إقـــــرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

"Determents and Challenges of Cloud Computing - Adoption in the Palestinian Ministry of Health"

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Joint Graduate Program Between
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And Al-Aqsa University

Management & Leadership Program

Determents and Challenges of Cloud Computing Adoption in the Palestinian Ministry of Health

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Master Degree in Management & Leadership

(2016 AD, 1437 AH)

نتيجة الحكم على أطروحة الماجستير

بناءً على موافقة المجلس الأكاديمي بأكاديمية الإدارة والسياسة للدراسات العليا على تشكيل لجنة الحكم على أطروحة الباحث/ **أدهم فتحي يوسف اللداوي**، لنيل درجة الماجستير في تخصص **القيادة والإدارة**، وموضوعها:

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- Adoption in the Palestinian Ministry of Health"

وبعد المناقشة التي تمت اليوم الثلاثاء 14 شوّال 1437 هـ، الموافق 2016/07/19م الساعة الحادية عشرة صباحاً، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في تخصص **القيادة والإدارة**.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ولزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق،،،

رئيس الأكاديمية

أ. د. محمد إبراهيم المدهون

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

(وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ)

التوبة (105)

Abstract

Cloud Computing is one the major factors that greatly contribute to E-health, which has become a necessary part of our life, as well as states have shown real concern in applying cloud computing, therefore, governments are racing against time to provide E health services for patients, physicians and employees of healthcare sector, thus, healthcare sector must move increasingly in technical development, in particular modern and useful techniques as cloud computing.

Cloud computing various benefits such as agility, greater flexibility, capability, cost reduction, and optimal resource utilization. Cloud Computing refers to data, processing power, or software stored on remote servers made accessible by the Internet as opposed to one's own computers.

Ministry of Health (MoH) in Gaza Strip established information systems (IS) division a decade ago. Since then, IT operations has developed IS gradually, however they began to work in cloud computing system of developed countries, in addition to introduce the concept of cloud computing by its operations as well as exert efforts to develop IS to improve both quality and efficiency.

This research contributes to Cloud Computing technology adoption and knowledge of main determinants and challenges in MoH at Palestinian authority, specifically information technology staff of MoH.

The research aims to find out determinants and main challenges of adopting cloud computing technology at MoH, thereby the study is applied on information technology staff of MoH. The results show weakness of some main determinants and the possibility of addressing it through hybrid cloud, and to developing various health data protection techniques. The research follows a descriptive analytical method which is appropriate to the nature of the topic and uses questionnaire, interview, and focuses on key aspects of cloud based services and solutions to achieve optimal results.

Key words: Cloud Adoption; Cloud Computing; Determinants; Challenges; Healthcare.

ملخص الدراسة

تشهد تكنولوجيا الحوسبة السحابية تطورا لافتا، إذ أصبحت تعتمد عليها الحكومات ومراكز البحوث العلمية والشركات الاقتصادية، وذلك لكونها منظومة أساسية في حفظ وإدارة وتنظيم البيانات والملفات، كما تساعد على سير الأعمال عبر شبكة الإنترنت، وتحاول الدخول بثبات في المجال الطبي للمساعدة على مقاومة الأمراض ومداواة المرضى.

الحوسبة السحابية كما يعرفها المعهد الوطني للمعايير والتقنية (NIST) هي مصطلح يشير إلى المصادر والأنظمة الحاسوبية المتوافرة تحت الطلب عبر الشبكة والتي تستطيع توفير عدد من الخدمات الحاسوبية المتكاملة دون التقيد بالموارد المحلية بهدف التيسير على المستخدم، كما ويستطيع المستخدم عند اتصاله بالشبكة التحكم في هذه الموارد عن طريق واجهة برمجية بسيطة تُبَسِّط وتتجاهل الكثير من التفاصيل والعمليات الداخلية.

أنشأت وزارة الصحة في قطاع غزة نظم معلومات قبل أكثر من عقد من الزمان، ومنذ ذلك الحين بدأت علميات تكنولوجيا المعلومات تنمو تدريجياً، حتى أصبحت تتطلع إلى العمل في نظام سحابة صحية على غرار البلدان المتقدمة، لتحسين عملياتها التكنولوجية والإدارية بكفاءة وجودة عالية.

هدفت هذه الدراسة لمعرفة المحددات والتحديات الرئيسية لتبني تكنولوجية الحوسبة السحابية في وزارة الصحة، حيث تم تطبيق هذه الدراسة على العاملين في وحدة تكنولوجيا المعلومات في كافة مرافق وزارة الصحة، كما بينت نتائج الدراسة أن هناك ضعفاً في بعض المحددات الرئيسية، ويمكن التغلب على التحديات بعمل سحابة هجينة، ووضع آليات لحماية البيانات الصحية بطرق مختلفة.

كلمات مفتاحية: الحوسبة السحابية، تبني السحابة، المحددات، التحديات، الرعاية الصحية.

DEDICATION

To my father soul, to my dear mother who emphasized the importance of education and helped me throughout my life, she supported me to continue my education.

To my dear wife and sons as well as all my friends.

I dedicate this work to all of you and prayed God Almighty to be beneficial

Researcher

Adham F. Alleddawi

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Abbreviation

Abbreviation	Description
CC	Cloud Computing
IT	Information Technology
MoH	Ministry of Health
IS	Information System
EHRs	Electronic Health Records
HIS	Health Information Systems
NIST	National Institute of Standards and Technology
PaaS	Platform as a Service
IaaS	Infrastructure as a Service
SaaS	Software as a Service
VM	Virtual Machine
HP	Hewlett Packard
HIPAA	Health Insurance Portability and Accountability Act
VMM	Virtual Machine Monitor
CSCC	Columbus State Community College
NHA	National Health Accounts
EMR	Electronic Medical Records
PHI	Protected Health Information
SLA	Service-Level Agreement
IUG	Islamic University of Gaza
ICT	Information and Communication Technology
CSP	Cloud Service Providers
CDSS	Clinical Decision Support Systems
CSA	Cloud Services Architecture
EEPR	Electronic Emergency Patient Record
SOA	Service-Oriented Architecture
VPN	Virtual Private Cloud
SPSS	Statistical Package for the Social Sciences
PACS	Picture Archiving and Communication Systems
HIT	Health Information Technology
SLA	A Service Level Agreement
EHGI	E-Health Governance Initiative
PRI	Patients Registries Initiative

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1.1 Overview

Cloud Computing refers to data, processing power, and software stored on remote servers made accessible by the Internet as opposed to one's own computers. The term "the cloud" comes from computer network diagrams, because the individual computers that formed its components were too numerous to show individually, depicted the Internet as a vast cloud at the top of the network chain. One of the key features of cloud computing is that the end users does not own the technology they are using. All the hardware and software is owned by a cloud computing service, while the user simply rents time or space. Several cloud computing applications, such web email, wiki applications, and online tax preparation, have become common experiences for the average Internet user (EPIC: Cloud Computing, 2011).

The emergence of cloud computing is transforming the way organizations purchase and manage computing resources, providing fundamentally different IT model in which a cloud provider might be responsible for a range of IT activities, including hardware and software installation, upgrades, maintenance, backup, data storage, and security (Garrison, Kim, and Wakefield, 2012).

The one advantage of cloud computing is that it is not limited by physical factors. A person can access information and avail facilities regardless of where he is located. Cloud computing can lead to sharing of data regardless of location or facility. For people who travel a lot, or relocate to other places, this can be an advantage, especially in the case of emergency. Often, precious time is lost in order to obtain patient history and other related information in situation, which need immediate medical attention. Cloud computing can come to the patient’s aid in such cases, as data can be shared between facilities (Healthcare global, 2012).

In addition, when it is more clear for organizations what the impact of Cloud Computing is, and how this could be tackled, organizations could make a more informed choice about using Cloud Computing for certain functionality (Heffner, 2010).

Planning to utilize the latest technologies in the healthcare industry is an important strategy for many healthcare organizations to enhance healthcare services. There is a high increase in the demand on healthcare services while the shortages in qualified healthcare professionals

such as doctors, nurses and pharmacists form one of the toughest challenges confronting healthcare providers (AbuKhousa, 2012).

Cloud computing has recently emerged as one of the buzzwords in the IT. Numerous from healthcare organizations that applied cloud computing in their organizations since years, so, cannot Palestinian Ministry of Health to distance itself to keep pace with new technologies such as cloud computing technology, in addition for that there are modern Palestinian studies such as studies (Mansour, 2013) (Shaath, 2013) (Gabi, 2015) shown importance adopting cloud computing technologies.

Depending on the previous information, it has been shown for researcher a problem and importance of the study, so he tries this study highlight the contribution in guiding the decision makers of the main determinants of which can be available and to clarify the challenges when moving to the use of cloud computing, and he sets realistic expectations with their cloud provider.

2.1 Problem Statement

In light of the continuing development of technology, as well as the entering of cloud computing into all electronic fields, in addition to the fact that the process of entering cloud computing in health information systems in the Palestinian health ministry still slow and late in adopting new techniques than most of other fields by some estimates by as much as 10 years (Hitachi Data Systems, 2012), also there is weakness and lack of awareness of using cloud technology techniques, while the medical services in need to such technologies to improve it and improve patient outcome.

The Palestinian health ministry complains about weakness of electronic correspondence with other ministries, the limitation of both internally and externally communications, and using tradition systems.

No doubt that cloud computing is facing enormous challenges in health field, their effectiveness varies in operational efficiency, required technological equipment, data security, electronic health records (HER), privacy, and cooperation between doctor and patient. These

challenges require clarifications and more detailing to use cloud computing in optimal way, and address problems that prevent the adoption of cloud computing.

This thesis attempts to identify key determinants and challenges for ministry of health at Gaza Strip, when deciding about adopting cloud computing technology.

2.2 Research Questions

The study deals with the determinants and challenges, which affect the adopting of the cloud computing in the Ministry of Health.

Hence, the research question is:

What are the main determinants and challenges of cloud computing adoption in the Palestinian ministry of health?

For the research question, there are sub-questions defined that help to oversee the steps to achieve a similar answer to the research question.

The sub research questions are:

- What is the role of Cloud Computing in the health field؟
- What are the main determinants of adopting cloud computing in the Palestinian MoH and its availability؟
- What are the main challenges of adopting Cloud Computing and what are the necessary recommendations to overcome them؟
- What is the reality of operational efficiency and its potential to adopt cloud computing؟
- Is there a possibility to alter workflow in MoH to comply with could computing technology؟
- What are the benefits of adopting could computing to MoH in Gaza Strip?

2.3 Research Hypotheses

There are three main hypotheses for this research:

1. There is a significance effect between Determinants and Challenges of Cloud Computing Adoption (at level of significance $\alpha = 0.05$).

From this main hypothesis, the following sub hypotheses are derived:

a) There is a statistical significant relation between top management support and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).
b) There is a statistical significant relation between technology readiness and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).
c) There is a statistical significant relation between regulatory support and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).
d) There is a statistical significant relation between operational efficiency and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).
e) There is a statistical significant relation between Security and Privacy and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).
f) There is a statistical significant relation between trust and Cloud Computing Adoption (at level of significance $\alpha = 0.05$).

2. There is a significance effect of “Determinants and Challenges" on Cloud Computing Adoption (at level of significance $\alpha \leq 0.05$).

3. There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to personal traits (Gender, Age, Qualifications, Type of Position, Position and Years of Experience) (at level of significance $\alpha \leq 0.05$).

2.4 Research Variables

The dependent variable:

Cloud Computing Adoption

The independent variables:

- Top management support
- Technology readiness
- Regulatory support
- Operational efficiency
- Security & Privacy
- Trust

2.5 Research Objectives

The main objective of the thesis is to determine the main determinants and challenges of cloud computing adoption in MoH at the Palestinian authority.

The specific objectives of this research are as follows:

- Knowing the role of cloud computing in health field .
- Identify the main determinants in the process of adopting cloud computing and its availability.
- Recognize the main challenges of adopting cloud computing and the necessary recommendations to overcome them.
- Knowing the reality of operational efficiency and the extent of adopting cloud computing.
- Determine the possibility of changing workflow in MoH to comply with cloud computing technology.
- Knowing the benefits of adopting cloud computing.

2.6 Research Importance

First: MoH

The study aims to show key determinants of cloud computing in the Palestinian ministry of health, the challenges that should be avoided encourage decision-makers in ministry of health to develop their technical processes, demonstrate the importance of cloud computing for interested persons in IT operations, improve provided services level, and to address the health institutions in a high technical way.

Adoption of the cloud computing in Palestinian Ministry of Health provide interoperability and information sharing services to a broad spectrum of applications, in a highly scalable manner.

Second: Researchers and interested

New topic on the Palestinian Health where technological opens the way for researchers to study the challenges and find ideal solutions commensurate with the Palestinian work environment. And will reflect the level of interest on his knowledge, increasing the practical and cognitive variables, and Cloud Computing applications on health.

Third: Citizens and government

Raise E-health services provided to citizens throughout modern technology, to save time, efforts, and expenses, furthermore the study indicates security challenges for interested persons, to know how to use and employ Cloud Computing technology in optimal way, it also will work to promote the culture and consciousness of citizens, and encouraging them to use modern technology and avoid challenges.

2.7 Scope and Limitation of Research

The scope of research is limited to MoH in Gaza Strip. In 2016. This study applied to the information technology staff in MoH, and we used the descriptive analytical method.

2.8 Data Resources

The main sources for the required data for this research are:

a) Primary Data

In order to analyze the qualitative and quantitative data of the research, the questionnaire and interview is used as a main tool for collecting necessary data.

b) Secondary Data

To introduce the theoretical literature of the subject, the research uses the secondary data resource, which may include previous studies, books, academic magazines, periodicals, and websites, MoH reports, published articles related to the subject, this data is essential to gain understanding of the research area and what has already been done.

2.9 Research Terms

Cloud Computing

Cloud Computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released. This cloud model is composed of five essential characteristics, three service models, and four deployment models (Mell, and Grance, 2011).

2.10 Research Structure

This study was divided into five chapters as follows:

Chapter One: Introduction

Chapter Two: Research Background

Chapter Three: Related Work

Chapter Four: Research Design and Methodology

Chapter Five: Conclusions, Recommendations and Future Work.

Chapter 2
Research Background

Chapter outline:

Section 1: Cloud Computing

Section 2: Cloud Computing in Health

Section 3: Palestinian Ministry of Health

Section One

Cloud Computing

2.1.1 Overview

2.1.2 Definition

2.1.3 Essential Characteristics

2.1.4 Type of Cloud Computing

2.1.5 Deployment Models of Cloud Computing

2.1.6 Hardware Virtualization

2.1.7 Determinants of Cloud Computing Adoption

2.1.8 Drivers and Barriers to Cloud Computing Adoption

2.1.9 Major Cloud Service Providers

2.1.1 Overview

It appears that a wide adoption of cloud computing in the foreseeable future is inevitable, and its adoption will bring about a sea change in the pricing and distribution practices for both software and hardware. There are, however, various issues that will impede adoption of Cloud Computing. Most of them can be solved (kim et al., 2009).

This section introduces the reader to the main concepts in the area of Cloud Computing. This includes Cloud Computing definitions, its essential characteristics, type of cloud computing, deployment models, hardware virtualization, general determinants and drivers & barriers for adoption in addition to an overview of the major Cloud service providers.

2.1.2 Definition of Cloud Computing

The term “cloud computing” is very broad, and covers a wide array of technologies. A full definition could take up pages and pages of paper, but at its most basic, the NIST Definition of Cloud Computing “is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models” (Mell and Grance, 2009).

Another definition of Cloud computing is a paradigm for large-scale distributed computing that makes use of existing technologies such as virtualization, service-orientation, and grid computing. It offers a different way to acquire and manage IT resources on a large scale. A simple example of cloud computing is webmail. The webmail provider maintains the server space and provides access; the webmail user just plugs a web address into a browser and submits user information to access an account (Lewis, 2010).

Also, Cloud computing can be defined as an emerging technology that has sparked the interest of a wide range of organizations. In general, cloud computing is a distributed computing paradigm that focuses on providing a wide range of users with distributed access to scalable,

virtualized hardware and/or software infra-structure over the internet (Strowd and Lewis, 2010).

In addition, Cloud Computing is a technology from a service provider who offers all computing resources like Infrastructure, Platform, software, and all the components that rely on the Internet to cater to the computing needs of the client. The definition of Cloud Computing has been rather elusive (Verma, 2010).

2.1.3 Essential Characteristics of Cloud Computing

Cloud Computing has the following Essential Characteristics are as defined by (Mell and Grance, 2009):

A. On-demand self-service:

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

B. Broad Network Access:

Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

C. Resource Pooling:

The provider is computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

D. Rapid Elasticity:

Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities

available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

E. **Measured Service:**

Cloud systems automatically control and optimize resource use by leveraging a metering capability (see figure 2.1) at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

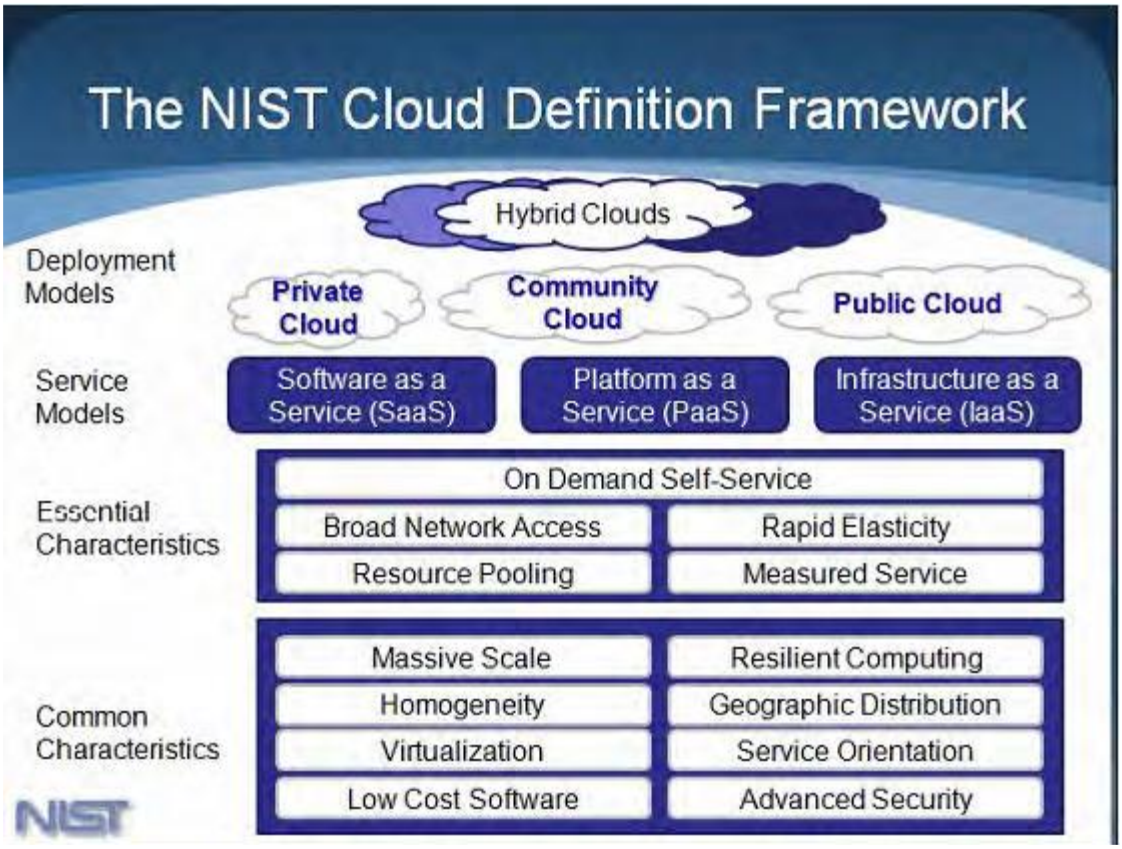

Figure 2.1: Cloud Computing Definition (Mell and Grance, 2009).

2.1.4 Types of Cloud

Could Computing has three types which are shown in Figure 2.5

A. Infrastructure as a Service (IaaS)

This is mainly computational infrastructure available over the internet, such as compute cycles and storage, which can be utilized in the same way as internally owned resources. IaaS providers en-force minimal restrictions on their users to allow them maximum control and configuration of the resources. If at any time the resources are no longer needed, they can potentially be terminated without incurring any additional costs (Lewis, 2010).

As such, there is no control over the physical hardware, but the consumer retains control over operating system parameters and some aspects of security. There is a trend emerging for 'bare metal' services, where access to the hardware at its most basic is provided, but this is more akin to traditional data center or 'hosting' services (Hill et al., 2013).

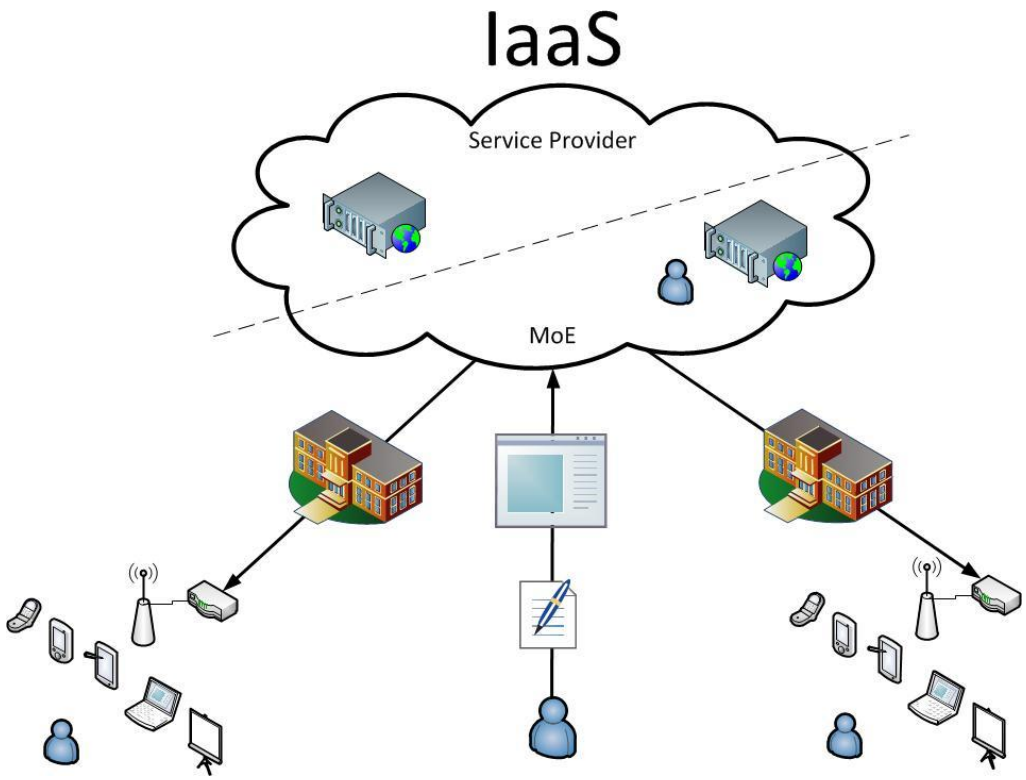

Figure 2.2: Infrastructure as a Service Model (Dan, 2015).

