Harkness et al., 2010) because this study was conducted in the Saudi context, where the official language is Arabic to avoid the differences between English and Arabic version questionnaire; thus, two bilinguals were employed, one translated from the original to the target language. The second blindly translated back from the target language (Arabic) to the source (English et al.). After that, a third investigator compared the two versions to ensure the original and the translated texts' equivalence and ascertain that both versions gave the same meaning. It found that are no differences between the two versions of the questionnaire (English and Arabic).

(b) Pilot Study

Quantitative primary data is collected through a set of formalized questionnaires prepared and designed to obtain information from respondents with minimal response error. "Sekaran and Bougie (2009)" described the questionnaire as a set of written questions that are pre-formulated for respondents to answer within closely outlined alternatives. Hence, survey researchers utilize questionnaires for gathering the necessary data. Thus, to enhance the research instrument's validity, a pilot study was carried out to reduce item ambiguity and keep questions precise and clear. A pilot study is considered informal procedures on small-scale participants to know the study variables' efficiency and test the feasibility of a full-scale test (Creswell, 2014; Sekaran & Bougie, 2009).

Pre-testing helps the researcher assess several vital issues related to the questionnaire (Boateng et al., 2018). For instance, the clarity of the instructions and questions, the cover letter, the time taken to complete the questionnaire, the likely response rate, the cost of administering the questionnaire, which questions are irrelevant, which are relevant, and whether questions on critical issues ignored. (Dashti et al., 2017) suggested that for original questionnaires, a mandatory pilot study should carry out. All the constructs in this study have been tested by several researchers worldwide. Since the cultural context of Saudi Arabia is different from other cultures; therefore, it is necessary to pre-testing the research questionnaire before distribution.

Following the recommendation (Johanson & Brooks, 2010), ten representative respondents from the targeted population are rational numbers recommended for any pilot study where the aim scale development or preliminary questionnaire. Hence, in this study, the survey instrument was initially pre-tested with ten employees of three local hospitals in KSA to clarify the questions and remove ambiguities. Based on the feedback from the respondents of the pre-testing. The survey instrument was revised and offered again to the selected sample, besides expert feedback. Reliability and validity are both significant issues in research for the measurement of variables. Reliability reflects the degree of a particular method of performance. When used the same object repeatedly, the result will be the same every time (Mohajan, 2017; Zikmund, 2003). At the same time, validity refers to empirical measure adequately, reflecting the real meaning of the concept under consideration (Saunders et al., 2012), where it can explain the capability of an evaluating instrument to measure what is planned to measure.

Therefore, the reliability and validity tests were applied in this study to ensure that the researcher measures the right constructs and dimensions (Technology and Organizational Readiness, Environmental Context, Perceived Ease of Use, and Intention to Adopt Cloud Computing). The next sub-sections demonstrated the methods used in this study to ensure excellent reliability for the pilot study. Notably, the validity and reliability also applied and required for the aggregate data collected has been reported in detail in chapter five of the study.

3.3.9.4 Reliability of the Instrument

In general, reliability analysis is used to assess the measurement test or instrument (Kaltenbrunner et al., 2017; Saunders & Lewis, 2009). Reliability concerns the texture and stability of a measurement scale. Consistency in reliability means that the repeated test on the same sample will deliver the same outcomes, which denotes that assurance is received when the same results are distributed over time and in multiple situations (Salkind, 2007; Zikmund et al., 2013). The internal consistency method tends to be the most appropriate method when investigating multidimensional constructs (Hair et al., 2006; Watkins, 2017). For this study, the internal consistency method is much more applicable since this study utilizes multidimensional constructs.

The most common approach used to measure internal consistency is the "Cronbach's alpha" alpha (α) Coefficient. Also, it indicates the homogeneity of items that comprised the measurement scales. For the pilot study, this technique was carried out for the following reasons; Cronbach's alpha is the most widely used measure, and Cronbach's alpha will better estimate reliability. Due to these reasons, internal consistency using Cronbach's alpha method was carried out for all constructs in this study to test multidimensional constructs (Technology and Organizational Readiness, Environmental Context, Perceived Ease of Use, and Intention to Adopt Cloud Computing). The value of (α) indicates whether different items on the scale converge. The value of (α) ranges from 0 (no consistency) to 1 (with complete consistency). In this study, the different dimensions of the instrument subjected to reliability analysis. A Cronbach Alpha Coefficient (α) was used to test the reliability of the internal reliability and consistency for the adopted questionnaire's measurement items, and the higher values reflect a higher degree of internal consistency (George & Mallery, 2003; Taber, 2018). The researcher conducted a pilot study to confirm the reliability of the overall study constructs—the authenticity of the measures tested using SPSS 26 to assess each construct's internal consistency. According to (De Smedt et al., 2013); Kline (2013), the acceptable value of Cronbach's alpha should be 0.70, while (Chin et al., 2014) suggested that a Cronbach's alpha value between 0.6 and 0.7 is also acceptable. Its reliability analysed the ten questionnaires. The result reveals that Cronbach's alpha values for all the constructs are more than (0.70). Also, this implies that all items forming the constructs are statistically reliable (see Table 3.7).

Table 3.7: Reliability Analysis of the Pilot Study

Themes	Independent Variables	No. of Items	Cronbach's Alpha Value
Technology and Organizational Readiness	Attitude Towards Change	2	0.73
	Compatibility	3	0.87
	Complicity	2	0.84
	Service Quality	2	0.75
	IT Infrastructure Readiness	2	0.72
	Relative Advantage	3	0.79
	Sharing and Collaboration	2	0.81
	Security and Privacy Concerns	5	0.84
	Sharing and Collaboration	2	0.81
	Technology Readiness	3	0.82
	Trust	2	0.77
Environmental Context	Government Support	2	0.80
	Regulations Compliance	3	0.78
	External Support	2	0.82
	Mobile Access	2	0.72
Business Context	Hard Financial Analysis	3	0.74
	Soft Financial Analysis	3	0.75
Perceived Ease of Use (PEOU)	PEOU	4	0.82
Dependent Variable			
Intention to Adopt Cloud Computing		4	0.84

3.4 Phase III: Framework Building

This phase explained the process of the model based on the outcome of the research analysis and findings. It mainly begins with the data preparation, data analysis, hypothesis testing, and the final step is the model building, as shown in Figure 3.9.

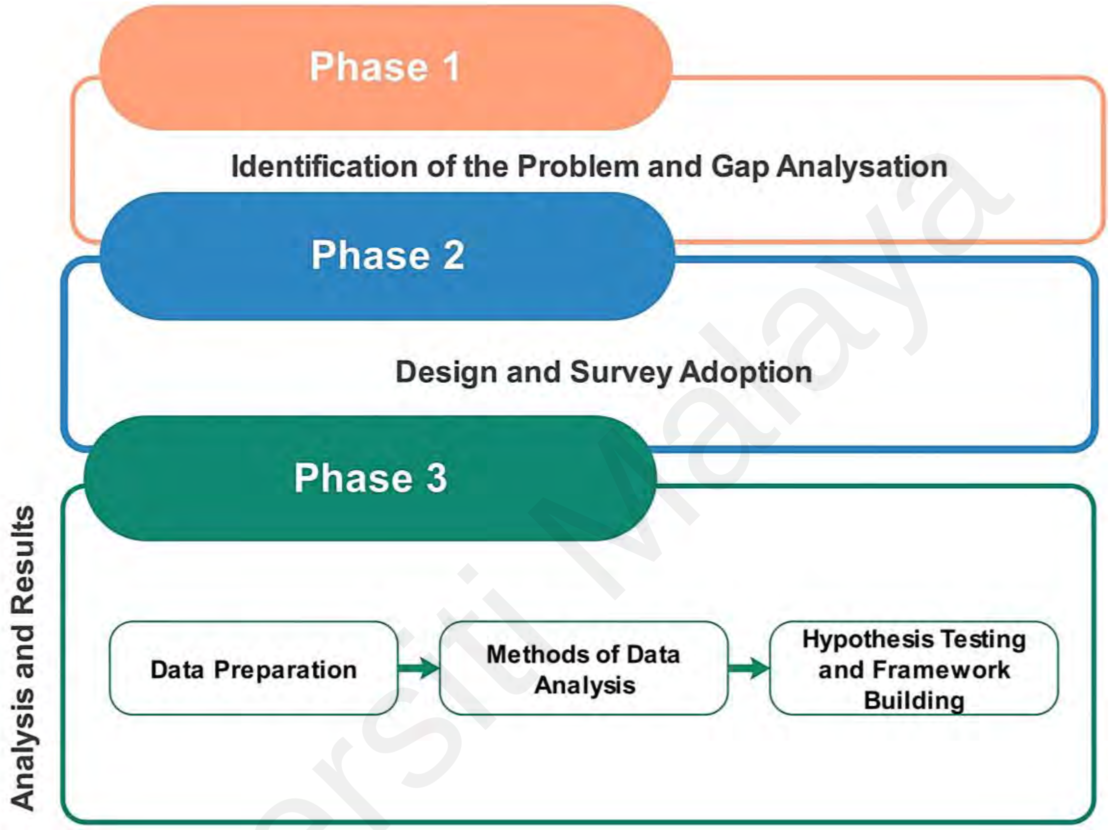

Figure 3.9: The Process of Phase -3

3.4.1 Data Preparation

It is essential to ensure that the data collected is correct before taking out the statistical analysis (Lindgren, 2017). The data preparation process used in this research, including questionnaire checking, editing, data cleaning, and data adjustment for data accuracy assurance, was necessary (Hayes & Rockwood, 2017). Furthermore, this research also looked at missing data and performed the required treatment before choosing a data examination strategy, including investigating the validity and reliability of the study constructs (Schabenberger & Gotway, 2017). Data Cleaning and Screening: before data analysis, the study developed a data screening and cleaning procedure to ensure the validity and consistency of the participant responses (DeSimone et al., 2015). The pre-analysis method is concerned with removing anomalies or data collection issues (Dziadkowiec et al., 2016).

The completed questionnaire checked for completeness and accuracy over this process. The data was entered and re-checked carefully to prevent any data entry errors (Brown et al., 2017). Then, all questionnaire items such as demographic information, independent and dependent, and comment moderation indicators are encrypted in (excel sheet) to dummy variables (Odom, 2017). Whereas, A dummy variable is also known as an indicator variable, design variable, Boolean indicator, binary variable, or qualitative variable. Where is one that takes the value (0 or 1) in statistics and econometrics, particularly in regression analysis, to indicate the absence or presence of some categorical effect that might be expected (Griffith & Paelinck, 2018). All the negative-worded questions need to reverse so that the researcher can see that these questions are in the same direction as the questionnaire's positive-worded questions (Vasileva, 2018; Wagner et al., 2018).

3.4.2 Method of Data Analysis

3.4.2.1 Quantitative Data

Besides, on the several processes for data analysis phases, the first phase of which is to analyse the data from the experiment conducted validated for the survey questionnaire structure preceded by the use of merged data from the experimental study meaning validity and reliability including its measurements as the second phase of data processing, (Hair et al., 2017).

According to (Hair et al., 2017a); Henseler and Sarstedt (2013), there are two popular approaches under SEM statistical technique. The first technique is CB-SEM (Covariance-based SEM), while the second technique is PLS-SEM (Partial Least Squares SEM). The objective of CB-SEM is to reproduce the theoretical covariance matrix without focusing on explained variance. Simultaneously, the CB-SEM aims to maximize the explained variance of the endogenous latent constructs (dependent variables). Many researchers increasingly acknowledge PLS-SEM usage to examine structural equation models (Hair et al., 2016). The rules for establishing the most suitable data analysis method are provided by (Hair et al., 2014), as presented in Table 3.8.

Table 3.8: Rules of Thumb for Selecting PLS-SEM or CB-SEM

<table>
<tr><th>Evaluation Criteria</th><th>PLS-SEM</th><th>CB-SEM</th><th>Studies</th></tr>
<tr><td>Research Goal</td><td>If the goal is predicting key target constructs or identifying the critical driver.
If the research exploratory or an extension of an existing structural theory.</td><td>If the goal is to test a theory or compare theory with an alternative approach.</td><td rowspan="7">(Hair et al., 2017b; Hair et al., 2014; Henseler & Chin, 2010;).</td></tr>
<tr><td>Measurement Model Specification</td><td>If formative constructs are part of the structural model</td><td>If error terms require additional specification such as co-variation.</td></tr>
<tr><td>Structural Model</td><td>If a structural model is a complex.</td><td>If a structural model is not recursive.</td></tr>
<tr><td rowspan="2">Data Characteristics and Algorithm</td><td>If CB-SEM cannot meet (i.e., model specification, non-convergence, distributional data assumptions).
If the sample size is relatively small, if data to some extend non- normal.</td><td>If data meet the CB-SEM assumption exactly.</td></tr>
<tr><td colspan="2">With large data sets, CB-SEM and PLS-SEM results are similar. PLS-SEM results are a good approximation of CB- SEM results.</td></tr>
<tr><td>Model Evaluation</td><td>If latent variable scores required in subsequent analyses</td><td>If global goodness of fit criterion is required.
If the test for measurement model invariance is required.</td></tr>
</table>

This study employed PLS-SEM; it is a type of Structured Equation Modelling (SEM). SEM is a multivariate analysis method similar to principal component and linear regression (Hair et al., 2012). The researcher has selected this analysis tool for several reasons. First, PLS-SEM is more appropriate for the study data is more relevant for predictive-causal investigation (Henseler & Chin, 2010), while CB-SEM is more suitable for theory testing. Second, PLS-SEM is beneficial when the researcher intends to confine the new constructs and measures to the next constructs in the structural paths. In other words, new measures and fundamental ways (Hair et al., 2017b). Second, the study's primary focus is to predict the theoretical conceptions of these variables and test their specified relationships in SHCIs empirically. Third, PLS-SEM can examine several relationships simultaneously because the current study's research model has a complex model with Four dimensions. Hence, PLS-SEM is the most appropriate method to test these types of complex models. Fifth, PLS-SEM is known to perform better in the case of non-normal data (Hair et al., 2014). Lastly, reasonably related to sample size, the sample size of this study considered relatively small (200 respondents), which is more appropriate for using PLS-SEM (Chin, 2010).

Analysis of the PLS path kept referring to as a soft modelling method with initially minimal measuring specifications, sample sizes, and negligible distribution (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018; Hair et al., 2017). Even though there are different statistical models and algorithms to explain in detail the various factors predicting and approximating relationships when (SEM), it allows the conversation of independent and dependent variables simultaneously (Hair et al., 2017).

They described as multivariate analytical techniques of the second generation as opposed to methods of the first generation, including factor analysis, discriminant analysis, and multi-regression in terms of supporting challenging modelling or measurement of theoretical constructs of latent variables (LVs). The concern of various internal and external sub-models is (LVs), connections (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018; Hair et al., 2017). The internal model or structural model includes (LVs), connections. Nervousness, self-efficacy, time availability, expected performance, expected effort, social influence, and conditions facilitating the CC adoption model are deemed independent (LVs), even when behavioural intent and behavioural use (LVs) are dependent. A comprehensive (SEM) includes a combination of structural and measuring models. Relationships of path coefficients calculated by variables may have determined by weights of formative constructs or loading conditions of reflective constructs. There are various considerations for partial model structures evaluating criteria and systematic application usually performed through two-step measurement model evaluation and structural model evaluation. (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018; Hair et al., 2017).

According to Hair Jr et al. (2014), this research framework's assessment using the PLS-SEM technique is based on two steps process proposed (Hair Jr et al., 2014). This process involves separate assessments, first assessing the measurement model, i.e., evaluating internal consistency, assessment indicator reliability, convergent assessment validity (Average Variance Extracted - AVE), and assessment discriminant Validity. Then, the structural model's assessment, i.e., evaluation of collinearity, evaluation of significance and relevance, coefficient determination evaluation R^2, evaluation of effect size f^2, finally, the basement of predictive relevance Q^2.

(a) Measurement Model

Model measurement evaluating internal reliability, indicator reliability, converging validity and discriminating validity by applying standard rules recognized as a reflective measurement model consisting of guidelines for validation. Security means repetitiveness, as well as consistency. Inner quality reliability evaluation modern criteria using Cronbach's Alpha (CA) presumed high alpha value to be the same range and connotation on one construction element. Furthermore, the suggestions proposed for using Composite Reliability (CR), an alternative measure to CA, capable of overcoming CA deficiencies of LV's internal quality reliability by SEM-PLS analytical methods by taking into account loading differences indicators (F. Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018; Hair et al., 2017) as shown in Table 3.9.

Table 3.9: Measurement Models Parameters for this Research

Validity Type	Criterion	Description	References
Internal Consistency Reliability	Composite Reliability (CR)	Factor loadings summation measurement relative to loadings factor plus variance error summation where the value of 0 indicates completely unreliable to 1 indicates entirely reliable. The explorative confirmative research value of CA's threshold proposed value to be > .800 or .900 (0.700) and minimum values of 600.	(Ali et al., 2018; Avkiran, 2018; Hair et al., 2017)
Indicator Reliability	Indicator loading	LV explained the variance indicators measurement where the value of 0.700 and higher implied significant benefits—used commonly in designs of experimental research designs.	(Ali et al., 2018; Avkiran, 2018; Hair et al., 2017)
Convergent Validity	Average Variance Extracted (AVE)	Measuring the LV variance error measurement indicators with the proposed value of threshold AVE > 0.500.	(Ali et al., 2018; Avkiran, 2018; Fornell & Larcker, 1981b; Hair et al., 2017)
Discriminate Validity	Cross-Loading	Correlation of scores' component of latent variable items where higher loading indicators of designated construct compared to other constructs indicates that each construct is implicative to be different.	(Ali et al., 2018; Avkiran, 2018; Hair et al., 2017)
	Fornell-Larcker criterion	Need for more LV sharing variance indicators assignment where each LV's AVE needs to be higher than any other LV highest squared correlation.	(Ali et al., 2018; Avkiran, 2018; Fornell & Larcker, 1981b; Hair et al., 2017)

Due to variations in the coefficient used for inner accuracy evaluation, data reliability does indeed have a value above (0.7), as commonly desirable values and any value below (0.7) represent a security slack. The reliability test indicates item reliability by demonstrative loading indicators where (50%) of each sign varies by LV's with a significant value of (0.7) loading indicator analysed using resampling techniques.

If the loading value is less than (0.7), the measurement model must modify by dropping the indicators caused and running the PLS algorithm for the expected outcome. (Hair et al., 2017). The validity test determines the intensity of the variables' intentional measurement (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018). When building validity assurance, similar construct indicator statements that correlate with high correlation value indicating convergent validity and difference are correlations of indicator statements that show low correlation value as discriminant validity.

Particles have different measurement concepts mentioned as validity convergent defined by the extracted average variance (AVE) (Avkiran & Ringle, 2018; Fornell & Larcker, 1981b; Hair et al., 2017). An AVE, the value of at least (0.500), showed much convergent validity meaning that indicators differed by one LV average. Discriminant validity represents variations in various constructs' measures—measurements of the construct of items tested by convergent validity. Discriminating validity allows for unintentional measuring tests. SEM-PLS (Ali et al., 2018; Avkiran, 2018), Discriminating validity specific steps are:

1. Cross-loading: association of all component products with component performance. Indicators of different constructions are non-exchangeable if the size is smaller than the index loading (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018).

2. Fornell-Larcker criterion: because more indicator variation allocated to LV's (Fornell & Larcker, 1981b; Hair et al., 2017), While LV's, and AVE, the square correlation is the highest LV's correlation. (Ali et al., 2018; Avkiran & Ringle, 2018; Avkiran, 2018; Hair et al., 2017).

(b) The Structural Model

Analysis of structural model after successfully validating reflective measurement models (Hair et al., 2017). Path coefficients significance and relevance assessment. The coefficient of determination (R^2) valuation of endogenous LV (Hair et al., 2017) shows the algebraic coefficient, eminence, and prominence checked by SEM. Path with a difference of signed compared to an expected relationship, in theory, indicates no-supporting evidence to the hypothesis proposed and eminence of path coefficients signifies the two LV's relationship strength (Hair et al., 2017). Prior researches suggested that path coefficients value be at least 0.100 for effect and 0.50 to be significant (Hair et al., 2017), using bootstrapping resampling techniques to determine significance (Zoumpoulaki et al., 2015) as shown in Table 3.10.

Table 3.10: Models of Structural Parameters for This Research

Validity Type	Criterion	Description	References
Model Validity	**Coefficient of Determination (R2)**	LV relative variance measurement explanation having a substantial value of 0.670, a moderate value of 0.333, and invalid values of 0.190 and below.	(Ali et al., 2018; Avkiran, 2018; Hair et al., 2017)
	Path Coefficients	The path coefficients for "LVs" and t-test analyses are based on (algebraic sign, eminence, and prominence).	(Ali et al., 2018; Avkiran, 2018; Fornell & Larcker, 1981b; Hair et al., 2017)

Selecting the most suitable statistical tool depends on many aspects, such as research type, data type, research objective, and many others. More information is needed to judge the use of the above tools. Make clear the information, then evaluate between using SPSS and Smart-PLS or Amos generation statistical analysis approaches, respectively. Wherever Smart-PLS used, it provides desirable graphical output. Compared with SPSS graphics, its production is very flexible. The Smart-PLS tool will help the researcher interpret the participants' answers to the research to draw accurate and meaningful conclusions. Moreover, Figure 3.10 illustrates the data analysis for both the SPSS and Smart-PLS models used in the current study data analysis.

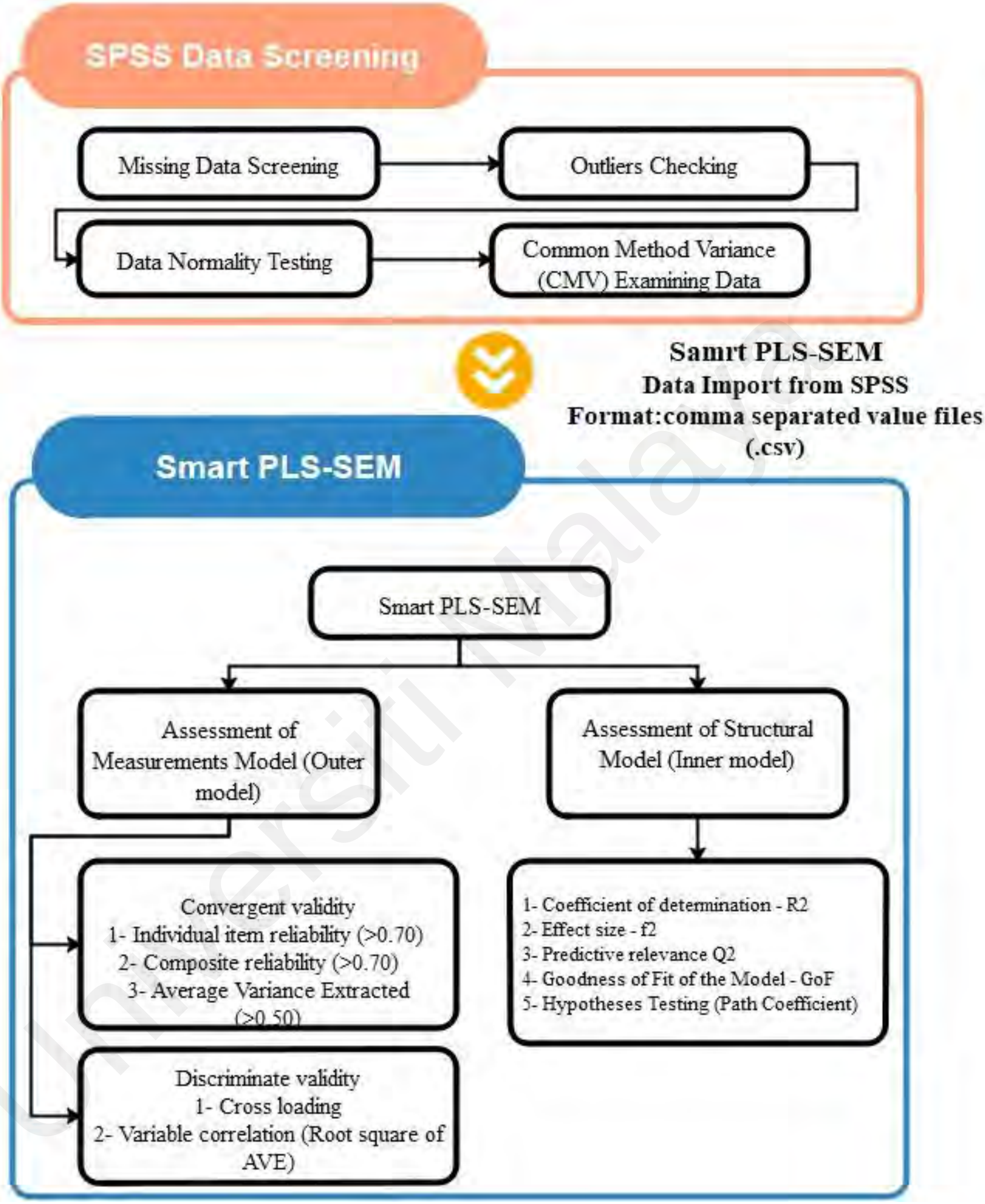

Figure 3.10: Data Analysis Process Used SPSS and PLS-SEM (Smart-PLS)

3.4.2.2 Qualitative Data

A thematic approach to the analysis was applied to allow the researcher to report the study findings. This approach is used to define, evaluate, and report trends (themes) within qualitative research data. Each item will represent something significant about the research activity data. The details are developed and realized by classifying the data through a comparison between and within cases. In analysing the data in this study, a framework analysis method, which is one method of thematic analysis, was applied. Data summarized utilizing a matrix output where rows represent cases and columns represent codes in the framework analysis (Gale et al., 2013). The researcher used the analytical framework steps relating to analytics steps by (Assasi et al., 2016), and the steps as shown in Table 3.11 :

Table 3.11: Analysing Qualitative Data: The Steps

Steps	Code	Description
1. Recognize the Data	QD-1	This step was achieved by transcribing checked the accuracy of the information.
2. Creating Codes	QD-2	The transcripts read in this step to generate an initial list of ideas about exciting elements. This step helps ensure that essential data aspects are not missed (Gale et al., 2013).
3. Assigning Themes	QD-3	Re-analysed data to organize the codes into groups or themes. At this point, iterations may be essential to review, identify, and name the themes (Gale et al., 2013). In this step, the researcher identified and classified into main themes the factors affecting the adoption of cloud computing in SHCIs.
4. Creating a Report	QD-4	The researcher carried out the final report, which showed the findings and the thematic analysis.

3.4.3 Hypothesis Testing and Framework Building

In the problem, the research hypothesis matches what the research tries to show real. Where then test the hypotheses, the results were used in Smart-PLS to ensure validity, reliability, and confidence. The best use of hypothesis testing is to investigate and analyse the issue and assess latent variables' existence by examining (Hair et al., 2017). Also, the research utilized testing of path coefficients for bootstrapping calculation. The non-parametric bootstrapping protocol with 503 cases, 5000 sub-samples, and individual sign changes were applied (Hair et al., 2017). The proposed research has 18 hypotheses for study, as mentioned earlier. Between these, 18 hypotheses demonstrate the effect of the factors and constructs towards cloud computing adoption.

3.5 Summary

This chapter addressed the methodology for that research. The discussions included detailed discussions on research design, such as the research model, study population, questionnaire design, and study experiment—the question's validity and the survey and its reliability. Moreover, the model's construction was discussed, such as data planning, data processing, and testing the hypotheses. We will be presenting the data collection in the next chapter. The following section offers a comprehensive data analysis and analytical evidence gathered.

CHAPTER 4: DEVELOPMENT OF THEORETICAL FRAMEWORK

4.1 Introduction

This chapter's design provides a response to the second study question (RQ2) regarding determining the factors influencing cloud computing adoption in SHCIs. Additionally, the third study question (RQ3) Develops the theoretical framework for applying cloud computing adoption in HCIs.

Furthermore, this chapter analyses related empirical research and theoretical literature by determining factors that influence cloud computing CC's adoption, ultimately leading to developing a theoretical framework for cloud-based government health-care institutions. Besides, the suggested conceptual framework would provide guidelines for an assessment of CC implementation in HCIs.

Also, this chapter engages with the usually used theories about innovation adoption. Two theoretical frameworks were employed to support the adoption of cloud computing in health-care institutions; the “Technology Acceptance Model (TAM)” and the “Technology-Organization-Environment (TOE)”. The proposed framework will be used as the basis for a general understanding of CC in the Saudi health-care institution's context and the data collection and analysis carried out in this study.

4.2 Research Framework

The research synthesized the conceptual framework for IS adoption of innovation in the organization by integrating two theoretical replicas of adopting innovation and accepting IS by consumers. The model is an integrated synthesis of TAM, TOE, and process models. The much more widely understood model for identifying important IS characteristics, adoption of innovation (Awa et al., 2015; Gangwar et al., 2015b; Hiran & Henten, 2019). TAM and TOE's combination helps us derive a model representing IS product adoption phases, pre-adoption, adoption-decision, and post-adoption. In empirical studies, TAM and TOE predict and justify consumer acceptance of IS innovation (Gangwar et al., 2015b). The evaluation of research that combines different theoretical models and factors is provided in Table 4.1.

Table 4.1: Related Studies: Theoretical Models and Frameworks Research

Theory	Sector	Preceding Studies
TOE	Organizations	(Gangwar et al., 2015b; Kim et al., 2015; Lee & Coughlin, 2015; Rezvani et al., 2015; Wilson et al., 2017; Wingo et al., 2017)
TOE	Firms	(Azmi et al., 2018; Cao et al., 2018; Hanafizadeh & Ravasan, 2018; Lai et al., 2018; Tu, 2018)
DOI & TOE	Manufacturing	(Al-Badi et al., 2018; Dash & Anusandhan, 2018; Moh'd Anwer, 2019; Sandu & Gide, 2018; Usman et al., 2019)
TOE	Government	(Albugmi, 2018; Alghamdi et al., 2018; El-Nakla et al., 2018; Rasmi et al., 2018; Tashkandi & Al-Jabri, 2015)
TOE & HOT-fit	Hospitals	(Ahmadi, Nilashi, et al., 2018; Ahmadi, Shahmoradi, et al., 2018; Alharbi, Atkins, & Stanier, 2016b; Amron et al., 2017a; Esfahani et al., 2018; Grandhi et al., 2019; Lynn et al., 2018; Senyo et al., 2018)
TOE	Educational	(Ahmed, 2018; Almarazroi et al., 2019; AlQurashe, 2018; Başaran & Hama, 2018; Qasem et al., 2018; Sirajudeen et al., 2018)
TOE	Hospitals	(Al-rawahna et al., 2018; Al–Shura et al., 2018; Bhuyan et al., 2018; Jeon et al., 2018)
IS	Hospitals	(Che et al., 2016; Chou et al., 2018; Esfahani et al., 2018; Kuo et al., 2018; Liu et al., 2018; Yeh et al., 2018)
TAM & TOE	Industry	(Arora & Sahney, 2018; Dash & Anusandhan, 2018; Dixit et al., 2018; Porselvi et al., 2018; Raut et al., 2018; Singla et al., 2018)
TAM & TOE	Health-Care Context	(Abdekhoda et al., 2019; Hafezi & Zolait, 2019; Masana & Muriithi, 2019; Ogwel et al., 2020; Wibowo & Mubarak, 2020)

Table 4.1 shows studies that employed TAM and TOE in different fields to support IS adoption. In this context, TAM, together with TOE, the system will allow customers to determine the adoption of innovations for both volitional and non-volitional environments (Hameed et al., 2012). For the IS adoption model to address the organizational level adoption process, an integrative illustration of TAM and TOE has to be combined with a contextual framework. The TOE model has been extensively developed for IS research

in organizational adoption (Puklavec et al., 2018; Sun et al., 2018; Tu, 2018; Tashkandi & Al-Jabri, 2015). Therefore, an integrative model consisting of TAM and TOE will thoroughly clarify IS organizational innovation adoption. The usage of TOE could effectively clarify the adoption process from an organizational perspective in the proposed model. Considering the characteristics of technology, organization, and environment that promote adoption, relational TAM and TOE elaborate the pre-adoption and adoption-decision phases of IS implementation in organizations. The proposed methods also use TAM and TOE constructs to compensate for consumer adoption of IS creativity. Therefore, characteristics of consumer acceptance of TAM and TOE impact on IS post-adoption adoption process.

4.3 Review of The Factors Affecting (CC) Adoption in Health-Care Institutions

This section answered the second research question (RQ2) on the determining factors affecting cloud computing adoption in health-care institutions. In this context, the lack of systems or methodologies to help the organization implement its cloud computing makes it impossible for lots of organizations to adopt cloud computing successfully, effectively, and efficiently (Chang et al., 2016; Gangwar et al., 2015b). Once cloud computing is introduced, organizations will closely examine the suspected shortcomings of cloud computing projects and why the projects fall flat among the measures towards cloud computing readiness status (Rad et al., 2017). Several issues that cause organizations to avoid adopting and implementing Cloud Storage include doubts about usability, customer apprehension or lock-in details, concerns about data privacy, cost, integrity issues, and poor connectivity (Roehrs et al., 2017; Sighom et al., 2017). In conclusion, Table 4.2 presented previous studies showing that there are factors with positive outcomes toward adopting new systems or technology based on the content analysis of related recent studies.

Table 4.2: Relevant Work Summarizes the Literature and Classification Factors

A. Technology and Organizational Readiness		
Construct	**Description**	**Studies**
Attitude Towards Change	The successful adoption of new technologies requires various changes to be made to the organizational structure; such changes may face resistance from physicians, administrative and IT staff	(Alharbi, 2017; Masana & Muriithi, 2016; Turan et al., 2014; Yeboah-Boateng et al., 2014)
Compatibility	The cloud computing service fits with existing equipment, in line with the current system, and is not a problem when deployed.	(Alharbi, 2017; Amron et al., 2019a; Baral et al., 2019; Gangwar et al., 2015c; Ogunlolu, 2019; Youssif et al., 2017)
Complexity	The level of difficulty experienced by users to learn and use cloud computing services	(Alharbi, 2017; Amron et al., 2019a; Ayoobkhan & Asirvatham, 2017; Dash & Anusandhan, 2018; Gangwar et al., 2015c; Ogunlolu, 2019; Youssif et al., 2017)
Service Quality	Cloud users are interested in the quality of service offered by Cloud Service Providers. While at the same time ensuring optimum use of resources.	(Abdulaziz et al., 2019; Alsanea, 2015; Lian et al., 2014; Mohammed, 2019; Odun-Ayo et al., 2018; ul Amin et al., 2017; Weng et al., 2016)
IT Infrastructure Readiness	Technology readiness could be an enabler factor in the decision of whether to adopt Cloud Computing.	(Alsanea, 2015; Hameed et al., 2015; Kuo, 2011; Ogunlolu, 2019; Sulaiman & Magaireah, 2014)
Relative Advantage	The extent to which organizations can enjoy the benefits and improved performance from the use of cloud computing.	(Alharbi, 2017; ALQarni & Barnawi; Amron et al., 2019b; Gangwar et al., 2015c; Ogunlolu, 2019; Ogwel, Otieno, & Odhiambo-Otieno, 2020)
Sharing & Collaboration	The option to share a document and more than one person can edit the same document at a time.	(Abdulaziz et al., 2019; Al-Sharafi et al., 2017; Alsmadi & Prybutok, 2018; Amron et al., 2019a; Pişirir et al., 2019)
Security & Privacy Concerns	Security and privacy issues in cloud computing are the primary concerns that overwhelm the benefits of this technology. However, safety is also a guarantee of the best service in cloud computing.	(Amron et al., 2019b; Ashtari et al., 2015; Rashid, 2018; Masana & Muriithi, 2019; Ogunlolu, 2019; Youssif et al., 2017)
Technology Readiness	Technology readiness encloses infrastructure and IT human resources. Therefore, organizations with a higher degree of technology readiness are more prepared to adopt Cloud Computing.	(Alharbi, 2017; Ayoobkhan & Asirvatham, 2017; Gutierrez et al., 2015; Masana & Muriithi, 2019; Oliveira et al., 2014; Qusef et al., 2019)
Top Management Support	The management team has a high level of involvement and interaction with employees towards adopting cloud computing services.	(Alharbi, 2017; Ayoobkhan & Asirvatham, 2017; Harfoushi et al., 2016; Lian et al., 2014; Ogunlolu, 2019; Yoo & Kim, 2018)
Trust	The organization believes that cloud computing will facilitate its business and believe the service provider will assist it without harming the organization.	(Amron et al., 2019b; Gangwar et al., 2015a; Ogunlolu, 2019; Rahi et al., 2017; Sadoughi, 2019; Shahbaz et al., 2019)

B. Environmental Context		
Construct	**Description**	**Studies**
Government Support	Rules and policies set by the authorities to assist in the implementation of cloud computing	(Al-Bajjari, 2017; Alharbi et al., 2016; Alsanea, 2015; Karim et al., 2017; Sadoughi, 2019)
Regulation Compliance	Government legislation and policies can affect the decisions of health-care organizations trying to adopt new technology	(Alharbi, 2017; Amron et al., 2019b; Lian et al., 2014; Morgan & Conboy, 2013; Oliveira et al., 2014; Sadoughi, 2019)
External Support	The availability of external support for the implementation and use of Cloud Computing will also be a positive factor supporting the adoption	(Alharbi, 2017; Sadoughi, 2019; Seddon et al., 2013; Sulaiman & Magaireah, 2014)
Mobile Access	The availability of mobile Access advantage for Cloud Computing will also be a positive factor supporting adoption.	(Amron et al., 2017b; Kavitha & Engineering, 2014; Roy et al., 2018; Shukur et al., 2018b)
C. Business Context		
Hard Financial Analysis	Hard financial analysis refers to financial analysis via the use of costing methods that utilize quantitative metrics.	(Alharbi, 2017; Alharbi et al., 2016a; Ayoobkhan & Asirvatham, 2017; Lian et al., 2014; Ogunlolu, 2019; Oliveira et al., 2014; Remondino, 2020)
Soft Financial Analysis	Cloud Computing technologies could add strategic value to health-care organizations, which could be measured through a soft financial analysis of the Cloud Computing adoption decision such as customer satisfaction improvement.	(AbuKhousa et al., 2012; Alharbi, 2017; Elhoseny, 2017; Remondino, 2020; Zafar, 2014)
D. Perceived Ease of Use (PEOU)		
Perceived Ease of Use (PEOU)	This refers to the degree to which a person believes that using a particular system would be free of effort.	(Nassif, 2019; Ogwel, Otieno, & Odhiambo-Otieno, 2020; Palos-Sanchez et al., 2017; Sadoughi, 2019; Shukur et al., 2018a)

Also, independent and dependent variables were examined in the previous studies as factors in IS theories' view to enrich understanding of how new technologies are to be adopted. It has been noted that in one systematic model (McKenney & Reeves, 2018), rarely all the possible factors influencing the acceptance of new technologies are combined.