B. Platform as a Service (PaaS)

PaaS as a computing platform that allows the creation of web applications quickly and easily and without the complexity of buying and maintaining the software and infrastructure underneath it. PaaS is analogous to SaaS except that, rather than being software delivered over the web, it is a platform for the creation of software, delivered over the web (Cloud, 2011).

Services include, but are not limited to, software installation and configuration, resource scaling, and platform maintenance and upgrading. In order to enable these services, the provider places restrictions on the user by specifying various aspects of the platform, such as the programming languages supported, data storage mechanisms, and resource monitoring capabilities. In this model, user organizations use resources from the cloud and deploy their applications in the cloud as well. The key requirements for deploying an application into such an environment are to ensure that the selected platform will support the application and that the services offered meet the needs of the user. When these key criteria align, the user is able to leverage a significant amount of functionality with potentially very little effort (Lewis, 2010).

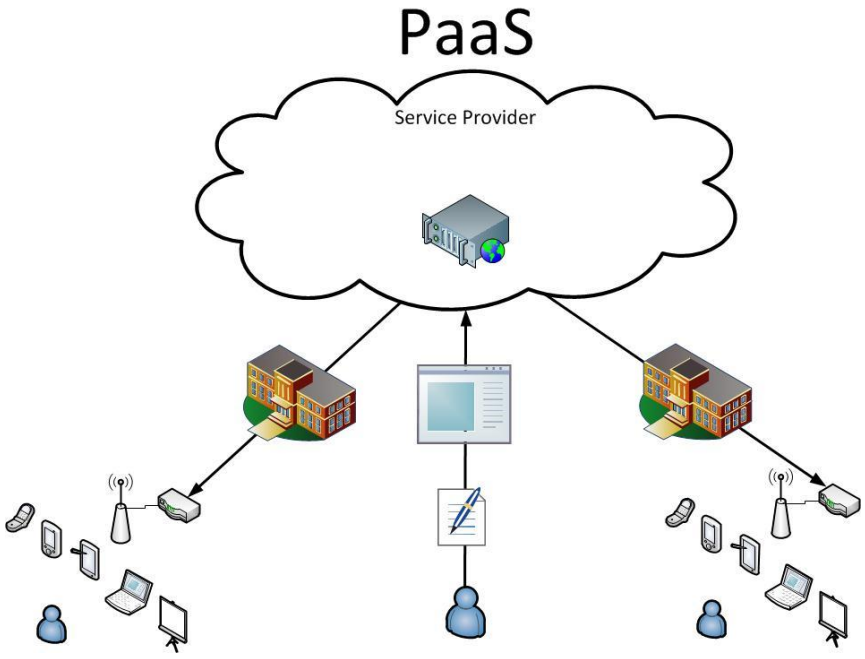

Figure 2.3: Platform as a Service Model (Dan, 2015)

C. Software as a Service (SaaS)

This service model abstracts the consumer away from any infrastructure or platform level detail by concentrating upon the application level. Applications are available via thin client interfaces such as internet browsers or program interfaces such as mobile phone apps. An organization can adopt Gmail and never concern itself with hardware maintenance, uptime, security patching or even infrastructure management. The consumer can control parameters within the software to configure specific aspects, but such interventions are managed through the interface of the application (Hill et al., 2013).

An example is Microsoft's Office 365 a set of messaging and collaboration tools. This is what the Belgian Ministry of Health used to facilitate collaboration with the various ministries in the member states, the WHO and its own highly mobile staff during Belgium's Presidency of the European Union. The suite includes Microsoft Exchange Online for email and shared calendars and SharePoint Online for sharing documents and portals. Another example is how the pharmaceutical giant GlaxoSmithKline has cut its operational IT costs by 30 per cent2 (Wrobel, et al., 2010).

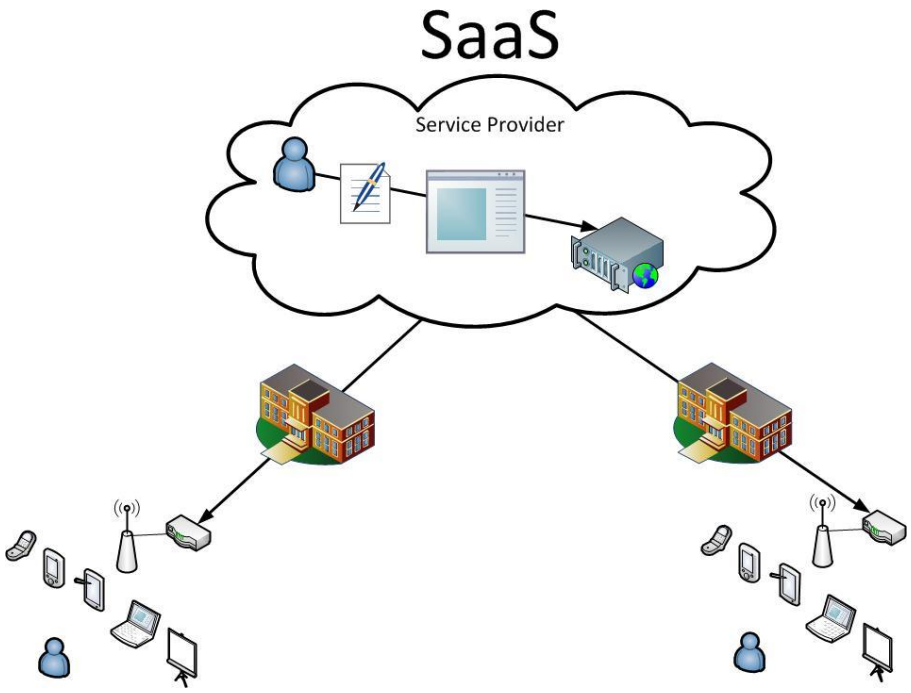

Figure 2.4: Software as a Service Model (Dan, 2015).

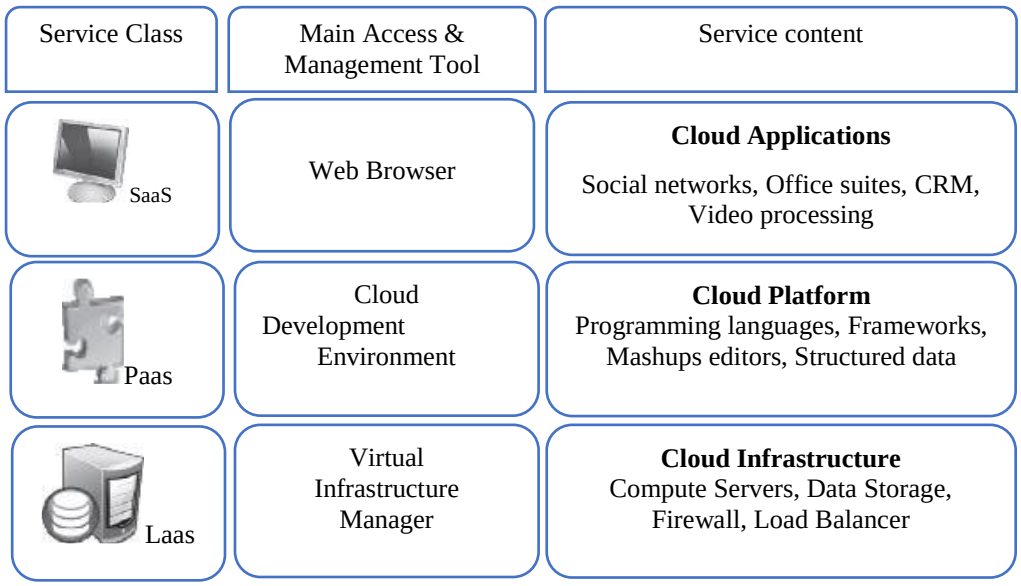

Figure 2.5: The Cloud Computing Stack (Buyya, 2011)

2.1.4 Deployment Models of Cloud Computing

Could computing has four deployment models which are:

A. Public Cloud

Public cloud is available to the general public and is managed by an organization. The organization may be a business (such as Google), academic or a governmental department. The Cloud Computing provider owns and manages the cloud infrastructure. The existence of many different consumers within one cloud architecture is referred to as a multi tenancy model. (Buyya, et, 2011).

In public clouds, as seen in Figure 2.6 resources are offered as a service, usually over an internet connection, for a pay-per-usage fee. Users can scale on demand and do not need to purchase hardware. Cloud providers manage the infrastructure and pool resources into capacity required by its users (Strowd and Lewis, 2010).

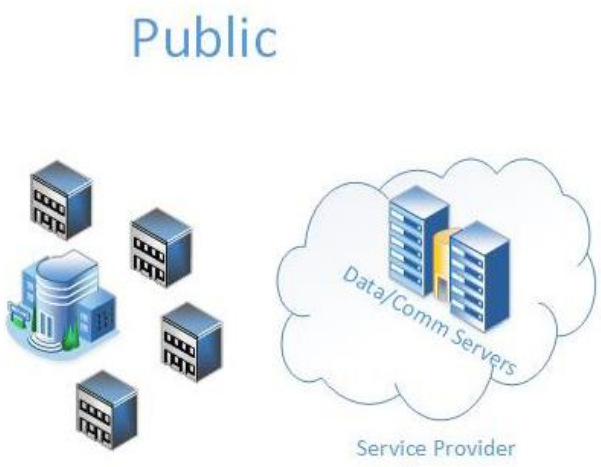

Figure 2.6: Public Cloud (Herrington, 2013).

B. Private Cloud

A private cloud as shown in the Figure 2.7 has an exclusive purpose for a particular organization. The cloud resources may be located on or off premise and could be owned and managed by the consuming organization or a third party. This may be an example of an organization who has decided to adopt the infrastructure cost saving potential of a virtualized architecture on top of existing hardware. The organization feels unable to remotely host their data, so they are looking to the cloud to improve their resource utilization and automate the management of such resources. Such an organization may feel uncomfortable with their data being held alongside a potential competitor's data in the multi tenancy model (Buyya, et al., 2011).

Large corporations may choose to build a private cloud, which can be administered either internally or through an outside service. What sets a private cloud apart from a corporate data center is the efficiency of operation. A private cloud can be shared among all the groups within the corporation (Lee, 2014).

Private clouds are typically deployed inside a firewall and managed by the user organization. In this case, the user organization owns the software and hardware running in the cloud, manages the cloud, and provides virtualized cloud resources. These resources are typically not shared outside the organization and full control is retained by the organization (Strowd and Lewis, 2010).

Figure 2.7: Private Cloud (Herrington, 2013).

C. Hybrid Cloud

A hybrid cloud as shown in the Figure 2.8 is formed when more than one type of cloud infrastructure is utilized for a particular situation. For instance, an organization may utilize a public cloud for some aspect of its business, yet also have a private cloud on premise for data that is sensitive. As organizations start to exploit cloud service models, it is increasingly likely that a hybrid model is adopted as the specific characteristics of each of the different service models are harnessed (Buyya, et all, 2011).

By having the public cloud component in the architecture the hybrid cloud offers the cloud advantages of scalability, availability, demand elasticity and pay-as-you-go model. Hybrid cloud is suitable for large businesses or niche businesses with a compute intensive system that would experience demand fluctuation. Major cloud providers such as Amazon, VM ware and HP all provide hybrid cloud service (Srinivasan, 2014).

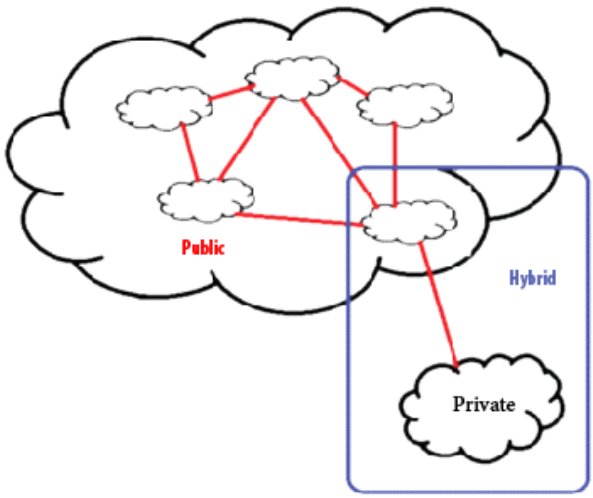

Figure 2.8: Hybrid Cloud (Torre Diez, et al, 2012)

D. Community Cloud

Community clouds are model of cloud computing where the resources exist for a number of parties who have a shared interest or cause. The cloud is owned and managed by one or more of the collaborators in the community, and it may exist either on or off premise (Strowd and Lewis, 2010).

The community cloud as shown in the Figure 2.9 concept evolved when businesses in a particular sector such as automotive, energy, financial and health care realized that they need specialized applications that are not applicable to other sectors. The community cloud offers the benefits of public cloud computing but restricted to a particular industry segment and the security features of a hosted private cloud. For example, a community cloud for the health care sector could focus on HIPAA compliance and the associated need for patient data protection and privacy. For example, a communication between two doctors on a community cloud would not be part of the general email community and as such will be able to provide greater protection for the content (Srinivasan, 2014).

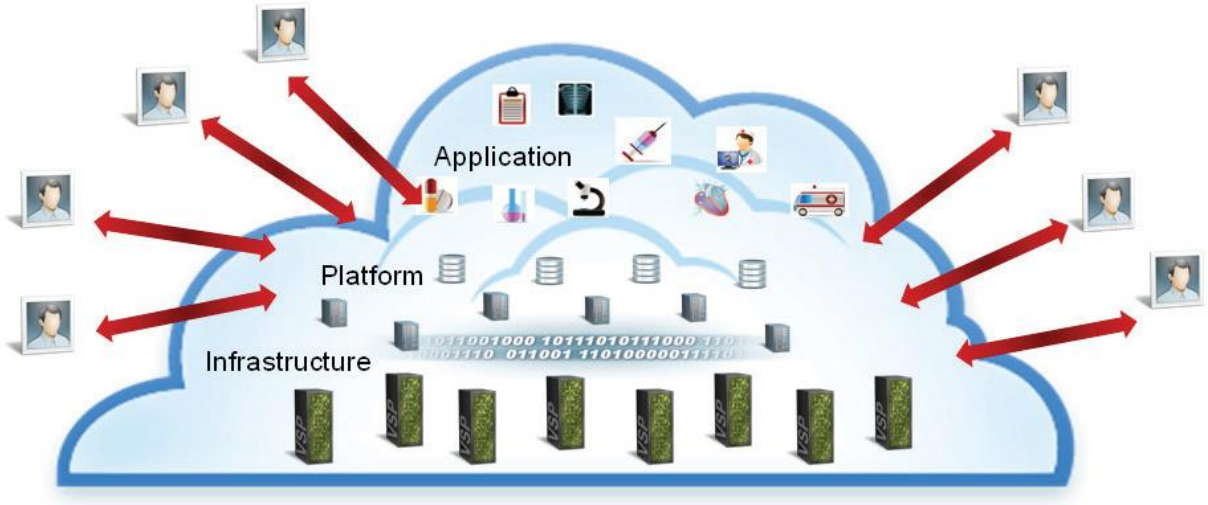

Figure: **2.9:** Community Cloud Architecture (Hitachi Data Systems, 2012)

2.1.5 Hardware Virtualization

Hardware virtualization as shown in the Figure 2.10 is a developing technology that is exploiting the continued increase in processor power, enabling 'virtual' instances of hardware to execute on disparate physical infrastructure. This technology has permitted organizations such as data centers to improve the utilization and management of their own resources by building virtual layers of hardware across the numerous physical machines that they own (Hill et al., 2013).

Hardware virtualization allows running multiple operating systems and software stacks on a single physical platform. The virtual machine monitor (VMM), also called a hypervisor, mediates access to the physical hardware presenting to each guest operating system a virtual machine (VM), which is a set of virtual platform interfaces (Buyya, et al, 2011).

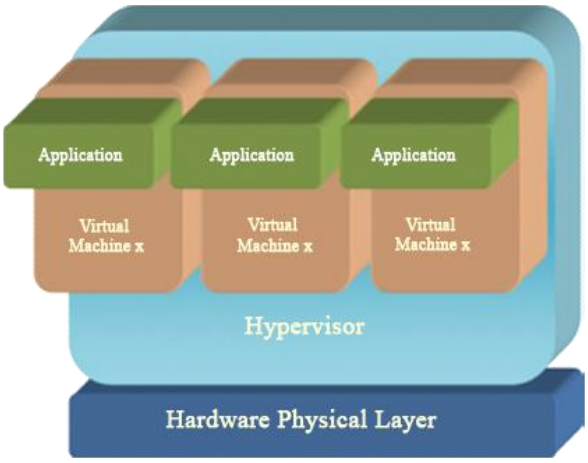

Figure 2.10: Virtualization Overview

2.1.6 Determinants of Cloud Computing Adoption

The determinants of cloud computing adoption are as follows:

- **Top Management Support**

  Top management plays an important role because cloud Computing implementation may involve integration of resources and reengineering of processes. As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation (Cloud, 2011). Top management is regarded as a significant impact on the adoption of the new innovations of information technology. It helps the firms by overcoming any barrage and internal resistance to the change (Hahri et, al. 2013).

- **Technological Readiness**

  The technological readiness of organizations, meaning technological infrastructure and IT human resources, influences the adoption of new technology. Technological infrastructure refers to installed network technologies and enterprise systems, which provide a platform on which the cloud computing applications can be built. IT human resources provide the knowledge and skills to implement Cloud computing related IT applications. Cloud computing services can become part of value chain activities only if firms have the required infrastructure and technical competence. Therefore, firms that have technological readiness are more prepared for the adoption of cloud computing (Cloud, 2011). Therefore, firms with a

higher degree of technology readiness are better positioned for the adoption of cloud computing (Amini, 2014).

- **Regulatory Support**

Regulatory support is another critical environmental factor that can influence Cloud Computing adoption. It refers to the support given by the government authority in order to encourage IT innovation by firms. The impact of existing laws and regulations can be critical in the adoption of new technologies and prevailing government regulations can encourage or discourage businesses to adopt cloud computing by creating rules to protect businesses in the use of this system. National legislation, as well as European Union regulations, requires, now, some restrictions regarding the handling and protection of data (Amini, 2014).

2.1.7 Drivers and Barriers to Cloud Computing Adoption

Cloud Computing, there is a wide range of claims being made about cloud computing adoption. They are classified them as either drivers for or barriers to cloud computing adoption as shown Table 2.1 and Table 2.2, respectively. In each table, the entries are listed in alphabetical order that will be described in the next section.

Driver	Description
Availability	Users have the ability to access their resources at any time through a standard internet connection.
Collaboration	Users are starting to see the cloud as a way to work simultaneously on common data and in-formation.
Elasticity	The provider transparently manages a user's resource utilization based on dynamically changing needs.
Lower Infrastructure Costs	The pay-per-usage model allows an organization to pay only for the resources it needs, with basically no investment in the physical resources available in the cloud. There are also no infrastructure maintenance or upgrade costs.
Mobility	Users have the ability to access data and applications from around the globe.
Risk Reduction	Organizations can use the cloud to test ideas and concepts before making major investments in technology.
Scalability	Users have access to a large amount of resources that scale based on user demand.
Virtualization	Each user has a single view of the available resources, independently of how they are arranged in terms of physical devices. Therefore, there is potential from a provider perspective to serve a greater number of users with fewer physical resources.

Table 2.1: *Drivers for Cloud Computing Adoption* (Strowd and Lewis, 2010).

Barrier	Description
Interoperability	A set of universal standards and/or interfaces has not yet been defined, resulting in a significant risk of vendor lock-in.
Latency	All access to the cloud is done via the internet, introducing latency into every communication between the user and the provider.
Platform or Language Constraints	Some cloud providers support specific platforms and languages only.
Regulations	There are concerns in the cloud computing community over jurisdiction, data protection, fair information practices, and international data transfer that are a concern mainly to organizations that manage sensitive data.
Trust	Many existing cloud infrastructures leverage commodity hardware that is known to fail unexpectedly.
Resource Control	The amount of control that the user has over the cloud provider and its resources varies greatly between providers.
Security	The main concern is data privacy: users do not have control of or know where their data is being stored.
Interoperability	A set of universal standards and/or interfaces has not yet been defined, resulting in a significant risk of vendor lock-in.

***Table 2.2**: Barriers to Cloud Computing Adoption* (Strowd and Lewis, 2010).

Section 2

Cloud Computing in Health

2.2.1 Overview

2.2.2 Health Information Systems (HIS)

2.2.3 Applications of Cloud in Healthcare

2.2.4 Benefits of Cloud Computing Adoption for Healthcare

2.2.5 Challenges to Cloud Computing Adoption in the Healthcare

2.2.1 Overview

The healthcare system is vast, diverse and highly complex that includes health insurance companies, hospital and physician networks, laboratories, pharmacies, patients and other entities. And all these must work within several governmental regulations **(**Ahuja et, al. 2012).

Cloud computing offers significant benefits to the healthcare sector: doctor's clinics, hospitals, and health clinics require quick access to computing and large storage facilities which are not provided in the traditional settings. Moreover, healthcare data needs to be shared across various settings and geographies, which further burden the healthcare provider and the patient causing significant delay in treatment and loss of time. Cloud caters to all these requirements thus providing the healthcare organizations an incredible opportunity to improve services to their customers, the patients, to share information more easily than ever before, and improve operational efficiency at the same time (CSCC, 2012).

This section discusses brief health information systems, applications of Cloud Computing in healthcare, general benefits and challenges to cloud computing adoption in the healthcare.

2.2.2 Health Information Systems (HIS)

Healthcare Information System (HIS) is the system designed to manage the daily operations and processes of the healthcare organizations such as clinical activities, administration activities, patient registration, patient medical records, communications and financial aspects (Wager, et al., 2005).

HIS is needed because decision making at all levels of a health system requires reliable health statistics that are disaggregated by sex, age and socioeconomic characteristics. At a policy level, decisions informed by evidence contribute to more efficient resource allocation and, at the delivery level, information about the quality and effectiveness of services can contribute to better outcomes (PHIH, 2015).

HIS is made up of a number of sub-systems which are integrated together so as to achieve the best possible support of patient care and hospital administration. In HIS, collection, storage and analysis of health information is done systematically. Data sources that HIS collects can

be classified into three categories as: clinical information created during patients visit to hospital, administrative information and external information. Generally, it includes health facility data, administrative data, household surveys, civil registrations; national health accounts (NHA) and health researches (Smolander et al, 2013).

2.2.3 Health Cloud

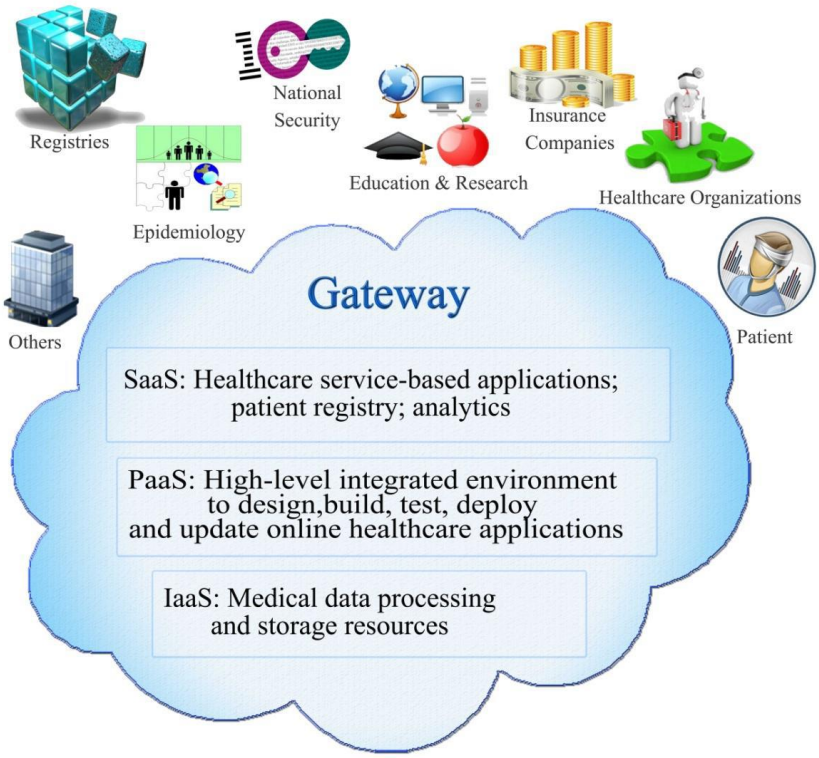

Figure 2.11: The generic architecture of e-Health Cloud (AbuKhousa et al, 2012)

E-Health Cloud (AbuKhousa et al, 2012) presented in the Figure 2.11 is a special focus Cloud that provides IT services to improve patient care while increasing operational efficiency. Typically, the cloud consists of an array of layered elements, starting at the most basic physical layer of storage and server infrastructure and working up through the application and communication layers. The e-Health Cloud can be further divided into different implementation models based on whether it is created internally (private Cloud), outsourced (public Cloud) or a combination of the two (hybrid Cloud). The layers of e-Health Cloud aim to help optimize the healthcare data facility environment, to create a platform that provides pre-built software tools for specialized HIT providers and software designers; and finally to

provide Cloud based HIT solutions for healthcare providers, patients and other concerned organizations such as insurance companies and research facilities. The e-Health Cloud consists of a Gateway and Service Based Applications in addition to the generic three-layer architecture of the Cloud:

- **Gateway**

  This component can be set to perform several important tasks: (i) managing access to the Cloud; (ii) verifying EHR (Electronic Health Record) provided by different health care providers in terms of integrity, authenticity, confidentiality and compliance with medical data exchange regulations; (iii) combining and integrating EHR data into a new composite Cloud-based EHR; (iv) selecting and de-identifying EHR to share with the public Cloud for research, educational and industrial purposes (AbuKhousa et al, 2012).

- **Service Based Applications**

  Such as services for national security and epidemiology, registries, Web Portal, Picture Archiving and Communication Systems (PACS); all of which provided as services that are easily managed through CC operational parameters (AbuKhousa, 2012).

2.2.4 Applications of Cloud in Healthcare

Cloud can be used in HIS as follows:

A. Infrastructure and Dynamic Scalability

The cloud provides Infrastructure-as-a-Service and Platform-as-a-Service business models where organizations can use the existing infrastructure or customize to suit their business and needs. Since the cloud provides scalable infrastructure, the organizations may be able to better adjust and optimize their resource capacity planning. For some of the clinics that are small to medium sized and cannot afford large IT investments and staff can take great advantage from cloud computing with their cost effective fee structure and low cost maintenance. An example for this is Amazon's S3 that provides scalable storage architecture (Ahuja et al, 2012).

B. Information Sharing

Health organizations do not function in silo. They have to constantly interact with other organizations. A lot of information is sent and received in order to process claims, provide customer support services, new member acquisitions, process provider requests etc. In today's world providers store the EMRs in their own databases. If some of this information can be moved to the cloud and shared across these organizations and platforms it may lead to better and faster coordination of services and eventually more customer satisfaction (Ahuja et al, 2012).

C. Healthcare Payers

Health Plans: Bigger health plan companies involved in Business Intelligence, Data mining and predictive for new plans or new configuration can benefit from cloud. Instead of investing significantly in infrastructure for hosting these huge database, they can leverage the Iaas and save millions of dollars (Verma, 2010).

D) Healthcare life Sciences

In Pharmaceutical analysis, where researches are expected to compare more than 5 million samples which may take weeks to get the results unless company is willing to spend substantial amount on IT investment. These huge databases can be kept on clouds and exploited with other capabilities to get faster results (Verma, 2010).

2.2.5 Benefits of Cloud Computing Adoption for Healthcare

There are many benefits of cloud computing, which are endless, are following:

1. **Integrated Services**

"All-in-One" solution: easily incorporating all of your practice's workflows, from scheduling to patient encounters, and from billing to order management. "All-in-One" means any and all functions - Practice Management, EHR, patient communications and care coordination - operate smoothly from the same platform (CureMD, 2014).

2. **Optimal Mobility**

   Healthcare services providers enable their staff to access to information anywhere and anytime. The whole purpose of adopting Electronic Health Records (EHRs) is to enable physicians to access key clinical information simultaneously from various locations. Thus, information becomes readily available to participants spread across different geographical locations (CureMD, 2014).

3. **Speed**

   Cloud solutions offer faster, less expensive and uninterrupted services while synchronizing and sharing data in real time for health service providers and their patients (CureMD, 2014).

4. **Electronic Medical Records**

   Hospitals and physicians are starting to see cloud-based medical records and medical image archiving services coming on line. The objective is to offload a burdensome task from hospital IT departments and allow them to focus on supporting other imperatives such as EMR adoption and improved clinical support systems (CSCC, 2012).

5. **Collaboration Solutions**

   Early successes of cloud-based physician collaboration solutions such as remote video conference physician visits are being trialed. Extending such offerings to a mobile environment for rural telehealth or disaster response is becoming more real with broader wireless broadband and smartphone adoption. Cloud technology supports collaboration and team-based care delivery and the ability to use applications based on business model requirements and a common set of clinical information (CSCC, 2012).

6. **Telemedicine**

   With the increase in availability of mobile technologies and intelligent medical devices, telemedicine has grown to include not only tele-consultations and telesurgeries, but also health record exchange, video-conferencing, and home monitoring (CSCC, 2012).

7. **Big Data**

Healthcare organizations turn to cloud computing to save on the costs of storing hardware locally. The cloud holds big data sets for EHRs, radiology images and genomic data for clinical drug trials. Attempting to share EHRs among facilities in various geographic areas without the benefits of cloud storage could delay treatment of patients.

8. **Analytics**

Cloud computing facilitates practice and population scale information and insights are available in near real-time. This availability ensures that the most current, complete insights and clinical knowledge are available to support care provider decisions and to enable a focus on value creation related to improving outcomes rather than.

9. **Consumption**

Information contained within a cloud can also be better analyzed and tracked (with the proper information governance) so that data on treatments, costs, performance, and effectiveness studies can be analyzed and acted upon. Information can be harvested and repurposed for more appropriate referrals and medical research to support the promise of personalized health and care.

10. **Clinical Research**

Many pharmacology vendors are starting to tap the cloud to improve research and drug development. The 'explosion of data' from next generation sequencing as well as the growing importance of biologics in the research process is making cloud-based computing "an increasingly important aspect of R&D". Currently, npharma firms do not have the capacity to run large datasets especially DNA sequencing as the size of the data can overwhelm their computers. Commercial cloud vendors have developed pharma-specific clinical research cloud offerings with the goal of lowering the cost and development of new drugs (CSCC, November 2012).

11. Health Information Exchange

Health Information Exchanges help healthcare organizations to share data contained in largely proprietary EHR systems. CIOs may accelerate the deployment of HIE via a linkage to a strategic cloud implementation.

12. **Low cost** of entry to start or expand with new applications, its storage and infrastructure.
13. **Pay-per**-use and not by foreseen usage and ability to access resources.
14. **Scalability** as and when required with faster run time and response time (verma, 2010).
15. **Collaboration** between researchers or physicians and allied health professionals suddenly becomes a reality, as patient information is centrally located and accessible to authorized users.
16. **Access to pathologists** who previously were reachable only near centers of excellence means that remote facilities can offer new services to the local patient population, relying on remote experts to render their diagnoses. Patient care can be improved by providing this service through the cloud faster and more efficiently. Since patients do not need to travel, waiting lists are more easily managed as more patients can have the same tests in more locations with a larger availability of experts (Hitachi Data Systems, 2012).

17. Hospitals, clinics, imaging centers, pharmacies and insurance companies can efficiently share patient's medical records, prescription information, X rays, test results, physician's references, physician's availability, etc. that can be accessed anywhere and everywhere by authorized entities. All this information would be used for making decisions, obtaining better diagnosis and treatments to yield better results, scheduling physician's appointments, speeding insurance approval, etc. There is also a very important beneficial factor for healthcare organizations, which is the IT costs (Ahuja et al, 2012).

2.2.6 Challenges to cloud computing adoption in the healthcare

Although there are many benefits to adopting cloud computing, there are also some significant challenges to adoption.

1. Regulatory Compliances

The biggest challenge to the healthcare world is to comply with the regulatory compliance status of the government. In many countries, the patient's Protected Health Information (PHI) cannot be taken out of the country. Apart from this, the patients themselves will be concerned about the security of their confidential information (Verma, 2010).

2. Workflow

Any transition to a cloud would require significant support from the technology partners to ensure a smooth transition for users. As a part of this workflow transition, serious consideration should be given to staffing needs within the organization's IT department. As the cloud starts to permeate the clinical environment, no longer will the same skill sets be required. Different technology will need to be supported, new training will be required and new skill sets will need to be defined. An organization that had staff working on managing backups and archiving will now migrate to network connections and clinical applications.

IT staff will focus on the rollout of the electronic medical record (EMR) instead of managing the storage layer the EMR sits upon. Access to this kind of skill set is in high demand today.

3. Security and Privacy

The security of computer systems, and the data stored on them, can be compromised in so many ways, 100% security is simply impossible. Sophisticated hackers can break into just about any computer system. A cloud may become a “honey pot” that attracts hackers. Accidents may happen during physical transportation or electronic transfer of a large volume of data.

However, that the clouds are not less secure than on premises computing systems. There is no reason that the best security technologies and processes that can have been adopted for on premises computing systems cannot be used by the cloud service providers (kim, 2009).

Cloud Computing represents a new computing model, there is a great deal of uncertainty about how security at all levels (e.g., network, host, application, and data levels) can be achieved (avram, 2014).

Data maintained in a cloud may contain personal, private or confidential information such as healthcare related information that requires the proper safeguards to prevent disclosure, Compromise or misuse. Globally, concerns related to data jurisdiction, security, privacy and Compliance are impacting adoption by healthcare organizations (CSCC, november 2012).

Putting personal health information into a 3rd-party, remote data center raises red flags where patient privacy laws are concerned. The possibility that patient data could be lost, misused or fall into the wrong hands affects adoption (AbuKhousa, 2012).

A potential solution is a private cloud model. In this case the data still resides at the customer data center and a certain degree of control still exists for organizations to manage patient privacy. Health and human services studies show that PHI violations have come from the theft of computers taken from facilities, loading docks and even physicians' vehicles. These thefts have been more for the computer and less for the PHI (avram, 2014).

High security concerns are usually associated with open environments which are provided by a number of service providers and shared among a number of service consumers. A healthcare provider that owns IT applications within its premises can apply and monitor proper security policies and controls for identity and access control managements. However, with open environments, it is very important to provide cloud services which support suitable and adequate access control and authentication mechanisms in addition to mechanisms to secure the transfer of such data to and from clients and service providers. That is essential since data must be kept secure in the multi-tenant clouds where it is stored along with other healthcare providers' data. In addition, it is necessary to make sure that the service provider itself cannot access or use the healthcare providers' data (AbuKhousa, 2012).

Legal and regulatory issues also need attention. When data are moved into the Cloud, providers may choose to locate them anywhere on the planet. The physical location of data

centers determines the set of laws that can be applied to the management of data. For example, specific cryptography techniques could not be used because they are not allowed in some countries. Similarly, country laws can impose that sensitive data, such as patient health records, are to be stored within national borders (Buyya, et all, 2011).

4. Trust

"Trust, but verify" is a good advice for dealing with the relationships between cloud users and cloud service providers. After establishing the initial trust and employing a cloud service, the cloud user needs to verify and reevaluate the trust. A service level agreement (SLA) is a legal contract between a cloud user and a cloud service provider. Therefore, quality of service (QoS) monitoring and SLA verification is an important basis of trust management for cloud computing (Huang and Nicol, 2013).

The reputation of a cloud service provider reflects the overall view of a community towards that provider, therefore it is more useful for the cloud users (mostly individual users) in choosing a cloud service from many options without particular requirements. The reputation of cloud services or cloud service providers will undoubtably impact cloud users' choice of cloud services; consequently, cloud providers try to build and maintain higher reputation. Naturally, reputation-based trust enters into the vision of making trust judgment in cloud computing (Huang and Nicol, 2013).

Cloud computing has opened up a new frontier of challenges by introducing a different type of trust scenario. Today, the problem of trusting cloud computing is a paramount concern for most enterprises. It's not that the enterprises don't trust the cloud providers' intentions; rather, they question cloud computing's capabilities. Yet the challenges of trusting cloud computing don't lie entirely in the technology itself. The dearth of customer confidence also stems from a lack of transparency, a loss of control over data assets, and unclear security assurances. Unfortunately, the adoption of cloud computing came before the appropriate technologies appeared to tackle the accompanying challenges of trust. This gap between adoption and innovation is so wide that cloud computing consumers don't fully trust this new way of computing (Khan and Malluhi, 2010).

5. Reliability

High availability of the cloud services can only help the health organizations to provide uninterrupted services with minimum downtimes (Ahuja et, al. 2012).

Even large companies such as Google and Amazon experienced many similar cases in the past and they will have many more in the future. Consequently, recommends that critical applications should not be taken into the cloud. Nowadays, Cloud providers are trying to avoid outage and promise a high level of availability in the Service-Level Agreement (SLA) and try to compensate their users in the case of an outage of the service. This factor represents a risk and it is one of the effective factors in Cloud Computing adoption. It will determine the kind of applications that can be used in the cloud along with its adoption strategy (Mansour, 2013).

This could drastically reduce the costs of maintenance. In depth understanding of the healthcare security and privacy concerns could be the first step in moving the healthcare applications into the cloud (Rui & Ling, 2010).

Section 3

Palestinian Ministry of Health

2.3.1 Overview of the MoH

2.3.2 Health Sector

2.3.3 Mission of MoH

2.3.4 Strategic Objectives of MoH

2.3.5 Information Technology at MoH

2.3.6 IT Staff

2.3.7 Main Online Services Provided by MoH

2.3.8 IT Departments at MoH

2.3.1 Overview of the MoH

Palestinian MoH growth to reach the Palestinian society to the highest possible degree of improving well-being in the physical, psychological and social health to become a community product, provides the health system, health services in several levels of a primary, secondary care, ambulance, emergency services, and is a health insurance a health system resources, source of financing him, as health projects constitute a source of operational funding for the Ministry, and MoH provides a list of essential medicines.

2.3.2 Health sector

For health system advanced importance to the government and People, as is the point of interest of Arab and international donors in terms of investment in infrastructure, health, capacity building, and the evidence for that is that some of the national health indicators comparable to those of medium-states or even high income, however, goes a UN report about life in Gaza by the year 2020 that the health services in the sector need to be improved.

2.3.3 Mission of MoH

Ensure existence of health facilities and trained human resources that needed to provide adequate health services and facilities, to ensure the provision of funds for these services on a permanent basis, and access for all members of society in an equitable manner, to ensure their natural rights and humanitarian access to these services.

2.3.4 Strategic Objectives of MoH

1- Ensure the provision of the three levels of basic healthcare services to citizens of Palestine to protect them from diseases and to reduce the mortality rate.
2- Continue the efforts of getting necessary financial resources to cover medical services, in particular governmental sector.
3- Promote the available resources' effectiveness to give highest possible achievements in developing health services.
4- Exerting more efforts to improve health service quality at MoH facilities.
5- Enable citizens to have an easy access to health services.
6- Achieve self-sufficiency of specialized medical services.
7- Build an effective management system that ensures justice and fairness for staff.

2.3.5 Information Technology at MoH

IT unit is considered as primarily responsible for computer-related tasks, developing information technology to have E-ministry, and to enhance online services provided to MoH staff and community by building IT infrastructure that include obtaining advanced equipment's, develop information systems and it's managing and applying to use it in an efficient way to provide an integrated quality of IT and communication systems at MoH which comply with mission and vision of the ministry such as building IT networks in MoH facilities to connect them to each other and the global network, in addition to enhance the speed and performance of the network, as well as providing technical services to both systems and applications, establishing information system using latest sciences, and develop applications for administrative, financial and medical tasks (Al Shourafa, 2015).

2.3.6 IT Staff

Official Governmental Hospital Covered by the MoH Regarding to the Number of Its IT Staff as Shown in the Following Table 2.3:

Hospitals	NO
Beit Hanon Hospital	1
Kamal Edwan Hospital	1
Shifa Hospital	8
Eye Specialist Hospital	2
Al Naser Paediatric	2
Al Rantesii	2
Al Dura Hospital	1
Shohda'a Alaqsa	2
Naser Kh.Younis	5
European Gaza Hospital	6
Al-najjar	2
Al-Helal El-Emarati	3
Al-Remal Primary HealthCare	3
Center Operations Unit	44
Total	82

Table 2.3: List of hospitalizes and available capabilities for IT affairs at MoH in the Gaza Strip**.**

2.3.7 Main Online Services Provided by MoH

1. Joint online gate to MoH staff:

Online gate allows MoH staff access to the available electronic systems according employee's granted authority, also allows employees access to his/her account through ID No. and password.

2. Unified Electronic Registration System for Citizens

It is an electronic system for citizens and can benefit from the electronic services provided by ministries, government departments, to enable citizens to use electronic services must obtain account through this system, and account will have ID No. and password.

3. Mandatory Training System

It is a mandatory training program for graduates of medicine, dental, pharmacy, physical therapy and medical tests, and the duration of each program (12 months).

Is not considered eligible for the graduate exam to practice the profession, only after the completion of that period successfully .

No	Operating System / Program	Service Provided
1	Microsoft Exchange 2010	E- mail service
2	Microsoft TMG Forefront 2010	Internet service
3	Microsoft ISA 2006	Internet service
4	Oracle 10g Data Base	Database
5	Linux Centos 5	Operating System
6	VMware ESX 4	Virtual Operating System
7	Nod 32 Antivirus	Antivirus Pc
8	Kaspersky	Antivirus Servers
9	Java beans	Deportation results of medical tests and stored in databases
10	Oracle 6i	Interface
11	PHP	Web server
12	pfsense Hotspot System	Open source firewall/router

Table (2.4): Available services in the MoH (Fraja, 2015).

2.3.8 IT Departments at MoH

A. Networking and Maintenance:

Oversees department of maintenance and networks to provide development services, installation, network management architecture, operating systems, and computer services

support to achieve high operational efficiency of the techniques of modern information. In addition to computer equipment and related accessories, operating systems, fiber optic networks, wired and wireless networks, and data in terms of telecommunication services, data transmission and this department oversees **as follows:**

1. **Operating Systems and Networks**

Responsible for the operation and management of all office equipment, central systems, networking devices, and the available operative systems, library systems and computerized systems on these devices, and provide technical support for internal network and its devices.

No	System name	Department	No	System name	Department
1	Purchasing	Department of finance and administration	10	Medical Archive	Department Computerization of Hospitals
2	Payment and expense		11	Entry/exit system	
3	Financial		12	Emergency	
4	Revenue Management		13	Referral	
5	Warehouse Management		14	Laboratories and Blood Banks administration	
6	E-Mail		15	Nursery Management	
7	Health Insurance		16	Medical history	
			17	Operations	
			18	Pharmacy	
			19	Medical Reports	
			20	Electronic Birth Registration System “EBRS”	
			21	External clinic	
			22	X-ray system	
			23	Follow-up of patients in the dormitories	

Table (2.5): Internal Programming Systems at MoH applications (Younes, 2015)

Source: Interview with (Fraja, 2015) manager of department programmer at MoH.

2. **Maintenance and Extension of Networks**

Responsible for maintenance of all computer and Peripherals, installation of computer networks in the various facilities of the MoH. In addition to the technical specifications for the needs of the ministry and to participate in decision-making committees.