Table 4.2 offers a review of research performed to assess the extent of technology acceptance at the organization's level. The growing analysis includes other variables that are not the same in all studies. Many variables are critical and chosen in a study, whereas other studies (George, 2019) do not need that. It also contributes to developing the three major themes mentioned in the next section.

4.4 Hypothesis Development

Hypothesis studied the relationship between independent and dependent variables to understand the adoption of new technologies like CC services. Table 4.2 depicts the factors and constructs identified relevant to prior empirical researches done. Table 4.3 shows the findings from recent studies highlighting the lack of a framework for health-care information systems designed based on CC architecture. It also presents the empirical information explaining the adoption and diffusion of CC in the health-care institutions in developing countries like KSA. The studies indicated a research gap where there is a need for a study on health-care information systems based on CC architecture. In this context, this research used TAM and TOE theories as these theories were found to be robust and can make understanding of technology acceptance in the context of organization and environment easier and meaningful. It enables this research to apply scales that have been developed and empirically validated on constructs of TAM and TOE. The subsequent sections deal with the response to the research question (RQ3) on improving the theoretical framework for adopting cloud computing adoption in HCIs.

4.4.1 Theme 1: Technology and Organizational Readiness

This dimension looked at the technical issues affecting the adoption of CC services that influenced IT adoption decisions (Alharbi et al., 2017a), especially involving technology changes (Harfoushi, 2016) in the organization. The environmental dimension referred to the organization operating attributes. The adoption of CC in eHealth is influenced by many parties like the government, CC service providers, and HCIs. Resources like finance and technology reflect organizational readiness (Alsanea, 2015).

4.4.2 Theme 2: Environmental Context

Environmental context refers to the organization's external world's attributes, such as government, vendors, and other organizations. These factors can be opportunities and constraints (barriers) to CC's adoption (Alharbi et al., 2017a).

4.4.3 Theme 3: Business Context

It is referred to issues relating to business and decision to adopt CC, which can affect the success of systems adoption (Alharbi et al., 2017a; El-Gazzar et al., 2016). Other business considerations to be included are financial analysis (i.e., tangible (hard) and intangible (Softpedia) aspects) (Alharbi et al., 2017a).

4.4.4 Theme 4: PEOU

PEOU reflected on believing ease of use to users. It is made possible when the IT infrastructure use and management are accessible due to the flexibility, scalability, and power of hosted cloud services, making the cloud a powerful tool for enabling IT success (Shukur et al., 2018a).

4.5 An Integrative Conceptual Framework

The proposed conceptual framework combines two IS models and consists of four main themes, as shown in Figure 4.1:

A. **Theme 1:** Technology and Organizational Readiness, as used in the TOE model and Iacovou model and services, influenced IT adoption decisions.

B. **Theme 2:** Environmental Context, as used in the TOE model and Iacovou model (Harfoushi, 2016).

C. **Theme 3:** Business Context can affect the success of systems adoption, and business considerations to be included are financial analysis (Alharbi et al., 2017a).

D. **Theme 4:** PEOU, making the cloud a powerful tool for enabling IT success (Shukur et al., 2018a).

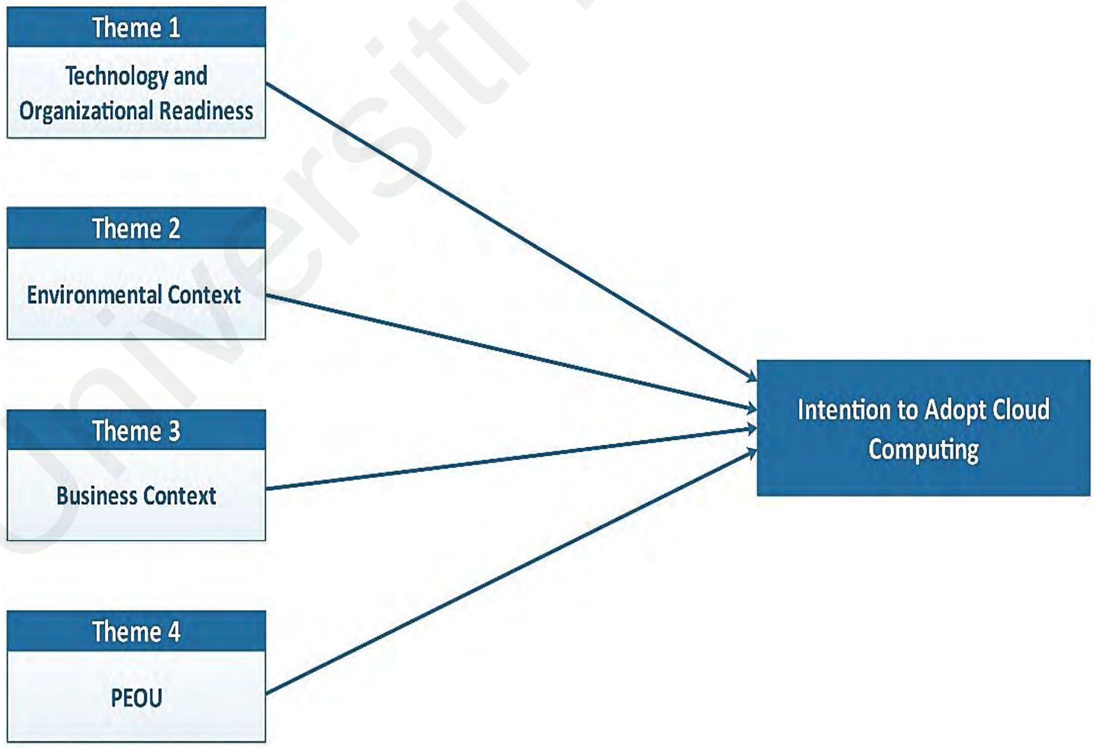

Figure 4.1: An Integrated Conceptual Framework of the Adoption of CC at the Organizational Level

4.6 Research Model and Hypotheses Concerning Cloud Computing Adoption

A total of eighteen (18) hypotheses have been proposed in this research based on the review of relevant literature sources. The constructs were Relative Advantage, Compatibility, Complexity, Technology Readiness, Top Management Support, Security and Privacy, Quality of Service, Attitude towards Change, Usefulness, IT Infrastructure Readiness, Trust, Government Support, Regulatory Concerns, External Support, Mobile Access, Ease of Use, Hard Financial Analysis and Soft Financial Analysis as seen in Table 4.3, and Figure 4.2.

Table 4.3: Research Hypothesis

HN	Independent Variable	Dependent Variable	Relation
H1	Attitude Towards Change	Intention to adopt CC	Negative
H2	Compatibility	Intention to adopt CC	Positive
H3	Complexity	Intention to adopt CC	Negative
H4	Service Quality	Intention to adopt CC	Positive
H5	IT Infrastructure Readiness	Intention to adopt CC	Positive
H6	Relative Advantage	Intention to adopt CC	Positive
H7	Sharing & Collaboration	Intention to adopt CC	Positive
H8	Security and Privacy	Intention to adopt CC	Negative
H9	Technology Readiness	Intention to adopt CC	Positive
H10	Top Management Support	Intention to adopt CC	Positive
H11	Trust	Intention to adopt CC	Positive
H12	Government Support	Intention to adopt CC	Positive
H13	Regulation Compliance	Intention to adopt CC	Negative
H14	External Support	Intention to adopt CC	Positive
H15	Mobile Access	Intention to adopt CC	Positive
H16	Hard Financial Analysis	Intention to adopt CC	Positive
H17	Soft Financial Analysis	Intention to adopt CC	Positive
H18	Ease of Use	Intention to adopt CC	Positive

4.6.1 Attitude Towards Change

It referred to character, behaviour, or frame of mind to accept changes. Resistance to change in adopting changes in HIS potentially caused system failure (Alharbi et al., 2016a) due to insufficient knowledge about the new technology and not knowing how changes affect business processes. Therefore, there is a need for a change management campaign and awareness that will benefit the organization (El-Gazzar et al., 2016).

H1: The relationship between attitude towards change and intention to adopt cloud computing in Saudi health-care institutions is negative.

4.6.2 Compatibility

It was reflected in the organization's values, present needs, and previous practices like existing IT systems, methods, and health-care institutions' requirements. Though some studies returned a positive relationship of compatibility affecting the intention to adopt CC (Tashkandi & Al-Jabri, 2015); yet many other studies indicated a positive relationship, and the compatibility factor is considered when adopting CC services.

H2: The relationship between compatibility and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.3 Complexity

It referred to ease in using and understanding new technology. eHealth can be complicated and challenging to use because it consists of many HISs and integrating many clouds. Although complexity can be significantly affecting the adoption of CC (Alsanea, 2015) in many studies like, and complexity has a negative relationship to the adoption of CC (Alhammadi et al., 2015).

H3: The relationship between compatibility and intention to adopt cloud computing in Saudi health-care institutions is negative.

4.6.4 Service Quality

It referred to the performance, reliability, and availability levels provided by cloud services (Jelassi, Ghazel, & Saïdane, 2017) that challenged CC services to be delivered to customers at a satisfactory acceptable level. QoS positively relates to CC adoption (Alsanea, 2015; Buyya et al., 2015; Jelassi et al., 2017).

H4: The relationship between quality of service and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.5 IT Infrastructure Readiness

The infrastructure is available for the organization's operation and management like composite hardware, software, network resources, and services. IT infrastructure readiness positively affects CC adoption (Alsanea, 2015; Shukur et al., 2018a).

H5: The relationship between IT Infrastructure Readiness and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.6 Relative Advantage

Referred to technology benefits such as operational and strategic benefited the health-care institutions (Alharbi et al., 2017), indicating its importance to facilitating the adoption of technology.

H6: The relationship between relative advantage and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.7 Sharing & Collaboration

The ability to share a document and edit the same document by more than one person at a time (Abdulaziz et al., 2019; Al-Sharafi et al., 2017; Alsmadi & Prybutok, 2018; Amron et al., 2019a; Pişirir et al., 2019).

H7: The relationship between sharing and collaboration and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.8 Security & Privacy Concern

As mentioned in recent studies, the highest risk factors in adopting CC (Alhammadi et al., 2015; Alsanea, 2015; Gangwar et al., 2015b).

H8: The relationship between security & privacy concerns and intention to adopt cloud computing in Saudi health-care institutions is negative.

4.6.9 Technology Readiness

It referred to ready to adopt technology as a significant decision factor to adopt CC services. Studies have identified technology readiness as an enabler factor and have a positive relationship in adopting CC. Based on previous studies, it was found that in KSA, the IT infrastructure readiness had a positive impact on CC adoption (Alsanea, 2015). Nevertheless, some other studies indicated that infrastructure readiness negatively affected CC's adoption, especially in terms of internet and bandwidth readiness (Alharbi et al., 2017). Technology readiness in terms of IT resources like software, hardware, network security, internet speed, and infrastructure availability are essential factors for adopting CC (Alharbi et al., 2017).

H9: The relationship between technology readiness and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.10 Top Management Support

It referred to the nature and functions of executives and managers in the organizations towards CC technology. Management support includes accepting changes and providing resources for change found to be an essential determinant in adopting CC (Alharbi et al., 2017). The researchers Alhammadi et al. (2015) showed that management support positively correlates with CC's adoption. However, in some other instances, management support was negatively associated with CC adoption due to management support's different nature (Alhammadi et al., 2015).

H10: The relationship between top management support and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.11 Trust

Referred to the user's confidence in using the systems and was seemed like an essential factor for the successful adoption of cloud services. However, a few kinds of research on trust have been done on CC services, resulting in a poor understanding of trust's effect on cloud services (Chiregi & Navimipour, 2017).

H11: The relationship between trust and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.12 Government Support

Whereas the laws' regulations, policies, and initiatives from the government (Alhammadi et al., 2015). Government support had a positive relationship with CC adoption, SMEs receiving government support in KSA (Alhammadi et al., 2015).

H12: The relationship between Support from the Government and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.13 Regulation Compliance

It is referred to as abiding by government legislation and policies, especially relating to data security and privacy protection. Though data security concerns every user of cloud service; however, the service provider is responsible for providing reasonable security controls and complying with regulatory laws like stated in the Health Insurance Portability and Accountability Act HIPAA regulations. Regulations and policies are essential for safe CC adoption (El-Gazzar et al., 2016); however, it can slow down the adoption process (Alsanea, 2015; El-Gazzar et al., 2016).

H13: The relationship between regulation compliance and intention to adopt cloud computing in Saudi health-care institutions is negative.

4.6.14 External Support

It is referred to as the support of the CSPs. Although studies have shown a poor understanding of cloud services, cloud architecture, and pricing models creating barriers to CC adoption (Alhammadi et al., 2015); however, external support can positively affect CC adoption.

H14: The relationship between external support and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.15 Mobile Access

It is referred to as the users' ability to receive services anytime (Shukur et al., 2018a). As a new platform for CC Mobile (MCC), added on mobile devices capability with cloud services to meet the users' service objective of accessing the system anytime anyplace in addition to ease of use, additional data storage, scalability, and automatic backup and recovery (Shukur et al., 2018a).

H15: The relationship between mobile access and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.16 Hard Financial Analysis

It utilized quantitative metrics as the costing methods to do financial analysis and using both CAPEX and OPEX as costs being the significant IT investment. High investment costs can be one of the barrier factors in adopting CC (Almuayqil et al., 2016). Among the method used to analyse investment costs include many financial analyses that can be considered like Return on Investment (ROI), Total Cost of Ownership (TCO), and Activity Based Costing (ABC), where ROI measures the efficiency of cloud adoption (Mohammed et al., 2017) and direct and indirect adoption cost measured by TCO. Furthermore, the ROI calculation for adopting CC is:

$$\text{CC ROI} = \frac{\text{Cloud Benefits} - \text{Cloud Cost}}{\text{Cloud Cost}}$$

In TCO, the cost of owning IT resources includes the purchasing cost and other costs such as integration with current systems, software licenses, training, warranty, maintenance, and support services. ABC cost method looked at task accomplishment activities. The selection of the costing method in CC adoption depends on the organizations' cost measuring and accounting preferences and practices (Almuayqil et al., 2016).

H16: The relationship between hard financial analysis and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.17 Soft Financial Analysis

It has added strategic value to the organizations measured by elastic financial analysis, such as improved customer experiences. The use of cloud services enhanced customer satisfaction by offering mobile health, telemedicine, and big data and increased patients' safety, impacting CC adoption. Health-care technology is moving from a traditional health-care paper-based model (doctor-centred model) to the new health-care model (patient-centred model) by facilitating the information sharing of patients' medical data and increasing patients' engagement giving potential benefits to the organizations (El-Gazzar et al., 2016).

Cost-Benefit Analysis (CBA) calculates the intangible costs and the benefits of adopting CC financial value. Another costing method, the Balanced Score Card (BSC), combined traditional financial measures with non-financial qualitative performance indicators implemented widely by many health-care providers and is the preferred technique used in most health-care institutions in KSA (Turshan et al., 2020).

H17: The relationship between soft financial analysis and intention to adopt cloud computing in Saudi health-care institutions is positive.

4.6.18 Ease of Use (PEOU)

PEOU reflected on believing ease of use to users. It is made possible when the IT infrastructure use and management are easy due to the flexibility, scalability, and power of hosted cloud services, making the cloud a powerful tool for enabling IT success (Shukur et al., 2018a).

H18: The relationship between ease of use and intention to adopt cloud computing in Saudi health-care institutions is positive.

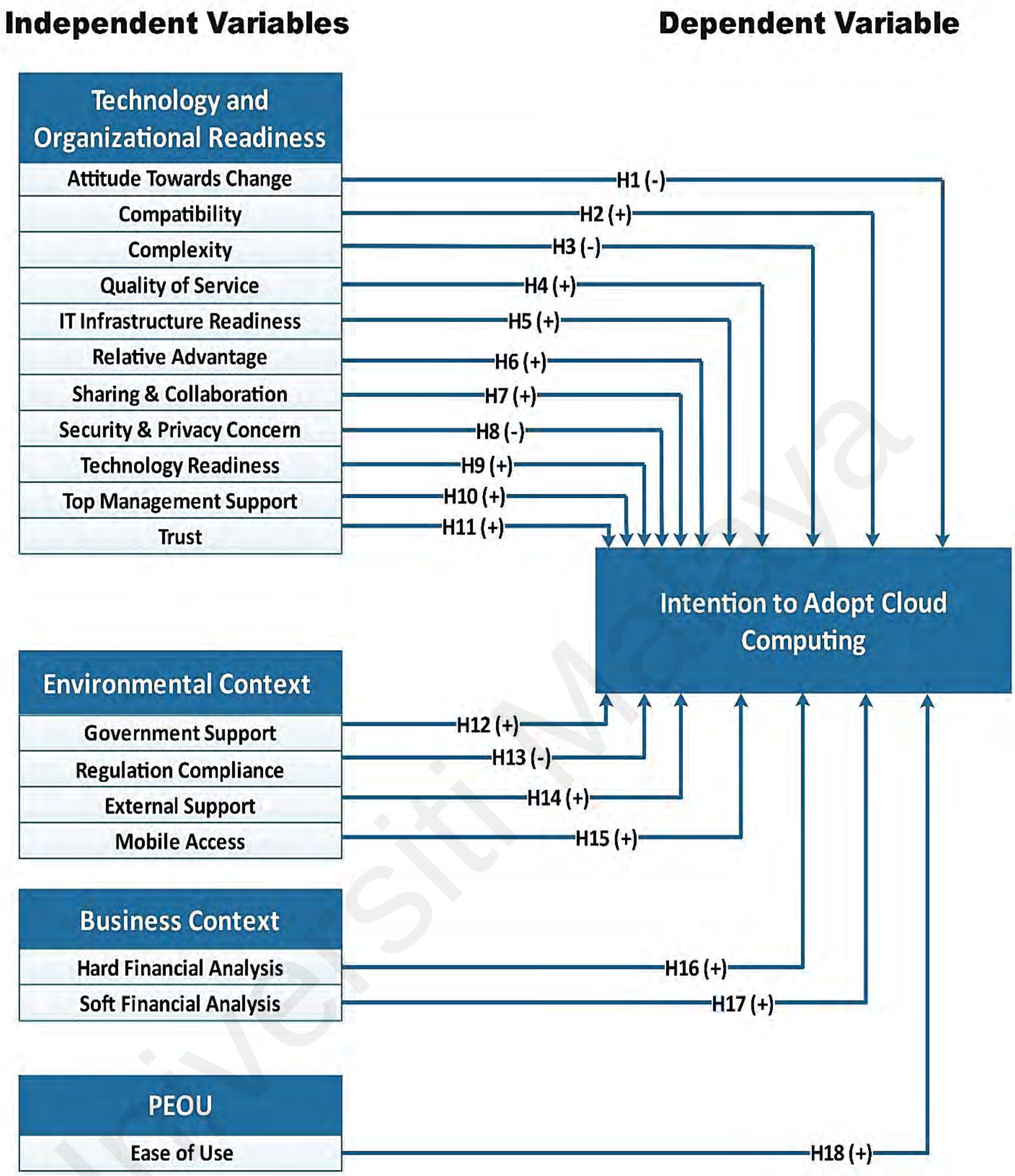

Figure 4.2: Research Framework of Cloud Computing Adoption in Health-Care Institutions

4.7 Summary

The chapter outlined the answers for (RQ2 and RQ3) helping health-care institutions in KSA in their cloud computing step. It concluded by presenting the theoretical frameworks which support the framework's growth. Two well-documented theoretical frameworks have been selected to promote cloud computing implementation in health-care institutions; the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) model are the three aspects of this framework: technology and organizational readiness, internal and external limitations, and potential benefits. Also, describe the factors impacting cloud computing adoption in Saudi health-care institutions. A conceptual framework, which includes the TAM and TOE, were also developed. This approach is used as a systemic framework to investigate the use of cloud computing in health-care institutions. The research analysis also indicates that frameworks analysing deployment in a dynamic situation, such as organizations in the health-care sector, need to consider factors such as the type of technology involved, the organisation's capabilities, and the outside environment. Those are considered explanatory factors in various studies. The subsequent chapter discusses the research approach used to test the proposed framework for appropriateness in Saudi health-care.

CHAPTER 5: DATA ANALYSIS AND FINDINGS

5.1 Introduction

This chapter's design provides a response to the fourth research question (RQ4) regarding validating a research framework for CC's adoption in SHCIs. In this context, this chapter contains, firstly, data collection regarding detailed results and empirical findings of the current study. Significant aspects of the findings include a brief discussion on the questionnaire distribution process and response rate. Also, followed by an explanation of the preliminary analyses such as missing data analysis, detection, and treatment of outliers, normality assessment, and standard method variance to check possible bias and descriptive study, where the frequencies and percentages relating to the demographic characteristics presented. The data was collected using survey questionnaires and observations. Data were analysed to investigate the staff's information to achieve the research aims. This chapter also signifies descriptive statistics of the variables.

Secondly, it narrates the correlation analysis among the study variables. This study used the structural equation modelling approach (SEM) through Partial Least Square (Plsek & Greenhalgh, 2001), a variance-based statistical technique to analyse structural relationships among the current study variables. PLS-SEM results report in two steps. The first step deals with the measurement model analysis, including assessing factor loadings and cross-loadings, average variance extracted (AVE), construct reliability, and validity. Subsequently, an explanation of the structural model analysis is presented along with the outcome of the hypothesis's tests, as stated by (Chin, 2010) and Hair et al. (2006). The investigations carried out using the SPSS (v. 26) and Smart-PLS (v. 3.3.3). Table 5.1 presents a summary of the specific statistical tools used at every stage of the analyses. Simultaneously, the qualitative data were transcribed, coded, and analysed the framework model theoretically (refer to Chapter 3).

Table 5.1: Summary of the Stages and Statistical Methods used in this Research

Stage	Analysis	Statistical Tests and Methods	Statistical Software
1	Preliminary Data and Screening	Treatment of Outliers	SPSS 26.0
		Normality Assessment	
2	Descriptive Analysis	Frequencies and Percentages	
3	Measurement Model Test	Factor Loading, Cross Loadings, AVE, Inter-Correlations, Alpha and Composite Reliability Common Method Variance	SmartPLS 3.3.3
4	Structural Model Analysis	Coefficients, R-square, and Bootstrapping Method.	SmartPLS 3.3.3

5.2 Data Collection: Preliminary Data Analysis and Screening

This section discusses the preliminary data analysis and screening and examines missing data followed by detection and treatment of outliers.

5.2.1 Response Rate

Given the importance of having enough data for this study's analysis, these questionnaires were conducted between March to May 2020. A total of 230 questionnaires were distributed face-to-face in the data collection process. Two hundred (200) surveys were returned for review, which contributed to a response rate of 86.9%. The current study investigates the intention to adopt cloud computing on an individual level as the unit of analysis. Questionnaires were distributed face to face to the hospital staff, i.e., physicians, nurses, laboratory staff, pharmacists, and administrative staff. They were working in the local government hospitals in KSA.

5.2.2 Missing Data

Researchers generally consider missing data as one of the unavoidable research issues (Hair et al., 2006; Hayes & Moulton, 2017; Zikmund et al., 2013). Missing data occurs when respondents fail to respond to one or more research instrument items (Hair et al., 2016). Cases of missing data are usually under consideration from researchers for two reasons. First, the retention of such missing data could lead to biased or inaccurate results.

On the other hand, removing such cases could reduce sample size, thus decreasing statistical power and limiting the study results' generalisation (Hair et al., 2006; Vinzi et al., 2010). Therefore, Hair et al. (2006) suggest that researchers are encouraged to properly examine the type, extent, and nature of missing data and then apply appropriate remedies.

After checking the dataset for missing values in the returned questionnaires, no uncompleted or obtaining missing values were found in the current study. Thus, 200 completed questionnaires were entered into the Statistical Package for Social Science SPSS v. 26 to screen data statistically. Hence a descriptive frequency statistic using SPSS v. 26 ("Encyclopedia of Survey Research Methods," 2008) was conducted to detect the missing values. The output showed that there were no missing data existed in the dataset.

5.2.3 Detection and Treatment of Outliers

Outliers generally refer to cases or observations with values that differ from most dataset cases, mostly due to too high or low scores (Hair et al., 2006). Outliers can either be univariate or multivariate. Univariate outlier refers to a case with an extreme value on a single variable, while multivariate outlier refers to the fact with the odd combination of extreme values in two or more variables (Hair et al., 2010a; Kline, 2011; Tabachnick & Fidell, 2007). It recommended that outliers should be appropriately identified and removed from the dataset because they could result in the non-normality of data, which could, in turn, lead to distorted statistical results (Hair et al., 2010b; Kline, 2011; Tabachnick & Fidell, 2007). The researcher used multivariate analysis outliers for checking outliers since the current study using more than one variable.

The Mahalanobis D2 measure can detect values that fall at the distribution's outer ranges for the multivariate outliers. The linear regression method in SPSS 26 was applied to calculate the Mahalanobis D2 value. Subsequently, Chi-square statistics and associated probability values also calculated for the Mahalanobis D2 using the number of independent variables as degrees of freedom. Tabachnick and Fidell (2007) recommend that cases with an associated chi-squared probability of 0.001 or less can be considered multivariate outliers and should be reviewed for removal. Also, using criterion, no instances of multivariate outliers were identified. Thus, none of the cases was removed from the dataset. The remaining (200) usable questionnaires (86.9%) have proceeded to the next data analysis stage.

5.2.4 Assessment of Normality

Data normality is considered an essential assumption in multivariate analysis (Chin, 2010; Hair et al., 2006; Tabachnick & Fidell, 2007). PLS-SEM can predict a relatively complex model without requiring the fulfilment of distribution assumptions and, therefore, it can handle non-normal distribution data, which is a phenomenon commonly encountered by business and social sciences researchers (Hair et al., 2014; Sarstedt et al., 2014). In this analysis, normality tests were conducted to predict more reliable outcomes. This to check that the data is not too far from the standard. When data are extremely non-normal, they tend to inflate the standard error obtained from the bootstrapping procedure, thus affecting the validity of results (Hair et al., 2010b)

In this study, the normality of data assessed by examining the skewness and kurtosis of each item (i.e., univariate normality), as well as for each construct (multivariate normality). Skewness relates to the asymmetrical shape of a unimodal distribution regarding its mean, which can either be negative or positive. Negative skewness implies that most of the scores are above the mean, while positive skewness indicates the opposite. On the other hand, Kurtosis relates to the "peakiness" or height of the normal curve. Positive kurtosis shows more massive tails and a higher peak, while negative kurtosis demonstrates the opposite.

Several rules of thumb have been proposed for acceptable ranges of skewness and kurtosis. The values range from -2 to +2 (Kline, 2011; Tabachnick & Fidell, 2007), -2.58 to +2.58 (Hair et al., 2006); and -3 to +3 (Hair et al., 2010b) and -1 to +1 (Hair et al., 2014). In this study, the univariate normality test results at the individual items and construct levels are presented in Tables 5.2 and 5.3, respectively.

Table 5.2: Univariate Normality Statistics for Constructs

Construct	N	Min	Max	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Attitude Towards Change	200	1	5	.106	.172	-.451	.342
Compatibility	200	1	5	.145	.172	1.019	.342
Complexity	200	1	5	-1.146	.172	.954	.342
Service Quality	200	1	5	.689	.172	.932	.342
IT Infrastructure Readiness	200	1	5	-1.221	.172	1.683	.342
Relative Advantage	200	1	5	-.627	.172	-.245	.342
Sharing & Collaboration	200	1	5	-.741	.172	.907	.342
Security and Privacy	200	1	5	-.029	.172	1.742	.342
Technology Readiness	200	1	5	-.429	.172	.915	.342
Top Management Support	200	1	5	.076	.172	-.496	.342
Trust	200	1	5	-.988	.172	.319	.342
Government Support	200	1	5	.195	.172	.742	.342
Regulation Compliance	200	1	5	-.939	.172	.484	.342
External Support	200	1	5	-.125	.172	.151	.342
Mobile Access	200	1	5	-.238	.172	.989	.342
Hard Financial Analysis	200	1	5	-.188	.172	.276	.342
Soft Financial Analysis	200	1	5	-1.457	.172	.309	.342
Ease of Use	200	1	5	-.536	.172	-.753	.342
Valid N	200						

As can be seen in Table 5.3, the results exhibit that values for skewness and kurtosis for all the individual items are within the acceptable ranges of -2.00 to +2.00 (Hair, Sarstedt, Ringle, et al., 2012; Kline, 2011; Tabachnick & Fidell, 2007) which mean all data were normal. Likewise, at the construct level, normality assessment results indicate that skewness and kurtosis for all constructs are within acceptable ranges of -1.00 to +1.00 (Hair et al., 2014). The values presented in Table 5.3.

Table 5.3: Univariate Normality Statistics for the Research Constructs

Variables	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Independent Variables				
Technology and Organizational Readiness	-.041	.172	-.251	.342
Environmental Context	-.711	.172	-.205	.342
Business Context	-.195	.172	-.608	.342
Perceived Ease of Use	-.821	.172	.930	.342
Dependent Variable				
Intention to Adopt Cloud Computing	-.251	.172	-.185	342

5.2.5 Common Method Variance

Common Method Variance (CMV) technique, used to know the external effects on the study measures. CMV often occurs in researches using a research instrument with similar scales and the same number of response options (Podsakoff et al., 2003), as well as differences between early and late responses (Hair et al., 2007). The existence of standard method variance in research often generates spurious relationships among constructs, thus affecting the validity of the real results (Podsakoff et al., 2003). Besides, the current study also relied on employees as respondents to rate the questionnaire as the whole; therefore, the possibility of potential standard method variance was likely to occur.

According to Doty and Glick (1998) and Spector (2006), standard method variance is rarely a severe issue to invalidate research findings. However, the researcher in this study has taken several steps to reduce CMV. Initially, all measurement items in the study were adopted from scales that have been validated in previous studies. Secondly, in addition to using previously validated scales, the research instrument was reviewed by seven experienced (senior) academics and one professional (IT manager). Thirdly, the instrument was further pre-tested among a sample of likely respondents to ensure clarity and adequate understanding. Finally, the recommended statistical test (Harman's one-factor test) was conducted on the returned questionnaires to check and correct for possible any standard method variance in the data.

Since the researcher uses Harman's one-factor test, the results must satisfy two primary certification conditions as free from standard method variance. First, there must be more than one factor with an Eigenvalue greater than 1. Second, no single factor must account for more than 50% of the total variance emanating from an Exploratory Factor Analysis (EFA) conducted on the scale items (Podsakoff et al., 2003). The EFA results were conducted on the scale items for this study, as shown in Table 5.4, indicating that these two conditions are fully fulfilled. A total of 16 factors emerged with Eigenvalue >1, and the principal factor accounted for only 28.03% of the total variance. Consequently, the stated results show a lack of variation in this dataset and confirm the absence of standard method variance, as shown in Table 5.4.

Table 5.4: Common Method Variance (Total Variance Explained)

Item	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	18.783	28.035	28.035	18.783	28.035	28.035
2	12.411	18.524	46.559	12.411	18.524	46.559
3	3.828	5.713	52.272	3.828	5.713	52.272
4	3.410	5.089	57.361	3.410	5.089	57.361
5	3.064	4.572	61.934	3.064	4.572	61.934
6	2.764	4.125	66.059	2.764	4.125	66.059
7	2.435	3.635	69.693	2.435	3.635	69.693
8	2.074	3.095	72.789	2.074	3.095	72.789
9	1.740	2.598	75.386	1.740	2.598	75.386
10	1.717	2.563	77.949	1.717	2.563	77.949
11	1.399	2.088	80.037	1.399	2.088	80.037
12	1.362	2.033	82.070	1.362	2.033	82.070
13	1.241	1.852	83.922	1.241	1.852	83.922
14	1.132	1.689	85.611	1.132	1.689	85.611
15	1.005	1.500	87.112	1.005	1.500	87.112
16	.945	1.411	88.523			
17	.828	1.236	89.759			
18	.782	1.168	90.926			
Method of Extraction: Principal Component Analysis						

5.3 Demographic Profile of Respondents

This section demonstrates the demographic details for the 200 respondents, which represent a returned number of structured questionnaires, representing a response rate of (86.9%). The demographic information included in the study consists of the respondents' age, gender, position, level of education, English language level, name of the hospital currently working in, and job category (e.g., nurse, doctor, pharmacist, administration officer) of the respondents.

The quantitative data obtained from the survey questionnaire were analysed using SPSS v. 26 and examined the respondents' demographics to gain a better understanding of their work nature and environment. The results of the descriptive analysis as follows.

5.3.1 Gender

The term gender is used to refer to male or female. The researcher asked respondents to give their gender as part of the demographic variables of the study. Table 5.5 and Figure 5.1 shows socio-demographic information of the sample of 200 participants, where 151 (75.5%) respondents were male, and 49 (24.5%) respondents were female, indicating that female had a lower number of staff working in health-care organizations in KSA.

Table 5.5: Gender of the Respondents

Demographic Variables	Frequency	Percent (%)
Gender		
Male	151	75.5%
Female	49	24.5%
Total	**200**	**100.0**

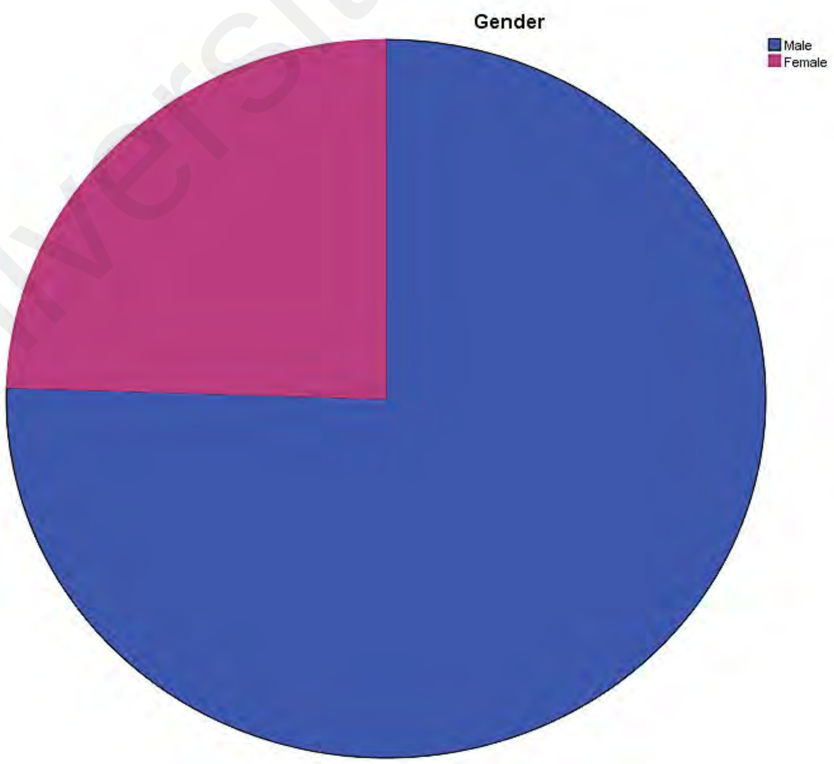

Figure 5.1: Gender of the Respondents

5.3.2 Age Group

Table 5.6 and Figure 5.2. respectively, presented the term age used to refer to how old the respondents were in the survey time. The researcher asked respondents to give their age as part of the demographic variables of the study. Also, the age of the participants showed that for the aged group 20–29 years (93%), age group 30–39 years (25%) and 40–49 years (18.5%) and 50-59 years (10%). The age group of 20–29 years and 30–39 years comprised the largest group in the sample of the 200 participants.