3. **IT Center**

It oversees the provision of hosting services for all computerized programs in the ministry, publish it through the internal and external network, oversees of the necessary designs for network security, information systems in the ministry facilities, and to provide necessary protection for all the services provided by the network and monitoring the safety of data and network.

4. **Spine Connecting Section**

Its oversees the installation and follow-up the government network and wireless network linking the ministry's facilities to each other.

5. **External Departments**

Computer departments in the various Ministry's facilities, which oversees internal network management, and operation of computerized programs in supervising the facilities.

IT Unit Hierarchy

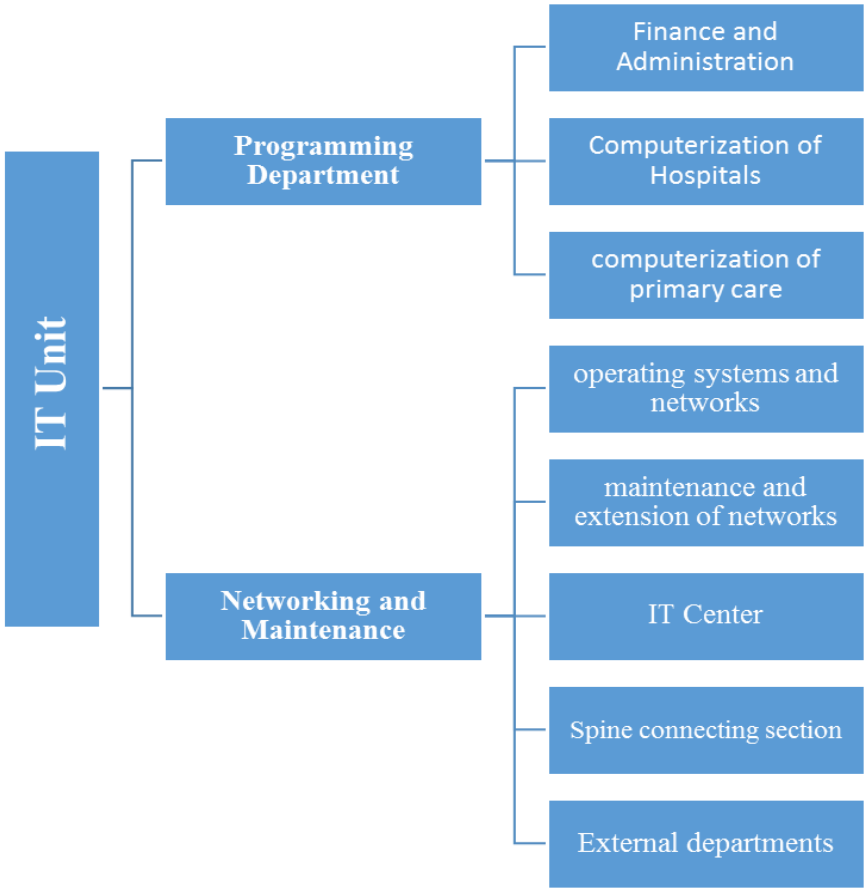

Figure 2.12: IT Unit Hierarchy (Web Site MoH, 2016)

B. Department of Programming

Department of Programming at MoH consists of three sections as follows:

1. Finance and Administration

Computerization of administrative and financial systems (finance, stores, purchases) and staff management system in the ministry, and follow-up, evaluate, and training employees to use the system, where the team built a set a financial and administrative systems to run them in all ministry facilities.

2. Computerization of Hospitals

Responsible for applying the computerization system in all Gaza Strip hospitals, training, and follow-up systems. In addition to develop a system in all hospitals.

3. Computerization of Primary Care:

Responsible for computerization primary care departments, follow-up, training the staff, and preparation of plans to be applied in all primary care clinics, where the healthcare team built a web system and applying it in all clinics of Gaza, and as follows Primary care system goals:

1. Unifying mechanism of work in all primary care centers, through centralized database.
2. Receiving all patients at health centers through electronic registration by ID No., then do an internal transfer the application to the section you want to visit (clinic, laboratory, pharmacy...).
3. Use electronic medical records (EMRs) that contains the entire patient's data and previous visits archive to the center, so it could be used by the system monitor.

Chapter 3

Related work

Chapter outline:

3.1 Overview

This chapter aims to explore different perspectives of adopting cloud computing through search in various sources to find related work to research topic. “Cloud Computing Adoption: Determinants and Challenges (case study: Palestinian Ministry of health)”. It aims to take advantage of researchers' experiences as well as the main results and recommendations of their studies. The researcher discusses in this chapter (20) related works to the research topic, from several countries, (10) Health Cloud Studies, (5) Palestinian studies, and (5) international studies. The researcher concludes the chapter by commenting on related works to explain the differences and similarities among it and this research as well as the extent of benefits. The researcher also explores the distinguishes of the research and discusses related works from earliest to latest.

3.2 Health Cloud Studies

1. **Cloud Standards Customer Council, (2012) “Impact of Cloud Computing on Healthcare”.**

The aim of this guide is to provide a practical reference to help enterprise information technology (IT) and business decision makers of the healthcare industry as they analyze and consider the implications of cloud computing on their business. The guide includes guidance and strategies, designed to help these decision makers evaluate and compare Cloud Computing offerings in key areas from different cloud providers, taking into account different requirements from various factors including medical practices, hospitals, research facilities, insurance companies and governments.

The guide introduces the key factors expected to accelerate adoption of cloud computing in the healthcare industry along with an overview of the key barriers that must be addressed. It also highlights the key considerations for service and deployment models. The Challenges section explains the critical barriers to cloud computing adoption for the healthcare industry with specific focus on the stringent security and privacy requirements that must be addressed including the impact of government and industry regulations. The “Benefits of Cloud Computing” section discusses specific IT trends in the healthcare industry that are addressed

most effectively, both technically and economically, by cloud computing as opposed to traditional IT environments.

The guide closes with "Strategic Recommendations" section that provides healthcare consumers with specific guidance on how best to achieve the benefits of cloud computing while maintaining an acceptable level of risk. Although guidance is provided, each organization must perform its own analysis of its needs, and assess, select, engage, and oversee the cloud services that can best fulfill those needs. Throughout the guide, the role that standards play to improve the flexibility, interoperability and portability of cloud computing environments is highlighted. It also identifies areas where future standardization could be effective.

2. **Patra, et al. (2012) "CRHIS: Cloud based Rural Healthcare Information System".**

This research studies how modern ICT in general and cloud computing in particular can be used in the healthcare sector in order to facilitate improved medical services in the rural areas at reduced costs. They argue that cloud services stand as a potential alternative to facilitate rural healthcare information management in terms of cost reduction and resource utilization.

At the same time, it can improve maintainability and use of up-to-date technologies in the healthcare sector. The main objective of a Cloud based information system is to create secure and state-of-the-art facility to store patient data which can be accessed by the medical professionals and policy makers for disease diagnosis and control. A cloud based information repository system can offer new possibilities, such as easy and ubiquitous access to medical data, and opportunities to utilize the services of medical experts which are otherwise unavailable in rural areas.

They propose a cloud based model for building a rural healthcare information system. Design of an overall system along with the functional components is presented and the advantages, open issues and prospects for further improvement of this model is also highlighted.

In this research, they investigate how Cloud computing can provide affordable solution to many of the problems encountered in rural healthcare services. Several dimensions of rural healthcare are investigated and the prospects of sharing resources in term of infrastructure, software and applications to facilitate healthcare related data processing is explored.

3. **Abu Khousa, et. al. (2012) "e-Health Cloud: Opportunities and Challenges".**

In this research they introduce the concept of "e-Health Cloud" in UAE highlighting many of its constituents and proposing building an e-health environment and elucidating many of the challenges confronting the success of the e-Health Cloud. They also discuss different possible solutions to address challenges such as security and privacy.

In the research, they emphasis on the importance of the concepts involved, implementations and challenges. They highlighted the different facets that contribute to building the e-Health Cloud according to four categories: (1) cloud-based storage solutions and HIT applications and systems; (2) platform solutions; (3) e-Health Cloud implementation models; and (4) security solutions for the e-Health Cloud. They described the major technical and non-technical challenges facing the e-Health Cloud which hinder its large-scale diffusion. They also discussed several proposed solutions to address the challenges and we concentrated on the security and privacy issues in e-Health Cloud as they represent the biggest challenges.

4. **Ahmed, Abdullah (2011) "E-healthcare and data management services in a cloud".**

In this research, they discussed E-Healthcare data management in SA as a core issue in a modern hospital. Where the data generated is enormous due to newer diagnostic techniques. In this areas, the medical doctors and patients demand a greater lifetime for medical data records; they require fast data retrieval, and presentation services for Clinical Decision Support Systems (CDSS). The cost on maintaining a data service center in an average hospital may be substantial on both infrastructure and qualified ICT staff. The availability of large storage capacities and computing resources from Cloud Service Providers (CSP) is seen as an opportunity to save investment by outsourcing information services. Electronic Patient Record (EPR) management is sensitive issue, which requires a foolproof security. It is extremely

important to develop methods to relieve the clients from problems of security, integrity, availability and cross CSP mobility.

They present E-Healthcare models for ubiquitous services for data acquisition archiving and presentation in Cloud. The management issues and security concerns in cloud domains are addressed by a services architecture proposed. The model includes Wireless Sensor Networks besides communication and storage systems for a typical hospital taking advantage of the Cloud Services Architecture (CSA).

5. Verma, (2010) "Cloud Computing in Healthcare IT" USA.

This research aims to provide an understanding of the model and exploring options available for complementing the technology and infrastructure needs of Healthcare organizations.

The healthcare industry needs from clouds are centralization, collaboration and virtualization. Through centralization, all the patient data needs to be at one place so that the right information is available to the right care provider at the right time. The collaboration needs to be at two levels, one at the clouds provider level to have standards and secondly at the regulation level. Virtualization is going to be the key of services in clouds. Nothing is physically visible to the consumer though they are able to operate and perform at much better pace and at lower cost. Clouds have the potential to transform many challenges of the Healthcare IT, if Healthcare can drive the clouds instead of clouds telling the healthcare professionals what to do and what not to do. There cannot be one deployment model or the service model that can cater to Healthcare world. It has to be customized clouds. Clouds have the potential to transform many challenges. The healthcare world has to make some harsh decisions and tradeoff between of the Healthcare IT, if cost/benefits and the associated risks.

6. Haufe et. al (2014) "Proposal for a Security Management in Cloud Computing for Health Care".

In this research they propose a framework that includes the most important security processes regarding cloud computing in the health care sector. Starting with a framework of general information security management processes derived from standards of the ISO 27000 family the most important information security processes for health care organizations using

cloud computing will be identified considering the main risks regarding cloud computing and the type of information processed. The identified processes help a health care organization using cloud computing to focus on the most important ISMS processes and establish and operate them at an appropriate level of maturity considering limited resources.

Computing services in a cloud to assure an appropriate level of information security. Actually a specific framework for security management in cloud computing for health care does not exist. To address this open research question, in this paper a health care organization using cloud computing focus on the identified processes of information security risk assessment, information security risk treatment, the control of outsourced processes, and requirements management. Particularly for these processes an adequate level of maturity is needed.

In this context future, work is necessary to develop a more detailed framework of ISMS processes (input, output, and interfaces) and their interaction at an activity level to ensure an appropriate interaction of the ISMS processes.

While not every ISMS process needs the same level of maturity, also an approach should be developed to identify the appropriate level of maturity using a proper maturity level model. By considering a maturity level model for ISMS processes combined with an approach for the determination of the necessary maturity level, the appropriateness of an ISMS can be made transparent and unnecessary costs of information governance can be avoided.

7. **Rodrigues, et al. (2013)** "**Analysis of the Security and Privacy Requirements of Cloud-Based Electronic Health Records Systems".**

This research addresses the health care providers' security and privacy issues that must be considered when deploying EHR management systems. Taking into account these issues on both sides, the migration process will be more secure and transparent. Some security mechanisms necessary to deploy a proper solution are suggested.

The aim of this research, is to show that, before moving patient health records to the Cloud, security and privacy concerns must be considered by both health care providers and Cloud service providers. Security requirements of a generic Cloud service provider are analyzed.

Some of the security issues that should be considered by both Cloud service providers and their health care customers are: role-based access, network security mechanisms, data encryption, digital signatures, and access monitoring. Furthermore, to guarantee the safety of the information and comply with privacy policies, the Cloud service provider must be compliant with various certifications and third-party requirements, storing sensitive information such as EHRs in the Cloud means that precautions must be taken to ensure the safety and confidentiality of the data. A relationship built on trust with the Cloud service provider is essential to ensure a transparent process. Cloud service providers must make certain that all security mechanisms are in place to avoid unauthorized access and data breaches. Patients must be kept informed about how their data are being managed.

8. **Poorejbari and Vahdat-Nejad (2014)** "**An Introduction to Cloud-Based Pervasive Healthcare Systems".**

In this research, they review the significance and opportunities of using cloud computing in pervasive healthcare, and then look at the current as well as the future challenges it faces.

The study concluded that Cloud computing offers potential opportunities for improving EHR adoption and provides an altogether new generation of healthcare services. It also provides more flexibility, less expense, and more efficiency in IT services. Cloud-based healthcare systems can create more vital solutions for preventive or emergency care in cases such as chronic diseases like diabetes. Related studies show a lack of research on the various issues of this area. Generally speaking, cloud-based pervasive healthcare is a new paradigm in healthcare sector and has many potential and beneficial features.

9. **Zhang and Lee, (2015)** "**CloudMonatt: An Architecture for Security Health Monitoring and Attestation of Virtual Machines in Cloud Computing".**

In this research, they present an end-to-end architecture for both monitoring and attestation of a VM's security properties in an IaaS Cloud.

In an IaaS cloud, a customer requests to launch a VM (Virtual Machines) in the cloud system. The cloud provider places the VM in a virtualized cloud server, and allocates a specified amount of physical resources (CPU, memory, disk, etc.) to this VM. The customer is granted remote access to this VM. During the VM's lifetime, the customer would like to know if his VM has good security health.

This paper shows how to increase assurance in cloud systems by enabling secure monitoring and attestation of security features provided by a cloud server for the customer's VMs. Key advances over prior work include: (1) Providing a flexible architecture for a rich set of security properties for VM attestation; (2) building the framework for bridging the semantic gap between the security properties a customer wants to request and the measurements collected from a cloud server; (3) enabling initialization as well as runtime attestation during the lifetime of the VM; (4) designing two new cloud-based attacks and the corresponding mechanisms for monitoring those types of confidentiality and availability attacks; (5) defining a novel periodic attestation capability during VM runtime; and (6) building in automated responses to bad attestation results to prevent potential, or further, security breaches. To the best of our knowledge, this is the first real implementation of property based attestation, for security properties other than integrity checking.

For fast deploy ability, they leverage existing cloud mechanisms and well-honed security mechanisms where possible, identifying the minimal changes needed for a cloud system to implement our CloudMonatt architecture. they also show the set of cryptographic keys that must be present or established, and we define and formally verify our secure attestation protocol. The feasibility of our solution is established by an implementation on the Open Stack cloud software.

In this research, a cloud-based service-oriented architecture (SOA) is described for the implementation of an electronic emergency patient record system (E-EPR) that provide functionality for managing (retrieving, transforming, exchanging and storing) emergency case information and patient critical medical information in a distributed and ubiquitous manner that supports several platforms and applications. The proposed system can be easily integrated with existing ambulance service and

hospital information systems because of the use of open-wide standards. An experimental implementation of the system in a simulated laboratory environment is presented.

10. **Malamateniou et. Al (2011)** "**E-EPR: A cloud-based architecture of an electronic emergency patient record".**

In this research, a cloud-based service-oriented architecture (SOA) is described for the implementation of an electronic emergency patient record system (E-EPR) that provide functionality for managing (retrieving, transforming, exchanging and storing) emergency case information and patient critical medical information in a distributed and ubiquitous manner that supports several platforms and applications. The proposed system can be easily integrated with existing ambulance service and hospital information systems because of the use of open-wide standards. An experimental implementation of the system in a simulated laboratory environment is presented.

This research presents an electronic emergency patient record (EEPR) as a service on a cloud that aims at making available the information needed by emergency department physicians at the point of care (e.g. on a tablet pc or mobile phone). In particular, the system allows emergency department physicians to access emergency case information that has been collected during the pre-hospital emergency care process as well as selected portions of patient information (e.g. patient allergies and chronic diseases) from the patient's Personal Health Record (PHR) stored in a central repository.

On this paper, the implementation of the E-EPR is described with the use of a service-oriented approach that utilizes web services and BPEL on a cloud computing platform. For the E-EPR implementation Amazon cloud is suggested and used as a leader company on cloud computing that provides a full set of secured cloud services for IaaS, PaaS and SaaS. This way a scalable system was developed and the TCO and the overhead of IT management are decreased for the participating organizations. As concerns security, the security features of Amazon cloud services were used and security servers were deployed locally at ambulance service and hospital emergency departments and on cloud infrastructure to provide role and context-based authorization services. Currently, the domain context information is not organized into domain ontology. The proposed E-EPR architecture is indented to be further extended by organizing domain context information into domain ontology to enable context

sharing in a semantic way and context reasoning. In addition, the Amazon Virtual Private Cloud (VPN) service is indented to be used to create a secure bridge among the ambulance service, hospital emergency departments and the Amazon cloud.

3.3 Palestinian Studies

1. **Jabi, (2015) "Cloud Computing in the Palestinian Public Sector, Opportunities and Challenges"**

   The primary purposes of this research is to assess the possibility of adoption cloud computing in the Palestinian public sector. In addition, it identifies all potential opportunities and challenges for switching from existing computing arrangements to cloud computing. Based on the results of this research, it can be concluded that the Palestinian public sector is not ready to adopt Cloud Computing in its operations yet due to the lack of top management support, awareness of the objectives and benefits of Cloud Computing adoption, infrastructure's support and experience of IT human sources.

   This study, also, identified the most important opportunities that can be gained by the Palestinian public sector from the adoption of cloud Computing. In addition, it identified the most important challenges that may hamper Cloud Computing adoption in the Palestinian public sector. The study recommended the Palestinian public sector to prepare a future plan to adopt Cloud Computing in its operations which is an attractive technological and economic option in addition to prepare plans to eliminate any obstacle that may hinder the use of Cloud Computing technology.

2. **Almabhouh, (2015) "Opportunities of Adopting Cloud Computing in Palestinian Industries"**

   This research attempts to determine the opportunities and strategies of adoption Cloud Computing in Palestine. A focus group has been conducted in order to accomplish the research objectives. Data were collected from 12 Palestinian firms. Accepted methodology was used to explore the current stage of cloud computing adoption in Palestinian firms and to identify the most important barriers hindering the adoption.

The main obstacles that were identified as performing a significance role in Palestinian firms' adoption of cloud computing services include: lack of top management awareness, insufficient financial resources and budgets, shortage of cloud computing experts and professionals, inadequate network bandwidth, weakness of IT companies capabilities, sensitivity of data, legal and regulatory issues, and compatibility with the existing IT systems. In actuality, these results should present a basis for the Palestinian IT managers in terms of formulating a concrete plan for cloud computing adoption.

3. **Mansour, (2013) "The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges (Case Study on Islamic University of Gaza "IUG")"**

This research aims at showing the concerns and challenges of the adoption of Cloud Computing technology in Higher Education Institutions, case study Islamic university of Gaza (IUG). Using the descriptive analytical method to study the effects of the main five dimensions (Top management support, Support and integration with university Services, Skills of IT human resources, Security effectiveness and Cost reduction) on the adoption of Cloud Computing technology. This research focuses on IUG as a case study of the academic institutions of Palestine, which is the first from among other universities in terms of modern technology utilizing in its operations. Moreover, it's used several services of Cloud Computing technology for example IUG Gmail, Facebook, Flicker, and IUG Tube …etc.

The researcher used a questionnaire as a data collection tool. The research population was (95) of the IUG employees whose qualifications is related to computers and IT. (82) Questionnaires were recollected out of (95) questionnaires that were distributed and were analyzed by SPSS program for statistical analysis. The results showed that there is a significant relationship between the adoption of Cloud Computing and the five independent variables; (Top management support, Support and integration with university Services, Skills of IT human resources, Security effectiveness and Cost reduction) at level of significance $\alpha = 0.05$. The research recommended that IUG can adopt Cloud Computing technology in its operations, if it is interesting on the side of IT human resource through training, scientific missions, and innovations, etc.

In addition, interesting on the side of security through putting the non-critical application and data in the cloud, or through creating hybrid cloud which consists of public cloud for non-critical applications like e-mail and private cloud for critical and sensitive applications and data. Without a doubt, the top management has vital role in the adoption of this technology in its operations though its decisions and facilities … etc.

4. **Qraiqea, (2014) "The effectiveness of the training program to employ Cloud Computing applications in the development of e-skills education teachers with technology"**

This research aimed to build training program to employ Cloud Computing applications in the development of e-educational skills among technology teachers and study the effectiveness of this program.

Results of the study showed the effectiveness of cloud computing applications in the development of e-educational, cognitive and, applied skills, therefore; the researcher of this work recommends the necessity to adopt educational institutions the use of cloud computing applications in teaching and training the staff to use it.

To achieve the objective of the study was selected a sample of (20) a teachers of technology in the west of Gaza Directorate, has been subjecting the independent variable (cloud computing applications) for experimentation and measure its impact on the dependent variable (educational e-skills). The study was implemented during the first semester of the 2013-2014.

Researcher have been used according to the nature of the study "constructive method" and "experimental method" by applying the tools of the study on the sample, with knowing that the study used the test tool to measure cognitive side and "evaluation card" to evaluate teachers' work where it was applied before and after the experiment on the study sample.

5. **Shaath, (2013) "Proposal for Using Governmental Cloud to Develop the Palestinian E-Governance"**

The benefits expected by the e-governance motivate the Palestinian government in Gaza strip to consider applying it. The e-governance facilitates the working procedures and reduces the required effort and cost.

The objective of this thesis is to propose an e-governance applicable model as well as highlights the importance of using a g-cloud. Additionally, the thesis aims to study the availability of the necessary implementation requirements of the g-cloud. Moreover, the study clarifies the obstacles against applying the g-cloud in Palestine. A possible g-cloud implementation roadmap is also provided.