Table 5.6: Age Group of the Respondents

Demographic Variables	Frequency	Percent (%)
Age		
20 – 29 years	93	46.5%
30 – 39 years	50	25.0%
40 – 49 years	37	18.5%
50 – 59 years	20	10.0%
Total	**200**	**100.0**

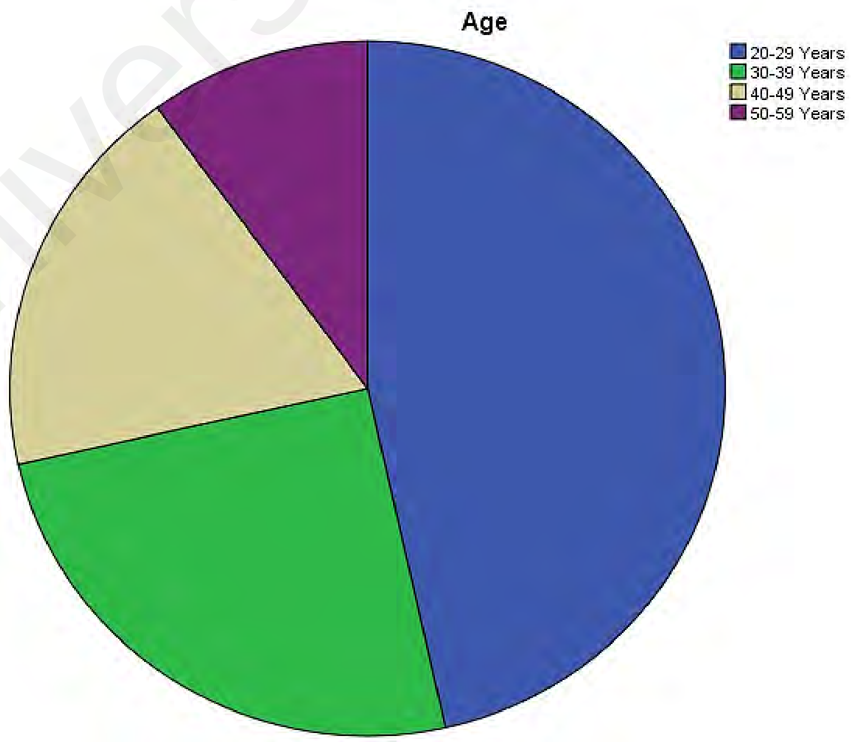

Figure 5.2: Age Group of the Respondents

5.3.3 First Language of Participant

Table 5.7, and Figure 5.3, also demonstrates the respondents' analysis of the knowledge relevant to language speaks. This information will allow the researcher to assess if the organization is utilizing professional expertise by recruiting qualified staff. In this study, the researcher asked respondents to give their background about the languages speaks as the first language.

Table 5.7: First Language of Respondents - Arabic and English

Demographic Variables	Frequency	Percent (%)
Is Arabic your FIRST language?		
Yes	151	75.5%
No	49	24.5%
Total	**200**	**100.0**

The research found that 151 respondents (75.5%) spoke in the Arabic language as a first language, and 49 participants (24.5%) having a different expression of the respondents were foreigners working in the health-care organizations in KSA.

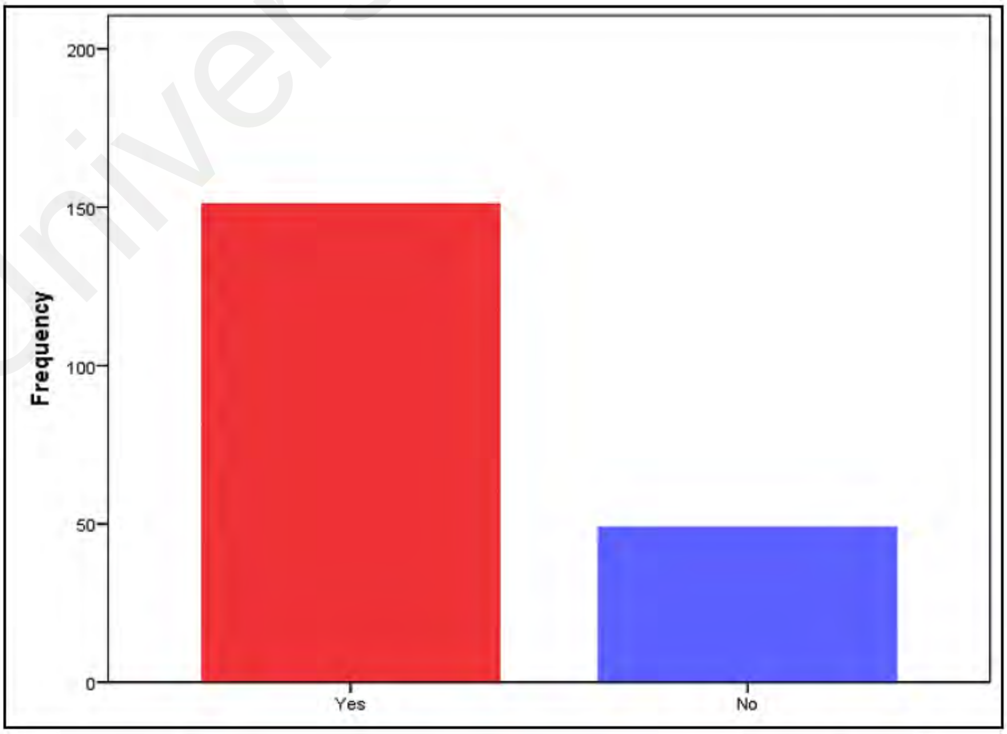

Figure 5.3: First Language of Respondents - Arabic and English

5.3.4 Respondents First English Language Level

Table 5.8 and Figure 5.4 also show the information that the participants analysed regarding the English language level. This information would allow the researcher to assess if the organization utilized technical knowledge by using qualified staff. In this study, the researcher asked the respondents to give their background in their English experience.

Table 5.8: Describe Participant English Language Level

Demographic Variables	Frequency	Percent (%)
How would you describe your English language level?		
Poor	44	22.0%
Fair	30	15.0%
Good	98	49.0%
Excellent	28	14.0%
Total	**200**	**100.0**

As shown in Table 5.8 that English language level presents 98 respondents (49%) have a right level in the English language, 28 participants (14%) have an excellent level of English language, and fair 30 respondents (15%) have an acceptable level in the English language whereas, the poor in English was 44 respondents (22%).

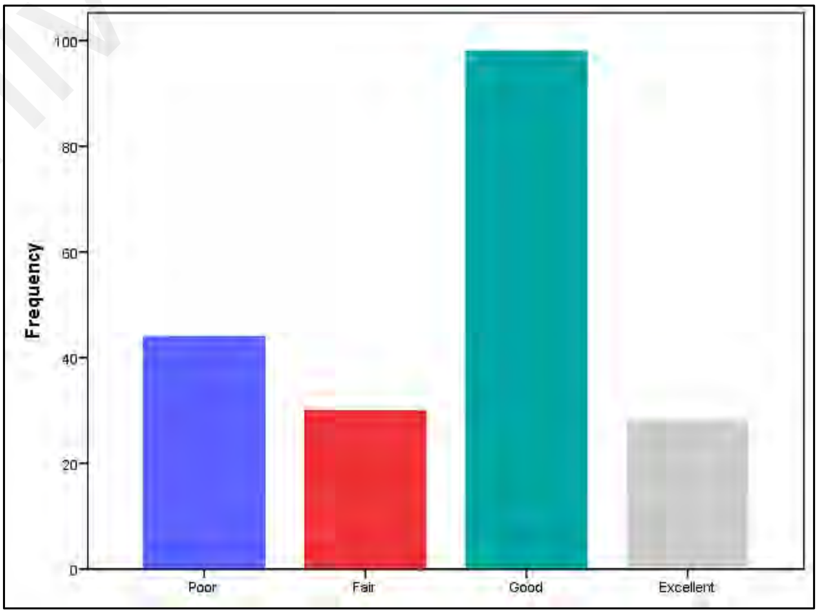

Figure 5.4: First Language of Respondents - Arabic and English

5.3.5 Education Level

Table 5.9 and Figure 5.5 also show the information analysed regarding the level of education the respondents achieved. This information will allow the researcher to assess if the organization is exploiting professional expertise by engaging qualified staff. In this study, the researcher asked respondents to provide their background in terms of the work activity.

Table 5.9: Education Level of Respondents

Demographic Variables	Frequency	Percent (%)
What is your education level?		
High School	42	21.0%
Diploma	7	03.5%
Bachelor	84	43.0%
Master	20	10.0%
Doctorate	47	23.5%
Total	**200**	**100.0**

The education levels of the respondents found to educated, and this indicated as follows: 84 participants (42%) have Bachelor's degree, 47 participants (23.5%) have a Doctorate, 20 participants (10%) have a Master degree, and 7 participants (3.5%) have Diploma degree, while, high school 42 participants (21%) as shown in Table 5.9.

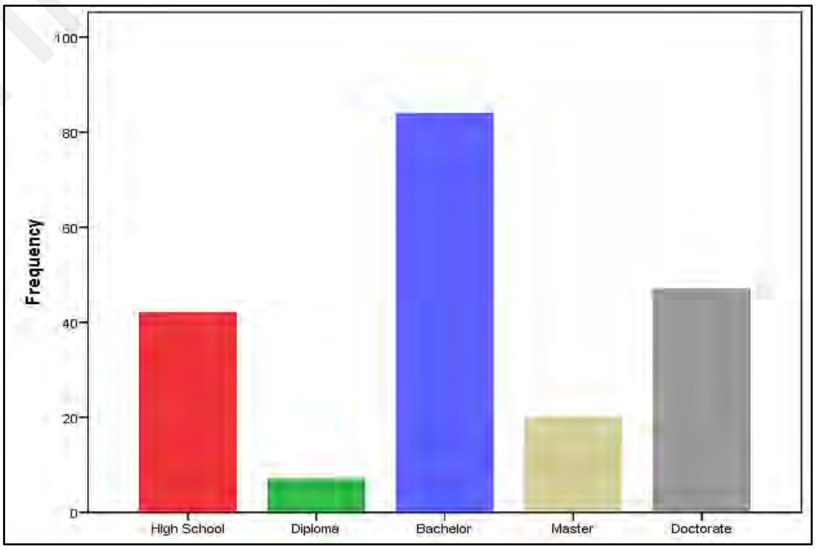

Figure 5.5: Education Level of Respondents

5.3.6 Hospital Workplace

Table 5.10, and Figure 5.6, shows the hospitals in which they work. Whereas the findings are justifiable, as three (3) local government hospitals are located in KSA. Besides, the researcher met the participants in three hospitals. The first hospital is King Abdulaziz Specialist Hospital, as a case 1, (Hospital A), 80 participants, as a percentage (88%). And second, King Faisal Hospital, as case 2, (Hospital B), 70 participants, as a percentage, (87.5%). Finally, the Children Hospital, as case 3 (Hospital C), 50 participants, as a percentage, (83.3%).

Table 5.10: Hospital Workplace

Demographic Variables	Frequency	Percent (%)
Which hospital are you currently working?		
King Abdulaziz Specialist Hospital (Hospital A)	80	(88.0 %)
King Faisal Hospital (Hospital B)	70	(87.5 %)
Children Hospital, (Hospital C)	50	(83.3 %)
Total	**200**	**100.0**

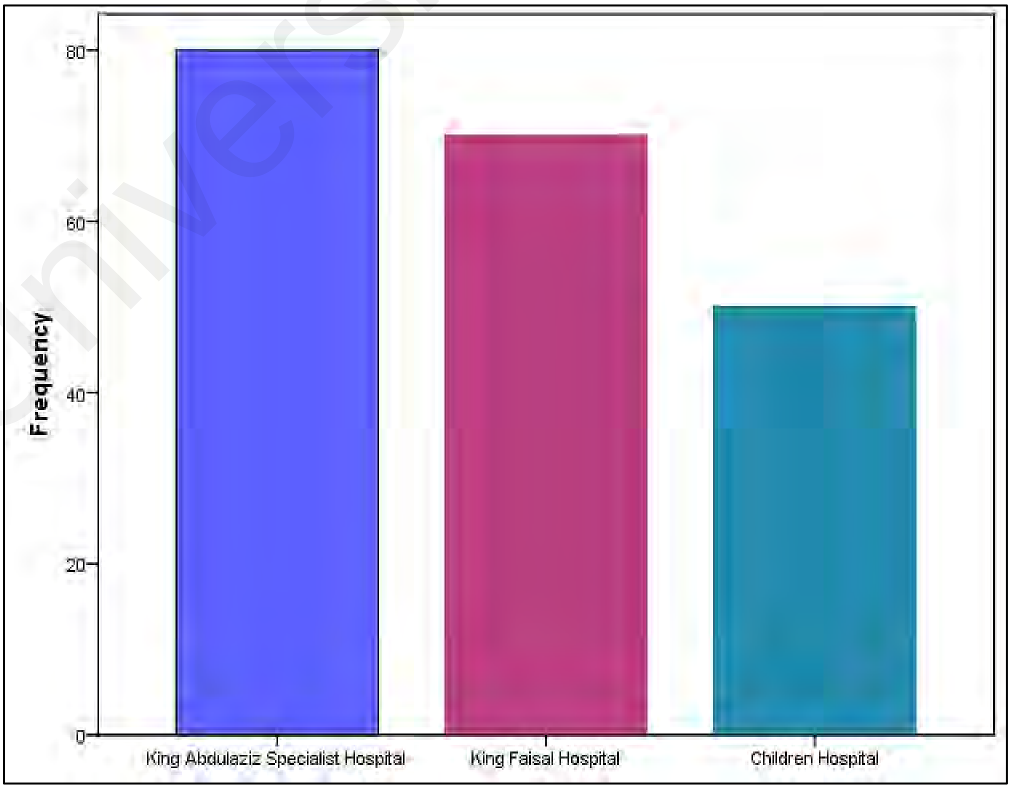

Figure 5.6: Hospital Workplace

5.3.7 The Position at Work of Participants

The title position works used in a current study to refer to the participant's position in their organization. The researcher asked participants to participate in their job position as part of the study's demographic variables, as shown in Table 5.11 and Figure 5.7, respectively. Moreover, the questionnaire finding presented the professional group in this research consisted of physicians 81 participants (40.5%), nurses 31 participants (15.5%), laboratory staff 56 participants (28%), pharmacists 10 participants (5%), administrators 8 participants (4%), receptionist 12 participants (6%) and other staff, 2 participants (1%).

Table 5.11: Position at Work of Participants

Demographic Variables	Frequency	Percent (%)
What is your position at work?		
Laboratory Staff	56	28.0%
Receptionist	12	06.0%
Pharmacist	10	05.0%
Nurse	31	15.5%
Physician	81	40.5%
Administrator	8	04.0%
Other	2	01.0%
Total	**200**	**100.0**

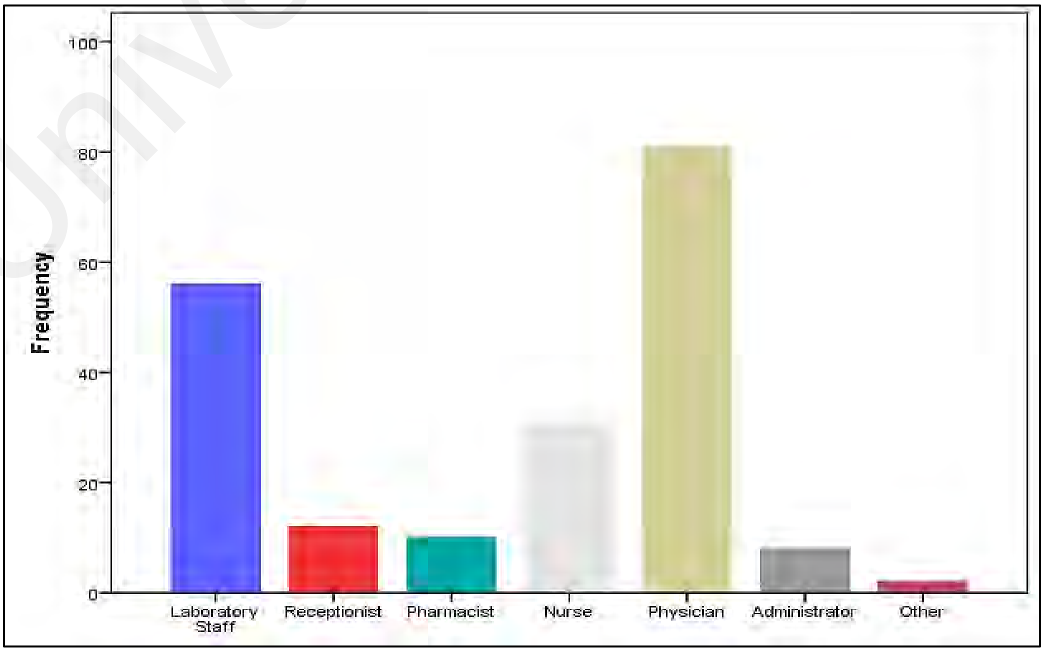

Figure 5.7: Position at Work of Participants

5.4 Assessment of the Measurement Model –PLS-SEM

This section discusses testing the measurement model to establish the validity and reliability of the research variables. The research by Chin (2010) stated argued that it is necessary for reflective constructs in a model to assess the reliability and validity of the research variables (Chin, 2010). The last preceding study also explained that the measurement model or outer model relates observed variables (indicators) to their latent variables (construct) (Chin, 2010). The first step in analysing the measurement model is to examine the measurement model's convergent validity (Hair et al., 2010b). To establish convergent validity, the researcher examined the outer loadings (items loading) of the indicators as well as the average variance extracted (AVE). In PLS, one of the essential steps in evaluating the measurement model's suitability (i.e., survey items) is their effects on the structural and path analysis models. In other words, the measurement model is the foundation of the structural model, which measures hypothesis and path analysis (Hair et al., 2014; Monecke & Leisch, 2012).

Following Hair et al. (2012), Chin (2010), Götz et al. (2010), this assessment includes the convergent validity (item loadings and the average variance extracted, AVE); discriminant validity (cross-loadings, square root of AVE, and HTMT); and construct reliability was assessed by testing (composite reliability and internal reliability) (Hair et al., 2012; Chin, 2010; Götz et al., 2010). The results of these tests for the reflective items in the study presented in the following subsections.

5.4.1 Convergent Validity

Convergent validity refers to the degree to which one indicator positively correlated with other indicators designed to assess one construct (Hair et al., 2014). Urbach and Ahlemann (2010) define convergent validity is the degree to which individual indicators reflect a construct converging compared to indicators measuring other constructs. Essentially, a test of convergent validity determines whether the items in a scale converge or load together on a single construct in the measurement model. The conventional methods of establishing convergent validity involve examining each indicator's outer loadings and the average variance extracted (AVE) for each construct. AVE value is calculated as the mean of the squared loadings for all indicators associated with a construct (Hair et al., 2014).

Hair et al. (2014) recommends outer loadings of 0.70 or higher for indicators and a minimum AVE of 0.50 for each construct. AVE value of 0.50 or higher indicates that, on average, the construct explains more than 50% of the variance of its indicators (items). On the other hand, AVE less than 0.50, on average, indicates the existence of error in the items, thus requiring the deletion of the offending items, provided such deletion will improve the AVE beyond the minimum threshold of 0.5. The item loadings and corresponding AVE are presented in the following subsections Figure 5.8.

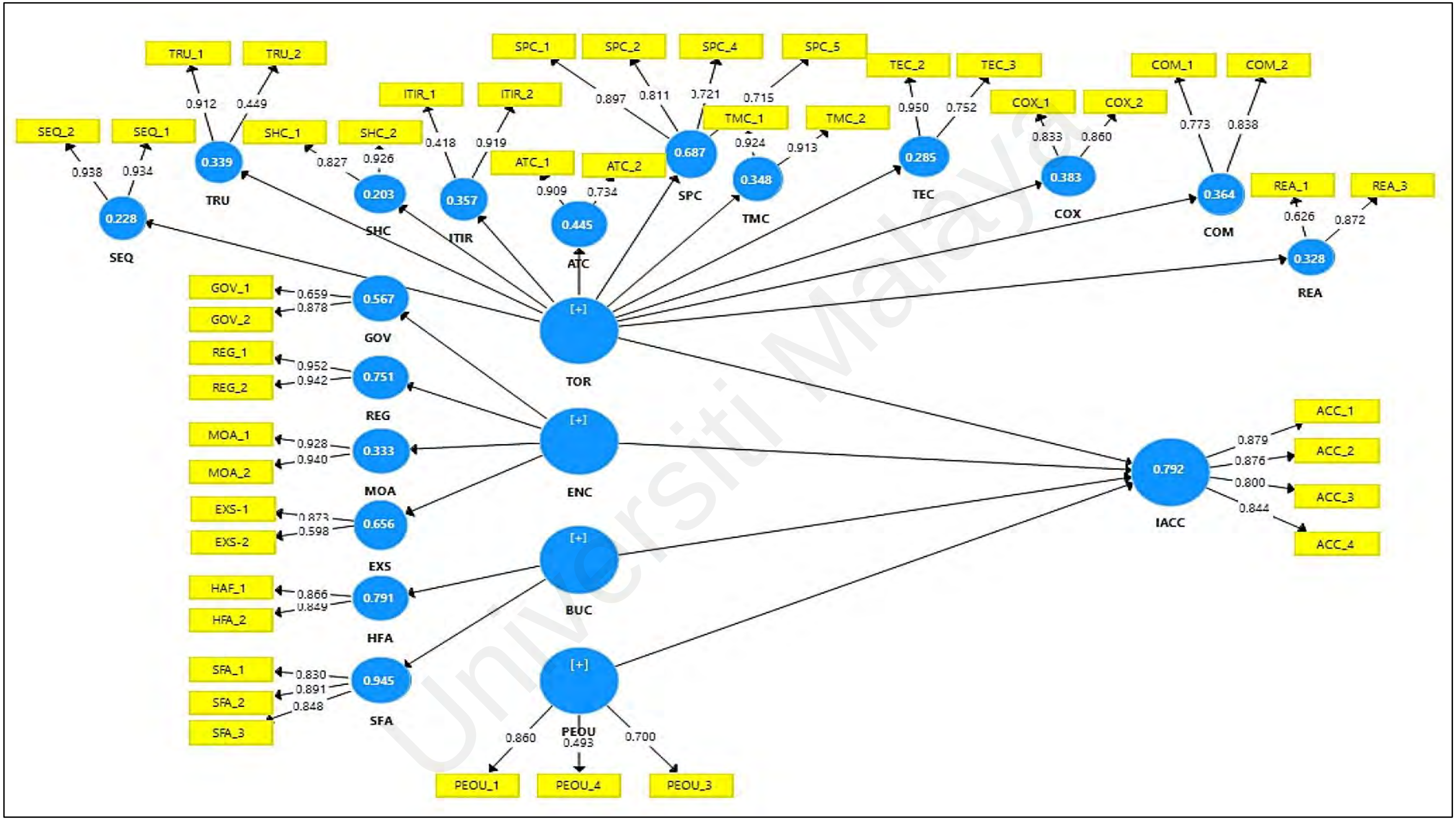

Figure 5.8: Overall Measurement Model

5.4.1.1 Item/Factor Loadings

Item loading serves as an indication of the extent to which the observed variable related to the latent variable it is intended to measure and indicates the item's level of reliability. In other words, the link between the measured indicator for each variable and reflective construct (Hair et al., 2011). The researcher examined the indicator reliability through indicator loadings, also called factor/outer loadings in PLS-SEM. Stevens (2012) recommends, firstly, removing the items with factor loading < 0.3 (Stevens, 2012). Then, if the model fits still low, it is recommended to delete items with the lowest factor loading consequently until improving model fit. Hair et al. (2014) suggested that the issues with factor loadings less than 0.40 should remove from the scale. The items with factor loadings between 0.40 and 0.70 should be considered for removal only when deleting the indicator leads to an increase in AVE value above the proposed threshold. For the evaluation of the model item loading, the researcher has run the PLS Algorithm. Following Hair et al. (2014), all items with low factor loading have been removed subsequently.

The results in Table 5.12 demonstrate that the item loadings ranged from 0.418 to 0.952, and they were statistically significant ($p< 0.01$). These values were attained after the deletion of six items out of 51 items from all constructs. These items found had poor loading (REA_2, SPC_3, TEC_1, REG_3, HFA_3 PEOU_2). The loading of those items was 0.237, 0.032, 0.087, -0.250, 0.134, 0.221 respectively. Subsequently, these items were removed from the model. The removal of the items was done in sequences (i.e., one item at one time) after each subsequent run of the PLS algorithm until the measurement model meets all the requirements. Besides, seven items indicate value below 0.7 (REA_1: 0.626, SHC_1: 0.640, ITIR_1: 0.418, TRU_2: 0.449, GOV_1: 0.659, PEOU_4: 0.493, EXS_2: 0.598). Following Hair et al. (2014) recommendation, these seven items were examined for their elimination effects, and the researcher decided to retain them based on their contribution to content validity. Table 5.12 illustrates the resulting items and their respective loadings after the removal of the poor items loading. As a result, the first condition of the convergent validity was attained. Therefore, the researcher can proceed to the next assessment, AVE, to evaluate convergent validity at the construct level.

Table 5.12: Outer Loadings for all Items (After Deleted 6 Items)

Themes	Constructs	Indicators	Loading
Technology and Organizational Readiness	Attitude Towards Change	ATT_1	0.909
		ATT_2	0.734
	Compatibility	COM_1	0.773
		COM_2	0.838
	Complexity	COX_1	0.833
		COX_2	0.860
	Service Quality	SEQ_1	0.934
		SEQ_2	0.939
	IT Infrastructure Readiness	ITIR_1	0.418
		ITIR_2	0.919
	Relative Advantage	REA_1	0.626
		REA_3	0.872
	Sharing & Collaboration	SHC_1	0.640
		SHC_2	0.792
	Security & Privacy Concerns	SPC_1	0.897
		SPC_2	0.811
		SPC_4	0.721
		SPC_5	0.715
	Technology Readiness	TEC_1	0.950
		TEC_2	0.752
	Top Management Support	TMC_1	0924
		TMC_2	0.751
	Trust	TRU_1	0.912
		TRU_2	0.449
Environmental Context	Government Support	GOV_1	0.659
		GOV_2	0.878
	Regulation Compliance	REG_1	0.952
		REG_2	0.942
	External Support	EXS_1	0.873
		EXS_2	0.598
	Mobile Access	MOA_1	0.928
		MOA_2	0.940
Perceived Ease of Use	Perceived Ease of Use (PEOU)	PEOU_1	0.860
		PEOU_3	0.700
		PEOU_4	0.493
Business Context	Hard Financial Analysis	HFA_1	0.866
		HFA_2	0.849
	Soft Financial Analysis	SFA_1	0.830
		SFA_2	0.891
		SFA_3	0.848
Intention to Adopt Cloud Computing		ACC_1	0.879
		ACC_2	0.876
		ACC_3	0.800
		ACC_4	0.844

5.4.1.2 Average Variance Extracted (AVE)

The average variance extracted (AVE) is used to confirm the reflective model's convergent validity in PLS-SEM. AVE is the average variation in observed variables (indicators) that a latent construct can explain (Farrell, 2010). Generally, convergent validity used to identify how an indicator positively correlated with other indicators under the same umbrella of the theoretical framework (Chin, 2010). The AVE is the sum of the squared loading divided by the number of indicators in a construct (Hair et al., 2014). Construct validity considered adequate when the construct attains an AVE of 0.50 or higher. In other words, these values provided the evidence of convergent validity as they exceed 50% of the extracted variance for every construct in the study model (Chin, 1998; Hair et al., 2014), whiles AVE less than 0.50 indicates that, on average, more error remains in the items than the variance explained by the construct (Hair et al., 2011).

As shown in the results presented in Table 5.13, the AVE and Composite Reliabilities (CR) for the constructs in this study ranged between 0.512– 0.897 and 0.711– 0.946, respectively. Also, the indicates that the measurement error is less than the variance explained by the constructs, thus providing evidence for convergent validity (Hair et al., 2014). Therefore, the significance of the item loadings and sufficient AVE values suggest that all indicators and first-order latent constructs have demonstrated adequate convergent validity.

Table 5.13: AVE and CR for Reflective Constructs

Construct	Composite Reliability (CR> 0.70)	Average Variance Extracted (AVE> 0.50)
ATT	0.810	0.683
COM	0.788	0.650
COX	0.835	0.717
EXS	0.711	0.560
GOV	0.748	0.602
HFA	0.848	0.736
IACC	0.912	0.723
ITIR	0.745	0.532
MOA	0.932	0.873
PEOU	0.734	0.512
REA	0.726	0.576
REG	0.946	0.897
SEQ	0.934	0.877
SFA	0.892	0.734
SHC	0.870	0.771
SPC	0.868	0.623
TEC	0.845	0.734
TMC	0.915	0.844

5.4.2 Discriminant Validity

Discriminant validity is the last step to verify the quality criteria under the measurement model. The discriminant validity assessment has the goal to ensure that a reflective construct has the most robust relationships with its indicators (Hair et al., 2016). The traditional methods of measuring discriminant validity are the Fornell-Larcker criterion (i.e., the squared root of AVE) and the items' cross-loadings. In this study, discriminant validity assessed using these two methods, along with the recently advanced HTMT criterion (Henseler et al., 2015). Each of these criteria is explained in the subsequent subtopics.

5.4.2.1 Fornell-Larcker Criterion

Following the Fornell-Larcker criterion, discriminant validity is confirmed by comparing the correlation estimates between the constructs and the square root of the average variance extracted (AVE) of the respective constructs (Fornell & Larcker, 1981a). Discriminant validity confirmed if (1) correlation estimates among constructs do not exceed 0.85, and (2) the square root of each construct's AVE is higher than its correlation with another construct (Chin, 2010; Fornell & Larcker, 1981a). As shown in Table 5.14, discriminant validity is established in this study, as the inter-construct correlation values are less than 0.85. All the AVE's squared roots for each construct (i.e., the diagonal values presented in bold fonts) are more significant than the off-diagonal correlation values with other constructs. These results thus provide sufficient evidence that the discriminant validity of the constructs has been established.

Table 5.14: Fornell-Larcker Criterion (Correlation Between the Main Constructs)

	ATT	COM	COX	EXS	GOV	HFA	ITIR	MOA	PEOU	REA	REG	SEQ	SFA	SHC	SPC	TEC	TMC	TRU
ATT	**0.83**																	
COM	0.70	**0.81**																
COX	0.54	0.60	**0.84**															
EXS	0.56	0.58	0.29	**0.75**														
GOV	0.44	0.10	0.21	0.62	**0.78**													
HFA	0.59	0.21	0.07	0.61	0.51	**0.83**												
ITIR	0.28	0.28	0.60	0.49	0.40	0.39	**0.71**											
MOA	0.74	0.68	0.50	0.24	0.31	0.06	0.29	**0.73**										
PEOU	0.34	0.32	0.65	0.56	0.55	0.83	0.43	0.24	**0.70**									
REA	0.39	0.56	0.48	0.71	0.70	0.68	0.40	0.21	0.64	**0.77**								
REG	0.31	0.36	0.33	0.53	0.51	0.55	0.37	0.48	0.57	0.50	**0.79**							
SEQ	0.06	0.22	0.32	0.25	0.45	0.52	0.32	0.16	0.39	0.40	0.39	**0.74**						
SFA	0.00	0.69	0.29	0.73	0.67	0.81	0.50	0.12	0.64	0.75	0.50	0.58	**0.82**					
SHC	0.53	0.68	0.56	0.01	0.05	-0.25	0.27	0.53	-0.08	-0.13	0.25	0.11	-0.16	**0.78**				
SPC	0.39	0.35	0.53	0.51	0.57	0.65	0.55	0.46	0.62	0.54	0.62	0.76	0.71	0.25	**0.79**			
TEC	0.70	0.69	0.24	0.01	0.15	-0.17	0.05	0.69	0.02	0.03	0.28	-0.07	-0.17	0.49	0.17	**0.76**		
TMC	0.12	0.29	0.31	0.55	0.57	0.69	0.56	0.26	0.66	0.47	0.55	0.51	0.68	0.00	0.70	-0.07	**0.72**	
TRU	0.35	0.53	0.62	0.26	0.13	0.05	0.48	0.52	0.11	0.17	0.23	0.39	0.28	0.63	0.46	0.23	0.25	**0.71**

5.4.2.2 Cross-Loading

PLS-SEM provides cross-loading values for all items by correlating each latent variable's component scores with all the other things in the model (Chin, 2010). To achieve discriminant validity, the loadings of an indicator on its assigned latent variable should be higher than the loadings on all other latent variables (Chin, 2010; Ramayah et al., 2016). Otherwise, the problem of cross-loading said to be present among the indicators, and this might indicate a problem within the items (Chin, 2010). Assessment of the cross-loading values in this study reveals that every issue of the respective construct has higher loadings as compared to others in their relative rows. Hence, confirming evidence that adequate discriminant validity between all the constructs (Hair et al., 2011). The cross-loadings presented in Table 5.15.

Table 5.15: Cross Loading of all Factors/Constructs

	ATT	COM	COX	EXS	GOV	HFA	ITIR	MOA	PEOU	REA	REG	SEQ	SFA	SHC	SPC	TEC	TMC	TRU
ATT_1	**0.91**	0.60	0.54	0.21	0.29	0.06	0.33	0.64	0.20	0.15	0.43	0.07	0.09	0.48	0.45	0.54	0.28	0.25
ATT_2	**0.73**	0.58	0.31	-0.03	0.06	-0.30	0.08	0.59	-0.12	-0.04	0.00	0.03	-0.14	0.38	0.14	0.67	-0.20	0.38
COM_1	0.43	**0.84**	0.59	0.05	0.00	-0.06	0.36	0.46	0.04	-0.14	0.25	0.16	0.02	0.59	0.36	0.23	0.41	0.60
COM_2	0.69	**0.77**	0.40	0.03	0.15	-0.27	0.11	0.62	-0.06	0.03	0.32	0.04	-0.15	0.52	0.21	0.84	-0.07	0.29
COX_1	0.38	0.47	**0.86**	0.21	0.22	0.03	0.45	0.42	0.14	0.16	0.32	0.35	0.20	0.63	0.49	0.19	0.20	0.60
COX_2	0.53	0.54	**0.83**	0.28	0.14	0.09	0.57	0.43	0.04	0.16	0.25	0.20	0.29	0.33	0.40	0.21	0.32	0.46
EXS-1	-0.01	0.02	0.17	**0.87**	0.52	0.64	0.46	0.14	0.58	0.64	0.54	0.24	0.70	0.02	0.42	-0.06	0.55	0.24
EXS-2	0.30	0.09	0.31	**0.60**	0.41	0.18	0.23	0.26	0.18	0.40	0.20	0.11	0.42	0.00	0.35	0.11	0.22	0.14
GOV_1	0.44	0.39	0.18	0.11	**0.88**	0.09	0.23	0.51	0.26	0.33	0.42	0.41	0.22	0.32	0.44	0.46	0.35	0.23
GOV_2	0.04	-0.12	0.16	0.73	**0.67**	0.60	0.36	0.08	0.55	0.65	0.39	0.32	0.73	-0.14	0.46	-0.10	0.52	0.02
HAF_1	-0.09	-0.25	0.02	0.43	0.37	**0.87**	0.30	-0.02	0.71	0.59	0.34	0.39	0.63	-0.28	0.50	-0.11	0.41	-0.08
HFA_2	-0.07	-0.11	0.11	0.62	0.50	**0.85**	0.37	0.12	0.71	0.58	0.61	0.50	0.77	-0.15	0.63	-0.17	0.79	0.17
ITIR_1	-0.03	0.06	0.17	0.23	0.46	0.33	**0.89**	0.11	0.34	0.38	0.30	0.38	0.34	-0.16	0.33	-0.11	0.54	0.05
ITIR_2	0.32	0.28	0.59	0.44	0.24	0.28	**0.64**	0.27	0.32	0.27	0.27	0.18	0.40	0.37	0.46	0.10	0.39	0.51
MOA_1	0.58	0.63	0.53	0.24	0.23	0.05	0.30	**0.88**	0.17	0.17	0.41	0.16	0.16	0.50	0.44	0.56	0.29	0.57
MOA_2	0.79	0.63	0.40	0.22	0.34	0.06	0.25	**0.84**	0.27	0.22	0.49	0.14	0.07	0.50	0.41	0.73	0.20	0.40
PEOU_1	0.02	-0.09	-0.01	0.46	0.40	0.72	0.31	0.15	**0.86**	0.57	0.42	0.38	0.54	-0.15	0.51	-0.07	0.55	0.00
PEOU_3	-0.12	-0.18	-0.01	0.35	0.40	0.68	0.21	-0.13	**0.70**	0.35	0.42	0.28	0.48	-0.24	0.40	-0.08	0.54	-0.11
PEOU_4	0.40	0.33	0.31	0.36	0.37	0.27	0.41	0.60	**0.49**	0.43	0.34	0.12	0.29	0.33	0.40	0.27	0.26	0.47
REA_1	0.17	0.05	0.18	0.16	0.28	0.25	0.28	0.14	0.32	**0.87**	0.25	0.34	0.22	0.14	0.32	0.16	0.03	0.17
REA_3	0.01	-0.10	0.12	0.80	0.71	0.70	0.33	0.18	0.62	**0.63**	0.48	0.29	0.81	-0.25	0.48	-0.06	0.57	0.11
REG_1	0.34	0.39	0.38	0.54	0.52	0.53	0.35	0.51	0.53	0.54	**0.91**	0.41	0.51	0.26	0.60	0.24	0.57	0.28
REG_2	0.25	0.28	0.25	0.47	0.44	0.51	0.34	0.40	0.55	0.40	**0.88**	0.32	0.42	0.22	0.58	0.29	0.46	0.15

Table 5.15: Continued

	ATT	COM	COX	EXS	GOV	HFA	ITIR	MOA	PEOU	REA	REG	SEQ	SFA	SHC	SPC	TEC	TMC	TRU
SEQ_1	0.02	0.10	0.36	0.23	0.40	0.48	0.36	0.16	0.37	0.40	0.32	**0.83**	0.58	0.03	0.74	-0.17	0.57	0.40
SEQ_2	0.10	0.11	0.25	0.24	0.44	0.48	0.24	0.14	0.36	0.34	0.40	**0.78**	0.50	0.17	0.69	0.04	0.39	0.33
SFA_1	0.03	0.04	0.36	0.51	0.53	0.72	0.50	0.14	0.63	0.47	0.54	0.66	**0.89**	0.00	0.72	-0.17	0.73	0.35
SFA_2	-0.04	-0.12	0.16	0.73	0.61	0.78	0.44	0.12	0.62	0.83	0.46	0.47	**0.85**	-0.29	0.61	-0.15	0.57	0.18
SFA_3	0.02	-0.15	0.22	0.76	0.58	0.57	0.34	0.05	0.37	0.60	0.27	0.34	**0.82**	-0.11	0.48	-0.11	0.45	0.21
SHC_1	0.39	0.61	0.45	-0.12	-0.11	-0.33	0.19	0.42	-0.20	-0.25	0.14	-0.05	-0.25	**0.83**	0.10	0.43	-0.09	0.53
SHC_2	0.52	0.60	0.52	0.10	0.15	-0.15	0.28	0.50	0.01	-0.03	0.29	0.20	-0.07	**0.93**	0.31	0.45	0.06	0.58
SPC_1	0.26	0.19	0.34	0.41	0.52	0.69	0.44	0.37	0.66	0.56	0.56	0.72	0.72	0.12	**0.90**	0.10	0.66	0.41
SPC_2	0.28	0.07	0.35	0.71	0.62	0.72	0.56	0.29	0.67	0.65	0.56	0.58	0.74	-0.03	**0.81**	0.02	0.73	0.21
SPC_4	0.54	0.69	0.66	0.18	0.18	0.17	0.44	0.58	0.18	0.13	0.44	0.43	0.26	0.56	**0.72**	0.40	0.32	0.60
SPC_5	0.07	0.04	0.24	0.29	0.52	0.49	0.22	0.09	0.46	0.34	0.35	0.75	0.53	0.09	**0.71**	-0.12	0.49	0.15
TEC_2	0.63	0.64	0.18	0.08	0.21	-0.03	0.11	0.66	0.11	0.11	0.30	0.02	-0.06	0.46	0.23	**0.85**	0.06	0.27
TEC_3	0.60	0.56	0.29	-0.16	-0.02	-0.40	-0.09	0.52	-0.19	-0.14	0.13	-0.22	-0.34	0.39	-0.04	**0.75**	-0.33	0.07
TMC_1	0.22	0.21	0.31	0.55	0.64	0.61	0.53	0.25	0.64	0.47	0.51	0.41	0.60	0.02	0.64	0.02	**0.73**	0.13
TMC_2	-0.02	0.14	0.25	0.46	0.39	0.67	0.51	0.23	0.58	0.40	0.50	0.54	0.65	-0.02	0.65	-0.16	**0.71**	0.35
TRU_1	0.46	0.61	0.61	0.14	-0.03	-0.08	0.42	0.57	0.01	0.05	0.19	0.16	0.09	0.73	0.28	0.39	0.10	**0.91**
TRU_2	-0.14	-0.02	0.19	0.32	0.38	0.30	0.26	0.01	0.26	0.32	0.14	0.45	0.50	-0.04	0.51	-0.29	0.41	**0.59**

5.4.2.3 The Heterotrait Monotrait Ratio (HTMT) Criterion

The third and most recently advanced method of establishing discriminant validity is through the Heterotrait Monotrait Ratio (HTMT) criterion proposed by (Henseler et al., 2015). The traditional approaches of measuring discriminant validity, namely the Fornnel-Lacker Criterion. Furthermore, the items' cross-loadings perform poorly to identify discriminant problems (Henseler et al., 2015). The HTMT refers to the average (mean value) of the correlations of indicators between different constructs relative to the correlations of indicators within the same construct (Henseler et al., 2015). The HTMT ratio is suggested as a better and more rigorous criterion for assessing discriminant validity (Henseler et al., 2015). Using the HTMT ratio to assess discriminant validity is the presence of value closer to 1 considered to indicate a lack of discriminant validity between constructs.