The analysis of the collected data shows the significant gain of using g-cloud from an economic, technical, administrative, and development perspective. Moreover, the results reveal the sufficient availability of the initial requirements needed for the creation and management of the proposed g-cloud. In addition to that, the results report and discuss the existence of some difficulties that should be overcome before the real implementation.

The research recommends moving towards the g-cloud adoption as a basis for the future e-governance application. Additionally, the thesis highlights the necessity of creation of a political will to implement the g-cloud. Moreover, the results emphasize that the government should consider the g-cloud as a national project that has a valuable economical and developmental impact. Eventually, the thesis clarified the high contribution of the g-cloud in the achievement of the good governance.

3.4 International Studies

1. **Akin, et al. (2014) "The Impact and Challenges of Cloud Computing Adoption on Public Universities in Southwestern Nigeria"**

This research investigates the impact and challenges of the adoption of cloud computing by public universities in the Southwestern part of Nigeria.

The purpose of this paper is to investigate the factors that affect the adoption of cloud computing by firms belonging to the high-tech industry. The eight factors examined in this study are relative advantage, complexity, compatibility, top management support, firm size, technology readiness, competitive pressure, and trading partner pressure. The findings

revealed that relative advantage, top management support, firm size, competitive pressure, and trading partner pressure characteristics have a significant effect on the adoption of cloud computing.

The result of the findings revealed that the adoption of cloud computing has a significant impact on cost effectiveness, enhanced availability, low environmental impact, reduced IT complexities, mobility, scalability, increased operability and reduced investment in physical asset However, the major challenges confronting the adoption of cloud are data insecurity, regulatory compliance concerns, lock-in and privacy concerns. This paper concludes by recommending strategies to manage the identified challenges in the study area.

2. **Hanna, et al. (2014) "The Cloud: Requirements for a Better Service".**

In this research, they define a set of requirements for Cloud computing. Then they highlight the level of importance of each one for government organizations' applications, which are large-scale computations, financial services, healthcare applications, and the online entertainment. The aim of the presented interpretation is to assist organizations in making the right choice of service provider which corresponds to the minimum trade-off of their essential requirements. Then they start addressing each requirement individually to provide the suitable techniques and models that will help design and implement them efficiently. As a result, they aim to provide a road map for the design of efficient models to offer all the requirements for a specific domain or sector efficiently and in a cost-effective manner.

3. **Avram, (2013) "Advantages and challenges of adopting cloud computing from an enterprise perspective".**

In this research the author analyzed from a company's point of view the factors that need to be considered by an enterprise when making the decision of using cloud computing. Some of the companies are moving towards cloud computing just because it is the latest trend in information technology. On the other hand, other companies cannot even take into consideration the idea of having their sensitive data outside their premises. Both of these cases represent companies that are just not very well informed. She is not sustaining that cloud computing is a perfect solution for everybody, but adopting it or not should be result of a very

well informed analysis. She analyzed the positive and negative aspects of each of the following factors: integration with existing IT infrastructure and existing software, costs, return on investment, performances, and security. Also, she correlated all these factors with the company size and business area in order to identify if or what type of cloud computing solution is suitable for their needs.

4. **Low, et al. (2011) "Understanding the determinants of cloud computing adoption".**

The purpose of this research is to investigate the factors that affect the adoption of cloud computing by firms belonging to the high-tech industry in china. The eight factors examined in this study are relative advantage, complexity, compatibility, top management support, firm size, technology readiness, competitive pressure, and trading partner pressure.

The findings revealed that relative advantage, top management support, firm size, competitive pressure, and trading partner pressure characteristics have a significant effect on the adoption of cloud computing.

The research contributes to the application of new technology cloud computing adoption in the high-tech industry through the use of a wide range of variables. The findings, also, help firms consider their information technologies investments when implementing cloud computing.

3.5 Comment on Previous Studies

The researcher found that these works were conducted recently, which commensurate with research topic, also the Palestinian studies are similar to this research in term of discussing the adoption of cloud computing or in one of sub-variable to the dependent variable such as top management support, privacy and security. The researcher comments on differences and similarities aspects among this research and related works. As follows-:

1. In Terms of Research Topic and Aims:

All related works mentioned the value of adopting cloud computing in information technology operations and its important role in improving administration and electronic services in all fields especially health sector. In addition, all of related works agreed on

privacy, security and reliability of main challenges to adopt cloud computing in any field. They provide an understanding of the model and exploring options available for complementing the technology and infrastructure needs of Healthcare organizations.

2. In Terms of Research Methodology

The studies agreed on using descriptive analytical method, because it adapt to research's aims, and its capability to directly assist the scientific material and express it as a quantity which can be measured, some of the Palestinian studies that used this method are: (Mansour, 2013), (Shaath, 2013), (Jabi, 2015), (Qraiqea, 2014), (Almabhouh, 2015) and some foreign studies such as (low, et al., 2011).

3. In Term of Benefit

The researcher benefit from related work in writing research hypotheses, identification problem, collect theoretical framework material, select study tools (survey, interview) and explain the results.

4. In Terms of Results

The related works conclude to number of results: -

1- Most of these studies recommended the adoption of cloud computing through improve the electronic infrastructure, enhance the experience and needed skills, as well as making flexible strategies and plans to shift to cloud computing.
2- The importance of higher management support of modern IT operations through facilitation and administrative decisions.
3- Take care of IT employees through training and scholarships, etc.
4- The studies focused on virtual shift of the cloud, develop the physical and human Infrastructure to a better operational efficiency.
5- There are number of successful application of cloud computing in health sector at international organizations.
6- The Palestinian studies concluded that there are several obstacles, most important of it are: lack of higher management and decision makers' awareness about technology, inefficiency

of financial resources and budget, legal and regulatory weakness in shifting to cloud computing.

5. In Terms of Difference from Other Studies:

This research distinct is from other researches in the following:

1- To the knowledge of the researcher, this is the first research that deals with adopting cloud computing in the health sector in Palestine.
2- This research focuses on the fundamental determinants and challenges of adopting Cloud Computing at Palestinian Ministry of Health - Gaza Strip.
3- The researcher used (survey and, interview) as study tools, to reach accurate results.
4- The research focuses on overcoming the challenges.
5- Technicians and engineers at ministry of health have great experiences in software field, and lack of experience in hardware field.
6- The availability of an infrastructure capable of creating private cloud at ministry of health.

3.6 Research Gap

The content of this research agrees with above - mentioned related work, such as (Mansour; 2013) (Al Mabhouh; 2015) and (Jabi; 2015), this research focuses on fundamental determinants and challenges of cloud computing in health sector through clarifying number of criteria that contribute in using best information produced by the IT operations. It also focuses on sample's size and quality that targeted the completely technical and administrative employees at IT unit including decision-makers in the unit at MoH. The research also agrees with related works in term of methodology, it worth mention that presented related works integrate with each other to form the different axes of this research**.**

Chapter 4

Research Methodology

Chapter Outline:

4.1 Overview

This chapter describes the methodology of this research. The adopted methodology to accomplish this study uses the following techniques: the information about research design, research population, questionnaire design, statistical data analysis, content validity and pilot study.

4.2 Research Methodology

The study adopt descriptive analytical method appropriate to the nature of the topic; the study primary and secondary sources will be used to obtain the data necessary to answer the questions of the study.

Researcher in the study make questionnaire, resolution after the arbitration, to ensure validity, reliability, and bring down the scientific research on the reality in MoH.

4.3 Research Design

- **The first phase** of the research thesis includes identifying and defining the problem and objectives of the study and develops the research plan.
- **The second phase** of the research includes a summary of the comprehensive literature review. Literatures on claim management reviewed.
- **The third phase** of the research includes a field survey which was conducted with information technology staff in the Ministry of Health in the Gaza Strip.
- **The fourth phase** of the research focuses on the modification of the questionnaire design, through distributing the questionnaire to pilot study, the purpose of the pilot study to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. The questionnaire modified based on the results of the pilot study.
- **The fifth phase** of the research focuses on distributing questionnaire. This questionnaire used to collect the required data in order to achieve the research objective.
- **The sixth phase** of the research is about data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) is used to perform the required analysis. The final phase includes the conclusions and recommendations.

(105) questionnaires were distributed to the research population and (88) questionnaires are received.

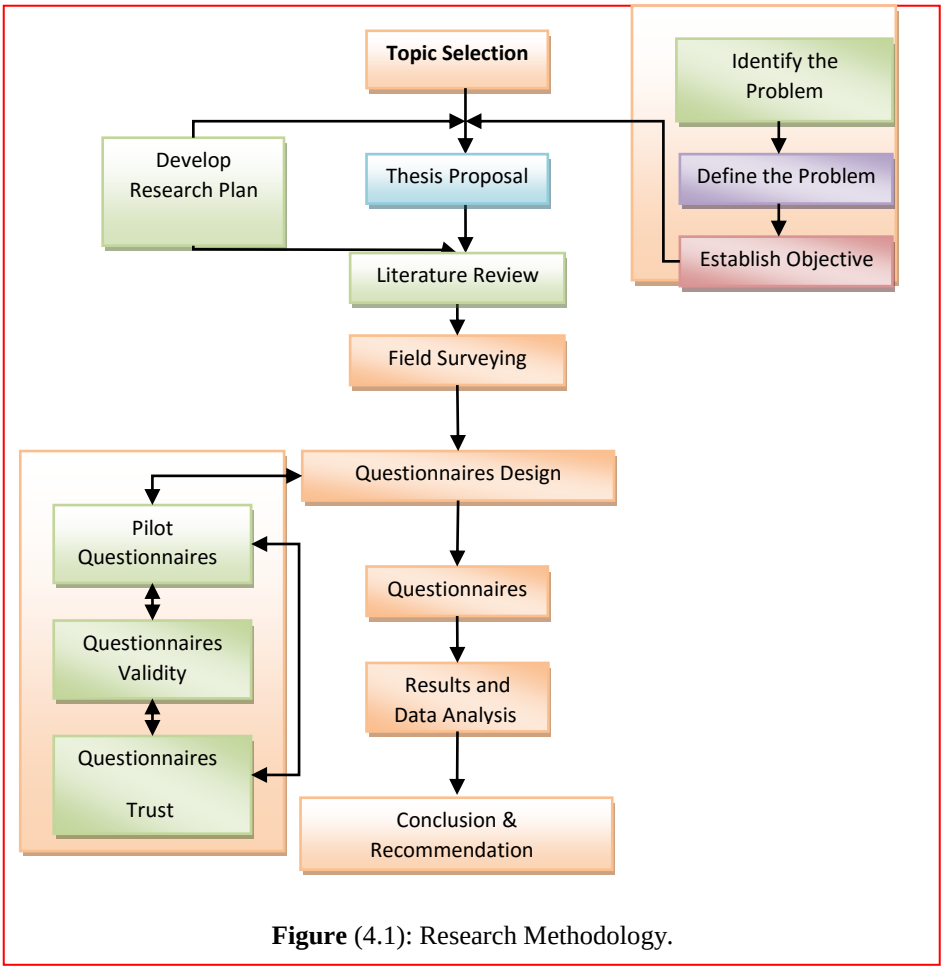

Figure (4.1): Research Methodology.

Figure (4.1) shows the methodology flowchart, which leads to achieve the research objective.

4.4 Data Collection Methodology

In order to collect the needed data for this research, we use the secondary resources in collecting data such as books, journals, statistics and web pages, in addition to preliminary resources that are not available in secondary resources through distributing questionnaires on study population in order to get their opinions about the subject of the study. Research methodology depend on the analysis of data on the use of descriptive analysis, which depends on the poll and use the main program (SPSS).

4.5 Population and Sample Size

The population includes employees in information technology division and top management support in MOH at Gaza Strip. They were selected based on their career and their knowledge of the subject of study.

4.6 Pilot Study

A pilot study for the questionnaire conducted before collecting the results of the sample. It provides a trial run for the questionnaire, which involves testing the wordings of question, identifying ambiguous questions, testing the techniques that used to collect data, and measuring the effectiveness of standard invitation to respondents.

4.7 Research Tools

This section explains the instruments that will be utilized to answer the research questions, the question be developed from the existing instruments used in previous studies, the questionnaire will consist of 6 sections (see appendix A) to capture the variables related to (cloud Computing Adoption, Determinants and Challenges), demographic variable, then represent the questionnaire in pilot study.

4.8 Validation Tool

- **Validity Questionnaire:** It is intending to measure the resolution paragraphs are developing to measure it, and will make sure researcher of validity questionnaire in two ways:

A. **Judgment Panel:** verifies the tool (research questionnaire) through expert's opinions of professors from different universities who are specialist in it and expert's opinions in MOH at Gaza Strip (see appendix A), experienced and competent in the field, where they present their views on the formulation of paragraphs and paragraphs belonging to the areas set where each paragraph.

B. **Validity of Internal Consistency:** a pilot study will be conduct to retest the instruments

4.9 Data Measurement

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is/are an appropriate method/s that can be applied and not others. In this research, scale 1-10 is used as table (4.1).

Item	***Strongly Disagree***									***Strongly agree***
Scale	1	2	3	4	5	6	7	8	9	10

Table 4.1: The degree of approval

- **Test of Normality**

The One-Sample Kolmogorov-Smirnov test procedure compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. The Kolmogorov-Smirnov Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test tests whether the observations could reasonably have come from the specified distribution. Many parametric tests require normally distributed variables. The one-sample Kolmogorov-Smirnov test can be used to test that a variable of interest is normally distributed (Henry, and Thode, 2002).

Table 4.1 shows the results for Kolmogorov-Smirnov test of normality. From Table (), the p-value for each variable is greater than 0.05 level of significance, then the distributions for these variables are normally distributed. Consequently, parametric tests should be used to perform the statistical data analysis.

Field	Kolmogorov-Smirnov	
	Statistic	**P-value**
Cloud Computing Adoption	0.806	0.534
Top Management Support	1.005	0.265
Technology Readiness	0.456	0.986
Regulatory Support	0.523	0.947
Operational Efficiency	0.977	0.296
Security & Privacy	0.533	0.939
Trust	0.575	0.895
All items of the questionnaire	0.473	0.978

Table 4.2: Kolmogorov-Smirnov test

4.10 Statistical Analysis Tools

The researcher used data analysis both qualitative and quantitative data analysis methods. The data analysis made utilizing (SPSS 22). The researcher utilizes the following statistical tools:

1) **Kolmogorov-Smirnov test of normality.**
2) **Pearson correlation coefficient for validity.**
3) **Cronbach's Alpha for trust Statistics.**
4) **Frequency and descriptive analysis.**
5) **Multiple Linear Regression Model.**
6) **One-sample T test.**

T test is used to determine if the mean of an item is significantly different from a hypothesized value 6. If the P-value (Sig.) is smaller than or equal to the level of significance, $\alpha = 0.05$, then the mean of an item is significantly different from a hypothesized value 6. The sign of the Test value indicates whether the mean is significantly greater or smaller than hypothesized value 6. On the other hand, if the P-value (Sig.) is greater than the level of significance, $\alpha = 0.05$, then the mean an item is insignificantly different from a hypothesized value 6.

7) Independent Samples T-test

The Independent Samples T-test is used to examine if there is a statistical significant difference between two means among the respondents toward the cloud computing adoption due to (Gender and Age).

8) Analysis of Variance

The One- Way Analysis of Variance (ANOVA) is used to examine if there is a statistical significant difference between several means among the respondents toward the cloud computing adoption due to (Qualification and Years of experience).

4.11 Statistical Validity of the Questionnaire

Validity refers to the degree to which an instrument measures what it is supposed to be measuring. Validity has a number of different aspects and assessment approaches. To insure the validity of the questionnaire, two statistical tests should be applied.

4.12 Internal Validity

Internal validity of the questionnaire is the first statistical test that used to test the validity of the questionnaire. It is measured by a scouting sample, which consisted of 30 questionnaires through measuring the correlation coefficients between each item in one field and the whole field.

Tables 4.2, 4.3, 4.4, 4.5, 4.6, and 4.7 present the correlation coefficient for each item of a field and the total of the corresponding field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of all items are significant at $\alpha = 0.05$, so it can be said that all items of each field are consistent and valid to be measure what it was set for.

Table 4.3: Correlation coefficient of each item of "Cloud Computing adoption" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	MoH attaches great technological and economic importance to adopt Cloud Computing.	.885	0.000*
2.	The size of MoH's facilities are assistant factor to adopt Cloud Computing.	.866	0.000*
3.	MoH is looking to adopt Cloud Computing savings in operational costs, and the cost of hardware and software.	.827	0.000*
4.	MoH develops its IT systems to keep up with Could Computing tech.	.862	0.000*
5.	MoH has a clear strategy regarding the use of modern techniques such as "cloud computing."	.806	0.000*
6.	MoH seeks Telehealth by adopting cloud computing.	.841	0.000*
7.	Expansion of information systems at MoH, reduces the burden of maintenance and problems of software through adoption of cloud computing.	.552	0.001*
8.	MoH looking to Integrate the data with the rest of government ministries through the development of information systems to access the cloud from anywhere.	.769	0.000*

* Correlation is significant at the 0.05 level

Table 4.4: Correlation coefficient of each item of "Top Management Support" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Top management support new tech in IT field as Cloud Computing.	.849	0.000*
2.	Top management put plans and objectives to adopt every new technology as Cloud Computing.	.881	0.000*
3.	There are awareness about importance of moving to Cloud Computing by decision makers.	.838	0.000*
4.	Top management provide necessary requirements to adopt Cloud Computing technology.	.713	0.000*
5.	Top management put plans to avoid challenges that face applying new technologies such as Cloud Computing.	.775	0.000*
6.	Top management study and analysis institutions that apply Cloud Computing.	.821	0.000*
7.	Top management compatible with ministry of Communications to process re-engineering in accordance with new technologies as Cloud Computing.	.831	0.000*

* Correlation is significant at the 0.05 level

Table 4.5: Correlation coefficient of each item of "Technology Readiness" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	There is infrastructure support of applying Cloud Computing at MoH.	.860	0.000*
2.	There is network supported by High-speed Internet connections among MoH facilities.	.671	0.000*
3.	There are information systems and applications that assist in adopting cloud computing.	.861	0.000*
4.	Applications and systems are updated constantly to adjust with new developments.	.809	0.000*
5.	It's possible to move applications and information systems to Cloud Computing.	.905	0.000*
6.	There are techquines problems faces adopting cloud computing.	.860	0.000*

* Correlation is significant at the 0.05 level

Table 4.6: Correlation coefficient of each item of "Regulatory Support" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	The organizational structure of MoH support plans and strategies for adopting any new technology as Cloud Computing.	.748	0.000*
2.	There is a systematic way to exchange E-information among MoH facilities.	.624	0.000*
3.	It's possible to shift workflow in accordance with Cloud Computing technology.	.564	0.001*
4.	There are dedicated to training and the purchase of new hardware and software on information technology in the Ministry of Health annual budget.	.722	0.000*
5.	There are joint computerized projects among MoH facilities.	.710	0.000*
6.	There is cooperation among institutions and MoH facilities.	.555	0.001*
7.	MoH hold workshops constantly to raise awareness about new technologies' benefits.	.853	0.000*
8.	It's possible to provide clear regulations for using Cloud Computing services such as holding video conference between IT experts and IT department staff to adopt Cloud Computing.	.429	0.010*
9.	MoH provide scholarships and missions to MoH's staff to benefit from new technology.	.724	0.000*

* Correlation is significant at the 0.05 level

Table 4.7: Correlation coefficient of each item of "Operational Efficiency" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	IT staff at MoH are aware of Cloud Computing importance.	.568	0.001*
2.	MoH have core skills (Human resources, Technical readiness) to adopt Cloud Computing.	.578	0.001*
3.	There are enough well-trained experts of cloud computing.	.740	0.000*

4.	The provided training in IT field to MoH's Employees able them to keep up with latest technologies.	.709	0.000*
5.	MoH fully employ its Human, financial and technology resources for new technologies as Cloud Computing.	.750	0.000*
6.	MoH activities are compatible with adopting Cloud Computing.	.703	0.000*
7.	There is enough awareness about aims and benefits of cloud computing at MoH.	.617	0.000*

* Correlation is significant at the 0.05 level

Table 4.8: Correlation coefficient of each item of "Security & Privacy" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Privacy and data security are the biggest challenges that face MoH in adopting new technologies.	.419	0.011*
2.	The level of securing data depends on service provider's security abilities.	.632	0.000*
3.	MoH is legally protecting sensitive data of patients and employees from leaking to an unauthorized employee.	.672	0.000*
4.	The ministry is aware of the nature of the cloud hand, place and method of access to data.	.715	0.000*
5.	Most of security and privacy issues related to new technologies at MoH are results of the absence of monitoring the infrastructure.	.523	0.002*
6.	Avoid putting applications and sensitive data in the cloud is an assistant factor to let MoH overcome security concerns	.645	0.000*
7.	MoH looking to compatible with government at (Hybrid Cloud) consists of applications for the development of public and non-sensitive and also from (Cloud Private) to maintain the confidentiality and security of their data.	.569	0.001*
8.	MoH put plans laws and restrictions on the user provider of cloud computing for data protection and health records service.	.569	0.001*
9.	MoH controls sensitive data.	.582	0.000*
10.	MoH seek to modernize and develop the physical hardware and software to protect confidential data.	.528	0.001*

* Correlation is significant at the 0.05 level

Table 4.9: Correlation coefficient of each item of "Trust" and the total of this field

No.	Item	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Trust is the most important factor for cloud Computing users (physicians, patients) at MoH.	.477	0.004*
2.	Trust vary between using E-mail (Gmail, Hotmail, etc.) and using Cloud Computing.	.502	0.002*
3.	Trust rises with Cloud Computing service companies if there are clear agreements related to amendments and E-security violations.	.542	0.001*
4.	There is a trust to new tech services providers of big companies (Amazon, Google, Microsoft etc.)	.725	0.000*
5.	Top management support trust new tech and Cloud Computing services providers.	.685	0.000*
6.	The agreement between MoH and services provider considered as safety measures to data.	.674	0.000*
7.	MoH is worried about using the data by Cloud Computing service provider for political preseasons.	.628	0.000*
8.	There is confidence of workers in the health sector (nurses, doctors) to provide the necessary information to the cloud.	.556	0.001*

* Correlation is significant at the 0.05 level

4.13 Structure Validity of the Questionnaire

Structure validity is the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of liker scale.