There are two criteria values recommended in the literature that often considered in HTMT evaluation: (1). the conservative ratio of 0.85 (HTMT.85) proposed by (Kline, 2011), (2) the liberate ratio of 0.90 (HTMT.90) recommended by (Gold et al., 2001; Teo et al., 2008). Henseler et al., 2015 strongly recommend using the HTMT criterion to assess discriminant validity. If the HTMT value is below 0.90, discriminant validity has been established between two reflective constructs. The HTMT ratios obtained in this study, as shown in Table 5.16, clearly indicate that there is no problem with discriminant validity between the reflective constructs. The highest HTMT value of inter-correlation constructs are 0.85 between (GOV and EXS). This value is below 0.90, and this means discriminant validity has established in this study.

Table 5.16: HTMT Criterion Values

	ATT	COM	COX	EXS	GOV	HFA	ITIR	MOA	PEOU	REA	REG	SEQ	SFA	SHC	SPC	TEC	TMC	TRU
ATT																		
COM	1.37																	
COX	0.69	0.76																
EXS	0.60	0.39	0.54															
GOV	0.79	0.79	0.47	**0.85**														
HFA	0.37	0.46	0.18	0.43	0.73													
ITIR	0.62	0.44	0.08	0.15	0.66	0.42												
MOA	0.07	0.06	0.70	0.60	0.67	0.13	0.82											
PEOU	0.59	0.60	0.36	0.50	0.25	0.41	0.02	0.64										
REA	0.43	0.54	0.48	0.37	0.94	0.47	3.82	0.42	0.66									
REG	0.38	0.55	0.45	0.08	0.72	0.73	0.91	0.55	0.75	0.84								
SEQ	0.10	0.23	0.45	0.53	0.64	0.70	0.71	0.19	0.57	0.64	0.74							
SFA	0.21	0.30	0.41	0.71	1.12	0.12	0.57	0.15	0.55	0.39	0.57	0.69						
SHC	0.31	0.20	0.35	0.34	0.44	0.40	0.11	0.55	0.40	0.49	0.30	0.18	0.58					
SPC	0.52	0.52	0.33	0.16	0.10	0.42	0.25	0.51	0.48	0.08	0.42	0.35	0.46	0.54				
TEC	0.21	0.18	0.32	0.29	0.17	0.34	0.30	0.19	0.21	0.15	0.33	0.26	0.24	0.31	0.37			
TMC	0.22	0.14	0.03	0.16	0.02	0.07	0.24	0.21	0.01	0.23	0.24	0.22	0.13	0.11	0.26	0.31		
TRU	0.10	0.42	0.02	0.07	0.32	0.30	0.03	0.08	0.15	0.12	0.05	0.34	0.37	0.29	0.22	0.04	0.28	

5.4.3 Summary of Reflective Measurement Model

In summary, the results have shown that the measurement model has achieved recommended and satisfactory levels. As such, the validity and reliability of the constructs have been established. The measurement model has undergone and proven to comply with validity and reliability assessment of the indicators (items) and constructs. In the next stage, the structural model analysis involves evaluating the relationship amongst the constructs in a research model shown—the summary of the measurement model test presented in Table 5.17.

Table 5.17: Summary of Reflective Measures Assessment

Measurement Test	Type	Results
Unidimensionalty	Factor loading	All items loading > 0.6
		Six (6) items deleted from all constructs
Validity	Convergent Validity	AVE > 0.5
	Discriminant Validity	The square root of the AVE > than off-diagonal correlations, no obvious cross-loadings, HTMT ratio < 0.90
Reliability	Internal Reliability	Cronbach's Alpha > 0.7
		Composite Reliability CR>0.7

5.5 Assessment of the Structural Model

The structural model assesses the relationships amongst the constructs in a research model, leading to the test of hypothesis and the model's predictive capabilities (Hair et al., 2014; Urbach & Ahlemann, 2010). Chin (2010) indicates that the structural models can only analyse after successful validation of the measurement model (Chin, 2010). Using PLS-SEM, three essential criteria must attain to assess the structural model: i) path coefficients, ii) coefficient of determination (R^2), and iii) effect size (f^2) (Hair et al., 2014; Urbach &

Ahlemann, 2010). Moreover, Hair et al. (2014) suggest that a collinearity assessment should precede the structural model analysis.

This assessment is necessary because multicollinearity among constructs is a potential issue, affecting the statistical results and subsequent conclusions. Collinearity occurs when two or more predictors measure the same underlying constructs. In other words, each predictor constructs need to be assessed separately for each subset of the structural model (Kock & Lynn, 2012b). Further, a collinearity problem can decrease the predictive power of predicting variables (Hair et al., 2006). For this reason, a Variance Inflation Factor (VIF) test was conducted for predicting the research variables of this study. Subsequently, the assessment of the full structural model was also carried out for this study.

5.5.1 Collinearity Assessment

For collinearity assessment in the context of PLS-SEM, Kock and Lynn (2012a) and (Kock & Gaskins, 2014) proposed a full collinearity test as a comprehensive procedure for the simultaneous assessment of both vertical and lateral collinearity. Variance inflation factors (VIFs) were generated for all latent variables in the research model. The occurrence of VIF greater than 3.3 is proposed as an indication of pathological collinearity and indicates that a model may contaminate by common method bias. Therefore, if all VIFs resulting from a full collinearity test are equal to or lower than 3.3, the model can be considered a lack of standard method bias (Kock, 2015, p. 7). Table 5.18 shows the VIFs obtained for all the latent variables in the current study's research model based on a full collinearity test. As it can see, the results revealed that the proposed research framework for the present study lacks the standard method bias includes a latent variable with a VIF > 3.3, Thus, providing sufficient evidence that there is no indication of collinearity between each set of predictors constructs. Table 5.18 exhibits collinearity statistics for the independent and dependent variables of the study.

Table 5.18: Multicollinearity Assessment

Theme	Independents (Predictors)	Collinearity Statistics Variance Inflation Factors (VIF)
Technology and Organizational Readiness	Relative Advantage	2.124
	Compatibility	1.288
	Complicity	1.232
	Technology Readiness	1.486
	Top Management Support	1.754
	Security and Privacy Concerns	1.890
	Service Quality	2.312
	Attitude Towards Change	1.255
	Sharing and Collaboration	1.597
	IT Infrastructure Readiness	1.486
	Trust	1.397
Environmental Context	Government Support	1.449
	Regulations Compliance	2.807
	External Support	1.650
	Mobile Access	2.346
Perceived Ease of Use	PEOU	2.742
Business Context	Hard Financial Analysis	2.057
	Soft Financial Analysis	2.182
Dependent Variable		
Intention to Adopt Cloud Computing		2.202

5.5.2 Testing the Structural Model

Structural model assessment in PLS-SEM involves examining the research model's predictive capabilities and the relationships between exogenous and endogenous constructs (Hair et al., 2014). According to Hair et al. (2014) and Urbach and Ahlemann (2010), using PLS-SEM, three essential criteria must be attained to assess the structural model: i) path coefficients (β), ii) coefficient of determination (R^2), and iii) the bootstrap statistics (t-value and p-value). Emphasis is placed on the bootstrap procedure because it produces the relevant statistics (i.e., t-value, p-value, and confidence intervals) for estimating the statistical significance of the path coefficients (Hair et al., 2013). However, this analysis does not present the model's Goodness of Fit (GoF) since GoF does not represent a goodness-of-fit criterion in PLS-SEM (Hair et al., 2014; Henseler & Sarstedt, 2013).

To determine the level of significance among structural models, a resampling procedure using the bootstrapping method was conducted in this study, which resulted in a computation t-value. In bootstrapping, subsamples generated by PLS software drawn from the original set of data samples are drawn with replacements ranging from 500 to 5000 samples (Hair et al., 2014; Ramayah et al., 2016). Hair et al. (2014) recommended a 5000-bootstrap resample to evaluate path coefficients' statistical significance as a rule of thumb. To measure whether path coefficients are significant or not, Hair et al. (2014), Ringle et al. (2015), and Streukens and Leroi-Werelds (2016) suggest that critical path coefficients for a two-tailed test should evaluate using t- statistics values of 1.65 ($p<0.1$), 1.96 ($p<0.05$) and 2.57 ($p<0.01$). In this study, path coefficients with a 5% probability error at (95% significance level) are considered significant. The results of the structural model and test of the hypothesis are presented in the next subsections.

5.5.3 Hypotheses Testing for Direct Relationships

The structural model in this study contains eighteen (18) hypothesized direct relationships. The immediate effects of exogenous constructs on endogenous constructs were simultaneously tested by running the PLS algorithm to produce the path coefficients (β) (the structural model relationships), which also represent the hypothesized relationships among the construct and the coefficient of determination (R^2). Subsequently, the 5000-bootstrapping procedure was calculated to determine the significance level or otherwise of the hypothesized relationships. The structural model results are presented in Figure 5.9, while Table 5.19 shows the summarized results of the path coefficients together with their associated significance test results. The t-statistics are the indicators for path significance. If a value in the t-statistics is more significant than 1.96 (i.e., a two-tailed test at 95% confidence level), then the path is substantial, or in other words, a hypothesis accepted.

5.5.3.1 Findings of Technology and Organizational Readiness

To examine the relationship between technology and organizational readiness (i.e., relative advantage, compatibility, complexity, technology readiness, service quality, top management support, security and privacy concerns, sharing and collaboration, attitude towards change, IT infrastructure readiness, trust) and intention to adopt cloud computing in the SHCIs. Whereas, to achieve the deployment of the current study's cloud computing adoption, the direct path between technology and organizational readiness and intention to adopt cloud computing in the SHCIs. We simultaneously tested. Also, eleven hypotheses were established to answer the research question.

Table 5.19: Results of Hypotheses Testing for Direct Relationships

Relationships	Path Relationship (β)	Standard Deviation	T-Statistics	P-Values	Results
H1 ATT -> IACC	0.046	0.05	0.919	0.358	**Not Accepted**
H2 COM -> IACC	0.191	0.046	1.984	0.048	**Accepted**
H3 COX -> IACC	0.130	0.066	1.970	0.049	**Accepted**
H4 SEQ -> IACC	0.044	0.036	0.058	0.763	**Not Accepted**
H5 ITIR -> IACC	0.136	0.036	3.753	0.000	**Accepted**
H6 REA -> IACC	0.187	0.042	4.403	0.000	**Accepted**
H7 SHC -> IACC	0.213	0.069	3.084	0.002	**Accepted**
H8 SPC -> IACC	0.207	0.052	3.989	0.000	**Accepted**
H9 TEC -> IACC	0.172	0.040	4.258	0.000	**Accepted**
H10 TMC -> IACC	0.019	0.061	0.312	0.755	**Not Accepted**
H11 TRU -> IACC	0.149	0.046	3.268	0.001	**Accepted**
H12 GOV -> IACC	0.266	0.049	5.456	0.000	**Accepted**
H13 REG -> IACC	0.196	0.055	3.598	0.000	**Accepted**
H14 EXS -> IACC	0.220	0.064	3.409	0.001	**Accepted**
H15 MOA -> IACC	0.123	0.042	2.901	0.004	**Accepted**
H16 HFA -> IACC	0.062	0.039	1.605	0.109	**Not Accepted**
H17 SFA -> IACC	0.389	0.069	5.611	0.000	**Accepted**
H18 PEOU -> IACC	0.194	0.088	2.197	0.028	**Accepted**
Key: IACC= intention to adopt cloud computing, ATT= attitude towards change, COM-compatibility, COX, complexity, SEQ= service quality, ITIR= IT infrastructure readiness, REA= relative advantage, EXS= external support, HFA= hard financial analysis, SFA= soft financial analysis, GOV= government support, MOA= mobile access, REA= comparative advantage, REG= regulation compliance, SHC= sharing and collaboration, SPC= security, and privacy concerns, TEC= technology readiness, PEOU= perceived ease of use					
***p<0.01 (two-tail) All the hypothesized direct relationships are significant at less than a 1% significance level. **p<0.05, (two-tail) All the hypothesized direct relationships are meaningful at less than 5% significance level (p<0.05)					

In the current study, eleven direct hypotheses were framed to achieve the finding. These hypotheses explored the direct relationship of independent constructs (i.e., relative advantage, compatibility, complexity, technology readiness, service quality, top management support, security and privacy concerns, sharing and collaboration, attitude towards change, IT infrastructure readiness, trust), and intention to adopt cloud computing. The results of these hypotheses are summarized in Table 5.19. The results revealed that all hypotheses direct relationships accepted and significant at $p<0.05$ except for three direct relationships. Specifically, the findings show that compatibility, complexity and IT infrastructure readiness are positively and significantly correlated with intention adoption of cloud computing (H2: $\beta=0.191$, $t= 1.984$, $p=0.048$), (H3: $\beta=0.130$, $t= 1.970$, $p=0.049$), (H5: $\beta= 0.136$, $t= 3.753$, $p<0.05$), (H6: $\beta= 0.187$, $t= 4.403$, $p<0.05$), respectively. Thus, hypothesis (H2, H3, H5, and H6) are accepted. Besides, the findings also show that a positive and significant relationships between sharing and collaboration, technology readiness, security and privacy concerns, technology readiness and trust Precisely, the results revealed that (H7: $\beta= 0.213$, $t= 3.084$, $p=0.002$), (H8: $\beta= 0.207$, $t= 3.989$, $p<0.05$), (H9: $\beta= 0.172$, $t= 4.258$, $p<0.05$) and (H11: $\beta= 0.149$, $t= 0.312$, $p=0.001$) respectively. Therefore, hypothesis (H7, H8, and H9, H11) are accepted.

On the contrary, the results indicated non-significant relationships between that attitude towards change, service quality and top management support with intention adoption of cloud computing (H1: $\beta= 0.046$, $t= 0.919$, $p= 0.358$), (H4: $\beta= 0.044$, $t= 0.058$, $p= 0.763$), (H10: $\beta= 0.019$, $t= 0.312$, $p= 0.755$) respectively which is higher the cut-off ratio ($p<0.05$). Hence, H1, H4, and H10 are not accepted.

Furthermore, as a rule of thumb revealed by Hair et al. (2016), path coefficient values represent the strength of the relationship among constructs according to hypothesized relationships. As a result, the findings in Table 5.20 and Figure 5.9 illustrated that sharing and collaboration have the strongest relationship with intention to adopt cloud computing ($\beta=0.213$, $p<0.05$). Followed by, security and privacy concerns and relative advantage ($\beta=0.207$, $p<0.05$), ($\beta=0.213$, $p=0.001$), ($\beta=0.187$, $p<0.05$) respectively.

5.5.3.2 Findings of Environmental Context

Investigate the relationship between environmental context (i.e., government support, regulation compliance, external support, and mobile access) and intention to adopt cloud computing in the Saudi Health-Care Institutions (SHCIs).

5.5.3.3 Findings of Business Context

To investigate the relationship between business context (i.e., hard financial analysis and soft financial analysis) and intention to adopt cloud computing in the Saudi Health-Care Institutions (SHCIs).

5.5.3.4 Findings of Perceived Ease of Use

To examine the relationship between perceived ease of use and intention to adopt cloud computing in the Saudi Health-Care Institutions (SHCIs).

Additionally, seven direct hypotheses were established (H12, H13, H14, H15, H16, H17, and H18). These hypotheses were assessed by testing the direct path between environmental, business context, perceived ease of use, and intention to adopt cloud computing in the Saudi Health-Care Institutions (SHCIs), as shown in Table 5.19 Figure 5.9.

The results revealed that all hypotheses direct relationships accepted and significant at $p<0.05$ except one direct relationship. Precisely, the findings show that government support, regulation compliance, external support, and mobile access and soft financial analysis positively and significantly correlated with the intention to adopt cloud computing in the Saudi health-care Institutions (SHCIs). (H12: β=0.266, t= 5.456, $p<0.05$), (H13: β=0.196, t= 3.598, $p<0.05$), (H14: β= 0.220, t= 3.753, $p<0.05$), (H15: β= 0.123, t= 2.901, $p<0.05$), (H17: β= 0.389, t= 5.611, $p<0.05$) and (H18: β= 0.194, t= 2.197, $p<0.05$) respectively. Thus, hypotheses (H12, H13, H14, H15, H17, and H18 are accepted. Whereas the results showed a non-significant relationship between hard financial analysis and intention to adopt cloud computing in the Saudi health-care Institutions (SHCIs). (H16 β=0. 0.062, t= 1.605 $p<0.05$). Thus, H16 is not accepted.

Also, to achieve the current study's finding, one direct hypothesis was established to assess the relationship between perceived ease of use and intention to adopt cloud computing in Saudi Health-Care Institutions (SHCIs). The results revealed that hypothesis direct relationships with a positive and significant correlation (H18 β=0.194, t= 2.197p=0.028). Thus, H18 is accepted.

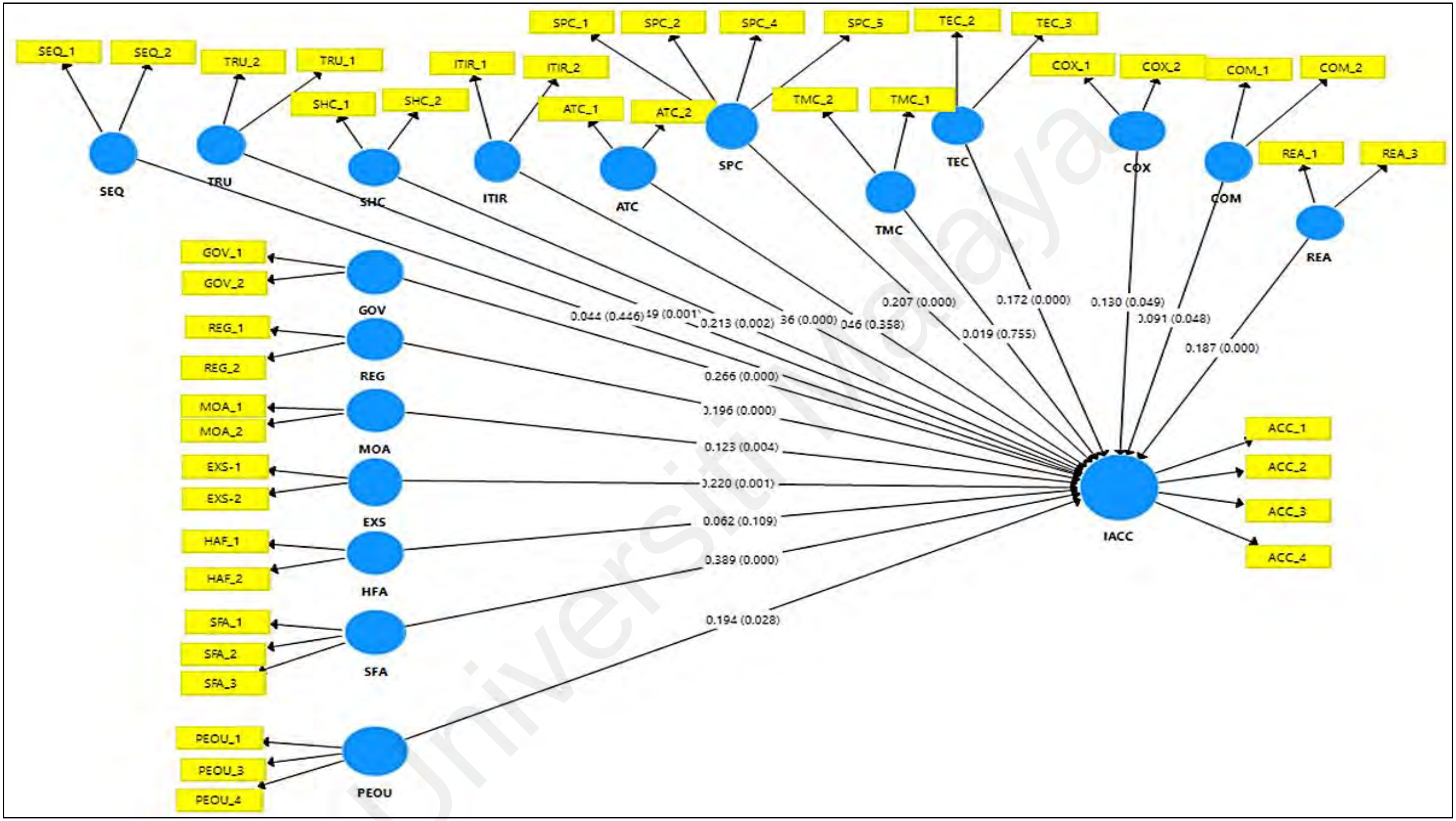

Figure 5.9: Final SmartPLS Analysis for Hypothesis Testing of the Research Frameworks

In summary, out of the 18 hypotheses tested in this study, 14 hypotheses were accepted by the findings, as shown in Figure 5.10.

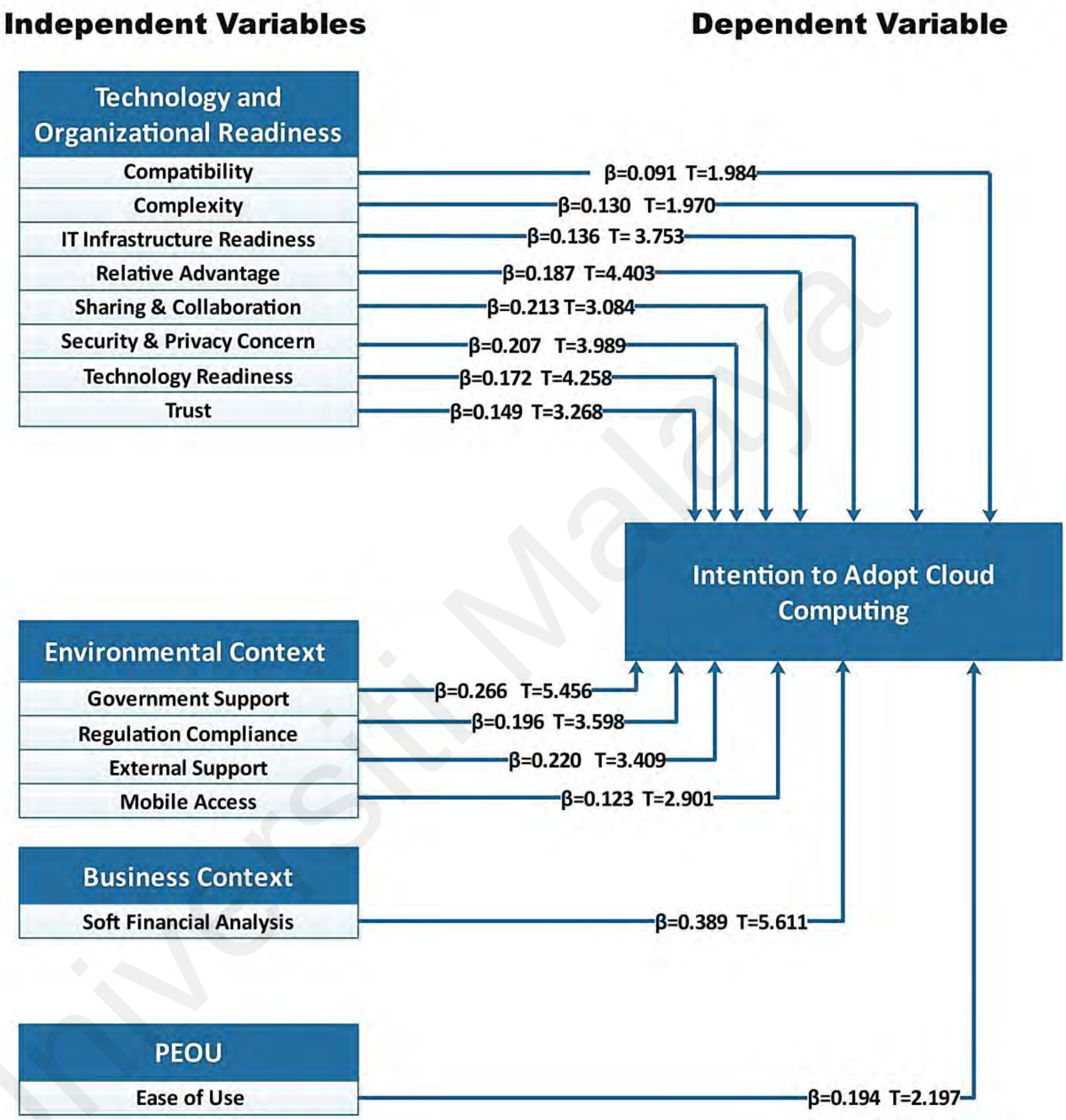

Figure 5.10: Research Framework

In summary, out of the 18 hypotheses tested in this study, 14 hypotheses were accepted by the findings—the overall summary of the hypothesis tests listed in Table 5.20.

Table 5.20: Summary of Hypothesis Tests for Direct and Indirect Relationships

N	Hypothesis Statement	Remarks
H1	There is a negative significant relationship between attitude towards change and intention to adopt cloud computing in the Saudi health-care Institutions.	**Not Accepted**
H2	There is a positive significant relationship between compatibility and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H3	There is a negative significant relationship between complexity and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H4	There is a positive significant relationship between quality of service and intention to adopt cloud computing in the Saudi health-care Institutions.	**Not Accepted**
H5	There is a positive significant relationship between IT infrastructure readiness and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H6	There is a positive significant relationship between relative advantage and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H7	There is a positive significant relationship between sharing and collaboration and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H8	There is a negative significant relationship between security and privacy concerns and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H9	There is a positive significant relationship between technology readiness and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H10	There is a positive significant relationship between top management support and intention to adopt cloud computing in the Saudi health-care Institutions.	**Not Accepted**
H11	There a positive significant relationship between trust and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H12	There is a positive significant relationship between government support and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H13	There is a positive significant relationship between regulation concerns and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H14	There is a positive significant relationship between external support and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H15	There is a positive significant relationship between mobile access and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H16	There is a positive significant relationship between hard financial analysis and intention to adopt cloud computing in Saudi health-care Institutions.	**Not Accepted**
H17	There is a positive significant relationship between soft financial analysis and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**
H18	There is a positive significant relationship between ease of use and intention to adopt cloud computing in the Saudi health-care Institutions.	**Accepted**

5.6 Assessment of Predictive Accuracy, Effect Size, and Predictive Relevance of Structural Model

It is essential to mention that the assessments of overall model fit, such as goodness-of-fit indices, are strictly required in covariance-based methods but not necessarily required in the case of PLS-SEM (Chin, 2010; Hair et al., 2013; Henseler & Chin, 2010). However, in PLS-SEM, model validity is measured by analysing the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2) (Hair et al., 2014; Henseler & Chin, 2010). The coefficient of determination R^2 is a measure of a model's predictive accuracy. R^2 represents the amount of variance in the dependent constructs explained by all of the independent constructs associated with it. In other words, it is a measure of the combined effects of all exogenous constructs linked to endogenous constructs. R^2 values range from 0 to 1, with higher values indicating higher levels of predictive accuracy.

A popular rule of thumb provided by Chin (1998) suggested that R^2 values of 0.19 as weak, while values range from 0.33 to 0.66 are moderate, whereas values from 0.67 or above as substantial (high). Given that R^2 values usually fluctuate with an increase/decrease in the number of predictor variables, researchers are also encouraged to report the adjusted R^2, which is regarded as a more stable indicator of predictive accuracy (Ramayah et al., 2016). The R^2 values for the three endogenous constructs in this study displayed in Table 5.23.

In this study, the adjusted R^2 of the structural model intention to adopt cloud computing was 0.789. They were indicating that ATT, COM, COX, EXS, HFA, GOV, ITIR. MOA, REA, REG, SEQ, HFA, SFA, SHC, SPC, TEC, TMC, PEOU explained 0.789 percent of the variance in intention to adopt cloud computing, as shown in Table 5.21. Therefore, going by Chin's (1998) rule of thumb, the results indicate that the predictive value of intention adoption of cloud computing can consider as substantial (high).

Table 5.21: Results for the Coefficient of Determination (R^2)

Endogenous Latent Variable	R^2	Adjusted R^2	Predictive Accuracy Level
IACC (ATT, COM, COX, EXS, HFA, GOV, ITIR. MOA, REA, REG, SEQ, HFA, SFA, SHC, SPC, TEC, TMC, PEOU -> IACC	0.782	0.789	Substantial (High)
Key: IACC= intention adoption of cloud computing, ATT= attitude towards change, COM- compatibility, COX, complexity, SEQ= service quality, ITIR= IT infrastructure readiness, REA= relative advantage, EXS= external support, HFA= hard financial analysis, SFA= soft financial analysis, GOV= government support, MOA= mobile access, REA= comparative advantage, REG= regulation compliance, SHC= sharing and collaboration, SPC= security and privacy concerns, TEC= technology readiness, PEOU= perceived ease of use.			

Subsequently, to evaluate the R^2 values of all endogenous constructs, the researcher assesses whether for any changes to R^2 value and when the specified exogenous construct is omitted from the model. In doing this assessment, the effect size f^2 used to determine whether the omitted construct has a substantive effect on the endogenous constructs—the results of the effect size f^2 presented in Table 5.22. For f^2, in multiple and partial correlations, the value of 0.02 to 0.15 indicates a small effect size, 0.15 to 0.35 indicates a common effect, while above 0.35 indicates a significant impact (Cohen, 1992). As presented in the results in Table 5.22 show that the business context has a significant effect size on the intention to adopt cloud computing. Whereas environmental context and perceived ease of use have a medium effect size, an intention to adopt cloud computing. In comparison, the direct effect size of technology and organizational readiness on intention adoption of cloud computing has a small effect.

Table 5.22: Results for Effect Size (f^2)

Relation Paths	f^2	
	Value	Effect
TOR -> -> IACC	0.132	Small
BUC-> IACC	0.692	Large
ENC -> IACC	0.198	Medium
PEOU -> IACC	0.323	Medium
Key: TOR= Technology and Organizational Readiness, BUC= Business Context, ENC= Environmental Context, PEOU= Perceived Ease of Use		

The final procedure for evaluating the structural model is to measure whether the path model has high predictive accuracy (Q^2). The Stone-Geisser's Q^2 test, developed by Geisser (1975) and Stone (1974), and recommended by Hair et al. (2014). Following the guidelines of (Hair et al., 2014), the researcher relied on a blindfolding procedure of PLS to obtain the cross-validated redundancy as a measure to verify the predictive relevance of the current study model. When measuring Q^2 statistics, the values obtained for a specific dependent construct should be greater than zero to be considered as having predictive relevance (Hair et al., 2014; Ramayah et al., 2016). The greater the value of Q^2, the higher the predictive relevance of the model. Q2 value less than or equal to zero suggests that the model lacks predictive relevance for a particular endogenous construct. The rule of thumb for Q^2 specified as 0.02 (small), 0.15 (medium), and 0.35 (large) predictive relevance.

As shown in Table 5.23, the Q^2 values for the endogenous constructs in this study (Intention to adopt cloud computing) are above zero, indicating that the model has predictive relevance. The results indicate that the path models have a large predictive connection to predicting the initially observed value for intention to adopt cloud computing, which supports the claim that this study model has adequate ability to predict.

Table 5.23: Results for Predictive Relevance (Q^2)

Endogenous Latent Construct	Q^2	Level of Predictive Relevance
Intention to adopt cloud computing	0.53	Large

5.7 Observation Analysis Finding

Direct and structured observations were used to collect the data. In this research, the observation protocol is classified into two significant streams. The first stream focused on health-care staff working style and the use of technology as HIS-based on CC in SHCIs "technology utilizing and implementing health-care environment." The second stream focused on factors influencing the deployment and acceptance of cloud computing services that support health-care, which is more closely linked to this research's study context. Each observation followed the same structure outlined in a protocol for consideration, as shown in Table 5.24.

Table 5.24: The Observation Protocol

<table>
<tr><td colspan="3">1. The first stream has focused on the work style of health-care staff by use of technology as HISs based on CC in SHCIs "technology using and adoption in the health-care environment", by items checking list as following</td></tr>
<tr><td rowspan="4">Items</td><td>a. Workstyle among specialists within selected SHCIs</td><td>☑</td></tr>
<tr><td>b. How HISs is using in selected SHCIs,</td><td>☑</td></tr>
<tr><td>c. Who is used HISs in selected SHCIs?</td><td>☑</td></tr>
<tr><td>d. Staffs' activities in the selected SHCIs based on HISs</td><td>☑</td></tr>
<tr><td colspan="3">2. The second stream has focused on the factors affecting the implementation and adoption of cloud computing services that support health-care, which are more related to the study background of this research, by the items checking list as following</td></tr>
<tr><td rowspan="5">Items</td><td>a. Technical Context</td><td>☑</td></tr>
<tr><td>b. Organizational Context</td><td>☑</td></tr>
<tr><td>c. Environmental Context</td><td>☑</td></tr>
<tr><td>d. Perceived Ease of use</td><td>☑</td></tr>
<tr><td>e. Business Context</td><td>☑</td></tr>
</table>

The independent works feature among specialists within selected SHCIs noted. Also, there is a lack of health-care specialists in selected SHCIs and a large number of patients. The specialists in selected SHCIs do not prefer to use technology during his works HIS because of many patients at a limited time. For this reason, the specialists within selected SHCIs prefer to use a paper-based system to register the health-care information.

The HIS is used as the second register for the health-care information, and this information registers most time by non-health-care specialists such as assistant staff and receptionists. The available systems developed in the English language and associate faculty have low English language using HIS in SHCIs. Besides, a multi-set of systems used in SHCIs to manage health-care information. The lack of the integration system is in the HCIs environment. The specialists within selected SHCIs spent a long time reading the health-care information from a patient's hard copy files; most of this information in a different format and written in an unclear font. In addition to health-care information written in Arabic and English, most health-care staff within SHCIs speak Arabic as their first language.

The activities among specialists within selected SHCIs are poorly, such as share information using HISs in research or health-care outcomes because (1) using the manual system to manage and share the health-care information is difficult, (2) The specialists within selected SHCIs have a poorly technology background and skills as using HIS to manage the health-care information in their works, and (3) Lack of workshops and training in HIS in SHCIs. The researcher observes the second stream focused on the factors affecting the implementation and adoption of cloud computing services. Where the support of health-care and is more related to the study background of this research. Some of the factors set noted by the researcher in a technical context as the poor infrastructure, software, hardware, and technical issues, IT infrastructure failure have a significant effect on HIS adoption. The manual system of health-care management limited HIS functionality. The available systems manage health-care information complexity and are not easy to use by specialists within selected SHCIs. The absence of integration systems in SHCIs.

In this study, the researcher noted the organizational context set of factors that affect technology adoption as HIS based-on CC in selected SHCIs. These factors as organizational readiness, top management support, IT infrastructure, and trust referred to the user's confidence in using the systems. These are essential factors to adopt new technology as CC to improve health-care services. For the environmental context, the researcher noted that external support from experts in technology and ease of use positively affect technology adoption. Business context as financial issues can be one of the barrier factors in adopting CC in SHCIs. Figure 5.11 shows a summary of researcher observation data. Whereas the researcher categorized the observation data, as shown in Table 5.25.

Researcher Observation Data
Located: Kingdom of Saudi Arabia – Saudi Health-Care Institutions (SHCIs)
Date: Academic Year 2019-2020

Summary Points

- ✓ The independently works feature among specialists within selected SHCIs is noted.
- ✓ Lack of healthcare specialists in selected SHCIs.
- ✓ Large number of patients.
- ✓ The specialists in selected SHCIs don't prefer to use technology during his works as HISs.
- ✓ Limited time.
- ✓ Paper-based system to register the health-care information.
- ✓ HISs used as second register for the health-care information.
- ✓ Healthcare information register in most time by non-healthcare specialists such as assistant staff, receptionist.
- ✓ Multi set of systems that used in SHCIs department to manage health-care information.
- ✓ The absence of the integration system is in SHCIs environment.
- ✓ The specialists within selected SHCIs are spent a long time to read the health-care.
- ✓ Healthcare information from patient's files hard copy.
- ✓ These information in different format and written unclear font.
- ✓ Healthcare information writes by Arabic and English language.
- ✓ Activities among specialists within selected SHCIs are poorly.
- ✓ Manual system to manage and share the health-care information.
- ✓ Poorly infrastructure, software, hardware, and technical issues.
- ✓ IT infrastructure failure have a great effect on HIS adopt.
- ✓ Manual system of health-care management,
- ✓ Limited HISs functionality.
- ✓ The available systems to manage health-care information is complexity and not easy to use.
- ✓ Organizational readiness.
- ✓ Top management support.
- ✓ IT infrastructure.
- ✓ Healthcare system services trust.
- ✓ External experts to support.
- ✓ Financial issues.

Figure 5.11: The Research Observation Data

Table 5.25: Categorization of Observation Data

Categories	Codes
eSkills	The specialists in selected SHCIs do not prefer to use technology during their works as HISs, Lack technology use background.
Management Issues	The independent works style among specialists within selected SHCIs noted a lack of health-care specialists in selected SHCIs. Many patients, the specialists within selected SHCIs, spent a long time reading the health-care, Health-care information from patient's files hard copy, this information in a different format and written unclear font, Health-care information writes by Arabic and English language.
Language Issue	English Language
Time	Limited time, large numbers of patients, lack of health-care specialists in selected SHCIs, physicians adopt quick processing paper-based systems.
Technological Issues	The technical context as weak infrastructure, hardware, software, and technical problems. Whereas, the IT infrastructure failure has a significant effect on (HIS) adoption, manual system of health-care management, limited (HIS) functionality, the available systems to manage health-care information complexity, and not easy to use by specialists within selected SHCIs. The absence of integration systems in SHCIs.
Organizational Context	That means organizational readiness, top management support, IT infrastructure, confidence, and policy regulations.
Environmental Contexts	External support from technology experts.
Business Context	Financial Issues.

This research's findings based on the observational data indicated that the intention of technology adoption HIS based-on CC was scarce use. Factors that acted as barriers to technology adoption and acceptance included the staff's ability and skill, management issues, time, culture, technological issues, environment issues, organization rules, inadequate infrastructure, and language issues.

5.8 Summary

This chapter began with data preparation. The regression analysis is done using PLS-SEM of the outer measurement model and inner structural model of the research framework with required validity and reliability checking. The analysis is done to understand the constructs of the research framework and relationships among factors. Also, it has explained the results and findings of this research.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter begins with a summary presentation of the research findings followed by the discussion, development of the finding's conclusions, and research recommendations to enhance the framework and recommendations for future research. It is aimed to develop a framework identifying the factors influencing Cloud Computing (CC) adoption in Health-Care Institutions (HCIs). To achieve the research's objectives, a conceptual framework was proposed, as shown in Figure 3.6, based on the literature reviews. Additionally, this study also evaluates CC adoption in Saudi Health-Care Institutions (SHCIs). Observations were done, and a survey was then developed; and the questionnaires refer to Appendix A and used to gather data as described in Chapter 4 and analysed based on Partial least squares (Plsek & Greenhalgh, 2001) as shown in Chapter 5. The survey data findings indicated the framework and confirmed the factors influencing the CC adoption in HCIs. Summation findings of the research, conclusions, and research limitations were made in this current chapter.

6.2 Overview of the Research Study

This section summarizes the research statement from the research purpose, research objectives and questions, research methodology, research findings, and research outcome. The implementation of information technology helps providers to provide faster and more effective health-care services (Mamlin & Tierney, 2016). In the HCIs, due to the complexity of the current technology adopted as the Hospital Information System (HIS) in many HCIs are considering shifting from traditional systems to modern-technologies (Almubarak, 2017). CC provides a solution to incorporate these technologies and use new IT outsourcing forms (Chasib & Al-Najjar, 2020; Williams, 2012). Concurrently, CC provides a solution, though, offering to outsource information and distribution services in infrastructure, platform, and software (Darwish, Hassanien, Elhoseny, Sangaiah, Muhammad, et al., 2019). The ability to access more generous data sharing and accessibility creates an increasing demand for hospital CC solutions (Altowaijri, 2020; Almubarak, 2017). Different HCIs adopt some types of CC services to meet their needs and to improve the quality of health-care services (AbuKhousa et al., 2012). CC adoption in HCIs will positively affect health-care outcomes as stated in the recent studies (Ali et al., 2018; Almubarak, 2017; Griebel et al., 2015; Masrom et al., 2014; Grindle et al., 2013; Ahuja et al., 2012). Furthermore, there is no need to buy expensive hardware and software licenses with CC solutions because the CC provider controls all processing (Griebel et al., 2015; Ahuja et al., 2012). CC will help health-care providers to reduce the expenses of maintenance and IT staff (Ali et al., 2018; Masrom et al., 2014). Although CC appears to be a perfect option for improving HIS, it was slow to adopt (Alharbi & Ali, 2018; Almubarak, 2017; Sirintrapun & Artz, 2015). In contrast, only 4% of United States health-care institutions use CC facilities. As anticipated, the acceptance of CC services in developed countries is lower such as the KSA, as, in some of their departments, these countries still use less prevalent methods and conventional manual paper-based records (Griebel et al., 2015). These findings explain the low and slow adoption of CC in SHCIs. This is because the HIS serve as a foundation for the adoption of CC solutions in SHCIs. This problem encourages researchers to highlight the factors behind the slow adoption rate of cloud services by HCIs as hospitals. In locking for reasons for such slowness in the adoption of CC in HCIs, researchers attributed that to the lack understanding of different factors related to the individual, organizational, technical and environmental factors (Alharbi et al., 2017b; Almubarak, 2017; Lee, 2015; Lian et al., 2014; Tweel, 2012). Therefore, it is vital to fill the gap related to the unclear understanding of these factors influence the CC adoption in the HCIs. Recently studies have identified some factors in different industries and nations. (Deilr & Brune, 2017; Almubarak, 2017;

Alharbi et al., 2016; Alkhater et al., 2014; Alsanea, 2015; Ratnam et al., 2014; Hailu, 2012; Tweel, 2012). Besides to the findings of the recent studies indicate to CC in KSA has not received much attention and little academic research conducted the implementation of CC in the country and, in particular, none within the Saudi health-care context. In sum, the studying adoption of CC in KSA in general and in HCIs, in particular, need more investigative.

In this context, developing the theoretical framework for adopting cloud computing in HCIs is the primary purpose of this study by identifying factors that influence health-care staff's adoption. However, the study has three essential objectives. These objectives serve as research guidelines and benchmarks for having a better overview of the method's results. The purposes of the study are as shown in Figure 6.1.

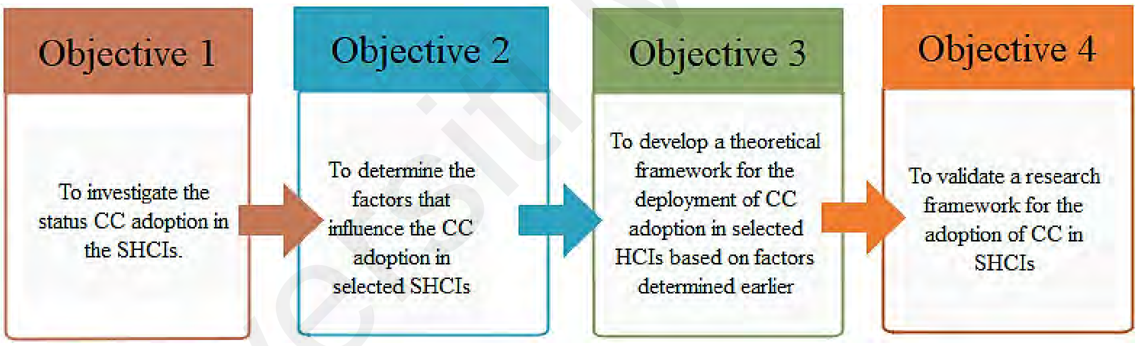

Figure 6.1: Research Objectives

This study applied mixed-methods approach research, combining quantitative and qualitative data collection methods using survey questionnaires and observation. Two hundred and thirty (230) questionnaires were submitted, and two hundred (200) completed questionnaires were received. Besides, there was a research observation done in the selected HCIs.

The framework development is based on recent studies highlighting the lack of a framework for health-care information systems designed based on CC architecture. It also presents the empirical information explaining CC's adoption and diffusion in the HCIs in developing-country like KSA. The studies indicated a research gap where there is a need for a study on HIS based-on CC architecture. In this context, this research used TAM and TOE theories as these theories were found to be robust and can make understanding of technology acceptance in the context of organization and environment easier and meaningful. It enables this research to apply scales that have been developed and empirically validated on constructs of TAM and TOE. Based on the outcome of the data collection phase, the framework was validated using Partial least squares (Plsek & Greenhalgh, 2001) to identify factors influencing the CC adoption in the SHCIs. Besides, the observations data were analysed based on qualitative data analysis techniques.

6.3 Discussion

This research covered the follows:

6.3.1 Investigate the CC Adoption in SHCIs

This research examined the adoption of CC, such as the HIS in the SHCIs, and gave insight into HIS adoption processes and, ultimately, HIS's effectiveness and efficiency in SHCIs. Recent studies on the adoption rate and decisive implementation of the HIS are weak in the SHCIs in this context (Al Mustanyir, 2019; Alharbi, 2018; Alharbi et al., 2017a; Alomeer, 2016; Hasanain, 2015). There are several reasons for the low adoption of HIS. However, in recent studies, researchers have reported low HIS levels. In SHCIs, whereas, the infrastructure in SHCIs have exacerbated problems and delayed the adoption of electronic health-care practices. Meanwhile, technological project capabilities have decreased, mostly due to high costs. Not only in KSA are these challenges. It is also regional and global (Alharbi, 2018; Alkraiji et al., 2016; Alharbi et al., 2014).

Besides, there is a need for more studies to understand HCIs in KSA and the best way to apply HISs to improve the successful implementation rate. Besides, a lack of inter-SHCIs coordination, collaboration, and planning affect to low adoption of HIS (Alharbi, 2018; Alkathiri, 2016; O'Donnell et al., 2018). As stated early, health-care services are going through many challenges in KSA, together with the shortages of health-care professionals, the growth of persistent diseases, and the high charge of health provision of services (Alharbi et al., 2014). As a result, many SHCIs have implemented IT, including eHealth solutions, in their systems to provide higher patient-care, improve efficiency, and use their financial assets effectively. Nevertheless, the adoption of IT as eHealth in SHCIs is still relatively low for many reasons, as mentioned earlier (Musaed Ali Alharbi, 2018). The scarcity of health informatics professionals and IT specialists is another impediment to eHealth projects. The implementation of eHealth solutions can also come with technical difficulties, complexity, compatibility, and inadequate IT infrastructure (Alharbi, 2018). According to Alharbi (2018), the adoption rate of these systems is still low, given the positive results of the HIS in the health-care sector, and faces resistance from health-care professionals. Barriers come up as they approach the implementation of systems (Alharbi, 2018).

Notwithstanding its outstanding potential, HIS, as a CC, the paradigm has not been substantially addressed inside the literature. There are not any apparent frameworks that embody all feasible schemes and interrelationships between HIS and CC. Therefore, it is crucial to examine and compare those schemes' effectiveness (Alharbi et al., 2016). Also, health-care customers want to have clear information about the potential advantages and threats related to CC when deciding to use CC and set reasonable goals for their cloud provider. The numerous provider models must remember, as each version incorporates its specific necessities and responsibilities. Cloud deployment models will also heavily weigh in strategic decision-making.

6.3.2 Determine the Factors That Influence the CC Adoption in Selected SHCIs

The lack of systems or methodologies to help the organization implement its cloud computing makes it impossible for lots of organizations to adopt cloud computing successfully, effectively, and efficiently (Chang et al., 2016; Gangwar et al., 2015b). Once cloud computing is introduced, organizations will closely examine the suspected shortcomings of cloud computing projects and why the projects fall flat among the measures towards cloud computing readiness status (Rad et al., 2017). Various problems that prevent cloud storage from being embraced adopting and implementing by organizations include doubts about usability, customer apprehension or lock-in details, concerns about data privacy, cost, integrity issues, and poor connectivity (Roehrs et al., 2017; Sighom et al., 2017). This study's findings refer to eighteen (18) factors that influence the CC adoption in HCIs. These factors are extracted based on recent studies and related works. The researcher classified extracted factors into four themes, as shown in Table 6.1 (refer to Chapter 4, Section 4.3).

Table 6.1: Factors Influence the CC Adoption in the HCIs

Themes	Factors
Technology and Organizational Readiness	Relative Advantage, Compatibility, Complexity, Technology Readiness, Top Management Support, Security and Privacy, Quality of Service, Attitude Towards Change, Sharing & Collaboration, IT Infrastructure Readiness, Trust
Environmental Context	Government Support, Regulatory Concerns, External Support, Mobile Access
Business Context	Hard Financial Analysis, Soft Financial Analysis
Perceived Ease of Use (PEOU)	Ease of Use

6.3.3 Develop A Theoretical Framework for the Deployment of CC Adoption in Selected SHCIs

The framework development based on recent studies highlights CC adoption in the HCIs in developing-country like the KSA. The studies indicated the need for more studies on HIS based-on CC architecture in HCIs. The current research applied TAM and TOE theories as these theories were robust and can understand technology acceptance in the context of organization and environment easier and meaningful. It enables this research to apply scales that have been developed and empirically validated on constructs of TAM and TOE. Based on the outcome of the data collection phase, the framework was validated using Partial least squares (Plsek & Greenhalgh, 2001) to identify significant factors influencing the CC adoption in SHCIs.

The TOE is an organizational-stage theory that provides a multi-angle framework using both internal and outside factors. TOE is like a taxonomy for classifying factors, not the handiest describing them. This framework's significant contribution is that it offers the researcher a free space to classify attributes underneath each context in a vast realm. The factors beneath every context are typically decided on from previous studies suitable for every study's condition. Therefore, TOE has selected many IT adoption research (Almubarak, 2017; Harfoushi, 2016).

A recent study related to TAM; the scientific proof will be advantageous in health-care as a theoretical tool. In this respect, the TAM study uses in health-care (Ammenwerth, 2019), It was found that TAM could predict (30-70%) the variance of "Behavioural Intention" to use, which could be considered reasonably high. According to the review study (Marangunić & Granić, 2015) conducted from 1986 to 2013. TAM, the theory of technology acceptance and use, has gained significant attention in the field of technology, providing a method and is recognized to be a "primary model" or "gold standard" in understanding predictors for IT acceptability (Marangunić & Granić, 2015). The TAM is also among the most significant influences and widely applied theories to describe the acceptance of an individual's information systems (Durodolu, 2016; Shim & Kim, 2018), where absolute values of both PU and PEOU dominated direct relations with the attitudes deciding the use of technology was observed (Shim et al., 2018a). PU, as seen from (Teo & Zhou, 2017), along with (Teo, 2019), As a particular philosophy, some application systems which have a positive effect on productivity performance improve the productivity of jobs in organizations (Zhou et al., 2017) (refer to Chapter 2, Sections 2.10.1 and 2.10.4).

6.3.4 To Validate A Research Framework for The Adoption of CC in SHCIs

The structural model analysis is applied to evaluate the theoretical framework, which involves assessing the relationship between the constructs in a research model. For this analysis, the structural model includes eighteen (18) possible direct relations (refer to Chapter 3, Table 3.5).

The immediate effects of exogenous constructs on endogenous constructs simultaneously evaluated using the PLS algorithm to generate the path coefficients (β) (the structural model's relationships). That also reflects hypothesized relationships between the construct and the determination coefficient (R^2). The 5000-bootstrapping procedure was subsequently calculated to determine the level of significance or otherwise of the hypothesized relations. The structural model results are presented, and the path coefficients' results are summarized along with their corresponding test results of significance. The t-statistics are the path-significance indicators. When a value in t-statistics is more critical than 1.96 (i.e., a two-tailed check at a confidence level of 95%), then the direction is substantial or, in other words, an agreed hypothesis (refer to Chapter 5, Table 5.19).

Moreover, in the current study, eleven direct hypotheses were framed to achieve the first objective. These hypotheses explored the direct relationship of independent constructs (i.e., relative advantage, compatibility, complexity, technology readiness, service quality, top management support, security and privacy concerns, sharing and collaboration, attitude towards change, IT infrastructure readiness, trust), and intention adoption of cloud computing. The results revealed that all hypotheses direct relationships accepted and significant at $p<0.05$ except for three direct relationships (H1: β= 0.046, t= 0.919, p= 0.358), (H4: β= 0.044, t= 0.058, p= 0.763), (H10: β= 0.019, t= 0.312, p= 0.755) respectively which is higher the cut-off ratio ($p<0.05$). Hence, H1, H4, and H10 are not accepted.

Specifically, the findings show that compatibility, complexity and IT infrastructure readiness are positively and significantly correlated with intention adoption of cloud computing (H2: β=0.191, t= 1.984, p=0.048), (H3: β=0.130, t= 1.970, p=0.049), (H5: β= 0.136, t= 3.753, $p<0.05$), (H6: β= 0.187, t= 4.403, $p<0.05$), respectively. Thus, hypothesis (H2, H3, H5, and H6) are accepted. Besides, the findings also show that positive and significant relationships between sharing and collaboration, technology readiness, security and privacy concerns, technology readiness and trust Precisely, the results revealed that (H7: β= 0.213, t= 3.084, p=0.002), (H8: β= 0.207, t= 3.989, $p<0.05$), (H9: β= 0.172, t= 4.258, $p<0.05$) and (H11: β= 0.149, t= 0.312, p=0.001) respectively.

Therefore, hypothesis (H7, H8, and H9, H11) are accepted. On the contrary, the results indicated non-significant relationships between that attitude towards change, service quality and top management support with intention adoption of cloud computing (H1: β= 0.046, t= 0.919, p= 0.358), (H4: β= 0.044, t= 0.058, p= 0.763), (H10: β= 0.019, t= 0.312, p= 0.755) respectively which is higher the cut-off ratio ($p<0.05$). Hence, H1, H4, and H10 are not accepted. Furthermore, as a rule of thumb revealed by (Hair Jr et al., 2016), path coefficient values represent the strength of the relationship among constructs according to hypothesized relationships.

As a result, the findings illustrated that sharing and collaboration have the strongest relationship with intention adoption of cloud computing (β=0.213, $p<0.05$). Followed by, security and privacy concerns and relative advantage (β=0.207, $p<0.05$), (β=0.213, p=0.001), (β=0.187, $p<0.05$) respectively. Additionally, seven direct hypotheses were established (H12, H13, H14, H15, H16, H17, and H18). These hypotheses were assessed by testing the direct path between environmental and business context and the intention to adopt cloud computing in the SHCIs. Also, it indicated that the hypothesized direct relationships between the results revealed that all hypotheses direct relationships accepted and significant at $p<0.05$ except one direct relationship (H16 β=0. 0.062, t= 1.605 $p<0.05$). Thus, H16 is not accepted.

Meanwhile, it is essential to realize that overall model fit evaluations, such as goodness-of-fit indices, are strictly relevant in covariance-based methods but not generally needed in the case of PLS-SEM (Chin, 2010; Hair et al., 2013; J. Henseler & W. W. Chin, 2010). In PLS-SEM, however, model validity is measured by analysis of the determination coefficient (R^2), effect size (f^2), and predictive relevance (Q^2) (Hair et al., 2014; J. Henseler & W. W. Chin, 2010). The determining coefficient (R^2) is a function of the predictive accuracy of a formula. (R^2) reflects the sum of variation in the dependent constructs described by all of the associated independent constructs. It is a test of all exogenous constructs' combined effects linked to endogenous constructs. (R^2) values range from (0 to 1), with higher levels of predictive accuracy.

The (R^2) values (0.19) as weak, while values range from (0.33 to 0.66) are moderate, whereas values from (0.67) or above as substantial (high). Otherwise, the existing presented result of the adjusted (R^2) of the structural model intention adoption of cloud computing was (0.789). They were indicating that ATT, COM, COX, EXS, HFA, GOV, ITIR. MOA, REA, REG, SEQ, HFA, SFA, SHC, SPC, TEC explained (0.789) percent of the variance in intention adoption of cloud computing. The results indicate that the predictive value of intention adoption of cloud computing can consider as substantial (high). Moreover, to evaluate the R^2 values of all endogenous constructs, the researcher assesses whether for any changes to R^2 value and when the specified exogenous construct omitted from the model.

In doing this assessment, the effect size f^2 used to determine whether the omitted construct has a substantive effect on the endogenous constructs—the results of the effect size f^2 presented, in multiple and partial correlations, the value of (0.02 to 0.15) indicates a small effect size, (0.15 to 0.35) indicates a common effect while above (0.35) indicates a significant impact (Cohen, 1992) as presented in the results. In contrast, the business context has a significant effect size on intention adoption of cloud computing. However, environmental context and perceived ease of use have a medium effect size on intention adoption of cloud computing. In comparison, the direct effect size of technology and organizational readiness on intention adoption of cloud computing has a small effect. The final procedure for evaluating the structural model is to measure whether the path model has high predictive accuracy (Q^2).

The researcher relied on a blindfolding procedure of PLS to obtain the cross-validated redundancy as a measure to verify the predictive relevance of the current study model. When measuring Q^2 statistics, the values obtained for a specific dependent construct should be greater than zero to consider having predictive relevance (Hair et al., 2014; Ramayah et al., 2016). The greater value of Q^2, the higher the predictive relevance of the model. The Q^2 value less than or equal to zero suggests that the model lacks predictive relevance for a particular endogenous construct. The rule of thumb for Q^2 specified as

0.02 (small), 0.15 (medium), and 0.35 (large) predictive relevance. However, the Q^2 values for the endogenous constructs in this study (Intention to adopt cloud computing) are above zero, indicating that the model has predictive relevance.

The results indicate that the path models have a sizeable predictive connection to predicting the initially observed value for intention adoption of cloud computing, which supports the claim that this study model has adequate ability to predict. On the other hand, direct and structured observations were used to collect the data. In this research, the observation protocol is classified into two (2) significant streams. The first stream focused on health-care staff working style and the use of technology as HIS-based on CC in SHCIs "technology utilizing and implementing health-care environment". The second stream focused on factors influencing the deployment and acceptance of cloud computing services that support health-care, which is more closely linked to this research study context. Each observation followed the same structure outlined in a protocol to consider the independent works feature among specialists within selected SHCIs noted, as shown in Table 5.24. Also, there is a lack of health-care specialists in selected SHCIs and many patients.

Whereas, the specialists in selected SHCIs do not prefer to use technology during his works HIS because of many patients at a limited time. Thus, the specialists within selected SHCIs prefer to use a paper-based system to register the health-care information. The HIS is used as the second register for the health-care information; this information registers most time by non-health-care specialists such as assistant staff and receptionists. The available systems developed in the English language and associate faculty have low English language using HIS in SHCIs. Besides, a multi-set of systems used in the HCIs department to manage health-care information. The lack of the integration system is in the HCIs environment. The specialists within selected SHCIs spent a long time reading the health-care information from patient's hard copy files; most of this information in a different format and written in an unclear font. In addition to health-care information written in Arabic and English, most health-care staff within SHCIs speak Arabic as their first language.

The activities among specialists within selected SHCIs are poorly, such as share information using HIS in research or health-care outcomes because (1) Using the manual system to manage and share the health-care information is difficult, (2) The specialists within selected SHCIs have a poor technology background and skills using the HIS to manage health-care information in their works, and (3) Lack of workshops and training in HIS in SHCIs. The researcher observes the second stream focused on the factors affecting the implementation and adoption of cloud computing services. The support of health-care is more related to the study background of this research, as shown in Table 5.24. In a technical context, some of the factors described by the researcher as weak infrastructure, software, hardware, and technical problems, IT infrastructure failure, have a significant impact on HIS adoption. The manual system of health-care management limited HIS functionality. The available systems manage health-care information complexity and are not easy to use by specialists within selected SHCIs. The absence of integration systems in SHCIs.

In this study, the researcher noted the organizational context set of factors that affect technology adoption as HIS based-on CC in selected SHCIs. These factors as organizational readiness, top management support, IT infrastructure, and trust referred to the user's confidence in using the systems. These are essential factors to adopt new technology as CC to improve health-care services. For the environmental context, the researcher noted that external support from experts in technology and ease of use positively affect technology adoption. Business context as a financial issue can be one of the barrier factors in adopting CC in SHCIs. Moreover, the research findings based on the observational data indicated that the intention of technology adoption HIS based-on CC was scarce use. Factors that acted as barriers to technology adoption and acceptance included the staff's ability and skill, management issues, time, culture, technological issues, environment issues, organization rules, inadequate infrastructure, and language issues.

6.4 Contribution

The theoretical contribution in this research has extensively extended, elaborated, and validated two theories: The Technology Acceptance Model (TAM) and Technology-Organizations-Environment (TOE) applicability to determine factors that influence the CC adoption in health-care institutions. It is considered a successful key factor in extending and elaborating the TAM and TOE in the current study. Therefore, the examined factors indeed contributed significantly to provide an in-depth understanding of how the CC adoption influenced these factors in health-care institutions. The proposed framework is helpful as a baseline reference for the factors affecting CC adoption in health-care institutions. The findings of the current study can use as a reference for academic purposes to fill the gap in existing CC adoption in HCIs.

This study's practical contribution provides some core information to CC adoption in HCIs in developing-country as the KSA. This study can help health-care stakeholders have a clear understanding of the potential benefits and risks associated with CC when deciding to use CC and set reasonable goals for their cloud provider. The refined framework in the current study can use the information to create a practical and useful approach to enhance CC adoption in HCIs (refer to Figure 6.1 Research Objectives).

This study applied mixed-methods approach research, combining quantitative and qualitative data collection methods using survey questionnaires and observation. Two hundred and thirty (230) questionnaires were submitted. Besides, there was a research observation done in the selected HCIs. PLS-SEM was used as the right data analysis technique to generate comprehensive explanations to establish variables interrelationship establishments. Some of the proposed framework variables were rejected based on the hypothesis's rejection during testing due to the insignificant effect.

6.5 Recommendations

The findings of this research offer baseline information for further research and investigations within the discipline of CC adoption with the aid of HCIs. This section shows the pointers for future research and practical thoughts for CC adoption through SHCIs.

1. This research is supposed to be expanded to undertake CC in both public and private HCIs in developing-country.
2. As the sample of current research is limited to health-care staff, the researcher recommends future quantitative and qualitative research to include a population representing all consumers of HCIs in different sectors.
3. Additionally, in the future, qualitative studies are recommended to be conducted on similar topics to provide an in-depth understanding of the elements that affect CC's adoption within HCIs.
4. Solutions of cloud computing should be investigated, and deployment in SHCIs in different sectors.
5. It is suggested to discover the influence of other crucial factors within the framework's different environments on CC adoption by HCIs.
6. Procedures and initiatives must be taken to adopt cloud computing solutions in SHCIs to enhance the value and management of health-care facilities' outcomes.

6.6 Future Research

Based on the crucial outcomes of this research, the subsequent proposals could be made for future research:

1. Conducting whole country comparisons to determine the difference that arises according to the health-care environments.
2. Examine and estimate the adoption of CC solutions by the Saudi health-care (public and private) institutions.
3. Examining concerns of protecting information in SHCIs.
4. Examining the Critical success factors (CSF) that assist in improving CC deployment in health-care institutions.
5. The current research proposed a general framework that can be configured to the system model in HCI based on different deployment models (public, private, hybrid, community) according to HCI requirements. In addition to HCI has the right to choose CC platforms like AWS, MS Azure.... etc.

REFERENCES

Aardoom, J. J., Dingemans, A. E., & Van Furth, E. F. (2016). E-health interventions for eating disorders: emerging findings, issues, and opportunities. *Current Psychiatry Reports, 18*(4), 42.

Abbas, A., & Khan, S. U. (2014). A review on the state-of-the-art privacy-preserving approaches in the e-health clouds. *Biomedical and Health Informatics, IEEE Journal of, 18*(4), 1431-1441.

Abbas, R. M., Carroll, N., & Richardson, I. (2018). In Technology We Trust: Extending TAM from a Healthcare Technology Perspective. 2018 IEEE International Conference on Healthcare Informatics (ICHI),

Abbas, R. M., Carroll, N., & Richardson, I. (2019). Assessing the Need of Decision-making Frameworks to Guide the Adoption of Health Information Systems in Healthcare.

Abd, S. K., Al-Haddad, S. A. R., Hashim, F., Abdullah, A. B., & Yussof, S. (2017). An effective approach for managing power consumption in cloud computing infrastructure. *journal of computational science, 21*, 349-360.

Abdekhoda, M., Dehnad, A., & Zarei, J. J. E. M. H. J. (2019). Determinant factors in applying electronic medical records in healthcare. *25*(1), 24-33.

Abdulaziz, S. G., Yasin, N. M., AlGamal, Z., Hateem, A., & Ramakrishnan, K. (2019). Electronic health cloud as service to improve collaboration in healthcare organizations. Journal of Physics: Conference Series,

Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in Human Behavior, 63*, 75-90.

Abdulnabi, M., Al-Haiqi, A., Kiah, M. L. M., Zaidan, A., Zaidan, B., & Hussain, M. (2017). A distributed framework for health information exchange using smartphone technologies. *Journal of biomedical informatics, 69*, 230-250.

Abeywickrama, D. B., & Ovaska, E. (2017). A survey of autonomic computing methods in digital service ecosystems. *Service Oriented Computing and Applications, 11*(1), 1-31.

AbuKhousa, E., Mohamed, N., & Al-Jaroodi, J. (2012). e-Health cloud: opportunities and challenges. *Future internet, 4*(3), 621-645.

Adelson, J. L., McCoach, D., Rogers, H., Adelson, J. A., & Sauer, T. M. (2017). Developing and applying the propensity score to make causal inferences: variable selection and stratification. *Frontiers in psychology, 8*, 1413.

Adler-Milstein, J., & Jha, A. K. (2017). HITECH Act drove large gains in hospital electronic health record adoption. *Health Affairs, 36*(8), 1416-1422.

Ahmadi, H., Ibrahim, O., & Nilashi, M. (2015). Investigating a new framework for hospital information system adoption: a case on Malaysia. *Journal of Soft Computing and Decision Support Systems, 2*(2), 26-33.

Ahmadi, H., Nilashi, M., & Ibrahim, O. (2015). Organizational decision to adopt hospital information system: An empirical investigation in the case of Malaysian public hospitals. *International Journal of Medical Informatics, 84*(3), 166-188.

Ahmadi, H., Nilashi, M., Shahmoradi, L., Ibrahim, O., Sadoughi, F., Alizadeh, M., & Alizadeh, A. (2018). The moderating effect of hospital size on inter and intra-organizational factors of Hospital Information System adoption. *Technological Forecasting and Social Change, 134*, 124-149.

Ahmadi, H., Shahmoradi, L., Sadoughi, F., Bashiri, A., Nilashi, M., Sheikhtaheri, A., Samad, S., & Ibrahim, O. (2018). A narrative literature review on the impact of organizational context perspective on innovative health technology adoption. *Journal of Soft Computing and Decision Support Systems, 5*(4), 1-12.

Ahmadian, L., Nejad, S. S., & Khajouei, R. J. I. j. o. m. i. (2015). Evaluation methods used on health information systems (HISs) in Iran and the effects of HISs on Iranian healthcare: A systematic review. *84*(6), 444-453.

Ahmed, A. I. (2018). Understanding the factors affecting the adoption of green computing in the Gulf Universities. *Int. J. Adv. Comput. Sci. Appl, 9*(3), 304-311.

Ahuja, S. P., Mani, S., Zambrano, J. J. N., & Technologies, C. (2012). A survey of the state of cloud computing in healthcare. *1*(2), 12.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11-39). Springer.

Åkerblad, L. (2017). Anticipatory orientation in temporary employment and employee performance: a qualitative exploratory study. *Scandinavian Journal of Work and Organizational Psychology, 2*(1).

Al-Badi, A., Tarhini, A., & Al-Qirim, N. (2018). Risks in adopting cloud computing: a proposed conceptual framework. International Conference for Emerging Technologies in Computing,

Al-Bajjari, F. F. S. (2017). *A model for adopting cloud computing in government sector: Case study in Iraq* Çankaya Üniversitesi].

Al-Barnawi, A., He, Y., Maglaras, L. A., & Janicke, H. (2019). Electronic medical records and risk management in hospitals of Saudi Arabia. *Informatics for Health and Social Care, 44*(2), 189-203.

Abdulaziz, S. G., Yasin, N. M., AlGamal, Z., Hateem, A., & Ramakrishnan, K. (2019). Electronic health cloud as service to improve collaboration in healthcare organizations. Journal of Physics: Conference Series,

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior, 56*, 93-102.

Al-Helayyil, A., Claps, M., Rajan, R., & Schaller, O. (2016). Saudi Arabia Vision 2030: Envisioning a Technology-Led Transformation–IDC's Initial View. *IDC# CEMA41301016*.

Al-Mamary, Y. H., Shamsuddin, A., & Abdul Hamid, N. A. J. M. J. o. S. S. (2015). Enhancing technological capability of telecommunications sector in Yemen: a technology adoption approach. *6*(4).

Al-nassar, B. A. Y., Rababah, K. A., Al-Nsour, S. a. N. J. I. J. o. I. S., & Management, C. (2016). Impact of computerised physician order entry in Jordanian hospitals by using technology acceptance model. *8*(3), 191-210.

Al-Qurashi, H. A. (2017). *Investigating the impact of aligning accreditation, performance and quality management on hospital improvement: the case of Saudi Arabia* Brunel University London].

Al-Radaideh, A. T., & Alazzam, M. B. (2020). Critical Successful Factors Affecting Adoption of E-Health System in Developing Countries.

Al-rawahna, A. S. M., Hung, C.-W., & Chen, S.-C. (2018). Readiness of government organizations for cloud-computing age: An empirical evidence from Jordan. *Journal of Business and Management Sciences, 6*(4), 152-162.

Al-Ruithe, M., Benkhelifa, E., & Hameed, K. (2018). Key issues for embracing the Cloud Computing to adopt a digital transformation: A study of Saudi public sector. *Procedia Computer Science, 130*, 1037-1043.

Al-Ruithe, M. S. (2018). *Development and Evaluation of a Holistic Framework and Maturity Assessment Tools for Data Governance in Cloud Computing Environments* Staffordshire University].

Al-Sharafi, M. A., Arshah, R. A., & Abu-Shanab, E. A. (2017). Factors influencing the continuous use of cloud computing services in organization level. Proceedings of the International Conference on Advances in Image Processing,

Al-Somali, S. A., Gholami, R., & Clegg, B. (2009). An investigation into the acceptance of online banking in Saudi Arabia. *Technovation, 29*(2), 130-141.

Al–Shura, M. S., Zabadi, A. M., Abughazaleh, M., & Alhadi, M. A. (2018). Critical Success Factors for Adopting Cloud Computing in the Pharmaceutical Manufacturing Companies. *Management and Economics Review, 3*(2), 123-137.

Al Asmri, M., Almalki, M. J., Fitzgerald, G., & Clark, M. J. E. M. H. J. (2019). The public healthcare system and primary care services in Saudi Arabia: a system in transition. *25*.

Al Mustanyir, S. (2019). *Health insurance in Saudi Arabia: funding options to manage the risk of government healthcare spending* University College Cork].