Table (4.9) clarifies the correlation coefficient for each field and the whole questionnaire. The p-values (Sig.) are less than 0.05, so the correlation coefficients of all the fields are significant at $\alpha = 0.05$, so it can be said that the fields are valid to be measured what it was set for to achieve the main aim of the study.

Table 4.10: Correlation coefficient of each field and questionnaire

No.	Field	Pearson Correlation Coefficient	P-Value (Sig.)
1.	**Cloud Computing adoption**	.801	0.000*
2.	Top management support	.835	0.000*
3.	Technology readiness	.768	0.000*
4.	Regulatory support	.863	0.000*
5.	Operational efficiency	.871	0.000*
6.	Security & Privacy	.684	0.000*
7.	Trust	.388	0.017*
8.	**Determinants and Challenges**	.982	0.000*

* Correlation is significant at the 0.05 level

4.14 Trust of the Research

The trust of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring (George and Mallery, 2006). The less variation an instrument produces in repeated measurements of an attribute, the higher its trust. Trust can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a trust coefficient (George and Mallery, 2006). To insure the trust of the questionnaire, Cronbach's Coefficient Alpha should be applied.

- **Cronbach's Coefficient Alpha**

Cronbach's alpha (George and Mallery, 2006) is designed as a measure of internal consistency, that is, do all items within the instrument measure the same thing. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. The Cronbach's coefficient alpha was calculated for each field of the questionnaire.

Table (4.11) shows the values of Cronbach's Alpha for each field of the questionnaire and the entire questionnaire. For the fields, values of Cronbach's Alpha were in the range from 0.734

and 0.930. This range is considered high; the result ensures the trust of each field of the questionnaire. Cronbach's Alpha equals 0.944 for the entire questionnaire which indicates an excellent trust of the entire questionnaire.

Table 4.11: Cronbach's Alpha for each field of the questionnaire

No.	Field	Cronbach's Alpha
1.	**Cloud Computing adoption**	0.919
2.	Top management support	0.916
3.	Technology readiness	0.808
4.	Regulatory support	0.810
5.	Operational efficiency	0.793
6.	Security & Privacy	0.785
7.	Trust	0.734
8.	**Determinants and Challenges**	0.930
	All items of the questionnaire	**0.944**

Thereby, it can be said that the researcher proved that the questionnaire is valid, reliable, and ready for distribution for the population sample.

Chapter 5

Data Analysis and Discussion

Chapter Outline:

5.1 Overview

5.2 Personal Data

5.3 Analysis for Each Field

5.4 Research Hypothesis

5.1 Overview

This chapter analyze personal data, dependent variable (cloud computing adoption), in dependent variable (Top management support, technology readiness, regulatory support, operational efficiency, security & Privacy, reliability), research hypotheses, and add comment on each item.

5.2 Personal Data

Table (5.1) lists characteristics of participative person data:

The number of male is twice the number of females in the sample, which is normal because the Palestinian society has tradition of carrying male responsibility of work more than females. The largest percentage in the age of the respondents ranged from 30 to less than 40 which is considered as a direct correlation with years of experience ranged from (5 - less than 10) years because of political events that occurred in 2007, which was followed by new jobs, the majority of respondents are engineers and programmers, and the large number of managers need a large number of health facilities.

Table (5.1): Personal Data (N=88)

Personal data		Frequency	Percent
Gender	Male	57	64.8
	Female	31	35.2
Age	From 18 – below 30	27	30.7
	From 30 – below 40	60	68.2
	From 40 – below 50	1	1.1
	Above 50 years	-	-
Qualification	Diploma or less	19	21.6
	Bachelor	59	67.0
	Postgraduate	10	11.4
Years of experience	Less than 5	28	31.8
	From 5- less than 10	45	51.1
	Above 10 years	15	17.0
Job title	Head of Division	9	10.2
	Head of Department	12	13.6
	Director of Department	5	5.7
	Deputy director of general	2	2.3
	Engineer	20	22.7
	Programmer	16	18.2
	Technical	1	1.1
	Data entry	21	23.9
	Other	2	2.3

5.3 Analysis for Each Field

1. Cloud Computing Adoption

Table (5.2) shows the following results:

- The mean of item #8 "MoH looking to integrate the data with the rest of government ministries through the development of information systems to access the cloud from anywhere" equals 6.48 (64.77%), Test-value = 2.05, and P-value = 0.022 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this item is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to this item.
- The mean of item #1 "MoH attaches great technological and economical importance to adopt Cloud Computing" equals 4.92 (49.20%), Test-value = -3.87, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.
- The mean of the field "Cloud Computing Adoption" equals 5.65 (56.46%), Test-value = -1.89, and P-value=0.031 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this field is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to field of "Cloud Computing adoption ".

- **Comments**

  Lack of decision-makers' knowledge about cloud computing technology reflected negatively on their interest in adopting it. The answers of respondents looking forward to the transformation of government cloud through the integration of data and the development of systems with the rest of other ministries, and (shaat, 2014) study has attached with the adoption of government cloud in the Gaza Strip. There is a difference and hesitation in adopting cloud computing through the answers of respondents because some employees have ample knowledge on the ministry's capabilities towards the adoption of cloud computing and others do not have enough knowledge.

Table (5.2): Means and Test Values for "Cloud Computing Adoption"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	MoH attaches great technological and economical importance to adopt Cloud Computing.	4.92	2.62	49.20	-3.87	0.000*	8
2.	The size of MoH's facilities are assistant factor to adopt Cloud Computing.	6.44	2.27	64.43	1.83	0.035*	3
3.	MoH is looking to adopt Cloud Computing savings in operational costs, and the cost of hardware and software.	5.34	2.36	53.41	-2.62	0.005*	5
4.	MoH develops its IT systems to keep up with Could Computing tech.	5.66	2.22	56.59	-1.44	0.076	4
5.	MoH has a clear strategy regarding the use of modern techniques such as "cloud computing."	4.92	2.18	49.20	-4.64	0.000*	7
6.	MoH seeks Telehealth by adopting cloud computing.	4.94	2.18	49.43	-4.55	0.000*	6
7.	Expansion of information systems at MoH, reduces the burden of maintenance and problems of software through adoption of cloud computing.	6.47	2.36	64.66	1.85	0.034*	2
8.	MoH looking to Integrate the data with the rest of government ministries through the development of information systems to access the cloud from anywhere.	6.48	2.19	64.77	2.05	0.022*	1
	All items of the field	5.65	1.76	56.46	-1.89	0.031*	

* The mean is significantly different from 6.

2. Top Management Support

Table (5.3) shows the following results:

- The mean of item #1 "Higher management support new tech in IT field as Cloud Computing" equals 5.58 (55.80%), Test-value = -1.92 and P-value = 0.029 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.

- The mean of item #6 “Higher management study and analysis institutions that apply Cloud Computing” equals 4.31 (43.07%), Test-value = -7.17, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.
- The mean of the field “Top management support” equals 4.98 (49.82%), Test-value = -5.96, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this field is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to field of “Top management support ".

- **Comments**

  Some of decision-makers have a little information about top management of new technology, so that the new technologies such as cloud computing don't have enough support to be adopted, and certainly there is no information and analysis for health institutions that apply cloud computing, **such as (**IBM) Watson Health، (epsos) European patents smart open Services, eHealth governance initiave (eHGI), Patients Registries iNiTiative (PARENT), (E-healthcare, 2016).

Table (5.3): Means and Test Values for "Top Management Support"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Top management support new tech in IT field as Cloud Computing.	5.58	2.05	55.80	-1.92	0.029*	1
2.	Top management put plans and objectives to adopt every new technology as Cloud Computing.	5.25	2.05	52.50	-3.43	0.000*	3
3.	There is awareness about importance of moving to Cloud Computing by decision makers.	4.95	2.11	49.55	-4.66	0.000*	4
4.	Top management provide necessary requirements to adopt Cloud Computing technology.	4.74	2.00	47.39	-5.92	0.000*	6
5.	Top management put plans to avoid challenges that face applying new technologies such as Cloud Computing.	4.75	1.98	47.50	-5.91	0.000*	5
6.	Top management study and analysis institutions that apply Cloud Computing.	4.31	2.21	43.07	-7.17	0.000*	7
7.	Top management compatible with ministry of Communications to process re-engineering in accordance with new technologies as Cloud Computing.	5.30	2.08	52.95	-3.18	0.001*	2
	All items of the field	4.98	1.60	49.82	-5.96	0.000*	

* The mean is significantly different from 6

3. Technology Readiness

Table (5.4) shows the following results:

- The mean of item #6 "There are techquines problems faces adopting cloud computing" equals 6.58 (65.81%), Test-value = 2.46, and P-value = 0.008 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this item is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to this item.
- The mean of item #2 "There is network supported by High-speed Internet connections among MoH facilities" equals 4.82 (48.16%), Test-value = -4.51, and P-value = 0.000 which

is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.

- The mean of the field "Technology readiness" equals 5.52 (55.18%), Test-value = -2.84, and P-value=0.003 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this field is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to field of "Technology readiness ".

- **Comments**

There is an internal network provided with the Internet in the MoH, but it is unstable and intermittent in some cases due to the current conditions of lacking of electricity in Gaza strip and poor operational budgets. The MoH is not ripe at the present time to adopt cloud computing hardware devices such as servers and private communication devices. In contrast, they have a highly skilled staff in software, where there is a group of engineers and programmers who are able to convert the workflow to cloud computing (Fraja, 2015)

Table (5.4): Means and Test Values for "Technology Readiness"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	There is infrastructure support of applying Cloud Computing at MoH.	5.21	2.46	52.07	-3.01	0.002*	5
2.	There is network supported by High-speed Internet connections among MoH facilities.	4.82	2.45	48.16	-4.51	0.000*	6
3.	There are information systems and applications that assist in adopting cloud computing.	5.62	2.09	56.21	-1.69	0.047*	3
4.	Applications and systems are updated constantly to adjust with new developments.	5.22	2.09	52.18	-3.49	0.000*	4
5.	It's possible to move applications and information systems to Cloud Computing.	5.67	1.88	56.67	-1.66	0.051	2
6.	There are techquines problems faces adopting cloud computing.	6.58	2.19	65.81	2.46	0.008*	1
	All items of the field	5.52	1.58	55.18	-2.84	0.003*	

* The mean is significantly different from 6.

4. Regulatory Support

Table (5.5) shows the following results:

- The mean of item #5 "There are joint computerized projects among MoH facilities" equals 6.08 (60.80%), Test-value = 0.38, and P-value = 0.354 which is greater than the level of significance $\alpha = 0.05$. Then the mean of this item is insignificantly different from the hypothesized value 6. We conclude that the respondents (Do not know, neutral) to this item.
- The mean of item #9 "MoH provide scholarships and missions to MoH's staff to benefit from new technology" equals 3.85 (38.47%), Test-value = -8.31, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.

- The mean of the field “Regulatory support” equals 5.19 (51.89%), Test-value = -5.56, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this field is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to field of “Regulatory support ".

- **Comments**

There is a common computerized programs among several health institutions such as the "mandatory training system", "the monthly reports for hospitals," "unified gateway" under the MoH. This gives an indication of the interest of the ministry-sharing data, health records and creates a support organization for the adoption of cloud computing, in addition to the big volume of information owned by the MoH, which is one of the most important things to cloud computing elements. In contrast, there is a need to train more workers and increase their experience to enable them to deal with any new technology of cloud computing, given that there are many countries applied years ago.

Table (5.5): Means and Test Values for “Regulatory Support”

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	The organizational structure of MoH support plans and strategies for adopting any new technology as Cloud Computing.	5.36	2.09	53.56	-2.88	0.003*	5
2.	There is a systematic way to exchange E-information among MoH facilities.	6.03	1.95	60.35	0.17	0.434	2
3.	It's possible to shift workflow in accordance with Cloud Computing technology.	5.65	1.79	56.47	-1.82	0.036*	4
4.	There are dedicated to training and the purchase of new hardware and software on information technology in the Ministry of Health annual budget.	4.18	2.48	41.84	-6.83	0.000*	8
5.	There are joint computerized projects among MoH facilities.	6.08	2.00	60.80	0.38	0.354	1

6.	There are cooperation among institutions and MoH facilities.	5.97	2.08	59.66	-0.15	0.439	3
7.	MoH hold workshops constantly to raise awareness about new technologies' benefits.	4.69	2.26	46.90	-5.41	0.000*	7
8.	It's possible to provide clear regulations for using Cloud Computing services such as holding video conference between IT experts and IT department staff to adopt Cloud Computing.	4.91	2.00	49.08	-5.08	0.000*	6
9.	MoH provide scholarships and missions to MoH's staff to benefit from new technology.	3.85	2.39	38.47	-8.31	0.000*	9
	All items of the field	5.19	1.36	51.89	-5.56	0.000*	

* The mean is significantly different from 6

5. Operational Efficiency

Table (5.6) shows the following results:

- The mean of item #1 “IT staff at MoH are aware of Cloud Computing importance” equals 6.61 (66.14%), Test-value = 2.66, and P-value = 0.005 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this item is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to this item.

- The mean of item #5 “MoH fully employit's Human, financial and technology resources for new technologies as Cloud Computing” equals 4.77 (47.73%), Test-value = -5.18, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.
- The mean of the field “Operational efficiency” equals 5.46 (54.63%), Test-value = -3.48, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this field is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to field of “Operational efficiency".

- **Comments**

Although there are some courses to improve the efficiency of the staff, but they are limited and few, and don't rise to the level of adoption cloud computing. There is an imbalance in the distribution and utilization of human, financial and technological resources towards adopting new technologies such as cloud computing.

Table (5.6): Means and Test Values for "Operational Efficiency"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	IT staff at MoH are aware of Cloud Computing importance.	6.61	2.17	66.14	2.66	0.005*	1
2.	MoH have core skills (Human resources, Technical readiness) to adopt Cloud Computing.	6.01	1.99	60.11	0.05	0.479	2
3.	There are enough well-trained experts of cloud computing.	5.73	2.13	57.27	-1.20	0.116	3
4.	The provided training in IT field to MoH's Employees able them to keep up with latest technologies.	5.16	2.16	51.59	-3.64	0.000*	4
5.	MoH fully employ it is Human, financial and technology resources for new technologies as Cloud Computing.	4.77	2.22	47.73	-5.18	0.000*	7
6.	MoH activities are compatible with adopting Cloud Computing.	5.03	2.20	50.34	-4.12	0.000*	5
7.	There is enough awareness about aims and benefits of cloud computing at MoH.	4.93	2.27	49.32	-4.41	0.000*	6
	All items of the field	5.46	1.45	54.63	-3.48	0.000*	

* The mean is significantly different from 6.

6. Security & Privacy

Table (5.7) shows the following results:

- The mean of item #1 “Privacy and data security are the biggest challenges that face MoH in adopting new technologies” equals 7.44 (74.43%), Test-value = 6.75, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this item is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to this item.

- The mean of item #8 “MoH put plans laws and restrictions on the user provider of cloud computing for data protection and health records service” equals 5.95 (59.55%), Test-value = -0.21, and P-value = 0.419 which is greater than the level of significance $\alpha = 0.05$. Then the mean of this item is insignificantly different from the hypothesized value 6. We conclude that the respondents (Do not know, neutral) to this item.

- The mean of the field “Security & Privacy” equals 6.53 (65.35%), Test-value = 4.20, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to field of “Security & Privacy ".

- **Comments**

The patient data security and medical records are one of the priorities of Information Technology Unit in the MoH, where there is a protection and control of data within the internal network, there are also a significant challenges regarding the default shift towards cloud computing.

Table (5.7): Means and Test Values for "Security & Privacy"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Privacy and data security are the biggest challenges that face MoH in adopting new technologies.	7.44	2.00	74.43	6.75	0.000*	1
2.	The level of securing data depends on service provider's security abilities.	7.05	1.89	70.46	5.17	0.000*	3
3.	MoH is legally protecting sensitive data of patients and employees from leaking to an unauthorized employee.	7.24	1.86	72.39	6.26	0.000*	2
4.	The ministry is aware of the nature of the cloud hand, place and method of access to data.	6.07	1.89	60.68	0.34	0.368	9
5.	Most of security and privacy issues related to new technologies at MoH are results of the absence of monitoring the infrastructure.	6.22	1.77	62.16	1.14	0.128	7
6.	Avoid putting applications and sensitive data in the cloud is an assistant factor to let MoH overcome security concerns	6.35	2.01	63.52	1.65	0.052	5
7.	MoH looking to compatible with government at (Hybrid Cloud) consists of applications for the development of public and non-sensitive and from (Cloud Private) to maintain the confidentiality and security of their data.	6.65	1.87	66.48	3.25	0.001*	4
8.	MoH put plans laws and restrictions on the user provider of cloud computing for data protection and health records service.	5.95	2.07	59.55	-0.21	0.419	10
9.	MoH controls sensitive data.	6.32	2.05	63.18	1.46	0.074	6
10.	MoH seek to modernize and develop the physical hardware and software to protect confidential data.	6.08	2.06	60.80	0.36	0.359	8
	All items of the field	6.53	1.20	65.35	4.20	0.000*	

* The mean is significantly different from 6.

7. **Trust**

Table (5.8) shows the following results:

- The mean of item #1 “Trust is the most important factor for cloud Computing users (physicians, patients) at MoH” equals 7.09 (70.91%), Test-value = 5.28, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this item is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to this item.
- The mean of item #5 “Higher management trust new tech and Cloud Computing services providers” equals 5.59 (55.91%), Test-value = -2.23, and P-value = 0.014 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this item is significantly smaller than the hypothesized value 6. We conclude that the respondents disagreed to this item.
- The mean of the field “Trust” equals 6.45 (64.52%), Test-value = 3.56, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 6. We conclude that the respondents agreed to field of “Trust".

- **Comments**

AS the trust is very important for the patient and the doctor as it disposes the adoption of the cloud within the functioning of the MoH or not, and also the lack of confidence with the providers of cloud computing services makes a greater burden to the technology of Ministry of Health, there are two solutions: either be working within a specially cloud provided by the national government without needing for international companies or staying in a modest technology.

Table (5.8): Means and Test Values for "Trust"

	Item	Mean	S.D.	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Trust is the most important factor for cloud Computing users (physicians, patients) at MoH.	7.09	1.94	70.91	5.28	0.000*	1
2.	Trust vary between using E-mail (Gmail, Hotmail etc) and using Cloud Computing.	6.26	2.05	62.61	1.20	0.117	5
3.	Trust rises with Cloud Computing service companies if there are clear agreements related to amendments and E-security violations.	7.08	1.69	70.80	5.99	0.000*	2
4.	There is a trust to new tech services providers of big companies (Amazon, Google, Microsoft etc.).	7.08	1.61	70.80	6.28	0.000*	2
5.	Higher management trust new tech and Cloud Computing services providers.	5.59	1.72	55.91	-2.23	0.014*	8
6.	The agreement between MoH and services provider considered as safety measures to data.	6.24	1.67	62.39	1.34	0.092	6
7.	MoH is worried about using the data by Cloud Computing service provider for political reseasons.	6.50	2.11	65.00	2.23	0.014*	4
8.	There is confidence of workers in the health sector (nurses, doctors) to provide the necessary information to the cloud.	5.77	1.96	57.73	-1.09	0.140	7
	All items of the field	6.45	1.19	64.52	3.56	0.000*	

* The mean is significantly different from 6.

5.4 Research Hypothesis

1. There is a significance relationship between Determinants and Challenges and Cloud Computing Adoption (at level of significance α= 0.05).

Table (5.9) shows that the correlation coefficient between determinants and challenges and cloud computing adoption equals .647 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05. We

conclude there exists a significant relationship between determinants and challenges and cloud computing adoption.

- **Comments**

The relationship between the determinants and challenges shows that every failure or weakness in the elements of determinants turns into a big challenge for the success of the adoption of cloud computing and vice versa.

Table (5.9): Correlation coefficient between determinants and challenges and cloud computing adoption

	Pearson Correlation Coefficient	**P-Value (Sig.)**
Relationship between top management support and Cloud Computing Adoption	.693	0.000*
Relationship between technology readiness and Cloud Computing Adoption	.674	0.000*
Relationship between regulatory support and Cloud Computing Adoption	.609	0.000*
Relationship between operational efficiency and Cloud Computing Adoption	.521	0.000*
Relationship between security & privacy and Cloud Computing Adoption	.246	0.010*
Relationship between trust and Cloud Computing Adoption	.256	0.008*
Relationship between Determinants and Challenges and Cloud Computing Adoption	**.647**	**0.000***

* Correlation is statistically significant at 0.05 level

2. **There is a significance effect of Determinants and Challenges on Cloud Computing Adoption (at level of significance α= 0.05).**

We use Multiple Linear Regression Model and obtain the following results:

- The Multiple correlation coefficient R =0.789 and R-Square = 0.623. This means 62.3% of the variation in cloud computing adoption by all of the independent variables together "Top management support, Technology readiness, Regulatory support, Operational efficiency, Security & Privacy and Trust".

- The Analysis of Variance for the regression model. F=21.717, Sig. = 0.000, so there is a significant relationship between the dependent variable cloud computing adoption and the independent variables "Top management support, Technology readiness, Regulatory support, Operational efficiency, Security & Privacy and Trust ".

- For the variable "**Top Management Support** ", the t-test =4.300, the P-value (Sig.) =0.000, which is smaller than 0.05, hence this variable is statistically significant. Since the sign of the test is positive, then there is significant positive effect of the variable extent of top management support on cloud computing adoption.
- For the variable "**Technology Readiness** ", the t-test =3.855, the P-value (Sig.) =0.000, which is smaller than 0.05, hence this variable is statistically significant. Since the sign of the test is positive, then there is significant positive effect of the variable extent of technology readiness on cloud computing adoption.
- For the variable "**Regulatory Support** ", the t-test = 0.046, the P-value (Sig.) =0.284, which is greater than 0.05, hence this variable is statistically insignificant. then there is insignificant effect of the variable extent of regulatory support on cloud computing adoption.
- For the variable "**Operational Efficiency** ", the t-test = 1.274, the P-value (Sig.) =0.206, which is greater than 0.05, hence this variable is statistically insignificant. then there is insignificant effect of the variable extent of operational efficiency on cloud computing adoption.
- For the variable "**Security & Privacy** ", the t-test =-2.593, the P-value (Sig.) =0.011, which is smaller than 0.05, hence this variable is statistically significant. Since the sign of the test is negative, then there is significant negative effect of the variable extent of security & privacy on cloud computing adoption.
- For the variable "**Trust** ", the t-test = 1.311, the P-value (Sig.) =0.194, which is greater than 0.05, hence this variable is statistically insignificant. then there is insignificant effect of the variable extent of trust on cloud computing adoption.

- In addition, based on the P-value (Sig.), the most significant independent variable is top management support, then technology readiness, then security & privacy, then trust, then operational efficiency and regulatory support.

The regression equation is:

Cloud computing adoption *= 1.047+ 0.458* (Top management support) + 0.453* (Technology readiness) + 0.046* (Regulatory support) + 0.169* (Operational efficiency) - 0.374* (Security & Privacy) + 0.170* (Trust)*

Table (5.10): Result of multiple linear regression analysis

Variable	B	T	Sig.	R	R-Square	F	Sig.
(Constant)	1.047	1.340	0.184	.789	0.623	21.717	0.000**
Top management support	0.458	4.300	0.000*				
Technology readiness	0.453	3.855	0.000*				
Regulatory support	0.046	0.284	0.777				
Operational efficiency	0.169	1.274	0.206				
Security & Privacy	-0.374	-2.593	0.011*				
Trust	0.170	1.311	0.194				

* The variable is statistically significant at 0.05 level

* * The relationship is statistically significant at 0.05 level

3. **There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to personal traits (Gender, Age, Qualifications and Years of Experience) (at level of significance $\alpha \leq 0.05$).**

This hypothesis can be divided into the following sub-hypotheses:

- **There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to gender (at level of significance $\alpha \leq 0.05$).**

Table (5.11) shows that the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$ for each field, then there is insignificant difference among the respondents toward each field due to gender. We conclude that the personal characteristics' gender has no effect on each field.

Table (5.11): Independent Samples T-test of the fields and their p-values for gender

No.	Field	Means		Test Value	Sig.
		Male	Female		
1.	Cloud Computing adoption	5.84	5.30	1.375	0.173
2.	Top management support	4.91	5.12	-0.592	0.555
3.	Technology readiness	5.49	5.57	-0.215	0.830
4.	Regulatory support	5.05	5.45	-1.304	0.196
5.	Operational efficiency	5.47	5.44	0.094	0.925
6.	Security & Privacy	6.46	6.67	-0.806	0.423
7.	Trust	6.41	6.54	-0.489	0.626
	All Items	5.70	5.78	-0.329	0.743

- **There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to age (at level of significance $\alpha \leq 0.05$).**

Table (5.12) shows that the p-value (Sig.) is smaller than the level of significance $\alpha = 0.05$ for the fields "Top management support and Regulatory support", then there is significant difference among the respondents toward these fields due to age. We conclude that the personal characteristics' age has an effect on these fields.

For the fields "Top management support and Regulatory support", the mean for " From 30 – below 50 " age are higher than " From 18 – below 30", then we conclude that from 30 – below 50 age respondents is agree for these fields much more than from 18 – below 30 age.

- **Comments**

Since most of older employees have a lot of experience, they have more information by virtue of their communication with decision-makers.

For the other fields, the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$, then there is insignificant difference among the respondents toward these fields due to age. We conclude that the personal characteristics' age has no effect on the other fields.

Table (5.12): Independent Samples T-test test of the fields and their p-values for age

No.	Field	Means		Test Value	Sig.
		From 18 – below 30	From 30 – below 50		
1.	Cloud Computing adoption	5.18	5.85	-1.686	0.096
2.	Top management support	4.47	5.21	-2.026	0.046*
3.	Technology readiness	5.06	5.73	-1.854	0.067
4.	Regulatory support	4.70	5.40	-2.258	0.027*
5.	Operational efficiency	5.03	5.65	-1.883	0.063
6.	Security & Privacy	6.41	6.59	-0.643	0.522
7.	Trust	6.52	6.42	0.372	0.711
	All Items	5.41	5.88	-1.886	0.063

* The mean difference is significant a 0.05 level

- **There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to qualification (at level of significance $\alpha \leq 0.05$).**

Table (5.13) shows that the p-value (Sig.) is smaller than the level of significance $\alpha = 0.05$ for the field "Top management support", then there is significant difference among the respondents toward these field due to qualification. We conclude that the personal characteristics' qualification has an effect on these fields.

For the field “Top management support”, the mean for the category “Diploma or less” respondents have the highest among the other qualification categories, then we conclude that the category “Diploma or less “respondents is agreeing for these field much more than the other qualification categories.

- **Comments**

The big difference between the "Diploma or less" and "other qualification categories" back to the supervisory positions occupied by the holders of BA degree rather than "Diploma or less" students who's the majority of them are working as data entries.

For the other fields, the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$, then there is insignificant difference among the respondents toward these fields due to qualification. We conclude that the personal characteristics’ qualification has no effect on the other fields.

- **Comments**

Most of respondents are owner of specialization who oversee any new technology and holder of bachelor's degree who enhances the accuracy of answer.

Table (5.13): ANOVA test of the fields and their p-values for qualification

No.	Field	Means			Test Value	Sig.
		Diploma or less	Bachelor	Postgraduate		
1.	Cloud Computing adoption	6.05	5.51	5.68	0.678	0.510
2.	Top management support	5.86	4.71	4.90	3.913	0.024*
3.	Technology readiness	6.13	5.39	5.08	2.010	0.140
4.	Regulatory support	5.71	5.03	5.12	1.839	0.165
5.	Operational efficiency	5.55	5.50	5.06	0.445	0.642
6.	Security & Privacy	6.73	6.49	6.45	0.327	0.722
7.	Trust	6.55	6.35	6.88	0.905	0.408
	All Items	6.11	5.62	5.66	1.491	0.231

* The mean difference is significant a 0.05 level

- **There are significant differences among respondents towards the Determinants & Challenges and Cloud Computing adoption observed by MoH due to years of experience (at level of significance $\alpha \leq 0.05$).**

Table (5.14) shows that the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$ for each field, then there is insignificant difference among the respondents toward each field due to years of experience. We conclude that the personal characteristics' years of experience has no effect on each field.

- **Comments**

Most workers in the information technology unit of the MoH have been working since the new government took in 2007, so the years of experience are closed due to the convergence of employment.

Table (5.14): ANOVA test of the fields and their p-values for years of experience

No.	Field	Means			Test Value	Sig.
		Less than 5	From 5-less than 10	Above 10 years		
1.	Cloud Computing adoption	6.01	5.42	5.65	0.992	0.375
2.	Top management support	5.32	4.76	5.01	1.055	0.353
3.	Technology readiness	5.78	5.30	5.71	0.924	0.401
4.	Regulatory support	5.65	4.96	5.05	2.350	0.102
5.	Operational efficiency	5.83	5.20	5.57	1.693	0.190
6.	Security & Privacy	6.72	6.29	6.91	2.088	0.130
7.	Trust	6.68	6.31	6.46	0.864	0.425
	All Items	6.05	5.51	5.81	2.278	0.109

Chapter 6

Conclusions, Recommendation, and Future Work

Chapter Outline:

6.1 Overview

6.2 Conclusions

6.3 Recommendations

6.4 Future Work

6.1 Overview

This chapter presents findings and recommendations of the study, based on statistical treatments carried out on collected and analyzed data from the instrument during the study, as well as the theoretical framework for the study.

The present study aimed to know determinants and challenges of adopting cloud computing in MoH, and measure research variables of (top management, organizational support, operational efficiency, privacy and security, reliability) as well as the measurement of demographic factors. This chapter has been divided into three sections, conclusions, recommendations, and future studies.

6.2 Research Conclusions

This section includes a presentation on the results of the demographic characteristics of the study sample, and then the results for the search variables, and finally test the hypotheses of the search results, and through statistical analysis of the views of the respondents and the results of studies and reports included in this study:

6.2.1 Research Demographic Characteristics

1. **Gender:**

The results showed that more than half of the sample (88) are males, with number of (57), (64.8%) of the total respondents, while the number of females reached (31), (53.2%) of the total respondents.

2. **Age:**

The results showed that the highest percentage of the respondents' ages range (from 30 to 40 years), with number of (60), (68.2%) of the total respondents, followed by people whom their ages range (from 18 to 30 years), with number of (27), (30.7%) of the total respondents.

3. **Qualification:**

The results showed that the highest percentage of respondents are holding a bachelor's degree, with number of (59), (67%) of the total respondents, followed by intermediate diploma

holders, with number of (19), (21.6%) of the total respondents, and in the third place are the holders of postgraduate certifications, with number of (10), (11.4%) of the total respondents.

4. Years of experience:

The results showed that the highest percentage of respondents are those with years of service range (from 5 to 10 years), with number of (45), (51.1%) of the total respondents, followed by respondents whom their years of service range (from 5 years or less), with number of (28), (31.8%) of the total respondents, followed by respondents whom their years of service range (from 10 years and over), with number of (15), (17.0%) of the total respondents.

5. Job Title:

The results showed that there is a convergence ratio among data entry**,** with number of (21), (23.9%) of the total respondents, followed by engineers with similar ratio, with number of (20), (22.7%) of the total respondents, followed by Programmer, with number of (16), (18.2%) of the total respondents followed by heads of department with number of (12), (13.6%) of the total respondents, followed by heads of division with number of (9), (10.2%) of the total respondents, followed by directors of department with number of (5), (5.7%) of the total respondents, followed by respondents whom their deputy director of general, with number of (2), (2.3%) of the total respondents, and finally there is technical, with number of (1), (1.1%) of the total respondents.

6.2.2 Research Variables

This section describes the results of the independent variables and dependent variable, and summarizes the result of each variable.

A. With regard to "Cloud Computing adoption at MoH"

The research concluded with the following statistical results:

1. There is (64.77%) of respondents assure that the MoH looking to Integrate the data with the rest of government ministries through the development of information systems to access the cloud from anywhere. In addition, there is (64.66%) of the respondents see that the expansion

of information systems at MoH, reduces the burden of maintenance and problems of software through adoption of cloud computing.

2. In addition, there is (64.43%) of the respondents see that the size of MoH's facilities are assistant factor to adopt Cloud Computing.

3. There is (56.59%) of the respondents see that the MoH develops its IT systems to keep up with Could Computing technology.

4. In addition, there is (53.41%) of the respondents see that the MoH is looking to adopt Cloud Computing savings in operational costs, and the cost of hardware and software. In addition, there is (49.43%) of the respondents see that the MoH seeks Telehealth by adopting cloud computing.

5. There is (49.20%) of the respondents see that the MoH has a clear strategy regarding the use of modern techniques such as "cloud computing". In addition, there is (49.20%) of the respondents see that the MoH attaches great technological and economical importance to adopt Cloud Computing.

6. In general, there is (56.46%) of the respondents see adopt cloud computing in MoH at Gaza strip, but this ratio shows different views of the respondents, as a result of the weakness of technological readiness of hardware, Regulatory support.

B. With regard to "Top Management Support "

The research concluded with the following statistical results:

7. There is (55.80%) of the respondents see that the top management support new technology in IT field as Cloud Computing. In addition, there is (52.95%) of the respondents see that the higher management compatible with ministry of Communications and Information Technology to process re-engineering in accordance with new technologies as Cloud Computing.

8. There is (52.50%) of the respondents see that the top management put plans and objectives to adopt every new technology such as Cloud Computing. In addition, there is (49.55%) of the respondents see that there is awareness about importance of moving to Cloud Computing by decision makers.

9. There is (47.50%) of the respondents see that the top management put plans to avoid challenges that face applying new technologies such as Cloud Computing. In addition, there is (47.39%) of the respondents see that the top management provide necessary requirements to adopt Cloud Computing technology.

10. There is (49.82%) of the respondents see that the top management study and analysis institutions that apply Cloud Computing.

11. In general, there is (49.82%) of the respondents see that the top management support is weakness, because there is no communication with the experts, and the lack of knowledge of new technologies.

C. With regard to "Technology Readiness"

The research concluded with the following statistical results:

1. There are (65.81%) of the respondents see that there are technical problems faces adopting cloud computing. Furthermore, there are (56.21%) of the respondents see that there are information systems and applications that assist in adopting cloud computing.
2. In addition, there is (56.67%) of the respondents see that it is possible to move applications and information systems to Cloud Computing.
3. There is (52.18%) of the respondents see that the applications and systems are updated constantly to adjust with new developments. Moreover, there is (52.07%) of the respondents see that is infrastructure support of applying Cloud Computing at MoH.
4. There is (48.16%) of the respondents see that is network supported by High-speed Internet connections among MoH facilities.
5. In general, there is (55.18%) of the respondents see that is still problems confront adopt cloud computing, because lack and weakness of hardware, although there are modest skills.

D. With regard to "Regulatory Support".

The research concluded with the following statistical results:

1. There is (60.80%) of the respondents see that there are joint computerized projects among MoH facilities. In addition, there is (60.35%) of the respondents see that there is a systematic way to exchange E-information among MoH facilities.
2. There is (59.66%) of the respondents see that there is cooperation among institutions and MoH facilities. Also, there is (56.47%) of the respondents see that it is possible to shift workflow in accordance with Cloud Computing technology.
3. There is (53.56%) of the respondents see that the organizational structure of MoH support plans and strategies for adopting any new technology as Cloud Computing.
4. There is (49.08%) of the respondents see that it's possible to provide clear regulations for using Cloud Computing services such as holding video conference between IT experts and IT department staff to adopt Cloud Computing.
5. There is (46.90%) of the respondents see that the MoH hold workshops constantly to raise awareness about new technologies' benefits. On the other hand, there is (41.84%) of the respondents see that there are dedicated to training and the purchase of new hardware and software on information technology in the Ministry of Health annual budget.
6. In addition, there is (38.47%) of the respondents see that the MoH provide scholarships and missions to MoH staff to benefit from new technology.
7. In general, there is (51.89%) of the respondents see that the results show there is an integrated network and cooperation in the exchange of information, but this is not enough for virtualization toward cloud computing and there are obstacles such as changing workflow.

E. With regard to "Operational Efficiency".

The research concluded with the following statistical results:

1. There is (66.14%) of the respondents see that the IT staff at MoH are aware of Cloud Computing importance.
2. There is (60.11%) of the respondents see that the MoH have core skills in human resources to adopt Cloud Computing. Moreover, there is (57.27%) of the respondents see that there are enough well-trained experts of cloud computing.

3. There is (51.59%) of the respondents see that the provided training in IT field to MoH employees able them to keep up with latest technologies.
4. There is (50.34%) of the respondents see that the MoH activities are compatible with adopting Cloud Computing. On the other hand, there is (49.32%) of the respondents see that there is enough awareness about aims and benefits of cloud computing at MoH.
5. In addition, there is (47.73%) of the respondents see that the MoH fully employit's Human, financial and technology resources for new technologies as Cloud Computing.
6. In general, there is (51.89%) of the respondents see that MoH staff have a good experience in Software, but they need more to training for adoption of cloud computing, also increase the efficiency of the hardware.

F. With regard to "Security & Privacy".

The research concluded with the following statistical results:

1. There is (74.43%) of the respondents see that Privacy and data security are the biggest challenges that face MoH in adopting new technologies.
2. There is (72.39%) of the respondents see that MoH is legally protecting sensitive data of patients and employees from leaking to an unauthorized employee. Moreover, there is (70.46%) of the respondents see that the level of securing data depends on service provider's security abilities.
3. There is (66.48%) of the respondents see that MoH looking to compatible with government at (Hybrid Cloud) consists of applications for the development of public and non-sensitive and also from (Cloud Private) to maintain the confidentiality and security of their data. On the other hand, there is (63.52%) of the respondents see that avoid putting applications and sensitive data in the cloud is an assistant factor to let MoH overcome security concerns.
4. There is (63.18%) of the respondents see that MoH controls sensitive data. Also there is (62.16%) of the respondents see that most of security and privacy issues related to new technologies at MoH are results of the absence of monitoring the infrastructure.
5. There is (60.80%) of the respondents see that MoH seek to modernize and develop the physical hardware and software to protect confidential data. Furthermore, there is (60.68%) of the respondents see that the ministry is aware of the nature of the cloud hand, place and method of access to data.

6. There is (59.55%) of the respondents see that MoH put plans laws and restrictions on the user provider of cloud computing for data protection and health records service.
7. In general, there is (65.35%) of the respondents see that the MoH can be controlled on sensitive data and can work on a hybrid cloud, but there are fears of the service provider without plans and restrictions imposed on him, also the ministry is seeking to put laws to protect patient data.

G. With regard to "Trust"

1. There is (70.91%) of the respondents see that trust is the most important factor for cloud Computing users (physicians, patients) at MoH.
2. There is (70.80%) of the respondents see that trust rises with Cloud Computing service companies if there are clear agreements related to amendments and E-security violations. In addition, the same ratio (70.80%) of the respondents see that is a trust to new tech services providers of big companies (Amazon, Google, Microsoft etc.).
3. There is (65.00%) of the respondents see that MoH is worried about using the data by Cloud Computing service provider for political reseasons.
4. There is (62.61%) of the respondents see that the trust varies between using E-mail (Gmail, Hotmail etc.) and using Cloud Computing. Furthermore, there is (62.39%) of the respondents see that the agreement between MoH and services provider considered as safety measures to data.
5. There is (57.73%) of the respondents see that there is confidence of workers in the health sector (nurses, doctors, etc.) to provide the necessary information to the cloud. On the other hand, there is (55.91%) of the respondents see that higher management trust new tech and Cloud Computing services providers.
6. In general, there is (64.52%) of the respondents see that the confidence most important factor for those working in the Ministry of Health to deal with the cloud, in terms of the laws imposed and agreements signed between the service providers, and it affects the size of the data and the successful adoption of cloud.

6.3 Recommendations

The study concluded a set of recommendations reached by the investigator based on previous results, as follows:

1. The top management should care of modern technology and finding a strong will to shift towards cloud computing, because it has too much information, and it is one of the largest ministries in the government.
2. MoH use a hybrid cloud, which consists of a public Cloud to put non-sensitive and public applications. Also from the Private Cloud to maintain the privacy and security of data.
3. MoH needs to improve hardware for adoption of new technologies such as cloud computing.
4. Top management should improve information systems like electronic medical records (EMR) and personal health records (PHR).
5. Strengthening the strategic vision to get a comprehensive and a long-term planning for e-health application.
6. Improving and developing the infrastructure and the efficiency of information systems' components in terms of hardware, software, and qualified human resources.
7. Evaluating the performance of employees continuously so that the overall performance commensurate with the rapid changes in the world of health technology, and to benefit from the experiences of previous health institutions that have implemented cloud computing.
8. Developing a flexible plan to manage changing resistance with the participation of all workers in the field of information technology in order to hold them a part of adoption of cloud computing responsibility.
9. Reengineering the operations and the procedures of the Ministry of Health commensurate with the adoption of cloud computing.
10. Cooperating with the Ministries of Interior and Education for the possibility of action an entire scheme to put the shared information in a public cloud and allocate a private cloud so that it can be traded by the users.
11. Identifying the authorized entity which are going to build the cloud in order to gain trust firstly and then choose the applications that will be adopted by the Ministry of Health in terms of speed, performance, and potential problems.
12. Implementing awareness and dissemination campaigns of e-health education for citizens and community, so there are no gaps between the users and the cloud applications.

6.4 Future Works

There are many areas that can be researched in the context of this study, which can enrich current finding. The following topics could be studied in the future:

1. Conduct a study on process re-engineering in the ministry of Health to adopt cloud computing.
2. Conduct a study on the impact of management information systems at the Ministry of Health related to adopting cloud computing.
3. Conduct a study on Impact of Cloud Computing on Healthcare.
4. Conduct a study on measuring the effectiveness of cloud computing in the Ministry of Health.
5. A comparative study between of Ministry of Health in Gaza strip and Ministry of Health in other states applied to cloud computing.
6. Conduct a study on the possibility of building public cloud for health sector in Palestine.
7. Conduct a study cloud computing for enhanced mobile health applications in health sector.
8. Cloud Computing: Building a New Foundation for Healthcare from (Smart Open Services for Palestinian Patients).

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Appendices

Appendix A: Questionnaire

(English Version)

Mr/s .....

May Allah's peace, mercy and blessing be upon you.

Questionnaire

The researcher is conducting a research titled (Determents and Challenges of Cloud Computing Adoption in the Palestinian Ministry of Health)

As a partial fulfillment of the requirements for the Degree of Master of Leadership and Management from joint graduate program between Management and Politics Academy and Al-Aqsa university.

It is an honor to have a person with experience and wide knowledge in scientific research field as you, to arbitrate the paragraphs of this Questionnaire, which is the research tool, before I do deliver it to research's sample.

I would kindly ask you to review the paragraphs of the questionnaire, then provide me with instructions to add, modify or delete, in addition to questionnaire language and to elaborate the extent of the paragraphs related to the topic, to have an appropriate tool for measurement.

Thank you for filling out this Questionnaire

Researcher / Adham Fathy Al leddawi

Definition of Cloud Computing:

Cloud Computing is a term that refers to sources and computer systems available on demand through the internet, which can provide a number of integrated computer services without being bound by local resources in order to make it easier for the user, and those resources include storage space, data backup, and self-synchronization. Also it includes processing capabilities software, scheduling of tasks, push e-mail, and remote printing. And the user can control when it is connected to the network in these resources through a simple software interface simplifies and ignores a lot of details and internal operations.

Research Variables:

Dependent Variables	Independent Variables
• The adoption of Cloud Computing Technology	• Top management support • Technology readiness • Regulatory support • Operational efficiency • Security & Privacy • Trust

Part one: Personal Functional Information

Would you please put tick (√) beside the appropriate answer:

1. **Gender:** Male Female
2. **Age: (in years)**

   From 18 – below 30 From 30 – below 40 From 40 – below 50 Above 50 years
3. **Qualification:**

   Diploma **or less** Bachelor postgraduate
4. **Years of Experience**

   Less than 5 From 5- less than 10 Above 10 years
5. **Job title**

   Head of Division Head of Department Director of Department

   Deputy director of general Engineer programmer Technical Data entry

   Other.

Part Two: Please write number where the degree of approval that (1) are less degrees (10) greater degree in the following terms.