Al Nuaimi, N., AlShamsi, A., Mohamed, N., & Al-Jaroodi, J. (2015). e-Health cloud implementation issues and efforts. 2015 International Conference on Industrial Engineering and Operations Management (IEOM),

Al Otaibi, A. S. (2017). An overview of health care system in Saudi Arabia. *International Journal of Management and Administrative Sciences, 4*(12), 1-12.

Al Otaibi, A. S. J. I. J. o. M., & Sciences, A. (2017). An overview of health care system in Saudi Arabia. *4*(12), 1-12.

Al Otaibi, M. N. (2019). Internet of Things (IoT) Saudi Arabia Healthcare Systems: State-Of-The-Art, Future Opportunities and Open Challenges. *Journal of Health Informatics in Developing Countries, 13*(1).

Alaiad, A., Alsharo, M., & Alnsour, Y. (2019). The Determinants of M-Health Adoption in Developing Countries: An Empirical Investigation. *Applied clinical informatics, 10*(05), 820-840.

Alassafi, M. O., Atlam, H. F., Alshdadi, A. A., Alzahrani, A. I., AlGhamdi, R. A., & Buhari, S. M. (2019). A validation of security determinants model for cloud adoption in Saudi organisations' context. *International Journal of Information Technology*, 1-11.

AlBar, A. M., & Hoque, M. R. (2019a). Factors affecting cloud ERP adoption in Saudi Arabia: An empirical study. *Information Development, 35*(1), 150-164.

AlBar, A. M., & Hoque, M. R. (2019b). Patient acceptance of e-health services in Saudi Arabia: An integrative perspective. *Telemedicine e-Health, 25*(9), 847-852.

AlBar, A. M., Hoque, M. R. J. T., & e-Health. (2019). Patient acceptance of e-health services in Saudi Arabia: An integrative perspective. *25*(9), 847-852.

Albugmi, A. N. (2018). *A model for cloud computing adoption by Saudi government overseas agencies* University of Southampton].

Aldosari, B. (2017a). Causes of EHR projects stalling or failing: A study of EHR projects in Saudi Arabia. *Computers in biology and medicine, 91*, 372-381.

Aldosari, B. (2017b). Patients' safety in the era of EMR/EHR automation. *Informatics in Medicine Unlocked, 9*, 230-233.

Aldosari, B., Al-Mansour, S., Aldosari, H., & Alanazi, A. (2018). Assessment of factors influencing nurses acceptance of electronic medical record in a Saudi Arabia hospital. *Informatics in Medicine Unlocked, 10*, 82-88.

Aldossary, S., & Allen, W. (2016). Data security, privacy, availability and integrity in cloud computing: issues and current solutions. *International Journal of Advanced Computer Science and Applications, 7*(4), 485-498.

Alfarra, N. (2015). *A qualitative study of an electronic health record: perspective on planning objectives and implementation at King Faisal Specialist Hospital & Research Centre (KFSH & RC), Saudi Arabia* Glasgow Caledonian University].

Alghamdi, F., Sharma, D., & Sathye, M. (2018). Investigating the Factors Affecting the Adoption of Cloud Computing in SMEs: A Case Study of Saudi Arabia. European, Mediterranean, and Middle Eastern Conference on Information Systems,

Alharbi, & Ali, M. (2018). The Status Quo of Health Information Technology and Health Information Management Efficiency in Saudi Arabia: A Narrative Review. *International Journal of Health Research Innovation, 6*(1), 11-23.

Alharbi, F. (2017). *Holistic Approach Framework for Cloud Computing Strategic Decision-Making in the Healthcare Sector (HAF-CCS)* Staffordshire University].

Alharbi, F., Atkins, A., & Stanier, C. (2014). Strategic Framework for Cloud Computing Decision-Making in Healthcare Sector in Saudi Arabia. *Health Informatics - An International Journal (HIIJ), 3*(2).

Alharbi, F., Atkins, A., & Stanier, C. (2015). Strategic framework for cloud computing decision-making in healthcare sector in Saudi Arabia. The seventh international conference on ehealth, telemedicine, and social medicine,

Alharbi, F., Atkins, A., & Stanier, C. (2016a). Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *Complex & Intelligent Systems*, 1-17.

Alharbi, F., Atkins, A., & Stanier, C. (2016b). Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *Complex & Intelligent Systems, 2*(3), 155-171.

Alharbi, F., Atkins, A., & Stanier, C. (2017a). Cloud computing adoption readiness assessment in saudi healthcare organisations: a strategic view. Proceedings of the Second International Conference on Internet of things and Cloud Computing,

Alharbi, F., Atkins, A., & Stanier, C. (2017b). Decision makers views of factors affecting cloud computing adoption in saudi healthcare organisations. 2017 International Conference on Informatics, Health & Technology (ICIHT),

Alharbi, F., Atkins, A., Stanier, C., & Al-Buti, H. A. (2016). Strategic Value of Cloud Computing in Healthcare Organisations Using the Balanced Scorecard Approach: A Case Study from a Saudi Hospital. *Procedia Computer Science, 98*, 332-339.

Alharbi, F., Atkins, A., Stanier, C. J. C., & Systems, I. (2016). Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *2*(3), 155-171.

Alharbi, M. A. (2018). The Status Quo of Health Information Technology and Health Information Management Efficiency in Saudi Arabia: A Narrative Review. *6*(1), 11-23.

Alharbi, M. A. (2018). The Status Quo of Health Information Technology and Health Information Management Efficiency in Saudi Arabia: A Narrative Review. *International Journal of Health Research and Innovation, 6*(1), 11-23.

Alharbi, M. A., Isouard, G., & Tolchard, B. (2019). The Development of ICD Adaptations and Modifications as Background to a Potential Saudi Arabia's National Version. *Global Journal of Health Science*.

Alharbi, M. A., Tolchard, B., & Isouard, G. (2019). Developing and Measuring the Reliability and Validity of the Factors Influencing the Implementation of ICD-10-AM and Clinical Coding in Saudi Public Hospitals. *Global Journal of Health Science*.

Alharthi, H. (2018). Healthcare predictive analytics: An overview with a focus on Saudi Arabia. *Journal of infection and public health, 11*(6), 749-756.

Ali, F., Rasoolimanesh, S. M., Sarstedt, M., Ringle, C. M., & Ryu, K. (2018). An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. *International Journal of Contemporary Hospitality Management*.

Ali, O., Shrestha, A., Soar, J., & Wamba, S. F. J. I. J. o. I. M. (2018). Cloud computing-enabled healthcare opportunities, issues, and applications: A systematic review. *43*, 146-158.

AlJarullah, A., Crowder, R., Wald, M., & Wills, G. (2018). Factors Affecting the Adoption of EHRs by Primary Healthcare Physicians in the Kingdom of Saudi Arabia: An Integrated Theoretical Framework.

Alkathiri, N. M. (2016). Ubiquitous Electronic Medical Record (EMR) for Developing Countries.

Alkhater, N., Wills, G., & Walters, R. (2014). Factors influencing an organisation's intention to adopt cloud computing in Saudi Arabia. 2014 IEEE 6th international conference on cloud computing technology and science,

Alkhlewi, A. S. (2018). *A framework for the implementation of a private government cloud in Saudi Arabia* University of Southampton].

Alkraiji, A. I., Jackson, T., & Murray, I. J. J. o. E. I. M. (2016). Factors impacting the adoption decision of health data standards in tertiary healthcare organisations in Saudi Arabia.

Almarazroi, A. A., Kabbar, E., Naser, M., & Shen, H. (2019). Gender Effect on Cloud Computing Services Adoption by University Students: Case Study of Saudi Arabia. *International Journal of Innovation: IJI Journal, 7*(1), 155-177.

Almeida, F. (2018). Strategies to perform a mixed methods study. *European Journal of Education Studies*.

Almekhlafi, M. A. (2016). Trends in one-year mortality for stroke in a tertiary academic center in Saudi Arabia: a 5-year retrospective analysis. *Annals of Saudi medicine, 36*(3), 197-202.

Almuayqil, S., Atkins, A., & Sharp, B. (2015). Knowledge management framework for e-healthcare in Saudi Arabia.

Almuayqil, S., Atkins, A. S., & Sharp, B. (2016). Ranking of E-Health Barriers Faced by Saudi Arabian Citizens, Healthcare Professionals and IT Specialists in Saudi Arabia. *Health, 8*(10), 1004.

Almubarak, S. S. (2017). Factors influencing the adoption of cloud computing by Saudi university hospitals. *Computing, 8*(1).

Almubarak, S. S. J. C. (2017). Factors influencing the adoption of cloud computing by Saudi university hospitals. *8*(1).

ALMutairi, N. N., & Thuwaini, S. F. (2015). Cloud computing uses for e-government in the middle east region opportunities and challenges. *International Journal of Business and Management, 10*(4), 60.

Alomeer, S. H. (2016). Integration of clinical information systems in Saudi Arabian health care contexts: A grounded theory exploration.

Alomi, Y., Alghamdi, S., & Alattyh, R. J. J. P. P. S. (2015). Strategic plan of general administration of pharmaceutical care at ministry of health in Saudi Arabia 2012–2022. *1*(3), 1-8.

Aloufi, A. D., Memish, Z. A., Assiri, A. M., & McNabb, S. J. (2016). Trends of reported human cases of brucellosis, Kingdom of Saudi Arabia, 2004–2012. *Journal of epidemiology and global health, 6*(1), 11-18.

Alqahtani, A., Crowder, R., & Wills, G. (2017). Barriers to the adoption of EHR systems in the Kingdom of Saudi Arabia: an exploratory study using a systematic literature review. *Journal of health informatics in developing countries, 11*(2).

ALQarni, T., & Barnawi, A. A Cloud adoption framework: assessing the factors and determinants of adoption cloud computing technology.

AlQurashe, K. I. (2018). Knowledge and Practice of Self Foot Care among Type 2 Diabetic Patients Attending Aladil Primary Health Care Centerin Makkah, Saudi Arabia.

Alsadi, M., & Saleh, A. (2019). Electronic health records implementation readiness: an integrative review. *Open Journal of Nursing, 9*(2), 152-162.

Alsadie, D., Tari, Z., Alzahrani, E. J., & Zomaya, A. Y. (2017). Energy-efficient tailoring of VM size and tasks in cloud data centers. 2017 IEEE 16th International Symposium on Network Computing and Applications (NCA),

Alsahafi, Y. (2012). Studies of EHR implementation and operation in different countries with particular reference to Saudi Arabia

Alsanea, M. (2015). *Factors Affecting the Adoption of Cloud Computing in Saudi Arabia's Government Sector* University of London].

Alsanea, N., Abduljabbar, A. S., Alhomoud, S., Ashari, L. H., Hibbert, D., & Bazarbashi, S. (2015). Colorectal cancer in Saudi Arabia: incidence, survival, demographics and implications for national policies. *Annals of Saudi medicine, 35*(3), 196-202.

Alshahrani, A., Stewart, D., & MacLure, K. (2019). A systematic review of the adoption and acceptance of eHealth in Saudi Arabia: Views of multiple stakeholders. *International journal of medical informatics*.

Alsmadi, D., & Prybutok, V. J. C. i. H. B. (2018). Sharing and storage behavior via cloud computing: Security and privacy in research and practice. *85*, 218-226.

Alsulame, K., Khalifa, M., & Househ, M. (2016). E-Health status in Saudi Arabia: A review of current literature. *Health Policy and Technology, 5*(2), 204-210.

Altowaijri, S. M. (2020). An architecture to improve the security of cloud computing in the healthcare sector. In *Smart Infrastructure and Applications* (pp. 249-266). Springer.

Amin, J., Siddiqui, A. A., Al-Oraibi, S., Alshammary, F., Amin, S., Abbas, T., & Alam, M. K. J. I. M. J. (2020). The Potential and Practice of Telemedicine to Empower Patient-Centered Healthcare in Saudi Arabia. *27*(2), 151-154.

Ammenwerth, E. (2019). Technology Acceptance Models in Health Informatics: TAM and UTAUT. *Studies in health technology and informatics, 263*, 64-71.

Amron, M. T., Ibrahim, R., Bakar, N. A. A., & Chuprat, S. J. O. I. J. o. I. (2019a). Development and Validation of a Questionnaire to Measure the Acceptance of Cloud Computing in Public Sectors. *7*(2), 85-95.

Amron, M. T., Ibrahim, R., Bakar, N. A. A., & Chuprat, S. J. P. C. S. (2019b). Determining factors influencing the acceptance of cloud computing implementation. *161*, 1055-1063.

Amron, M. T., Ibrahim, R., & Chuprat, S. (2017a). A review on cloud computing acceptance factors. *Procedia computer science, 124*, 639-646.

Amron, M. T., Ibrahim, R., & Chuprat, S. J. P. C. S. (2017b). A review on cloud computing acceptance factors. *124*, 639-646.

Andargoli, A. E., Scheepers, H., Rajendran, D., & Sohal, A. J. I. j. o. m. i. (2017). Health information systems evaluation frameworks: a systematic review. *97*, 195-209.

Andersen, T., Bansler, J. P., Kensing, F., Moll, J., Mønsted, T., Nielsen, K. D., Nielsen, O. W., Petersen, H. H., & Svendsen, J. H. (2018). Aligning Concerns in Telecare: Three Concepts to Guide the Design of Patient-Centred E-Health. *Computer Supported Cooperative Work, 27*(3-6), 1181-1214.

Andrès, E., Talha, S., Benyahia, A. A., Keller, O., Hajjam, M., Moukadem, A., Dieterlen, A., Hajjam, J., Ervé, S., & Hajjam, A. (2015). E-health: A promising solution for optimizing management of chronic diseases. Example of the national e-health project e-care based on an e-platform in the context of chronic heart failure. *European Research in Telemedicine/La Recherche Européenne en Télémédecine, 4*(3), 87-94.

Armbrust, M., Fox, A., & Griffith, R.). *Above the clouds: A berkeley view of cloud computing [J]. UC Berkley*. USA: Technical Report No. UCB/EECS-2009-28, 2009: 1-25.

Arora, S., & Sahney, S. (2018). Antecedents to consumers' showrooming behaviour: an integrated TAM-TPB framework. *Journal of Consumer Marketing*.

Asarnow, J. R., Kolko, D. J., Miranda, J., & Kazak, A. E. (2017). The pediatric patient-centered medical home: innovative models for improving behavioral health. *American Psychologist, 72*(1), 13.

Ashtari, S., Eydgahi, A., & Lee, H. (2015). Exploring cloud computing implementation issues in healthcare industry.

Asmaa Hatem Rashid, S. G. A., Norizan Binti Mohd Yasin. (2018). Technology Acceptance Models to Improve Adoption of Health Information Systems. *Journal of Advanced Sciences and Engineering Technologies, 1*(1), 17-29.

Assasi, N., Tarride, J.-E., O'Reilly, D., & Schwartz, L. (2016). Steps toward improving ethical evaluation in health technology assessment: a proposed framework. *BMC Medical Ethics, 17*(1), 34.

Avkiran, N., & Ringle, C. (2018). Partial least squares structural equation modeling. *Handbook of Market Research (Vol. 267)*.

Avkiran, N. K. (2018). An in-depth discussion and illustration of partial least squares structural equation modeling in health care. *Health Care Management Science, 21*(3), 401-408.

Awa, H. O., Ojiabo, O. U., & Emecheta, B. C. (2015). Integrating TAM, TPB and TOE frameworks and expanding their characteristic constructs for e-commerce adoption by SMEs. *Journal of Science & Technology Policy Management*.

Ayers, B. L. (2018). *Impact of Electronic Medical Records on Physician Job Satisfaction and Quality of Care*. Central Michigan University.

Ayoobkhan, A. L. M., & Asirvatham, D. (2017). Adoption of Cloud Computing Services in Healthcare Sectors: Special Attention to Private Hospitals in Colombo District, Sri Lanka.

Azeez, N. A., & Van der Vyver, C. J. E. I. J. (2019). Security and privacy issues in e-health cloud-based system: A comprehensive content analysis. *20*(2), 97-108.

Azmi, F. R., Musa, H., Sihombing, H., & Fen, F. S. (2018). Adoption factors of halal standards: The Malaysian perspectives. Proceedings of the 3rd International Halal Conference (INHAC 2016),

Bailey, J. S., & Burch, M. R. (2017). *Research methods in applied behavior analysis*. Routledge.

Bain, C., Goswami, A., Lloyd, S., & Davis, L. (2020). Post-implementation Evaluation of a Digital Dictation System in a Large Health Service Using HOT-Fit Framework. *Asia Pacific Journal of Health Management, 15*(4), 60-70.

Balas, E. A., & Chapman, W. W. (2018). Road map for diffusion of innovation in health care. *Health Affairs, 37*(2), 198-204.

Banditwattanawong, T., Masdisornchote, M., & Uthayopas, P. (2016). Multi-provider cloud computing network infrastructure optimization. *Future generation computer systems, 55*, 116-128.

Baniode, M., & Hamdan, M. (2014). *Users' Perspectives on the Computerized Health Management Information System in the Ministry of Health Hospitals in the West Bank-Palestine*. Mohammad Baniode.

Baral, M. M., Verma, A., & Chittipaka, V. (2019). Impact Of Cloud Computing In Indian Healthcare Firms: A Study.

Barrett, A. K., & Stephens, K. K. (2017). Making electronic health records (ehrs) work: Informal talk and workarounds in healthcare organizations. *Health communication, 32*(8), 1004-1013.

Başaran, S., & Hama, G. O. (2018). EXPLORING FACULTY MEMBERS'VIEWS ON ADOPTION OF CLOUD COMPUTING IN EDUCATION. Proceedings of the International Scientific Conference. Volume V,

Baumers, M., Dickens, P., Tuck, C., Hague, R. J. T. f., & change, s. (2016). The cost of additive manufacturing: machine productivity, economies of scale and technology-push. *102*, 193-201.

Bayati, S., Bastani, P., Sagheb, Z. M., Jamalabadi, S., & Samadbeik, M. (2017). The performance implications of pharmacy information system at the university teaching hospitals of Shiraz, Iran: Cluster approach. *Journal of Advanced Pharmaceutical Technology & Research, 8*(4), 125.

Becker, T. E., Atinc, G., Breaugh, J. A., Carlson, K. D., Edwards, J. R., & Spector, P. E. (2016). Statistical control in correlational studies: 10 essential recommendations for organizational researchers. *Journal of Organizational Behavior, 37*(2), 157-167.

Beerepoot, I., Koorn, J. J., van de Weerd, I., van den Hooff, B., Leopold, H., & Reijers, H. (2019). Working Around Health Information Systems: The Role of Power.

Bergman, P., Lasky-Fink, J., & Rogers, T. (2019). Simplification and defaults affect adoption and impact of technology, but decision makers do not realize it. *Organizational Behavior and Human Decision Processes*.

Bhuyan, S., Dash, M., & Anusandhan, S. O. (2018). Predicting Cloud Computing Adoption in Hospitals Using Regression Analysis. *Journal of Engineering and Applied Sciences, 13*(6), 1436-1441.

Bloom, D. E., & Luca, D. L. (2016). The global demography of aging: facts, explanations, future. In *Handbook of the economics of population aging* (Vol. 1, pp. 3-56). Elsevier.

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Frontiers in public health, 6*, 149.

Botta, A., de Donato, W., Persico, V., & Pescapé, A. (2016). Integration of cloud computing and internet of things: a survey. *Future Generation Computer Systems, 56*, 684-700.

Botto-Tobar, M., Ramirez-Anormaliza, R., Cevallos-Torres, L. J., & Cevallos-Ayon, E. (2017). Migrating SOA applications to cloud: a systematic mapping study. International Conference on Technologies and Innovation,

Bourdieu, P., Coleman, J. S., & Coleman, Z. W. (2019). *Social theory for a changing society*. Routledge.

Braithwaite, J., Churruca, K., Ellis, L. A., Long, J., Clay-Williams, R., Damen, N., Herkes, J., Pomare, C., & Ludlow, K. (2017). Complexity science in healthcare. *Aspirations, approaches, applications and accomplishments. A white paper. Sydney, Aust: Australian Institute of Health Innovation, Macquarie University*.

Branco Jr, T., de Sá-Soares, F., & Rivero, A. L. (2017). Key issues for the successful adoption of cloud computing. *Procedia computer science, 121*, 115-122.

Brauer, M., & Curtin, J. J. (2018). Linear mixed-effects models and the analysis of nonindependent data: A unified framework to analyze categorical and continuous independent variables that vary within-subjects and/or within-items. *Psychological Methods, 23*(3), 389.

Brown, C. L., Mulcaster, H. L., Triffitt, K. L., Sittig, D. F., Ash, J. S., Reygate, K., Husband, A. K., Bates, D. W., & Slight, S. P. (2017). A systematic review of the types and causes of prescribing errors generated from using computerized provider order entry systems in primary and secondary care. *Journal of the American Medical Informatics Association, 24*(2), 432-440.

Buller, A. (2016). Saudi Arabia enterprise IT trends for 2017. . *[Online]. 2016. computerweekly. Available from:* *http://www.computerweekly.com/news/450404528/Saudi-Arabia-enterprise-IT-trends-for-2017*. *[Accessed: 30 March 2017].*

Burke, N. (2018). An integrative literature review exploring the experiences and perceptions from patients and healthcare staff following an in-patient fall.

Butcher, C., Davies, C., & Highton, M. (2019). *Designing learning: from module outline to effective teaching*. Routledge.

Butler, C. E., Noel, S., Hibbs, S. P., Miles, D., Staves, J., Mohaghegh, P., Altmann, P., Curnow, E., & Murphy, M. F. (2015). Implementation of a clinical decision support system improves compliance with restrictive transfusion policies in hematology patients. *Transfusion, 55*(8), 1964-1971.

Buyya, R., Ramamohanarao, K., Leckie, C., Calheiros, R. N., Dastjerdi, A. V., & Versteeg, S. (2015). Big Data Analytics-Enhanced Cloud Computing: Challenges, Architectural Elements, and Future Directions.

Bygstad, B., & Hanseth, O. (2016). Governing e-health infrastructures: Dealing with tensions.

Calabrese, B., & Cannataro, M. (2015). Cloud computing in healthcare and biomedicine. *Scalable Computing: Practice and Experience, 16*(1), 1-18.

Cao, Y., Ajjan, H., Hong, P., & Le, T. (2018). Using social media for competitive business outcomes. *Journal of Advances in Management Research*.

Carman, K. L., & Workman, T. A. (2017). Engaging patients and consumers in research evidence: applying the conceptual model of patient and family engagement. *Patient education and counseling, 100*(1), 25-29.

Carmichael, T., & Cunningham, N. (2017). Theoretical Data Collection and Data Analysis with Gerunds in a Constructivist Grounded Theory Study. *Electronic Journal of Business Research Methods, 15*(2).

Casanovas, P., Mendelson, D., & Poblet, M. (2017). A linked democracy approach for regulating public health data. *Health and Technology, 7*(4), 519-537.

Cassel, J. B., Bowman, B., Rogers, M., Spragens, L. H., Meier, D. E., & Centers, P. C. L. (2018). Palliative care leadership centers are key to the diffusion of palliative care innovation. *Health Affairs, 37*(2), 231-239.

Celesti, A., Fazio, M., Romano, A., Bramanti, A., Bramanti, P., & Villari, M. (2017). An OAIS-based hospital information system on the cloud: Analysis of a NoSQL column-oriented approach. *IEEE journal of biomedical and health informatics, 22*(3), 912-918.

Chakraborty, R. P., & Ghosh, D. (2015). Revolution In Healthcare Systems Using Cloud Computing. *International Journal of Research in Engineering & Advanced Technology (IJREAT), 3*(5).

Chamney, A. (2015). *QuickForms 3.0: A Business Intelligence Application Framework for Integrating Mobile Forms Data* Université d'Ottawa/University of Ottawa].

Chandra, S., & Kumar, K. N. (2018). Exploring Factors Influencing Organizational Adoption Of Augmented Reality In E-Commerce: Empirical Analysis Using Technology-Organization-Environment Model. *Journal of Electronic Commerce Research, 19*(3).

Chang, V., Walters, R. J., & Wills, G. B. (2016). Organisational sustainability modelling—An emerging service and analytics model for evaluating Cloud Computing adoption with two case studies. *International Journal of Information Management, 36*(1), 167-179.

Chasib, H. S., & Al-Najjar, A. A. M. (2020). A Review of Significant Factors in Cloud Computing and Proposed a Model for Healthcare Sector in Iraq. *Journal of Applied Science and Computations*.

Che, H. L., Yeh, M. Y., Jiang, R. S., & Wu, S. M. (2016). Taiwanese nurses' experiences of difficulties in providing patient education in hospital settings. *Nursing & health sciences, 18*(1), 113-119.

Chege, S. M., & Wang, D. (2020). Information technology innovation and its impact on job creation by SMEs in developing countries: an analysis of the literature review. *Technology Analysis & Strategic Management, 32*(3), 256-271.

Chen, M., Ma, Y., Li, Y., Wu, D., Zhang, Y., & Youn, C.-H. (2017). Wearable 2.0: Enabling human-cloud integration in next generation healthcare systems. *IEEE Communications Magazine, 55*(1), 54-61.

Chen, Q. (2019). Toward realizing self-protecting healthcare information systems: Design and security challenges. In *Advances in Computers* (Vol. 114, pp. 113-149). Elsevier.

Chen, Z., Shen, L., & Li, F. (2017). Exploiting Web service geographical neighborhood for collaborative QoS prediction. *Future generation computer systems, 68*, 248-259.

Cheng, Y.-M. (2020). Quality antecedents and performance outcome of cloud-based hospital information system continuance intention. *Journal of Enterprise Information Management*.

Cheruiyot, P. C. (2018). *Influence Of Selectedstrategies On Implementation Of Donor Assisted E-Health Management Systems In Kenya: A Survey Of Public Health Facilities In Nakuru County* Kabarak University].

Chikhaoui, E., Sarabdeen, J., & Parveen, R. (2017). Privacy and Security Issues in the Use of Clouds in e-Health in the Kingdom of Saudi Arabia. *Communications of the IBIMA*, 1-18.

Chin, T. A., Hamid, A. B. A., Raslic, A., & Heng, L. H. (2014). The impact of supply chain integration on operational capability in Malaysian manufacturers. *Procedia-Social and Behavioral Sciences, 130*(Supplement C), 257-265.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Chin, W. W. (2010). How to write up and report PLS analyses. In *Handbook of partial least squares* (pp. 655-690). Springer.

Chiregi, M., & Navimipour, N. J. (2017). A comprehensive study of the trust evaluation mechanisms in the cloud computing. *Journal of Service Science Research, 9*(1), 1-30.

Chou, C.-H., Shrestha, S., Yang, C.-D., Chang, N.-W., Lin, Y.-L., Liao, K.-W., Huang, W.-C., Sun, T.-H., Tu, S.-J., & Lee, W.-H. (2018). miRTarBase update 2018: a resource for experimentally validated microRNA-target interactions. *Nucleic acids research, 46*(D1), D296-D302.

Christensen, T., Lægreid, P., & Rovik, K. A. (2020). *Organization theory and the public sector: Instrument, culture and myth*. Routledge.

Cohen, J. (1992). Quantitative methods in psychology: A power primer. *Psychological bulletin, 112*, 1155-1159.

Cook, J. L., Colvin, M., Francis, G. S., Grady, K. L., Hoffman, T. M., Jessup, M., John, R., Kiernan, M. S., Mitchell, J. E., & Pagani, F. D. J. C. (2017). Recommendations for the use of mechanical circulatory support: ambulatory and community patient care: a scientific statement from the American Heart Association. *135*(25), e1145-e1158.

Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: an interpretative review. *International Journal of Medical Informatics, 82*(5), e73-e86.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*. Sage Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Cunningham, S. G., Wake, D. J., Waller, A., & Morris, A. D. (2014). Definitions of eHealth. In *eHealth, Care and Quality of Life* (pp. 15-30). Springer.

Cypress, B. S. (2017). Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing, 36*(4), 253-263.

D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in healthcare: a comprehensive review. *Health policy, 119*(9), 1197-1209.

Dabholkar, P. A., & Bagozzi, R. P. J. J. o. t. a. o. m. s. (2002). An attitudinal model of technology-based self-service: moderating effects of consumer traits and situational factors. *30*(3), 184-201.

Darwish, A., Hassanien, A. E., Elhoseny, M., Sangaiah, A. K., & Muhammad, K. (2019). The impact of the hybrid platform of internet of things and cloud computing on healthcare systems: opportunities, challenges, and open problems. *Journal of Ambient Intelligence and Humanized Computing, 10*(10), 4151-4166.

Darwish, A., Hassanien, A. E., Elhoseny, M., Sangaiah, A. K., Muhammad, K. J. J. o. A. I., & Computing, H. (2019). The impact of the hybrid platform of internet of things and cloud computing on healthcare systems: opportunities, challenges, and open problems. *10*(10), 4151-4166.

Dash, M., & Anusandhan, S. O. (2018). Exploring Cloud Computing Adoption in Private Hospitals in India: An Investigation of DOI and TOE Model.

Dashti, S., Peyman, N., Tajfard, M., & Esmaeeli, H. (2017). E-Health literacy of medical and health sciences university students in Mashhad, Iran in 2016: a pilot study. *Electronic physician, 9*(3), 3966.

Davies, C., & Fisher, M. (2018). Understanding research paradigms. *Journal of the Australasian Rehabilitation Nurses Association, 21*(3), 21.

De Grood, C., Raissi, A., Kwon, Y., & Santana, M. J. (2016). Adoption of e-health technology by physicians: a scoping review. *Journal of multidisciplinary healthcare, 9*, 335.

De Smedt, D., Clays, E., Doyle, F., Kotseva, K., Prugger, C., Pająk, A., Jennings, C., Wood, D., De Bacquer, D., & Group, E. S. (2013). Validity and reliability of three commonly used quality of life measures in a large European population of coronary heart disease patients. *International journal of cardiology, 167*(5), 2294-2299.

de Visser, E. J., Pak, R., & Shaw, T. H. (2018). From 'automation'to 'autonomy': the importance of trust repair in human–machine interaction. *Ergonomics, 61*(10), 1409-1427.

Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health Affairs, 37*(2), 183-190.

Deeks, J. J., Higgins, J. P., Altman, D. G., & Group, C. S. M. (2019). Analysing data and undertaking meta-analyses. *Cochrane handbook for systematic reviews of interventions*, 241-284.

Deilr, R., & Brune, P. (2017). Cloudy with a Chance of Usage?-Towards a Model of Cloud Computing Adoption in German SME. CAiSE-Forum-DC,

Denver, U. o. (2016). *International Futures (IFs) forecasting system (2016) Key development forecasting—Saudi Arabia*. http://www.ifs.du.edu/ifs/frm_CountryProfile.aspx?Country=SA.

Denzin, N. K. (2018). *The qualitative manifesto: A call to arms*. Routledge.

DeSimone, J. A., Harms, P. D., & DeSimone, A. J. (2015). Best practice recommendations for data screening. *Journal of Organizational Behavior, 36*(2), 171-181.

Dessler, G., & Phillips, N. (1980). *Organization theory: Integrating structure and behavior*. Prentice-Hall Englewood Cliffs, NJ.

Devadass, L., & Sekaran, S. S. (2017). Cloud computing in healthcare. *5*(1), 25-31.

Devadass, L., Sekaran, S. S., & Thinakaran, R. (2017). Cloud computing in healthcare. *International Journal of Students' Research in Technology & Management, 5*(1), 25-31.

Devadass, L., Sekaran, S. S., Thinakaran, R. J. I. J. o. S. R. i. T., & Management. (2017). Cloud computing in healthcare. *5*(1), 25-31.

Devine, E. B., Totten, A. M., Gorman, P., Eden, K. B., Kassakian, S., Woods, S., Daeges, M., Pappas, M., McDonagh, M., & Hersh, W. R. J. e. (2017). Health information exchange use (1990-2015): a systematic review. *5*(1).

Dhaggara, D., Goswami, M., & Kumar, G. J. I. J. o. M. I. (2020). Impact of Trust and Privacy Concerns on Technology Acceptance in Healthcare: An Indian Perspective. 104164.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American sociological review*, 147-160.

Dixit, S., Mandal, S. N., Thanikal, J. V., & Saurabh, K. (2018). Critical analysis of factors affecting the on-site productivity in Indian construction industry.

Doarn, C. R. (2019). Advanced Technologies: Paperless Hospital, the Cost and the Benefits. In *The Modern Hospital* (pp. 145-155). Springer.

Doty, D. H., & Glick, W. H. (1998). Common methods bias: does common methods variance really bias results? *Organizational Research Methods, 1*(4), 374-406.

Downs Jr, G. W., & Mohr, L. B. (1976). Conceptual issues in the study of innovation. *Administrative Science Quarterly*, 700-714.

Dunleavy, P. (2003). *Authoring a PhD: How to plan, draft, write and finish a doctoral thesis or dissertation*. Macmillan International Higher Education.

Durodolu, O. O. (2016). Technology acceptance model as a predictor of using information system'to acquire information literacy skills.

Dziadkowiec, O., Callahan, T., Ozkaynak, M., Reeder, B., & Welton, J. (2016). Using a data quality framework to clean data extracted from the electronic health record: a case study. *eGEMs, 4*(1).

Ebert, J. F., Huibers, L., Christensen, B., & Christensen, M. B. (2018). or web-based questionnaire invitations as a method for data collection: cross-sectional comparative study of differences in response rate, completeness of data, and financial cost. *Journal of medical Internet research, 20*(1), e24.

El-Gazzar, R., Hustad, E., & Olsen, D. H. (2016). Understanding cloud computing adoption issues: A Delphi study approach. *Journal of Systems and Software, 118*, 64-84.

El-Nakla, S., Yahya, C. B., Peterson, H. P., Ouda, O. K., & Ouda, M. (2018). Residential Consumers Awareness of Energy Conservation Practices in Saudi Arabia. *KnE Engineering*, 244–258-244–258.

Elhoseny, M., Salama, A. S., Abdelaziz, A., & Riad, A. M. (2017). Intelligent systems based on loud computing for healthcare services: a survey. *IJCIStudies, 6(2/3), 1*, 57-188.

Elsheikh, A. S., Alqurashi, A. M., Wahba, M. A., & Hodhod, T. E. J. J. o. H. I. i. D. C. (2018). Healthcare Workforce in Saudi Arabia under Saudi Vision 2030. *12*(1).

Encyclopedia of Survey Research Methods. (2008, 2020/04/07). https://doi.org/10.4135/9781412963947

English, C., Casey, R., Bell, M., Bergin, D., & Murphy, J. (2015). The Sonographic Features of the Thyroid Gland after Treatment with Radioiodine Therapy in Patients with Graves' Disease. *Ultrasound in Medicine & Biology*.

Erlirianto, L. M., Ali, A. H. N., & Herdiyanti, A. J. P. C. S. (2015). The implementation of the human, organization, and technology–Fit (HOT–Fit) framework to evaluate the electronic medical record (EMR) system in a hospital. *72*, 580-587.

Esfahani, A. A., Ahmadi, H., Nilashi, M., Alizadeh, M., Bashiri, A., Farajzadeh, M. A., Shahmoradi, L., Nobakht, M., & Rasouli, H. R. (2018). An evaluation model for the implementation of hospital information system in public hospitals using multi-criteria-decision-making (MCDM) approaches. *International Journal of Engineering and Technology (UAE), 7*(1), 1-18.

Evans, R. G., & Stoddart, G. L. (2017). Producing health, consuming health care. In *Why are some people healthy and others not?* (pp. 27-64). Routledge.

Farahzadi, A., Shams, P., Rezazadeh, J., & Farahbakhsh, R. (2018). Middleware technologies for cloud of things: a survey. *Digital Communications and Networks, 4*(3), 176-188.

Farrell, A. M. (2010). Insufficient discriminant validity: A comment on Bove, Pervan, Beatty, and Shiu (2009). *Journal of Business Research, 63*(3), 324-327.

Fatima, T., Malik, S. A., & Shabbir, A. (2018). Hospital healthcare service quality, patient satisfaction and loyalty. *International Journal of Quality*

Reliability Management.

Fink, A. (2019). *Conducting research literature reviews: From the internet to paper*. Sage publications.

Fornell, C., & Larcker, D. F. (1981a). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 39-50.

Fornell, C., & Larcker, D. F. (1981b). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research, 18*(1), 39-50.

Fragidis, L. L., Chatzoglou, P. D. J. H. P., & Technology. (2017). Development of nationwide electronic health record (NEHR): an international survey. *6*(2), 124-133.

Fu, K., Nune, R., & Tao, J. X. (2015). *Social media data analysis for traffic incident detection and management*.

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. J. B. m. r. m. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *13*(1), 1-8.

Galvan, J. L., & Galvan, M. C. (2017). *Writing literature reviews: A guide for students of the social and behavioral sciences*. Taylor & Francis.

Gangwar, H., Date, H., & Ramaswamy, R. (2015a). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management, 28*(1), 107-130.

Gangwar, H., Date, H., & Ramaswamy, R. (2015b). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*.

Gangwar, H., Date, H., & Ramaswamy, R. J. J. o. E. I. M. (2015c). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model.

Gao, F., Thiebes, S., & Sunyaev, A. (2016a). Exploring cloudy collaboration in healthcare: an evaluation framework of cloud computing services for hospitals. 2016 49th Hawaii International Conference on System Sciences (HICSS),

Gao, F., Thiebes, S., & Sunyaev, A. (2016b). Exploring Cloudy Collaboration in Healthcare: An Evaluation Framework of Cloud Computing Services for Hospitals. 49th Hawaii International Conference on System Sciences

Geisser, S. (1975). The predictive sample reuse method with applications. *Journal of the American statistical Association, 70*(350), 320-328.