	Items	Agreement degree (1-10)
	Cloud Computing Adoption	
1	MoH attaches great technological and economical importance to adopt Cloud Computing.	
2	The size of MoH's facilities are assistant factor to adopt Cloud Computing.	
3	MoH is looking to adopt Cloud Computing savings in operational costs, and the cost of hardware and software.	
4	MoH develops its IT systems to keep up with Could Computing tech.	
5	MoH has a clear strategy regarding the use of modern techniques such as "cloud computing."	
6	MoH seeks Telehealth by adopting cloud computing.	
7	Expansion of information systems at MoH, reduces the burden of maintenance and problems of software through adoption of cloud computing.	
8	MoH looking to Integrate the data with the rest of government ministries through the development of information systems to access the cloud from anywhere.	

	Items	Agreement degree (1-10)
	I. Top Management Support	
1	Higher management support new tech in IT field as Cloud Computing.	
2	Higher management put plans and objectives to adopt every new technology as Cloud Computing.	
3	There are awareness about importance of moving to Cloud Computing by decision makers.	
4	Higher management provide necessary requirements to adopt Cloud Computing technology.	
5	Higher management put plans to avoid challenges that face applying new technologies such as Cloud Computing.	
6	Higher management study and analysis institutions that apply Cloud Computing.	
7	Higher management compatible with ministry of Communications to process re-engineering in accordance with new technologies as Cloud Computing.	

	Items	Agreement degree (1-10)
II. Technology Readiness		
1	There is infrastructure support of applying Cloud Computing at MoH.	
2	There is network supported by High-speed Internet connections among MoH facilities.	
3	There are information systems and applications that assist in adopting cloud computing.	
4	Applications and systems are updated constantly to adjust with new developments.	
5	It's possible to move applications and information systems to Cloud Computing.	
6	There are techquines problems faces adopting cloud computing.	

	Items	Agreement degree (1-10)
III. Regulatory Support		
1	The organizational structure of MoH support plans and strategies for adopting any new technology as Cloud Computing.	
2	There is a systematic way to exchange E-information among MoH facilities.	
3	It is possible to shift workflow in accordance with Cloud Computing technology.	
4	There are dedicated to training and the purchase of new hardware and software on information technology in the Ministry of Health annual budget.	
5	There are joint computerized projects among MoH facilities.	
6	There are cooperation among institutions and MoH facilities.	
7	MoH hold workshops constantly to raise awareness about new technologies' benefits.	
8	It is possible to provide clear regulations for using Cloud Computing services such as holding video conference between IT experts and IT department staff to adopt Cloud Computing.	
9	MoH provide scholarships and missions to MoH's staff to benefit from new technology.	

	Items	Agreement degree (1-10)
IV. Operational Efficiency		
1	IT staff at MoH are aware of Cloud Computing importance.	
2	MoH have core skills (Human resources, Technical readiness) to adopt Cloud Computing.	
3	There are enough well-trained experts of cloud computing.	
4	The provided training in IT field to MoH's Employees able them to keep up with latest technologies.	
5	MoH fully employ it's Human, financial and technology resources for new technologies as Cloud Computing.	
6	MoH activities are compatible with adopting Cloud Computing.	
7	There are enough awareness about aims and benefits of cloud computing at MoH.	

	Items	Agreement degree (1-10)
V. Security & Privacy		
1	Privacy and data security are the biggest challenges that face MoH in adopting new technologies.	
2	The level of securing data depends on service provider's security abilities.	
3	MoH is legally protecting sensitive data of patients and employees from leaking to an unauthorized employee.	
4	The ministry is aware of the nature of the cloud hand, place and method of access to data.	
5	Most of security and privacy issues related to new technologies at MoH are results of the absence of monitoring the infrastructure.	
6	Avoid putting applications and sensitive data in the cloud is an assistant factor to let MoH overcome security concerns	
7	MoH looking to compatible with government at (Hybrid Cloud) consists of applications for the development of public and non-sensitive and also from (Cloud Private) to maintain the confidentiality	

	and security of their data.	
8	MoH put plans laws and restrictions on the user provider of cloud computing for data protection and health records service.	
9	MoH controls sensitive data.	
10	MoH seek to modernize and develop the physical hardware and software to protect confidential data.	

Items		**Agreement degree (1-10)**
VI. Trust		
1	Trust is the most important factor for cloud Computing users (physicians, patients) at MoH.	
2	Trust vary between using E-mail (Gmail, Hotmail etc) and using Cloud Computing.	
3	Trust rises with Cloud Computing service companies if there are clear agreements related to amendments and E-security violations.	
4	There is a trust to new tech services providers of big companies (Amazon, Google, Microsoft etc.)	
5	Higher management trust new tech and Cloud Computing services providers.	
6	The agreement between MoH and services provider considered as safety measures to data.	
7	MoH is worried about using the data by Cloud Computing service provider for political reseasons.	
8	There is confidence of workers in the health sector (nurses, doctors) to provide the necessary information to the cloud.	

Questionnaire

(Arabic Version)

الأخ/ة الفاضل/ ة ..... حفظكم الله ورعاكم،،،

السلام عليكم ورحمة الله وبركاته

الاستبيان

بداية أهديك عاطر تحياتي، ويطيب لي أن أضع بين يديك الاستبيان الذي تم تصميمه بهدف جمع المعلومات اللازمة للتعرف على مدى " **المحددات والتحديات لتبني الحوسبة السحابية في وزارة الصحة الفلسطينية** "

Determents and Challenges of Cloud Computing Adoption in the Palestinian Ministry of Health

وذلك استكمالاً لمتطلبات الحصول على درجة الماجستير في القيادة والإدارة من البرنامج المشترك بين أكاديمية الإدارة والسياسة للدراسات العليا وجامعة الأقصى، وقد صممت هذه الأداة لجمع المعلومات حول موضوع الدراسة، ونرجو من سيادتكم الإجابة عن الأسئلة التالية بكل حيادية وموضوعية لخدمة هذه الدراسة.

وإذ يشكر الباحث لكم مقدما تعاونكم الصادق، ويؤكد لسيادتكم أن آرائكم وما تدلون به من اقتراحات ستكون محل اهتمام الباحث وعنايته وستستخدم لأغراض البحث العلمي، وسيتعامل معها الباحث بكل عناية للتوصل إلى نتائج تفضي إلى تحسين وتطوير أداء تكنولوجيا المعلومات في وزارة الصحة.

وتفضلوا بقبول فائق الاحترام والتقدير

الباحث: أدهم فتحي اللداوي

تعريف الحوسبة السحابية (Cloud Computing)

هي مصطلح يشير إلى المصادر والأنظمة الحاسوبية المتوافرة تحت الطلب عبر الشبكة والتي تستطيع توفير عدد من الخدمات الحاسوبية المتكاملة دون التقيد بالموارد المحلية بهدف التيسير على المستخدم، وتشمل تلك الموارد مساحة لتخزين البيانات والنسخ الاحتياطي والمزامنة الذاتية، كما تشمل قدرات معالجة برمجية وجدولة للمهام ودفع البريد الإلكتروني والطباعة عن بعد، ويستطيع المستخدم عند اتصاله بالشبكة التحكم في هذه الموارد عن طريق واجهة برمجية بسيطة تُبَسِّطُ وتتجاهل الكثير من التفاصيل والعمليات الداخلية.

المتغير التابع	المتغير المستقل	
تبني الحوسبة السحابية (Cloud Computing Adoption)	دعم الإدارة العليا	Top management support
	الاستعداد التكنولوجي	Technology readiness
	الدعم التنظيمي	Regulatory support
	الكفاءة التشغيلية	Operational efficiency
	الخصوصية والأمن	Security & Privacy
	الثقة	Trust

القسم الأول/ البيانات الشخصية: يرجى التكرم بوضع إشارة (▽) أمام الإجابة الصحيحة:

1. **الجنس** ذكر أنثى
2. **العمر**

من 18–أقل من 30 سنة من 30–أقل من 40 سنة من 40 – أقل 50 سنة

50 سنة فأكثر.

المؤهل العلمي دبلوم فأقل بكالوريوس دراسات عليا

3. **سنوات الخبرة**

أقل من 5 سنوات 5 – أقل من 10 سنوات 10 سنوات فأكثر

4. **المسمى الوظيفي**

رئيس شعبة رئيس قسم مدير دائرة نائب مدير عام مهندس

مبرمج فني مدخل بيانات أخرى

القسم الثاني: يرجى كتابة رقم درجة الموافقة حيث أن (1) هي أقل درجة و(10) أكبر درجة في العبارات التالية:

م	الفقرات	درجة الموافقة
	تبني الحوسبة السحابية (Cloud Computing Adoption)	**10-1**
1	تعطي وزارة الصحة اهتماماً تكنولوجياً واقتصادياً لتبني الحوسبة السحابية.	
2	حجم المرافق الصحية التابعة للوزارة يساعد على تبني الحوسبة السحابية.	
3	تتطلع وزارة الصحة لتبني الحوسبة السحابية للتوفير في التكلفة التشغيلية، وتكلفة الأجهزة والبرمجيات.	
4	تطور وزارة الصحة أنظمة معلوماتها بهدف مواكبة التقنيات الحديثة مثل "الحوسبة السحابية".	
5	يوجد لدى الإدارة في وزارة الصحة استراتيجية واضحة فيما يتعلق باستخدام التقنيات الحديثة مثل "الحوسبة السحابية".	
6	تتطلع وزارة الصحة نحو تبني الحوسبة السحابية لتحسين الرعاية الصحية عن بعد.	
7	توسيع نظم المعلومات في وزارة الصحة، يقلل أعباء الصيانة ويخفف من المشاكل البرمجية من خلال تبني الحوسبة السحابية.	
8	تتطلع وزارة الصحة لتكامل البيانات مع باقي الوزارات الحكومية من خلال تطوير أنظمة تكنولوجيا المعلومات لإمكانية الوصول للسحابة من أي مكان.	

م	الفقرات	درجة الموافقة
	أولاً/ دعم الإدارة العليا	**10-1**
1	الادارة العليا تدعم كل ما هو جديد في مجال تكنولوجيا المعلومات مثل تكنولوجيا الحوسبة السحابية.	
2	تضع الادارة العليا خطط وأهداف لتبني أيه تقنية جديدة كتقنية الحوسبة السحابية.	
3	يوجد وعي بأهمية الانتقال الافتراضي إلى السحابة من قبل المسؤولين والمعنيين باتخاذ القرار.	
4	توفر الادارة العليا المتطلبات اللازمة للموظفين من تدريب ومعدات حاسوبية لأية تكنولوجيا جديدة.	
5	تضع الادارة العليا خطط لتفادي التحديات التي تواجه استخدام ايه تقنية جديدة مثل تقنية الحوسبة السحابية.	
6	الادارة العليا تدرس وتحلل المؤسسات والمناطق التي استخدمت الحوسبة السحابية.	
7	تتوافق الادارة العليا في وزارة الصحة مع وزارة الاتصالات وتكنولوجيا المعلومات على إعادة هندسة العمليات بما يتوافق مع أيه تكنولوجيا جديدة مثل تبني الحوسبة السحابية.	

م	الفقرات	درجة الموافقة
	ثانياً/ الاستعداد تكنولوجياً	**10-1**
1	توجد بنية تحتية تدعم بناء الحوسبة السحابية في وزارة الصحة.	
2	يتوفر شبكة حاسوبية مدعمة بخطوط انترنت عالية السرعة مع المؤسسات الصحية التابعة لوزارة الصحة.	
3	يتوفر نظم معلومات وتطبيقات يمكن أن تساعد في تبني الحوسبة السحابية.	
4	يتم تحديث التطبيقات والانظمة بشكل مستمر لتناسب التطورات الجديدة.	
5	هناك امكانية لنقل التطبيقات ونظم المعلومات إلى الحوسبة السحابة.	
6	هناك مشاكل فنية قد تعيق تبني الحوسبة السحابية.	

م	الفقرات	درجة الموافقة
	ثالثاً/ الدعم التنظيمي	**10-1**
1	توجد هيكلية تنظيمية في وزارة الصحة تدعم مخططات واستراتيجيات تبني أيه تقنية جديدة مثل الحوسبة السحابية.	
2	وجود منهجية لتبادل المعلومات الالكترونية بين المرافق الصحية.	
3	هناك إمكانية لتغيير سير العمل بما يتوافق مع تقنية الحوسبة السحابية.	
4	هناك ميزانية سنوية مخصصة للتدريب ولشراء معدات وبرمجيات جديدة على تكنولوجيا المعلومات في وزارة الصحة.	
5	هناك بعض المشاريع المحوسبة المشتركة للمرافق الصحية.	
6	وجود تعاون بين المؤسسات والمرافق الصحية التابعة لوزارة الصحة مع وزارة الاتصالات وتكنولوجيا المعلومات.	
7	تعقد وزارة الصحة بشكل مستمر ورش عمل وندوات لزيادة الوعي بفوائد التكنولوجيا الحديثة مثل "الحوسبة السحابية".	
8	يمكن توفير قواعد تنظيمية واضحة لاستخدام خدمات الحوسبة السحابية مثل عقد مؤتمرات مرئية بين العاملين وخبراء تكنولوجيا المعلومات لتبني الحوسبة السحابية.	
9	يتم ارسال الموظفين الي بعثات علمية ضمن برنامج التدريب للاستفادة من التطورات التكنولوجية الجديدة.	

م	الفقرات	درجة الموافقة
	رابعاً/ الكفاءة التشغيلية	**1-10**
1	يدرك موظفو تكنولوجيا المعلومات في وزارة الصحة أهمية تبني الحوسبة السحابية.	
2	تتمتع وزارة الصحة بتوافر المهارات الأساسية (الموارد البشرية والاستعداد التقني) اللازمة لتبني الحوسبة السحابية.	
3	هناك ما يكفي من الخبراء والفنيين والمتخصصين على تقنية الحوسبة السحابية في وزارة الصحة.	
4	التدريب المتاح للموظفين في مجال تكنولوجيا المعلومات كافي في الوزارة، ويجعلهم متطلعين إلى حد ما إلى أحدث التقنيات.	
5	تسخر وزارة الصحة مواردها البشرية والمالية والتكنولوجية نحو الاستخدام الأمثل لأية تقنية جديدة مثل الحوسبة السحابية.	
6	تتوافق النشاطات التي تقدمها وزارة الصحة مع تبني الحوسبة السحابية.	
7	هناك ما يكفي من الوعي لأهداف وفوائد الحوسبة السحابية في وزارة الصحة.	

م	الفقرات	درجة الموافقة
	خامساً/ الخصوصية والأمن	**1-10**
1	تعتبر سرية وأمن البيانات من أكبر التحديات التي تواجه وزارة الصحة في تبني أيه تقنية جديدة.	
2	تعتمد قوة الامن للبيانات على قوة مزود الخدمة من الناحية الأمنية.	
3	تحمي وزارة الصحة البيانات الحساسة الخاصة بالمرضى والعاملين من إمكانية تسريبها إلى الأفراد غير المخولين للاطلاع عليها قانوناً وتضع خطط لذلك.	
4	الوزارة مدركة لطبيعة السحابة من ناحية مكان وطريقة الوصول للبيانات.	
5	معظم قضايا الأمن والخصوصية في وزارة الصحة للتقنيات الجديدة هي نتيجة لعدم وجود رقابة على البنية التحتية المادية.	
6	من الأمور التي تساعد وزارة الصحة على تخطي مخاوف الأمان هو عدم وضع التطبيقات او البيانات الحساسة في السحابة	

7	يمكن ان تتوافق وزارة الصحة مع الحكومة على سحابة هجينة (Hybrid Cloud) تتكون من سحابة عامة (Cloud Public) لوضع التطبيقات العامة والغير حساسة وأيضا من سحابة خاصة (Cloud Private) للمحافظة على سرية وأمن بياناتها.	
8	تضع وزارة الصحة قوانين وقيود على مستخدم ومزود خدمة الحوسبة السحابية لحماية البيانات والسجلات الصحية.	
9	هناك سيطرة وتحكم للبيانات الحساسة في وزارة الصحة.	
10	تسعى وزارة الصحة لتحديث وتطوير الأجهزة المادية والبرمجية لتحمي بياناتها السرية.	

الفقرات		درجة الموافقة
م	**ثالثاً/ الثقة**	**10-1**
1	تعتبر الثقة العامل الأهم لمستخدمي (المرضى، الأطباء) الحوسبة السحابية في وزارة الصحة.	
2	تتغير الثقة من استخدام البريد الالكتروني (...،Gmail ،Hotmail) عن استخدام الحوسبة السحابية.	
3	تزيد الثقة مع شركات خدمة الحوسبة السحابية في حال وجود اتفاقيات واضحة تتعلق بالتعديلات والمخالفات الأمنية الالكترونية.	
4	يوجد ثقة بالتقنيات الجديدة وبمقدمي هذه الخدمات من الشركات العملاقة (جوجل، مايكروسوفت، الأمازون، ....)	
5	وجود ثقة من قبل الإدارة العليا وبالتقنيات الجديدة وبمزودي خدمات السحابة.	
6	يمكن اعتبار عقد الاتفاق بين وزارة الصحة ومزود الخدمة بمثابة موثوقية وامان للبيانات.	
7	مخاوف وزارة الصحة من مزودي خدمات الحوسبة السحابية لاستخدام بياناتها ومعلوماتها لأغراض سياسية.	
8	هناك ثقة للعاملين بالقطاع الصحي (ممرضين، أطباء) بتزويد السحابة بالمعلومات الضرورية.	

Appendix B
Jury Questionnaire

(Arabic version)

حضرة السيد/ ة ..... المحترم / المحترمة،

السلام عليكم ورحمة الله وبركاته

الموضوع: تحكيم أسئلة استبانة

يقوم الباحث بإعداد دراسة بعنوان: " **تبني الحوسبة السحابية: المحددات والتحديات – دراسة حالة: وزارة الصحة الفلسطينية** "

Determents and Challenges of Cloud Computing Adoption in the Palestinian Ministry of Health

وذلك استكمالاً لمتطلبات الحصول على درجة الماجستير في القيادة والإدارة من البرنامج المشترك بين أكاديمية الإدارة والسياسة للدراسات العليا وجامعة الأقصى.

ونظراً لما تتمتعون به من خبرة ودراية واسعة في موضوع البحث العلمي، ومنفعة العلم والمتعلمين، يشرفني أن أضع بين أيديكم هذه الورقة التي تشكل أداة الدراسة في صورتها الأولية، بهدف تحكيمها قبل تطبيقها ميدانياً، لذا نرجو من سيادتكم بالتكرم والاطلاع على فقرات هذا الاستبيان، وتقديم التوجيهات والإرشادات من أجل تعديل، أو حذف، أو إضافة ما ترونه مناسباً، وتوضيح مدى انتماء الفقرة لمحورها (أو لمجالها)، وتحكيمها من حيث سلامة الصياغة اللغوية، لتكون أداة جيدة، وتقيس ما وضعت لقياسه.

شاكرين لسيادتكم تفضلكم بتقديم المساعدة، وتحسين وتطوير البحث العلمي، وتزويد الطلبة بالعلم، والكفايات اللازمة لإعداد الكوادر البشرية بكفاءات وشهادات عالية، لخدمة المجتمع وتنميته.

وتفضلوا بقبول فائق الاحترام والتقدير

الباحث: أدهم فتحي اللداوي

List of Referees

(English version)

No	Name	Position
1	*Dr. Mohammed Elmadhoun*	Dean of the Academy of Management and policy for Graduate Studies
2	*Dr. Nabil El loh*	Head of Management & Leadership Program at academy of Management and policy for Graduate Studies
3	*Dr. Samir Safi*	**Associate Professor & Head of Economic Department at Commerce College - Islamic of University**
4	*Dr. Eng. Rebhi Baraka*	Associate professor of Computer Science Dean Faculty of IT - Islamic University of Gaza
5	*Dr. Khalid Abed Dahleez*	Assistant Professor at Business Administration Department Faculty of Commerce – Islamic of University
6	*Dr. Ahmed yehey Mahmoud*	Assistant Professor & Lecturer at the Faculty of IT at Al-Azhar University
7	*Prof. Sami Salem Abu Nasser*	Dean of the Faculty of Engineering and Information Technology at Al-Azhar University
8	*Dr. Ihab Zakout*	Lecturer in Faculty of Engineering & IT at Al-Azhar University
9	*Dr. Radwan baroud*	Director of Planning and Policy Formulation Unit
10	*Dr. AlaaEddin Almabhouh*	Assist. Prof. in Information Systems & Head of MIS Department at IT College - University of Palestine
11	*Eng. Alaa Al Shourafa*	Head of IT Unit – MoH
12	*Eng. Loay Fraja*	Head of Programming Department at IT Unit in MoH

List of Referees
(Arabic version)

م	الاسم	المسمى الوظيفي
1	د. محمد المدهون	عميد أكاديمية الإدارة والسياسة للدراسات العليا
2	د. نبيل اللوح	رئيس قسم القيادة والإدارة بأكاديمية الإدارة والسياسة للدراسات العليا
3	د. سمير صافي	رئيس قسم الاقتصاد بكلية التجارة في الجامعة الاسلامية
4	د. ربحي بركة	عميد كلية تكنولوجيا المعلومات في الجامعة الاسلامية
5	د. خالد الدهليز	محاضر في كلية التجارة في الجامعة الإسلامية
6	د. أحمد يحيى محمود	رئيس قسم تكنولوجيا المعلومات بجامعة الأزهر
7	أ.د سامي سليم أبو ناصر	عميد كلية الهندسة وتكنولوجيا المعلومات في جامعة الأزهر
8	د. إيهاب زقوت	محاضر في قسم تكنولوجيا المعلومات بجامعة الأزهر
9	د. رضوان الأخرس	مدير عام الرقابة الداخلية بوزارة الصحة
10	د. علاء المبحوح	رئيس قسم نظم المعلومات الإدارية في كلية تكنولوجيا المعلومات بجامعة فلسطين
11	م. علاء الشرفا	مدير وحدة تكنولوجيا المعلومات في وزارة الصحة
12	م. لؤي فريجة	مدير دائرة البرمجة في وحدة تكنولوجيا المعلومات في وزارة الصحة

Appendix C:
Demographics of Interviews
(English Version)

No.	Job Role
1	**Head of IT Unit – MoH**
2	**Head of Planning and Policy Formulation Unit**
3	**Head of Programming Department at IT Unit in MoH**
4	**Head of Administrative Control Department**
5	**Head of health information systems Unit**
6	**Programmer**
7	**Engineer computer**

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