George, A. L. (2019). Case studies and theory development: The method of structured, focused comparison. In *Alexander L. George: A pioneer in political and social sciences* (pp. 191-214). Springer.

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference, 13.0 update

Gewald, H., & Gewald, C. (2020). Inhibitors of Physicians' Use of Mandatory Hospital Information Systems (HIS). In *Data Analytics in Medicine: Concepts, Methodologies, Tools, and Applications* (pp. 1720-1737). IGI Global.

Ghahramani, M. H., Zhou, M., & Hon, C. T. (2017). Toward cloud computing QoS architecture: Analysis of cloud systems and cloud services. *IEEE/CAA Journal of Automatica Sinica, 4*(1), 6-18.

Ghanghs, R., & Sharma, R. (2016). An Extensive Study on Cloud Computing. *IJCER, 4*(6), 131-134.

Ginter, P. M., Duncan, W. J., & Swayne, L. E. (2018). *The strategic management of health care organizations*. John Wiley & Sons.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of management information systems, 18*(1), 185-214.

González, J. J., Canós-Cerdá, J. H., Norris, T., & Abbas, R. (2018). Towards Disaster e-Health Support Systems. ISCRAM,

Goodwin, S., McPherson, J. D., & McCombie, W. R. J. N. R. G. (2016). Coming of age: ten years of next-generation sequencing technologies. *17*(6), 333.

Götz, O., Liehr-Gobbers, K., & Krafft, M. (2010). Evaluation of structural equation models using the partial least squares (PLS) approach. In *Handbook of partial least squares* (pp. 691-711). Springer.

Govender, D. W. (2006). *Information and communications technology (ICT) integration in teaching and learning: a critical analysis*

Grandhi, S., Wibowo, S., & Balasooriya, P. (2019). Sec-HOTE-Fit Framework for Assessing Key Security Determinants in Cloud Computing Adoption. The 23rd Pacific Asia Conference on Information Systems, Green, D. R. (2020). Cloud Computing in Healthcare: Understanding User Perception, Organizational Operations, and IT Costs to Be Successful in the Cloud. Northcentral University,

Greenaway, K. H., Wright, R. G., Willingham, J., Reynolds, K. J., Haslam, S. A. J. P., & Bulletin, S. P. (2015). Shared identity is key to effective communication. *41*(2), 171-182.

Griebel, L., Prokosch, H.-U., Köpcke, F., Toddenroth, D., Christoph, J., Leb, I., Engel, I., & Sedlmayr, M. (2015). A scoping review of cloud computing in healthcare. *BMC medical informatics and decision making, 15*(1), 17.

Griebel, L., Prokosch, H.-U., Köpcke, F., Toddenroth, D., Christoph, J., Leb, I., Engel, I., Sedlmayr, M. J. B. m. i., & making, d. (2015). A scoping review of cloud computing in healthcare. *15*(1), 1-16.

Griffith, D. A., & Paelinck, J. H. (2018). General Conclusions About Spatial Statistics. In *Morphisms for Quantitative Spatial Analysis* (pp. 113-121). Springer.

Grindle, M., Kavathekar, G., & Wan, D. (2013). *A new era for the healthcare industry Accenture.* Assets/DotCom/Documents/Global/PDF/Technology_2/Accenture-New-Era-Healthcare-Industry-Cloud-Computing-Changes-Game.pdf

Group, O. B. (2017). *Positive forecast for data centres and cloud services in Saudi Arabia*. Oxford Business Group. https://oxfordbusinessgroup.com/analysis/silver-linings-forecast-bright-data-centres-and-cloud-services

Groves, P., Kayyali, B., Knott, D., & Kuiken, S. V. (2016). The'big data'revolution in healthcare: Accelerating value and innovation.

Gücin, N. Ö., Berk, Ö. S. J. P.-S., & Sciences, B. (2015). Technology acceptance in health care: An integrative review of predictive factors and intervention programs. *195*, 1698-1704.

Gupta, M., Abdelsalam, M., & Mittal, S. (2020). Enabling and enforcing social distancing measures using smart city and its infrastructures: a COVID-19 Use case. *arXiv preprint arXiv:.09246*.

Gutierrez, A., Boukrami, E., & Lumsden, R. J. J. o. E. I. M. (2015). Technological, organisational and environmental factors influencing managers' decision to adopt cloud computing in the UK.

Gutierrez, M., Moreno, R., & Rebelo, M. (2017). Information and communication technologies and global health challenges. In *Global Health Informatics* (pp. 50-93). Elsevier.

Haddara, M., & Staaby, A. (2018). RFID applications and adoptions in healthcare: a review on patient safety. *Procedia computer science, 138*, 80-88.

Hafezi, N. A., & Zolait, A. H. (2019). Does national culture and information system Quality impact the adoption of cloud computing? 2019 International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies (3ICT),

Haff, N., & Choudhry, N. K. (2018). The promise and pitfalls of pragmatic clinical trials for improving health care quality. *JAMA network open, 1*(6), e183376-e183376.

Hailu, A. (2012). *Factors influencing cloud-computing technology adoption in developing countries* Capella University].

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems*.

Hair, J. F., Black, W., & Babin, B. (2010a). Multivariate data analysis: A global perspective

Hair, J. F., Black, W., & Babin, B. (2010b). *Multivariate data analysis: A global perspective* (7 ed.). Pearson Prentice Hall.

Hair, J. F., Bush, R. P., & Ortinau, D. (2006). Marketing Research: Within Changing Information Environment

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2 ed.). Sage Publications.

Hair, J. F., Money, A. H., Samouel, P., & Page, M. (2007). Research Methods for Business. *Education+ Training, 49*(4), 336-337.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice, 19*(2), 139-152.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning, 1*(46), 1-12.

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications. *Long Range Planning, 45*(5-6), 320-340.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40*(3), 414-433.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications.

Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017a). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis, 1*(2), 107-123.

Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. J. I. J. o. M. D. A. (2017b). PLS-SEM or CB-SEM: updated guidelines on which method to use. *1*(2), 107-123.

Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM). *European business review*.

Hajlaoui, J. E., Omri, M. N., & Benslimane, D. (2017). Multi-tenancy aware configurable Service Discovery approach in Cloud Computing. 2017 IEEE 26th International Conference on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE),

Hall GE, W. R., Dossett W. (1973). A developmental conceptualization of the adoption process within educational institutions. p. 5.

Hallawi, H., Mehnen, J., & He, H. (2018). A comparison of resource allocation process in grid and cloud technologies. Journal of Physics: Conference Series,

Hameed, M. A., Counsell, S., & Swift, S. (2012). A conceptual model for the process of IT innovation adoption in organizations. *Journal of Engineering Technology Management, 29*(3), 358-390.

Hameed, R. T., Mohamad, O. A., Hamid, O. T., & Tapus, N. (2015). Design of e-Healthcare management system based on cloud and service oriented architecture. 2015 E-Health and Bioengineering Conference (EHB),

Hanafizadeh, P., & Ravasan, A. Z. (2018). An empirical analysis on outsourcing decision: the case of e-banking services. *Journal of Enterprise Information Management*.

Harfoushi, O., Akhorshaideh, A. H., Aqqad, N., Al Janini, M., Obiedat, R. J. C., & Network. (2016). Factors affecting the intention of adopting cloud computing in Jordanian hospitals. *8*(02), 88.

Harfoushi, O., Akhorshaideh, Abdel Hakim, Aqqad, Noor ,Al Janini, Marwa, Obiedat, Ruba. (2016). Factors affecting the intention of adopting cloud computing in Jordanian hospitals. *Communications and Network, 8*(02), 88.

Hasanain, R., Vallmuur, K., & Clark, M. (2014). Progress and challenges in the implementation of Electronic Medical Records in Saudi Arabia: a systematic review. *Health Informatics-An International Journal, 3*(2).

Hasanain, R. A. (2015). Development of an EMR implementation framework for public hospitals in Saudi Arabia.

Hasanain, R. A., & Cooper, H. (2014). Solutions to Overcome Technical and Social Barriers to Electronic Health Records Implementation in Saudi Public and Private Hospitals. *Journal of health informatics in developing countries, 8*(1).

Hasanain, R. A., & Cooper, H. (2014). Solutions to overcome technical and social barriers to electronic health records implementation in Saudi public and private hospitals. *8*(1).

Hasanain, R. A., Vallmuur, K., & Clark, M. (2015). Electronic medical record systems in Saudi Arabia: knowledge and preferences of healthcare professionals. *Journal of health informatics in developing countries, 9*(1).

Hashem, I. A. T., Yaqoob, I., Anuar, N. B., Mokhtar, S., Gani, A., & Khan, S. U. (2015). The rise of "big data" on cloud computing: review and open research issues. *Information Systems, 47*, 98-115.

Hassan, H. (2020). Factors Influencing Cloud Computing Adoption In Small Medium Enterprises. *Journal of Information and Communication Technology, 16*(1), 21-41.

Hassan, H. J. J. o. I., & Technology, C. (2020). FACTORS INFLUENCING CLOUD COMPUTING ADOPTION IN SMALL MEDIUM ENTERPRISES. *16*(1), 21-41.

Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour research and therapy, 98*, 39-57.

Hayes, R. J., & Moulton, L. H. (2017). *Cluster randomised trials*. CRC press.

health, m. o. (2017). *Maternity and Children Hospital* https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2017-10-24-004.aspx

Health, M. o. (2018). *YEARBOOK STATISTICAL*. Ministry of Health https://www.moh.gov.sa/Ministry/Statistics/book/Documents/book-Statistics-2018.pdf

Health, M. o. (2019). *Saudi Ministry of Health Strategy*. Saudi Ministry of Health. https://www.moh.gov.sa/Ministry/About/Documents/2019-004.pdf

Health, M. o. (2020). *Budget*. Retrieved 28 June, 2020, from https://www.moh.gov.sa/en/Ministry/About/Pages/Budget.aspx

Health, S. M. o. (2020). *archive of Saudi Ministry of Health's Budget* https://www.moh.gov.sa/en/Ministry/About/Pages/Budget.aspx

Heath, S. (2018). Methods and/or systems for an online and/or mobile privacy and/or security encryption technologies used in cloud computing with the combination of data mining and/or encryption of user's personal data and/or location data for marketing of internet posted promotions, social messaging or offers using multiple devices, browsers, operating systems, networks, fiber optic communications, multichannel platforms

Heery, E., Sheehan, A. M., While, A. E., & Coyne, I. J. C. h. d. (2015). Experiences and outcomes of transition from pediatric to adult health care services for young people with congenital heart disease: a systematic review. *10*(5), 413-427.

Hemingway, H., Asselbergs, F. W., Danesh, J., Dobson, R., Maniadakis, N., Maggioni, A., Van Thiel, G. J., Cronin, M., Brobert, G., & Vardas, P. (2018). Big data from electronic health records for early and late translational cardiovascular research: challenges and potential. *European heart journal, 39*(16), 1481-1495.

Hennemann, S., Beutel, M. E., & Zwerenz, R. (2017). Ready for eHealth? Health professionals' acceptance and adoption of eHealth interventions in inpatient routine care. *Journal of health communication, 22*(3), 274-284.

Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling, 17*(1), 82-109.

Henseler, J., & Chin, W. W. J. S. E. M. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *17*(1), 82-109.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115-135.

Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics, 28*(2), 565-580.

Hertin, R. D., & Al-Sanjary, O. I. (2018). Performance of Hospital Information System in Malaysian Public Hospital: a Review. *International Journal of Engineering & Technology, 7*(4.11), 24-28.

Hevner, A., & Chatterjee, S. (2010). *Design Research in Information Systems: Theory and Practice* (Vol. 22). Springer Science & Business Media.

Higman, S., Dwivedi, V., Nsaghurwe, A., Busiga, M., Sotter Rulagirwa, H., Smith, D., Wright, C., Nyinondi, S., & Nyella, E. (2019). Designing interoperable health information systems using Enterprise Architecture approach in resource-limited countries: A literature review. *The International journal of health planning and management, 34*(1), e85-e99.

Hiran, K. K., & Henten, A. (2019). An integrated TOE–DoI framework for cloud computing adoption in the higher education sector: case study of Sub-Saharan Africa, Ethiopia. *International Journal of System Assurance Engineering and Management*, 1-9.

Holden, R. J., & Karsh, B. T. (2010). Methodological Review: The Technology Acceptance Model: Its past and its future in health care. *Journal of biomedical informatics, 43*(1), 159-172.

Hoque, M. R., Hossin, M. E., & Khan, W. (2016). Strategic information systems planning (SISP) practices in health care sectors of Bangladesh. *European Scientific Journal, 12*(6).

Horton, J., Cameron, A., Devaraj, D., Hanson, R., & Hajkowicz, S. (2018). Workplace Safety Futures: The impact of emerging technologies and platforms on work health and safety and workers' compensation over the next 20 years

Hosseinian-Far, A., Ramachandran, M., & Slack, C. L. (2018). Emerging trends in cloud computing, big data, fog computing, IoT and smart living. In *Technology for Smart Futures* (pp. 29-40). Springer.

Hripcsak, G., Bloomrosen, M., FlatelyBrennan, P., Chute, C. G., Cimino, J., Detmer, D. E., Edmunds, M., Embi, P. J., Goldstein, M. M., & Hammond, W. E. (2014). Health data use, stewardship, and governance: ongoing gaps and challenges: a report from AMIA's 2012 Health Policy Meeting. *Journal of the American Medical Informatics Association, 21*(2), 204-211.

Hsieh, P.-J. J. C. i. H. B. (2016). An empirical investigation of patients' acceptance and resistance toward the health cloud: The dual factor perspective. *63*, 959-969.

Hu, P., Dhelim, S., Ning, H., & Qiu, T. (2017). Survey on fog computing: architecture, key technologies, applications and open issues. *Journal of network and computer applications, 98*, 27-42.

Hu, Y., & Bai, G. (2014). A systematic literature review of cloud computing in eHealth. *arXiv preprint arXiv:1412.2494*.

Hu, Y., & Bai, G. J. a. p. a. (2014). A systematic literature review of cloud computing in eHealth.

Hussey, P. A., & Kennedy, M. A. (2016). Instantiating informatics in nursing practice for integrated patient centred holistic models of care: a discussion paper. *Journal of advanced nursing, 72*(5), 1030-1041.

Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. *MIS quarterly*, 465-485.

Ibrahim, M. A., Fisol, W. N. M., & Haji-Othman, Y. (2017). Customer intention on Islamic home financing products: an application of theory of planned behavior (TPB). *Mediterranean Journal of Social Sciences, 8*(2), 77-86.

IDC. (2017). *IDC Predicts Saudi ICT Market to Bounce Back in 2017, with NTP Initiatives Spurring Spending to $33.8 Billion.* . [Online]. 2017. Available from: http://www.idc.com/getdoc.jsp?containerId=prCEMA42254117. [Accessed: 30 March 2017].

Idoga, P. E., Toycan, M., Nadiri, H., & Çelebi, E. (2018). Factors affecting the successful adoption of e-health cloud based health system from healthcare consumers' perspective. *IEEE Access, 6*, 71216-71228.

Ifinedo, P. (2017). Using an extended theory of planned behavior to study nurses' adoption of healthcare information systems in Nova Scotia. *International Journal of Technology Diffusion, 8*(1), 1-17.

Ilin, V., Ivetić, J., & Simić, D. (2017). Understanding the determinants of e-business adoption in ERP-enabled firms and non-ERP-enabled firms: A case study of the Western Balkan Peninsula. *Technological Forecasting and Social Change, 125*, 206-223.

Iorga, M., Feldman, L., Barton, R., Martin, M., Goren, N., & Mahmoudi, C. (2017). *The nist definition of fog computing*. National Institute of Standards and Technology.

Iqbal, R., Doctor, F., More, B., Mahmud, S., & Yousuf, U. (2016). Big Data analytics: Computational intelligence techniques and application areas. *International Journal of Information Management*.

Jabali, A. K. J. I. J. o. H. M. (2017). Progress in adopting EHR in Saudi eastern region private hospitals. *10*(1), 13-18.

Janal, R. (2017). Data Portability-A Tale of Two Concepts. *J. Intell. Prop. Info. Tech. & Elec. Com. L., 8*, 59.

Janssen, M., & Joha, A. (2011). Challenges for adopting cloud-based software as a service (saas) in the public sector.

Jelassi, M., Ghazel, C., & Saïdane, L. A. (2017). A survey on quality of service in cloud computing. 2017 3rd International Conference on Frontiers of Signal Processing (ICFSP),

Jeon, T., Vutescu, E. S., Saltzman, E. B., Villa, J. C., Wolfe, S. W., Lee, S. K., Feinberg, J. H., Pownder, S. L., Dyke, J. P., & Sneag, D. B. (2018). Evaluation of two collagen conduits and autograft in rabbit sciatic nerve regeneration with quantitative magnetic resonance DTI, electrophysiology, and histology. *European radiology experimental, 2*(1), 19.

Jiménez-Zarco, A. I., Rospigliosi, A., Martínez-Ruiz, M. P., & Izquierdo-Yusta, A. (2019). Marketing 4.0: enhancing consumer-brand engagement through big data analysis. In *Web Services: Concepts, Methodologies, Tools, and Applications* (pp. 2172-2195). IGI Global.

Jimmerson, C. (2017). *Value stream mapping for healthcare made easy*. CRC Press.

Johanson, G. A., & Brooks, G. P. (2010). Initial scale development: sample size for pilot studies. *Educational and psychological measurement, 70*(3), 394-400.

Johnson, C. M., & Turley, J. P. (2006). The significance of cognitive modeling in building healthcare interfaces. *International Journal of Medical Informatics, 75*(2), 163-172.

Johnson, R. B., & Christensen, L. (2019). *Educational research: Quantitative, qualitative, and mixed approaches*. SAGE Publications, Incorporated.

Johnston, M. P. (2017). Secondary data analysis: A method of which the time has come. *Qualitative and quantitative methods in libraries, 3*(3), 619-626.

Juris Bennett, C., Walston, S. L., & Al-Harbi, A. (2015). Understanding the effects of age, tenure, skill, and gender on employee perceptions of healthcare information technology within a Middle Eastern Hospital. *International Journal of Healthcare Management, 8*(4), 272-280.

Jylhä, T., & Suvanto, M. E. J. F. (2015). Impacts of poor quality of information in the facility management field.

Kadhum, A. M., & Hasan, M. K. (2017). Assessing the determinants of cloud computing services for utilizing health information systems: A case study. *International Journal on Advanced Science, Engineering and Information Technology, 7*(2), 503-510.

Kaltenbrunner, M., Bengtsson, L., Mathiassen, S. E., & Engström, M. (2017). A questionnaire measuring staff perceptions of Lean adoption in healthcare: development and psychometric testing. *BMC health services research, 17*(1), 235.

Kamal, S. A., Shafiq, M., & Kakria, P. J. T. i. S. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). *60*, 101212.

Kansal, N. J., & Chana, I. (2016). Energy-aware virtual machine migration for cloud computing-a firefly optimization approach. *Journal of Grid Computing, 14*(2), 327-345.

Kaplinger, T. E., Moore, V. S., & Nusbickel, W. L. (2018). Self-documentation for representational state transfer (REST) application programming interface (API)

Karim, F., Rampersad, G. J. C., & Science, I. (2017). Factors Affecting the Adoption of Cloud Computing in Saudi Arabian Universities. *10*(2), 109-123.

Kaushik, A., & Kumar, A. (2016). Application of cloud computing in libraries. *International Journal of Information Dissemination and Technology, 3*(4), 270-273.

Kavitha, K. J. I. J. o. I. R. i. C., & Engineering, C. (2014). Study on Cloud Computing Model and its Benefits, Challenges. *2*(1), 2423-2431.

Kebede, D. (2017). *Laboratory Information System for Arada Health Center: Using a Design Approach* Addis Ababa University].

Kellogg, K. M., Hettinger, Z., Shah, M., Wears, R. L., Sellers, C. R., Squires, M., & Fairbanks, R. J. (2017). Our current approach to root cause analysis: is it contributing to our failure to improve patient safety? *BMJ quality & safety, 26*(5), 381-387.

Ketikidis, P., Dimitrovski, T., Lazuras, L., & Bath, P. A. (2012). Acceptance of health information technology in health professionals: An application of the revised technology acceptance model. *Health Informatics Journal, 18*(2), 124-134.

Khan, A., & Woosley, J. M. (2011). Comparison of contemporary technology acceptance models and evaluation of the best fit for health industry organizations. *IJCSET, 1*(11), 709-717.

Khan, M. B., Iqbal, S. J. R., Innovation, & Vision, E. i. S. A. (2020). 7 Vision 2030 and the National Transformation Program. 146.

Khong, P. C. B., Holroyd, E., & Wang, W. (2015). A critical review of the theoretical frameworks and the conceptual factors in the adoption of clinical decision support systems. *CIN: Computers, Informatics, Nursing, 33*(12), 555-570.

Kim, M.-K., Chang, Y., Wong, S. F., & Park, M.-C. (2015). The effect of perceived risks and switching barriers on the intention to use smartphones among non-adopters in Korea. *Information Development, 31*(3), 258-269.

Kim, S., Lee, H., & Chung, Y. D. J. I. j. o. m. i. (2017). Privacy-preserving data cube for electronic medical records: An experimental evaluation. *97*, 33-42.

Kimble, C. (2015). Business models for e-health: Evidence from ten case studies. *Global Business and Organizational Excellence, 34*(4), 18-30.

King, N. J., Raja, V. J. C. L., & Review, S. (2012). Protecting the privacy and security of sensitive customer data in the cloud. *28*(3), 308-319.

Kline, P. (2013). *Handbook of psychological testing* (2, Ed.). Routledge.

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed ed.). The Guilford Press.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec), 11*(4), 1-10.

Kock, N., & Gaskins, L. (2014). The mediating role of voice and accountability in the relationship between Internet diffusion and government corruption in Latin America and Sub-Saharan Africa. *Information Technology for Development, 20*(1), 23-43.

Kock, N., & Lynn, G. (2012a). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for information Systems, 13*(7).

Kock, N., & Lynn, G. (2012b). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of Association for Information Systems, 13*(7), 546-580.

Kruse, C., DeShazo, J., Kim, F., & Fulton, L. (2016). Factors associated with adoption of health information technology: a conceptual model based on a systematic review. JMIR Med Inform. 2014; 2 (1): e9. doi: 10.2196/medinform. 3106. *External Resources Pubmed/Medline (NLM) Crossref (DOI)*.

Kruse, C. S., Frederick, B., Jacobson, T., & Monticone, D. K. (2017). Cybersecurity in healthcare: A systematic review of modern threats and trends. *Technology and Health Care, 25*(1), 1-10.

Kruse, C. S., Kristof, C., Jones, B., Mitchell, E., & Martinez, A. (2016). Barriers to electronic health record adoption: a systematic literature review. *Journal of medical systems, 40*(12), 252.

Kuo, K.-M., Liu, C.-F., Talley, P. C., & Pan, S.-Y. (2018). Strategic improvement for quality and satisfaction of hospital information systems. *Journal of healthcare engineering, 2018*.

Kuo, M.-H. J. J. o. m. I. r. (2011). Opportunities and challenges of cloud computing to improve health care services. *13*(3), e67.

Kyalo, C. K. (2018). *Integration of health management information systems in health care organizations in Kenya* KeMU].

La Rocca, A., & Hoholm, T. J. B. h. s. r. (2017). Coordination between primary and secondary care: the role of electronic messages and economic incentives. *17*(1), 149.

Lai, H.-M. (2015). Explaining Physicians'acceptance And Resistance To The Nhi Pharmacloud: A Theoretical Model And Empirical Test.

Lai, Y., Sun, H., & Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management. *The International Journal of Logistics Management*.

Lakkireddy, D. R., Chung, M. K., Gopinathannair, R., Patton, K. K., Gluckman, T. J., Turagam, M., Cheung, J., Patel, P., Sotomonte, J., & Lampert, R. J. H. R. (2020). Guidance for Cardiac Electrophysiology During the Coronavirus (COVID-19) Pandemic from the Heart Rhythm Society COVID-19 Task Force; Electrophysiology Section of the American College of Cardiology; and the Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, American Heart Association.

Lancaster, G., Kolakowsky-Hayner, S., Kovacich, J., & Greer-Williams, N. (2015). Interdisciplinary communication and collaboration among physicians, nurses, and unlicensed assistive personnel. *Journal of Nursing Scholarship, 47*(3), 275-284.

Lane, A. (2019). The impact of technology on the teaching and assessment of 'systems' diagrams in two online environmental management modules. *Open Learning: The Journal of Open, Distance and e-Learning, 34*(1), 61-77.

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Publications.

Lee, C., & Coughlin, J. F. (2015). PERSPECTIVE: Older adults' adoption of technology: an integrated approach to identifying determinants and barriers. *Journal of Product Innovation Management, 32*(5), 747-759.

Lee, C., Luo, Z., Ngiam, K. Y., Zhang, M., Zheng, K., Chen, G., Ooi, B. C., & Yip, W. L. J. (2017). Big healthcare data analytics: Challenges and applications. In *Handbook of Large-Scale Distributed Computing in Smart Healthcare* (pp. 11-41). Springer.

Lee, T. H. (2015). Regression analysis of cloud computing adoption for US hospitals.

Lee, Y., Kozar, K. A., & Larsen, K. R. J. C. o. t. A. f. i. s. (2003). The technology acceptance model: Past, present, and future. *12*(1), 50.

Leslie, H. H., Hirschhorn, L. R., Marchant, T., Doubova, S. V., Gureje, O., & Kruk, M. E. (2018). Health systems thinking: A new generation of research to improve healthcare quality. *PLoS medicine, 15*(10).

Li, H., Wu, J., Gao, Y., & Shi, Y. J. I. j. o. m. i. (2016). Examining individuals' adoption of healthcare wearable devices: An empirical study from privacy calculus perspective. *88*, 8-17.

Li, H., Wu, J., Liu, L., & Li, Q. (2015). Adoption of Big Data Analytics in Healthcare: The Efficiency and Privacy.

Lian, J.-W. (2017). Establishing a cloud computing success model for hospitals in Taiwan. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 54*, 0046958016685836.

Lian, J.-W., Yen, D. C., & Wang, Y.-T. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management, 34*(1), 28-36.

Liang, C., Gu, D., Tao, F., Jain, H. K., Zhao, Y., & Ding, B. (2017). Influence of mechanism of patient-accessible hospital information system implementation on doctor–patient relationships: A service fairness perspective. *Information & Management, 54*(1), 57-72.

Lim, C., Hernandez, M., Gaona, L., Helu-Brown, P., Barrio, C. J. A., Health, P. i. M., & Research, M. H. S. (2019). A Sociodemographic Profile of Asian Americans Served in Community Mental Health Centers for a Diagnosis of Schizophrenia Spectrum Disorder. *46*(4), 555-567.

Lindgren, B. (2017). *Statistical theory*. Routledge.

Liu, C.-H., Tsai, P.-H., & Chen, C.-Y. (2018). Discrepancy in Taiwanese psychiatrists' preferences for long-acting injectable antipsychotics across facilities: a nationwide questionnaire survey. *Neuropsychiatric disease and treatment, 14*, 429.

Liu, S., Chan, F. T., Yang, J., & Niu, B. (2018). Understanding the effect of cloud computing on organizational agility: An empirical examination. *International Journal of Information Management, 43*, 98-111.

Low, C., Chen, Y., Wu, M. J. I. m., & systems, d. (2011). Understanding the determinants of cloud computing adoption.

Luk, C. Y. (2018). The Impact of Digital Health on Traditional Healthcare Systems and Doctor-Patient Relationships: the case study of Singapore. In *Innovative Perspectives on Public Administration in the Digital Age* (pp. 143-167). IGI Global.

Lune, H., & Berg, B. L. (2017). *Qualitative research methods for the social sciences*. Pearson.

Lynn, T., Liang, X., Gourinovitch, A., Morrison, J. P., Fox, G., & Rosati, P. (2018). Understanding the determinants of cloud computing adoption for high performance computing. 51st Hawaii International Conference on System Sciences (HICSS-51),

Mackert, M., Mabry-Flynn, A., Champlin, S., Donovan, E. E., & Pounders, K. (2016). Health literacy and health information technology adoption: the potential for a new digital divide. *Journal of medical Internet research, 18*(10), e264.

Mahalli, A. E. (2015). Adoption and barriers to adoption of electronic health records by nurses in three governmental hospitals in Eastern Province, Saudi Arabia. *12*(Fall).

Makkah, G. D. o. H. A. i. (2017). *King Faisal Hospital in Makkah* http://mrhb.gov.sa/hospitals/show/025/23

Mamlin, B. W., & Tierney, W. M. J. T. A. j. o. t. m. s. (2016). The promise of information and communication technology in healthcare: extracting value from the chaos. *351*(1), 59-68.

Manning, K. (2017). *Organizational theory in higher education*. Routledge.

Manring, S. L., Rivkin, G. W., & Rivkin, M. D. (2003). The application of network and learning organization models to improve ecosystems management: Monroe 2020 case study. *Environmental Practice, 5*(2), 119-133.

Marangunić, N., & Granić, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *14*(1), 81-95.

Maresova, P., Sobeslav, V., & Krejcar, O. (2017). Cost–benefit analysis–evaluation model of cloud computing deployment for use in companies. *Applied Economics, 49*(6), 521-533.

Marinescu, D. C. (2017). *Cloud computing: theory and practice*. Morgan Kaufmann.

Masana, N., & Muriithi, G. J. I. I. J. (2016). Investigating the adoption of a cloud-based Electronic Medical Record (EMR) system in the Free-State province, South Africa. *15*(1), 18-34.

Masana, N., & Muriithi, G. M. (2019). Adoption of an Integrated Cloud-Based Electronic Medical Record System at Public Healthcare Facilities in Free-State, South Africa. 2019 Conference on Information Communications Technology and Society (ICTAS),

Masrom, M., & Rahimli, A. (2015). Cloud Computing Adoption in the Healthcare Sector: A SWOT Analysis. *Asian Social Science, 11*(10), 12.

Masrom, M., Rahimli, A. J. R. J. o. A. S., Engineering, & Technology. (2014). A review of cloud computing technology solution for healthcare system. *8*(20), 2150-2153.

Mata, P., Kuziemsky, C., & Peyton, L. (2019). A Framework for Performance Management of Clinical Practice.

Maxwell, S. E., Delaney, H. D., & Kelley, K. (2017). *Designing experiments and analyzing data: A model comparison perspective*. Routledge.

McCarthy, J. (1961). Life in the Cloud, Living with Cloud Computing

McGuirk, P. M., & O'Neill, P. (2016). Using questionnaires in qualitative human geography.

McInnes, M. D., Moher, D., Thombs, B. D., McGrath, T. A., Bossuyt, P. M., Clifford, T., Cohen, J. F., Deeks, J. J., Gatsonis, C., & Hooft, L. (2018). Preferred reporting items for a systematic review and meta-analysis of diagnostic test accuracy studies: the PRISMA-DTA statement. *Jama, 319*(4), 388-396.

McKenney, S., & Reeves, T. C. (2018). *Conducting educational design research*. Routledge.

Medicine, C. o., & Hospital, K. A. U. (2017). *King Abdulaziz University Hospital*. https://medicine.ksu.edu.sa/en/node/1247

Mehraeen, E., Ghazisaeedi, M., Farzi, J., & Mirshekari, S. (2017). Security Challenges in Healthcare Cloud Computing: A Systematic. *Global Journal of Health Science, 9*(3).

Meri, A., Hasan, M., Danaee, M., Jaber, M., Safei, N., Dauwed, M., . . . Al-bsheish, M. (2019). Modelling the utilization of cloud health information systems in the Iraqi public healthcare sector. *Telematics Informatics, 36*, 132-146.

Meri, A., Hasan, M. K., & Safie, N. (2017). Success factors affecting the healthcare professionals to utilize cloud computing services. *Asia-Pacific Journal of Information Technology and Multimedia, 6*(2), 31-42.

Meri, A., Hasan, M., & Safie, N. (2017). Towards Utilizing Cloud Health Infonuation Systems: A Proposed Model.

Meshal, A., EL Metwally, A., Anna, A., Jamal, A., Khalifa, M., & Househ, M. (2015). Health Information Technology (HIT) in Arab Countries: A Systematic Review Study on HIT Progress. *Journal of health informatics in developing countries, 9*(2).

Messerli, A. J., Voccio, P., & Hincher, J. C. (2017). Multi-level cloud computing system

Miah, S. J., Hasan, J., Gammack, J. G. J. T., & Informatics. (2017). On-cloud healthcare clinic: an e-health consultancy approach for remote communities in a developing country. *34*(1), 311-322.

Miotto, R., Li, L., Kidd, B. A., & Dudley, J. T. (2016). Deep patient: an unsupervised representation to predict the future of patients from the electronic health records. *Scientific reports, 6*(1), 1-10.

MoH. (2011). National E-Health Strategy, (Online), . *Available from: http://www.moh.gov.sa/en/Ministry/nehs/Pages/default.aspx, 103*(3), 154-155.

MoH. (2018). Digital Health Strategy,Update 2018, . *Avalibe on, https://www.moh.gov.sa/Ministry/vro/eHealth/Documents/MoH-Digital-Health-Strategy-Update.pdf*.

MoH (, 2016). Health statistics annual book.

Moh'd Anwer, A.-S. (2019). Towards better understanding of determinants logistical factors in SMEs for cloud ERP adoption in developing economies. *Business Process Management Journal*.

Mohajan, H. K. (2017). Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University. Economic Series, 17*(4), 59-82.

Mohajan, H. K. (2018). Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development, Environment and People, 7*(1), 23-48.

Mohammadhiwa, A., Afsaneh, D., & Javad, Z. (2019). Determinant factors in applying electronic medical records in healthcare.

Mohammadi, M. M., Poursaberi, R., & Salahshoor, M. R. (2018). Evaluating the adoption of evidence-based practice using Rogers's diffusion of innovation theory: a model testing study. *Health promotion perspectives, 8*(1), 25.

Mohammed, E. A. (2019). Adopting A Cloud Computing Framework For Health Management Information System.

Monecke, A., & Leisch, F. (2012). semPLS: structural equation modeling using partial least squares. *Journal of Statistical Software, 48*(3), 1–32.

Morgan, D. L. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative health research, 8*(3), 362-376.

Morgan, L., & Conboy, K. (2013). Factors affecting the adoption of cloud computing: an exploratory study.

Morrow, D., Hasegawa-Johnson, M., Huang, T., Schuh, W., Azevedo, R. F. L., Gu, K., Zhang, Y., Roy, B., & Garcia-Retamero, R. (2017). A multidisciplinary approach to designing and evaluating Electronic Medical Record portal messages that support patient self-care. *Journal of biomedical informatics, 69*, 63-74.

Mosco, V. (2015). *To the cloud: Big data in a turbulent world*. Routledge.

Moser, A., & Korstjens, I. (2018). Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. *European Journal of General Practice, 24*(1), 9-18.

Moser, C. A., & Kalton, G. (2017). *Survey methods in social investigation*. Routledge.

Mourya, A. K., & Idrees, S. M. (2020). Cloud Computing-Based Approach for Accessing Electronic Health Record for Healthcare Sector. In *Microservices in Big Data Analytics* (pp. 179-188). Springer.

Mousa, R. (2011). *E-government adoption process: XBRL adoption in HM revenue and customs and companies house* University of Birmingham].

Muda, M. N., & Yusof, Z. M. (2015). Conceptual Framework for Knowledge Sharing Initiative in Institution of Higher Learning to Enchance The Teaching Performance and Innovation. *Scientific Journal of PPI-UKM, 2*(1), 10-16.

Mukherjee, M., Matam, R., Shu, L., Maglaras, L., Ferrag, M. A., Choudhury, N., & Kumar, V. (2017). Security and privacy in fog computing: Challenges. *IEEE Access, 5*, 19293-19304.

Munir, A., Kansakar, P., & Khan, S. U. (2017). IFCIoT: Integrated Fog Cloud IoT: A novel architectural paradigm for the future Internet of Things. *IEEE Consumer Electronics Magazine, 6*(3), 74-82.

Nassif, G. T. (2019). *Cloud Computing Adoption in Afghanistan: A Quantitative Study Based on the Technology Acceptance Model* Walden University]. https://search.proquest.com/openview/60e3090ea774e860b8f3f6f8c26a94fb/1.pdf?pq-origsite=gscholar&cbl=18750&diss=y

Nazir, M., Bhardwaj, N., Chawda, R. K., & Mishra, R. G. (2015). Cloud Computing: Current Research Challenges. *Book Chapter of Cloud Computing: Reviews, Surveys, Tools, Techniques and Applications-An Open-Access eBook published by HCTL Open*.

Ndlovu, N. I., & Msweli, P. (2016). Theorizing and institutionalizing operation Sukuma Sakhe: a case study of integrated service delivery. *Environmental economics (Online)*.

Neamah, A. F., bin Ahmad, A., Alomari, E. S., Nuiaa, R. R., & UTeM, F. (2018). E-Health State In Middle East Countries: An Overview.

Nemeth, C. P. (2017). The context for improving healthcare team communication. In *Improving Healthcare Team Communication* (pp. 1-7). CRC Press.

Nguyen, L., Haddad, P., Moghimi, H., Muhammad, I., Coleman, K., Redley, B., Botti, M., & Wickramasinghe, N. (2016). The acceptance of nursing information systems: an analysis using UTAUT. In *Contemporary consumer health informatics* (pp. 347-365). Springer.

Nichols, T. (2017). *The death of expertise: The campaign against established knowledge and why it matters*. Oxford University Press.

Noor, A. (2019). The utilization of e-health in the Kingdom of Saudi Arabia. *International Research Journal of Engineering and Technology, 6*, 1229-1239.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*(1), 1609406917733847.

Nurunnabi, M. J. J. o. t. K. E. (2017). Transformation from an oil-based economy to a knowledge-based economy in Saudi Arabia: the Direction of Saudi Vision 2030. *8*(2), 536-564.

Nwaomah, A. E. (2017). Records information management practices: A study on a faith based University. *Int. J. Innov. Educ. Res., 5*(11), 87-102.

O'Donnell, A., Kaner, E., Shaw, C., & Haighton, C. (2018). Primary care physicians' attitudes to the adoption of electronic medical records: a systematic review and evidence synthesis using the clinical adoption framework. *BMC medical informatics and decision making, 18*(1), 101.

O'Donnell, A., Kaner, E., Shaw, C., Haighton, C. J. B. m. i., & making, d. (2018). Primary care physicians' attitudes to the adoption of electronic medical records: a systematic review and evidence synthesis using the clinical adoption framework. *18*(1), 101.

Odom, S. A. (2017). *Electronic health records: Overcoming obstacles to improve acceptance and utilization for mental health clinicians* Capella University].

Odun-Ayo, I., Ajayi, O., & Falade, A. (2018). Cloud Computing and Quality of Service: Issues and Developments.

Ogunlolu, I., and Dorina Rajanen. (2019). *Cloud Computing Adoption in Organizations: A Literature Review and a Unifying Mode* International Conference On Information Systems Development (Isd2019 Toulon), France.

Ogwel, B., Otieno, G., & Odhiambo-Otieno, G. (2020). Cloud Computing Adoption by Public Hospitals in Kenya: A Technological, Organisational and Behavioural Perspective.

Ogwel, B., Otieno, G., & Odhiambo, G. (2020). Cloud Computing Adoption by Public Hospitals in Kenya A Technological, Organisational and Behavioural Perspective.

Okediran, O. O., Wahab, W. B., & Oyediran, M. O. (2020). Factors Determining the Intention to Use Electronic Health Records: An Extension of the Technology Acceptance Model. *Journal of Scientific Research Reports*, 119-133.

Okediran, O. O., Wahab, W. B., Oyediran, M. O. J. J. o. S. R., & Reports. (2020). Factors Determining the Intention to Use Electronic Health Records: An Extension of the Technology Acceptance Model. 119-133.

Oliveira, T., & Martins, M. F. J. E. J. o. I. S. E. (2011). Literature review of information technology adoption models at firm level. *14*(1), 110.

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management, 51*(5), 497-510.

Omboni, S., Caserini, M., & Coronetti, C. (2016). Telemedicine and m-health in hypertension management: technologies, applications and clinical evidence. *High Blood Pressure & Cardiovascular Prevention, 23*(3), 187-196.

Organization, W. H. (2015). *Global technical strategy for malaria 2016-2030*. World Health Organization.

Organization, W. H. (2019). World health statistics 2019: monitoring health for the SDGs, sustainable development goals.

Osman, A. (2016). *Examining the Fundamental Obstructs of Adopting Cloud Computing for 9-1-1 Dispatch Centers in the USA*. Northcentral University.

Øvrelid, E., Bygstad, B., & Hanseth, O. (2017). Discursive formations and shifting strategies in e-health programmes.

Oyaro, K. M. J. I. M., & Systems, D. (2018). Application of Human Resource Information System at Independent Electoral and Boundaries Commission in Kenya. *119*(1), 210-228.

Özdemir-Güngör, D., Göken, M., Basoglu, N., Shaygan, A., Dabić, M., & Daim, T. U. (2020). An Acceptance Model for the Adoption of Smart Glasses Technology by Healthcare Professionals. In *International Business and Emerging Economy Firms* (pp. 163-194). Springer.

Özdemir, A., & Kabakuş, A. K. (2019). User acceptance of cloud based hospital information system. *Journal of Social Administrative Sciences, 6*(1), 28-46.

Özdemir, A., Kabakuş, A. K. J. J. o. S., & Sciences, A. (2019). User acceptance of cloud based hospital information system. *6*(1), 28-46.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health and mental health services research, 42*(5), 533-544.

Palos-Sanchez, P. R., Arenas-Marquez, F. J., & Aguayo-Camacho, M. (2017). Cloud Computing (SaaS) adoption as a strategic technology: Results of an empirical study. *Mobile Information Systems, 2017*.

Parajuli, A., Kuzgunkaya, O., & Vidyarthi, N. (2017). Responsive contingency planning of capacitated supply networks under disruption risks. *Transportation Research Part E: Logistics and Transportation Review, 102*, 13-37.

Parashar, M., & Hariri, S. (2018). *Autonomic computing: concepts, infrastructure, and applications*. CRC press.

Partners, W. M. (2020). *Health Plans*. © 2020 West Monroe. All Rights Reserved. Retrieved 17/8/2020, 2020, from https://www.westmonroepartners.com/industries/healthcare-life-sciences/health-plans

Patridge, E. F., & Bardyn, T. P. (2018). Research electronic data capture (REDCap). *Journal of the Medical Library Association: JMLA, 106*(1), 142.

Patros, P., Kent, K. B., & Dawson, M. (2017). SLO request modeling, reordering and scaling. Proceedings of the 27th Annual International Conference on Computer Science and Software Engineering,

Peters, G.-J. (2018). The alpha and the omega of scale reliability and validity: why and how to abandon Cronbach's alpha and the route towards more comprehensive assessment of scale quality.

Petratos, P. (2018). Why the economic calculation debate matters: The case for decentralisation in healthcare. In *Marketisation, Ethics and Healthcare* (pp. 13-31). Routledge.

Pişirir, E., Uçar, E., Chouseinoglou, O., & Sevgi, C. J. K. (2019). Structural equation modeling in cloud computing studies: a systematic literature review.

Plakosh, D., Hissam, S., & Wallnau, K. (1999). *Into the Black Box: A Case Study in Obtaining Visibility into Commercial Software*. DTIC Document.

Plsek, P. E., & Greenhalgh, T. (2001). Complexity science: The challenge of complexity in health care. *BMJ: British Medical Journal, 323*(7313), 625.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.

Poenaru, C. E., Dobrescu, R., & Merezeanu, D. (2017). Fractal Organization in Healthcare Information Systems. 2017 21st International Conference on Control Systems and Computer Science (CSCS),

Porselvi, W., Jublee, D. D., & Sivanesan, D. G. (2018). A Study on Factors Influencing Adoption of Technology and Innovation in Banking Industry, Tamilnadu, India. *International Journal of Mechanical Engineering and Technology, 9*(5).

Prasanna, R., & Huggins, T. J. (2016). Factors affecting the acceptance of information systems supporting emergency operations centres. *Computers in Human Behavior, 57*, 168-181.

Proctor, R. W., & Van Zandt, T. (2018). *Human factors in simple and complex systems*. CRC press.

Puklavec, B., Oliveira, T., & Popovič, A. (2018). Understanding the determinants of business intelligence system adoption stages. *Industrial Management & Data Systems*.

Pussewalage, H. S. G., & Oleshchuk, V. A. (2016). Privacy preserving mechanisms for enforcing security and privacy requirements in E-health solutions. *International Journal of Information Management, 36*(6), 1161-1173.

Qasem, Y. A., Abdullah, R., Atan, R., & Jusoh, Y. Y. (2018). Mapping and analyzing process of cloud-based education as a service (CEaaS) model for cloud computing adoption in higher education institutions. 2018 Fourth international conference on information retrieval and knowledge management (CAMP),

Qusef, A., Daradkeh, M., & Murad, S. (2019). A Strategic Approach for Patient-Centric E-Healthcare Development: Informatics Solution HIT as Case Study. In *Strategic Thinking, Planning, and Management Practice in the Arab World* (pp. 211-237). IGI Global.

Rad, B. B., Diaby, T., & Rana, M. E. (2017). Cloud computing adoption: a short review of issues and challenges. Proceedings of the 2017 International Conference on E-commerce, E-Business and E-Government,

Rahi, S. B., Bisui, S., & Misra, S. C. J. I. J. o. C. S. (2017). Identifying the moderating effect of trust on the adoption of cloud-based services. *30*(11), e3253.

Rahimi, B., Nadri, H., Afshar, H. L., & Timpka, T. (2018a). A systematic review of the technology acceptance model in health informatics. *Applied clinical informatics, 9*(3), 604.

Rahimi, B., Nadri, H., Afshar, H. L., & Timpka, T. J. A. c. i. (2018b). A systematic review of the technology acceptance model in health informatics. *9*(3), 604.

Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Memon, M. A. (2016). Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3.0: An Updated Guide and Practical Guide to Statistical Analysis

Rashid, A. H. (2014). *Collaborative healthcare information systems in privacy preservation based on K-anonymization model* University of Malaya].

Rashid, A. H., & Yasin, N. B. M. (2015). Sharing healthcare information based on privacy preservation. *Scientific Research and Essays, 10*(5), 184-195.

Rasmi, M., Alazzam, M. B., Alsmadi, M. K., Almarashdeh, I. A., Alkhasawneh, R. A., & Alsmadi, S. (2018). Healthcare professionals' acceptance Electronic Health Records system: Critical literature review (Jordan case study). *International Journal of Healthcare Management*, 1-13.

Ratnam, K. A., Dominic, P., & Ramayah, T. J. J. o. m. s. (2014). A structural equation modeling approach for the adoption of cloud computing to enhance the Malaysian healthcare sector. *38*(8), 82.

Raut, R., Priyadarshinee, P., & Jha, M. (2018). Understanding the mediation effect of cloud computing adoption in Indian organization: integrating TAM-TOE-Risk model. In *Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications* (pp. 675-697). IGI Global.

Razmak, J. (2016). *Innovative technology and change management: E-health applications in Canada* Laurentian University of Sudbury].

Razzaque, M. A., Milojevic-Jevric, M., Palade, A., & Clarke, S. (2015). Middleware for internet of things: a survey. *IEEE Internet of things journal, 3*(1), 70-95.

Reeves, S., Pelone, F., Harrison, R., Goldman, J., & Zwarenstein, M. (2017). Interprofessional collaboration to improve professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*(6).

Rejeb, O., Pilet, C., Hamana, S., Xie, X., Durand, T., Aloui, S., Doly, A., Biron, P., Perrier, L., & Augusto, V. (2018). Performance and cost evaluation of health information systems using micro-costing and discrete-event simulation. *Health Care Management Science, 21*(2), 204-223.

Remondino, M. (2020). IT Tools and Performance Indicators: A Qualitative Overview of Managerial, Organizational, Financial Strategies within Healthcare Sector. *International Journal of Business and Management, 2*(15).

Ren, L., Zhang, L., Wang, L., Tao, F., & Chai, X. (2017). Cloud manufacturing: key characteristics and applications. *International journal of computer integrated manufacturing, 30*(6), 501-515.

Rezvani, Z., Jansson, J., & Bodin, J. (2015). Advances in consumer electric vehicle adoption research: A review and research agenda. *Transportation research part D: transport and environment, 34*, 122-136.

Riahi, G. (2015). E-learning systems based on cloud computing: A review. SCSE,

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). *SmartPLS 3. Bonningstedt*. SmartPLS. Retrieved 25/2/2018, 2018, from https://www.smartpls.com/

Rittinghouse, J. W., & Ransome, J. F. (2016). Cloud computing: implementation, management, and security. CRC press.

Roehrs, A., da Costa, C. A., & da Rosa Righi, R. (2017). OmniPHR: A distributed architecture model to integrate personal health records. *Journal of biomedical informatics, 71*, 70-81.

Rogers, E. (1995). Diffusion of Innovations (4th Eds.) ACM The Free Press (Sept. 2001). *New York*, 15-23.

Rogers, E. M., Burdge, R. J., & Korsching, P. F. (1983). Diffusion of innovations (3rd editions) New York

Romanelli, M. (2016). New Technologies for Sustainable Health Care. International Conference on Exploring Services Science,

Rosas, S. R., & Ridings, J. W. (2017). The use of concept mapping in measurement development and evaluation: application and future directions. *Evaluation and program planning, 60*, 265-276.

Ross, J., Stevenson, F., Lau, R., & Murray, E. (2016). Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update). *Implementation science, 11*(1), 146.

Roy, S., Das, A. K., Chatterjee, S., Kumar, N., Chattopadhyay, S., & Rodrigues, J. J. J. I. T. o. I. I. (2018). Provably secure fine-grained data access control over multiple cloud servers in mobile cloud computing based healthcare applications. *15*(1), 457-468.

Sabr, D. S., & Neamah, A. F. (2017). Iraqi electronic government in health care. 2017 International Conference on Computer and Applications (ICCA),

Sadoughi, F., Omar Ali, and Leila Erfannia. (2019). Evaluating the factors that influence cloud technology adoption—comparative case analysis of health and non-health sectors: A systematic review. *Health informatics journal*, 1460458219879340.

Sadreddini, M. (2012). A framework for integrating distributed healthcare information systems. *International Journal of Information Science and Management (IJISM), 1*(1), 56-70.

Safdari, R., Saeedi, M. G., Valinejadi, A., Bouraghi, H., Shahnavazi, H. J. I. J. o. C. S., & Security, N. (2017). Technology Acceptance Model in health care centers of Iran. *17*(1), 42.

Salam, A. A., Elsegaey, I., Khraif, R., & Al-Mutairi, A. (2014). Population distribution and household conditions in Saudi Arabia: reflections from the 2010 Census. *SpringerPlus, 3*(1), 1.

Salkind, N. J. (2007). *Encyclopedia of measurement and statistics* (Vol. 1). Sage.

Sana'a, Y. J. I. j. o. h. i. t. (2016). A critical review of models and theories in field of individual acceptance of technology. *9*(6), 143-158.

Sandu, R., & Gide, E. (2018). Technological, Organisational and Environmental (TOE) factors that influence the adoption of Cloud based service SMEs in India. 2018 IEEE 11th International Conference on Cloud Computing (CLOUD),

Santoso, H. B., Nisa, A. K., & Fitriansyah, R. J. I. J. A. S. E. I. T. (2017). Usability evaluation of the Hospital Management Information System: Case study of an emergency installation application of a regional public hospital. *7*(6), 2294-2301.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy, 5*(1), 105-115.

Sarwar, A., Manhas, J., Sharma, V. J. T. S. o. e.-G. P., Processes, & Technologies. (2018). ICT in Healthcare. 31.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students 6th ed*. Pearson Education Limited.

Saunders, M. L., & Lewis, P. (2009). P. & thornhill, a.(2009). *Research methods for business students, 4*.

Schabenberger, O., & Gotway, C. A. (2017). *Statistical methods for spatial data analysis*. CRC press.

Schaltegger, S., & Burritt, R. (2017). *Contemporary environmental accounting: issues, concepts and practice*. Routledge.

Scherbov, S., Sanderson, W., & Andruchowitz, S. (2020). Aging Demographic Data Sheet 2020.

Schiza, E. C., Kyprianou, T. C., Petkov, N., Schizas, C. N. J. I. j. o. b., & informatics, h. (2018). Proposal for an ehealth based ecosystem serving national healthcare. *23*(3), 1346-1357.

Schneider, S., & Sunyaev, A. (2016). Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing. *Journal of information technology, 31*(1), 1-31.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie, 69*(2), 107-131.

Schotter, A. P., Mudambi, R., Doz, Y. L., & Gaur, A. (2017). Boundary spanning in global organizations. *Journal of Management Studies, 54*(4), 403-421.

Scott, W. R., & Christensen, S. (1995). *The institutional construction of organizations: International and longitudinal studies*. Sage Publications, Inc.

Seçkin, G., Yeatts, D., Hughes, S., Hudson, C., & Bell, V. J. J. o. m. I. r. (2016). Being an informed consumer of health information and assessment of electronic health literacy in a national sample of internet users: validity and reliability of the e-HLS instrument. *18*(7), e161.

Seddon, J. J., Currie, W. L. J. H. p., & technology. (2013). Cloud computing and trans-border health data: Unpacking US and EU healthcare regulation and compliance. *2*(4), 229-241.

Sekaran, U., & Bougie, R. (2009). Research Methods for Business (PDFDrive. com)(V). Chichester

Selwyn, N. (2020). *Telling tales on technology: Qualitative studies of technology and education*. Routledge.

Sen, J. (2015). Security and privacy issues in cloud computing. In *Cloud Technology: Concepts, Methodologies, Tools, and Applications* (pp. 1585-1630). IGI Global.

Senarathna, I., Yeoh, W., Warren, M., & Salzman, S. (2016). Security and Privacy Concerns for Australian SMEs Cloud Adoption: Empirical Study of Metropolitan Vs Regional SMEs. *Australasian Journal of Information Systems, 20*.

Senyo, P. K., Addae, E., & Boateng, R. (2018). Cloud computing research: A review of research themes, frameworks, methods and future research directions. *International Journal of Information Management, 38*(1), 128-139.

Shaashua, T. M., & Shaashua, O. (2017). Interoperability mechanisms for internet of things integration platform

Shah, B., & Gregar, A. (2019). Workplace flexibility to improve organizational performance. *Scientific papers of the University of Pardubice. Series D, Faculty of Economics and Administration. 45/2019*.

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F., & Hu, Y. J. J. o. B. D. (2019). Investigating the adoption of big data analytics in healthcare: the moderating role of resistance to change. *Journal of Big Data, 6*(1), 6.

Shahmoradi, L. (2016). Letter To The Editor: Integration Of Health Information Systems To Promote Health.

Sharma, R., & Mishra, R. (2017). Investigating the role of intermediaries in adoption of public access outlets for delivery of e-Government services in developing countries: An empirical study. *Government Information Quarterly, 34*(4), 658-679.

Sharma, S. K., Al-Badi, A. H., Govindaluri, S. M., & Al-Kharusi, M. (2016). Predicting motivators of cloud computing adoption: A developing country perspective. *Computers in Human Behavior, 62*, 61-69.

Sharma, S. K., & Govindaluri, S. M. (2014). Internet banking adoption in India. *Journal of Indian Business Research*.

Sheeran, P., Klein, W. M., & Rothman, A. J. (2017). Health behavior change: Moving from observation to intervention. *Annual review of psychology, 68*, 573-600.

Shim, H., & Kim, K. J. (2018). An exploration of the motivations for binge-watching and the role of individual differences. *Computers in Human Behavior, 82*, 94-100.

Shim, S., Lee, B., & Kim, S. L. (2018a). Rival precedence and open platform adoption: An empirical analysis. *38*(1), 217-231.

Shim, S., Lee, B., & Kim, S. L. (2018b). Rival precedence and open platform adoption: An empirical analysis. *International Journal of Information Management, 38*(1), 217-231.

Shukur, B. S., Ghani, M. K. A., & Burhanuddin, M. (2018a). An Analysis of Cloud Computing Adoption Framework for Iraqi e-Government. *culture, 19*, 34.

Shukur, B. S., Ghani, M. K. A., & Burhanuddin, M. J. C. (2018b). An Analysis of Cloud Computing Adoption Framework for Iraqi e-Government. *19*, 34.

Sighom, N., Raphael, J., Zhang, P., & You, L. (2017). Security enhancement for data migration in the cloud. *Future Internet, 9*(3), 23.

Simon, J. L. (1969). Basic research methods in social science.

Singh, L., Bansal, S., Bode, L., Budak, C., Chi, G., Kawintiranon, K., Padden, C., Vanarsdall, R., Vraga, E., & Wang, Y. J. a. p. a. (2020). A first look at COVID-19 information and misinformation sharing on Twitter.

Singla, A., Ahuja, I. S., & Sethi, A. (2018). Technology push and demand pull practices for achieving sustainable development in manufacturing industries. *Journal of Manufacturing Technology Management*.

Singla, A., Sethi, A., & Ahuja, I. S. (2018). A study of transitions between technology push and demand pull strategies for accomplishing sustainable development in manufacturing industries. *World Journal of Science, Technology and Sustainable Development*.

Sirajudeen, M. S., Muthusamy, H., Alqahtani, M., Waly, M., & Jilani, A. K. (2018). Computer-related health problems among university students in Majmaah region, Saudi Arabia. *Biomedical Research, 29*(11).

Sirintrapun, S. J., & Artz, D. R. (2015, Jun). Health Information Systems. *Surg Pathol Clin, 8*(2), 255-268. https://doi.org/10.1016/j.path.2015.02.014

Sirintrapun, S. J., & Artz, D. R. J. S. p. c. (2015). Health information systems. *Surgical pathology clinics, 8*(2), 255-268.

Sittig, D. F., & Singh, H. (2015). A new socio-technical model for studying health information technology in complex adaptive healthcare systems. In *Cognitive informatics for biomedicine* (pp. 59-80). Springer.

Slemp, G. R., Kern, M. L., Patrick, K. J., & Ryan, R. M. (2018). Leader autonomy support in the workplace: A meta-analytic review. *Motivation and emotion, 42*(5), 706-724.

Sligo, J., Gauld, R., Roberts, V., & Villa, L. J. I. j. o. m. i. (2017). A literature review for large-scale health information system project planning, implementation and evaluation. *97*, 86-97.

Sneha, S., & Straub, D. (2017). E-Health: Value Proposition and Technologies Enabling Collaborative Healthcare. Proceedings of the 50th Hawaii International Conference on System Sciences,

Softpedia. (2008, viewed 23 October 2012). MySQL description: MySQL is the world's most popular open source database.

Soliman, M., Saurin, T. A., & Anzanello, M. J. (2018). The impacts of lean production on the complexity of socio-technical systems. *International Journal of Production Economics, 197*, 342-357.

Sołtysik-Piorunkiewicz, A. (2016). Organization of healthcare entity: the study of hospital information system.[in:] R. *Innowacje w zarządzaniu i inżynierii produkcji, PTZP, Opole*, 141-147.

Somani, G., Gaur, M. S., Sanghi, D., Conti, M., & Buyya, R. (2017). DDoS attacks in cloud computing: Issues, taxonomy, and future directions. *Computer Communications, 107*, 30-48.

Sousa, V. E., Matson, J., & Dunn Lopez, K. (2017). Questionnaire adapting: little changes mean a lot. *Western Journal of Nursing Research, 39*(9), 1289-1300.

Spector, P. E. (2006). Method variance in organizational research: truth or urban legend? *Organizational Research Methods, 9*(2), 221-232.

Staley, D. J. (2015). *Computers, visualization, and history: How new technology will transform our understanding of the past*. Routledge.

Stevens, J. P. (2012). Exploratory and confirmatory factor analysis. In *Applied multivariate statistics for the social sciences* (pp. 337-406). Routledge.

Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the royal statistical society. Series B (Methodological)*, 111-147.

Streukens, S., & Leroi-Werelds, S. (2016). Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results. *European Management Journal, 34*(6), 618-632.

Sulaiman, H., & Magaireah, A. I. (2014). Factors affecting the adoption of integrated cloudbased e-health record in healthcare organizations: A case study of Jordan. Proceedings of the 6th International Conference on Information Technology and Multimedia,

Sultan, N. (2014). Making use of cloud computing for healthcare provision: Opportunities and challenges. *International Journal of Information Management, 34*(2), 177-184.

Sun, S., Cegielski, C. G., Jia, L., & Hall, D. J. (2018). Understanding the factors affecting the organizational adoption of big data. *Journal of Computer Information Systems, 58*(3), 193-203.

Svantesson, D., Clarke, R. J. C. l., & review, s. (2010). Privacy and consumer risks in cloud computing. *26*(4), 391-397.

Swartz, M. E., & Krull, I. S. (2018). *Analytical method development and validation*. CRC Press.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (5 ed.). Allyn and Bacon.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education, 48*(6), 1273-1296.

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia manufacturing, 22*, 960-967.

Tai-Seale, M., Olson, C. W., Li, J., Chan, A. S., Morikawa, C., Durbin, M., Wang, W., & Luft, H. S. (2017). Electronic health record logs indicate that physicians split time evenly between seeing patients and desktop medicine. *Health Affairs, 36*(4), 655-662.

Tarafdar, N., Lin, T., Fukuda, E., Bannazadeh, H., Leon-Garcia, A., & Chow, P. (2017). Enabling flexible network FPGA clusters in a heterogeneous cloud data center. Proceedings of the 2017 ACM/SIGDA International Symposium on Field-Programmable Gate Arrays,

Tarhini, A. A.-G., Khamis & Al-Badi, Ali & Alhinai, Yousuf. (2018). An Analysis of the Factors Affecting the Adoption of Cloud Computing in Higher Educational Institutions: A Developing Country Perspective. *International Journal of Cloud Applications and Computing (IJCAC), 8.*(10), 49-71.

Tarver, W. L., Menachemi, Nir. (2016). The impact of health information technology on cancer care across the continuum: a systematic review and meta-analysis. *Journal of the American Medical Informatics Association, 23*(2), 420-427.

Tashkandi, A., & Al-Jabri, I. (2015). Cloud computing adoption by higher education institutions in Saudi Arabia: Analysis based on TOE. 2015 International Conference on Cloud Computing (ICCC),

Tashkandi, A., & Al-Jabri, I. M. (2015). Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia. 2015 International Conference on Cloud Computing, Riyadh, Saudi Arabia,

Tashkandi, A. N., & Al-Jabri, I. M. (2015). Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study. *Cluster Computing, 18*(4), 1527-1537.

TEAM, D. (2019). Features of Cloud Computing, 10 Major Characteristics of Cloud Computing. *Data Flair , Cloud Computing Tutorials,* https://data-flair.training/blogs/features-of-cloud-computing/.

Tech, C. (2020). How cloud computing is keeping us connected amid the Covid-19 pandemic. *CLOUD-TECH,* http://www.cloudcomputing-news.net/.

Teo, T. (2019). Students and teachers' intention to use technology: Assessing their measurement equivalence and structural invariance. *Journal of Educational Computing Research, 57*(1), 201-225.

Teo, T., & Zhou, M. (2017). The influence of teachers' conceptions of teaching and learning on their technology acceptance. *Interactive Learning Environments, 25*(4), 513-527.

Teo, T. S., Srivastava, S. C., & Jiang, L. (2008). Trust and electronic government success: An empirical study. *Journal of management information systems, 25*(3), 99-132.

Thomas, D. R. (2017). Feedback from research participants: are member checks useful in qualitative research? *Qualitative Research in Psychology, 14*(1), 23-41.

Thombs, D. L., & Osborn, C. J. (2019). *Introduction to addictive behaviors*. Guilford Publications.

Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *Processes of technological innovation*. Lexington Books.

Tracy, S. J. (2019). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. John Wiley & Sons.

Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., Chastin, S. F., Altenburg, T. M., & Chinapaw, M. J. (2017). Sedentary behavior research network (SBRN)–terminology consensus project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 75.

Tsai, J. C.-A., & Hung, S.-Y. (2016). Determinants of Knowledge Management System Adoption in Healthcare. *Journal of Organizational Computing and Electronic Commerce*(just-accepted).

Tu, M. (2018). An exploratory study of Internet of Things (IoT) adoption intention in logistics and supply chain management. *The International Journal of Logistics Management*.

Turan, A. H., Palvia, P. C. J. I., & Management. (2014). Critical information technology issues in Turkish healthcare. *51*(1), 57-68.

Tweel, A. (2012). *Examining the relationship between technological, organizational, and environmental factors and cloud computing adoption*. Northcentral University.

ul Amin, R., Inayat, I., Shahzad, B., Saleem, K., & Aijun, L. J. A. o. T. (2017). An empirical study on acceptance of secure healthcare service in Malaysia, Pakistan, and Saudi Arabia: a mobile cloud computing perspective. *72*(5-6), 253-264.

Uluç, I., & Çiğdem, N. (2016). A comparative field study in four emerging markets; Turkey, Kingdom of Saudi Arabia, United Arab Emirates and Egypt on e-health development challenges and utilization capabilities.

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *JITTA: Journal of Information Technology Theory and Application, 11*(2), 5.

Usman, U. M. Z., Ahmad, M. N., & Zakaria, N. H. (2019). The Determinants of Adoption of Cloud-Based ERP of Nigerian's SMES Manufacturing Sector Using Toe Framework and Doi Theory. *International Journal of Enterprise Information Systems (IJEIS), 15*(3), 27-43.

Vasileva, V. (2018). A holistic approach to understanding sustainable consumer behavior and attitudes toward sustainable consumption: case company EcoGarmonia.

Vaubel, R., & Willett, T. D. (2019). *The political economy of international organizations: A public choice approach*. Routledge.

Velte, A. T., & Velte, T. J. (2019). *Cloud computing: a practical approach*. McGraw-Hill.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of partial least squares: Concepts, methods and applications*. Springer Science & Business Media.

Vision, S. (2018). 2030 (2016) National Transformation Program 2020 Available at http://vision2030. gov. sa/sites/default/files/NTP_En. pdf

Vitolo, C., Elkhatib, Y., Reusser, D., Macleod, C. J., & Buytaert, W. (2015). Web technologies for environmental Big Data. *Environmental Modelling & Software, 63*, 185-198.

Wager, K. A., Lee, F. W., & Glaser, J. P. (2017). *Health care information systems: a practical approach for health care management*. John Wiley & Sons.

Wagner, A., Michaelis, M., Luntz, E., Wittich, A., Schrappe, M., Lessing, C., & Rieger, M. A. (2018). Assessment of patient and occupational safety culture in hospitals: development of a questionnaire with comparable dimensions and results of a feasibility study in a German university hospital. *International journal of environmental research and public health, 15*(12), 2625.

Wang, H.-J., & Lo, J. (2016). Adoption of open government data among government agencies. *Government Information Quarterly, 33*(1), 80-88.

Wang, L., Ranjan, R., Chen, J., & Benatallah, B. (2017). *Cloud computing: methodology, systems, and applications*. CRC Press.

Wang, N., Liang, H., Jia, Y., Ge, S., Xue, Y., & Wang, Z. (2016). Cloud computing research in the IS discipline: A citation/co-citation analysis. *Decision support systems, 86*, 35-47.

Wang, X., Wu, H., & Hsu, C.-H. (2018). Mashup-oriented API recommendation via random walk on knowledge graph. *IEEE Access, 7*, 7651-7662.

Wang, Y., Kung, L., & Byrd, T. A. (2018). Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations. *Technological Forecasting*

Social Change, 126, 3-13.

Washington, S., Karlaftis, M. G., Mannering, F., & Anastasopoulos, P. (2020). *Statistical and econometric methods for transportation data analysis*. CRC press.

Watkins, M. W. (2017). The reliability of multidimensional neuropsychological measures: From alpha to omega. *The Clinical Neuropsychologist, 31*(6-7), 1113-1126.

Weber, A. S., Turjoman, R., Shaheen, Y., Al Sayyed, F., Hwang, M. J., & Malick, F. (2016). Systematic thematic review of e-health research in the Gulf Cooperation Council (Arabian Gulf): Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. *Journal of Telemedicine and Telecare*, 1357633X16647894.

Wen, D., Zhang, X., Wan, J., Fu, J., & Lei, J. (2017). The challenges of emerging HISs in bridging the communication gaps among physicians and nurses in China: an interview study. *BMC medical informatics and decision making, 17*(1), 85.

Weng, S.-J., Gotcher, D., Wu, H.-H., Xu, Y.-Y., Yang, C.-W., & Lai, L.-S. J. J. o. m. s. (2016). Cloud image data center for healthcare network in Taiwan. *40*(4), 89.

Wibowo, S., & Mubarak, S. (2020). Exploring Stakeholders Perceived Risk and Trust Towards their Intention to Adopt Cloud Computing: A Theoretical Framework. PACIS,

Williams, B. (2012). *The economics of cloud computing*. Cisco Press.

Wilson, C., Hargreaves, T., & Hauxwell-Baldwin, R. (2017). Benefits and risks of smart home technologies. *Energy Policy, 103*, 72-83.

Wingo, N. P., Ivankova, N. V., & Moss, J. A. (2017). Faculty perceptions about teaching online: Exploring the literature using the technology acceptance model as an organizing framework. *Online Learning, 21*(1), 15-35.

Winston, T. G., Paul, S., & Iyer, L. (2016). A Study of Privacy and Security Concerns on Doctors' and Nurses' Behavioral Intentions to Use RFID in Hospitals. 2016 49th Hawaii International Conference on System Sciences (HICSS),

Wu, X. Y., Han, L. H., Zhang, J. H., Luo, S., Hu, J. W., & Sun, K. (2017). The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. *PloS one, 12*(11).

Yaman, K., Er, K., & Köroğlu, E. Ö. (2016). Importance of Pricing for Hospitals‟ Expenses from Financial and Social Perspectives.

Yan, Z., Zhang, P., Vasilakos, A. V. J. S., & networks, c. (2016). A security and trust framework for virtualized networks and software-defined networking. *9*(16), 3059-3069.

Yeboah-Boateng, E. O., Essandoh, K. A. J. I. J. o. E. S., & Engineering. (2014). Factors influencing the adoption of cloud computing by small and medium enterprises in developing economies. *2*(4), 13-20.

Yeh, M.-Y., Wu, S.-C., & Tung, T.-H. (2018). The relation between patient education, patient empowerment and patient satisfaction: A cross-sectional-comparison study. *Applied nursing research, 39*, 11-17.

Yeow, A., & Huat Goh, K. J. M. Q. (2015). Work Harder or Work Smarter? Information Technology and Resource Allocation in Healthcare Processes. *39*(4).

Yoo, S.-K., & Kim, B.-Y. J. S. (2018). A decision-making model for adopting a cloud computing system. *10*(8), 2952.

Youssef, A. E., & Mostafa, A. M. (2019). Critical Decision-Making on Cloud Computing Adoption in Organizations Based on Augmented Force Field Analysis. *IEEE Access, 7*, 167229-167239.

Youssif, M. M., Cloodt, M., Reymen, I., & Peeters, T. (2017). Cloud Computing in the Dutch Healthcare.

Yusif, S., Hafeez-Baig, A., & Soar, J. (2017). E-health readiness assessment factors and measuring tools: a systematic review. *International journal of medical informatics, 107*, 56-64.

Yusof, M. M., Kuljis, J., Papazafeiropoulou, A., & Stergioulas, L. K. J. I. j. o. m. i. (2008). An evaluation framework for Health Information Systems: human, organization and technology-fit factors (HOT-fit). *77*(6), 386-398.

Zafar, Z., Islam, S., Aslam, M. S., & Sohaib, M. (2014). Cloud computing services for the healthcare industry. *Int J Multidiscip Sci Eng, 5*, 25-29.

Zaied, A. N. H., Elmogy, M., & Elkader, S. A. (2015). Electronic Health Records: Applications, Techniques and Challenges. *International Journal of Computer Applications, 119*(14).

Zayyad, M. A., & Toycan, M. (2018). Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals. *PeerJ, 6*, e4436.

Zhang, L. (2020). An institutional approach to gender diversity and firm performance. *Organization Science, 31*(2), 439-457.

Zhou, J., Cao, Z., Dong, X., & Vasilakos, A. (2017). Security and privacy for cloud-based IoT: Challenges. *55*(1), 26-33.

Zhou, M., Zhao, L., Kong, N., Campy, K. S., Qu, S., & Wang, S. J. I. j. o. m. i. (2019). Factors influencing behavior intentions to telehealth by Chinese elderly: An extended TAM model. *126*, 118-127.

Zikmund, W. (2003). *Business research methods* (7th ed ed.). Thomson/South-Western.

Zikmund, W., Babin, B., Carr, J., & Griffin, M. (2013). *Business research methods*. Cengage Learning.

Zineldin, M., & Vasicheva, V. (2017). *Technological Tools for Value-Based Sustainable Relationships in Health: Emerging Research and Opportunities: Emerging Research and Opportunities*. IGI Global.

Zoumpoulaki, A., Alsufyani, A., & Bowman, H. (2015). Resampling the peak, some dos and don'ts. *Psychophysiology, 52*(3), 444-448.

LIST OF PUBLICATIONS AND PAPERS PRESENTED

1- Shady Gomaa Abdulaziz, N. B. M. Y. (2019). An Exploratory Study to Understand the Critical Factors Affecting the Decision to Adopt Cloud Computing in Saudi Hospitals. PONTE Journal, Volume 75(6/12). **(ISI-Publication)** **http://dx.doi.org/10.21506/j.ponte.2019.6.12**

2- Shady Gomaa Abdulaziz, N. B. M. Y. (2019). Architecture Design for Electronic Health Cloud - As Service to Improve Collaboration in Healthcare Organizations. PONTE Journal, Volume75(4/1), 64-83. **(ISI-Publication)** **http://dx.doi.org/10.21506/j.ponte.2019.4.6**

3- Rashid, A. H., Abdulaziz, S. G., & Yasin, N. B. (2018, April 29). Using Healthcare Information Systems to analysis the Cancer Disease Development in Arab world. Journal of Advanced Sciences and Engineering Technologies, 1(1), 43-47. Retrieved from http://www.isnra.com/ojs/index.php/JASET/article/view/73

4- Rashid, A. H., Abdulaziz, S. G., & Yasin, N. B. M. (2018, April 29). Investigation to Adoption of Collaborative Health Information Systems using Extended Technology Acceptance Model: A Qualitative Research Study. Journal of Advanced Sciences and Engineering Technologies, 1(1), 17-29. Retrieved from http://www.isnra.com/ojs/index.php/JASET/article/view/66

5- Asmaa Hatem Rashid, S. G. A., Norizan Binti Mohd Yasin. (2018). Technology Acceptance Models to Improve Adoption of Health Information Systems. [full paper]. Journal of advanced Sciences and Engineering Technologies (JASET), 1(2), 31-37.