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Cloud Computing in the Palestinian Public Sector, Opportunities and Challenges

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This thesis was defended successfully on 5/2/2015, and approved by:

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1. Dr. Ayham Jaaron / Supervisor	.....
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Dedication

I would like to thank all who supported me for each step of the way, and to dedicate this work especially to:

The first teacher of human, Prophet Mohammad (pbuh).

My dear parents who supported me to finish this work.

Dear wife for her understanding, patience and continuous support.

My children (Yousef & Mariam) for their endurance.

To my brother and sisters

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First and foremost, praise and thanks to God who helped me to finish this work.

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الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل العنوان:

Cloud Computing in the Palestinian Public Sector, Opportunities and Challenges

الحوسبة السحابية في القطاع الحكومي الفلسطيني، تحديات وفرص

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وأن هذه الرسالة كاملة، أو أي جزء منها لم يقدم من قبل لنيل أي درجة أو لقب علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis، unless otherwise referenced، is the researcher's own work، and has not been submitted elsewhere for any other degree or qualification.

Student's name: شاهر يوسف فضل حياي **اسم الطالب:**

Signature: **التوقيع:**

Date: 5/2/2015 **التاريخ:**

Abbreviations

Abbreviation	Definition
ANOVA	Analysis of Variance
CIO	Chief Information Officer
CPU	Central Processing Unit
CSIRO	Commonwealth Scientific and Industrial Research Organization
ENISA	European Network and Information Security Agency
IaaS	Infrastructure as a Service
ICT	Information and Communications Technology
IT	Information Technology
LMS	Learning Management System
NIST	The National Institute of Standards and Technology
PaaS	Platform as a Service
PC	Personal Computer
SaaS	Software as a Service
SIS	Student Information System
SLA	Service level agreements
SPSS	Statistical Package for the Social Sciences
SQL	Structured Query Language
TCO	Total Cost of Ownership
VLE	Virtual Learning Environment

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Cloud Computing in the Palestinian Public Sector, Opportunities and Challenges

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Abstract

Cloud Computing is considered as one of the most important topics in the information technology in the recent few years. All Information Technology services are available wherever and whenever they are needed. Instead of owning hardware and software which require installation, maintenance and configuration, Cloud Computing offers the usage of Cloud applications and infrastructures based on pay per usage model.

The Palestinian public sector needs to know the possibility of adopting Cloud Computing in its operations. It also needs to know the objectives, benefits and concerns of Cloud Computing adoption. Therefore the primary purposes of this study are to assess the possibility of Cloud Computing adoption in the Palestinian public sector in addition to identify all potential opportunities and challenges for switching from existing computing arrangements to Cloud Computing.

This study used both the quantitative and qualitative research. The quantitative research included using questionnaires and the qualitative research through the semi-structured interviews to validate findings of the questionnaires. A questionnaire was distributed to the IT staff in the Palestinian public sector, a total of 152 questionnaires were collected and analyzed by SPSS program for statistical analysis. Then, eleven semi-

structure interviews were conducted with experts from the Palestinian public sector and were analyzed using Thematic Analysis.

On the basis of the results of this research, it can be concluded that the Palestinian public sector is not ready to adopt Cloud Computing in its operations 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 resources.

This study 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.

Moreover, the study recommended the Palestinian public sector with preparing a future plan to adopt Cloud Computing in its operations which is an attractive technological and economic option in addition to preparing plans to eliminate any obstacle that may hinder the use of Cloud Computing technology.

Chapter One

Introduction

Chapter One
Introduction

1.1. Overview

This chapter introduces the Cloud Computing concept. Moreover, this chapter clearly shows the problem statement, research objectives, research questions and research hypotheses. In addition, thesis structure will be explored at the end of this chapter.

1.2. Background

Recently, one of the hottest topics in the information technology is Cloud Computing. Cloud Computing is simply delivering infrastructure, services, and software on demand via the network where one of its main advantages is cost saving.

Cloud computing is a model where the most computing operations are done outside the boundaries of the organization using the Internet to access them. Cloud Computing enables organizations to focus on how to use Information and Communications Technology (ICT) services rather than owning and managing ICT services (Prince, 2011).

There are many simple definitions of Cloud Computing that emphasize on providing computing services via the Internet. The National Institute of Standards and Technology (NIST) defines Cloud as “Cloud Computing is a model for enabling convenient and 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." (Mell & Grance, 2011).

To simplify the concept of Cloud Computing, we can compare it to a source of electricity or gas for example. All these services are provided to users in a smooth and easy form to be understood without the need to know how to provide such services. Similarly, Cloud Computing provides computing services to users in a simple form and ignores a lot of details and internal operations, so users do not need to know what happens inside the cloud; they only concern about the output services (Jackson, 2011).

There is a lot of discussion which focused on the technical issues of Cloud Computing, but the most important thing is to talk about the impact of Cloud Computing on our lives and on our society. Many of the studies i.e. discussed the subject of Cloud Computing were proposed by researchers to help public sector to evaluate and adopt Cloud Computing but they did not cover the case of the Palestinian public sector about the lack of resources and presence of the occupation.

1.3. Problem Statement

Cloud computing is considered one of the most important technologies in the current IT world, it could be really useful for the developing countries as they do not have enough funds to have their own IT infrastructure and services.

Palestine has a special situation, in addition to being one of the developing countries; it is also an occupied country. With regard to its financial difficulties and lack of resources, the researcher suggests the Cloud Computing as a potential solution for the Palestinian public sector to manage costs and improve efficiency.

The Palestinian public sector was in need of knowing the objectives and benefits of Cloud Computing adoption. It also needs to know the possibility of adopting Cloud Computing in its operations. Therefore there is a strong need to conduct a research for achieving this.

This research inquiry aims to help the Palestinian public sector by studying the possibility of Cloud Computing adoption in its operations and by attempting to identify all potential opportunities and challenges when deciding on adopting Cloud Computing technology.

1.4. Significance of the Research

The relevance of this research work is of significant importance to the Palestinian public sector. It represents the first comprehensive study about Cloud Computing technology in the Palestinian public sector.

The main goals of this research are to provide a high-level overview of Cloud Computing and to assess the possibility of Cloud Computing adoption in the Palestinian public sector in addition to outline the most important opportunities that could be delivered to the Palestinian public sector and the most important challenges of Cloud Computing that may be

posed for the Palestinian public sector. Therefore, this research could help the Palestinian public sector by suggesting some early steps that can be taken toward Cloud Computing adoption.

1.5. Research Objectives

For this research to achieve the above mentioned goals, the following objectives need to be realized:

- Assessing the possibility of Cloud Computing adoption in the Palestinian public sector.
- Identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services.
- Develop a conceptual framework that helps IT managers in public sector to evaluate and adopt Cloud Computing.

1.6. Research Questions

Through this research project, the researcher aims to answer the following research questions which have been designed to achieve the research objectives.

- Is it possible to adopt Cloud Computing in the Palestinian public sector?
- What are the most important opportunities and challenges for the adoption of Cloud Computing in the Palestinian public sector?

1.7. Research Hypotheses

Hypotheses were formulated during the literature review to further investigate the relationship between the adoption of Cloud Computing in the Palestinian public sector and the respondents' personal characteristics. The following hypothesis will be tested to enhance the search results:

$H1_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Gender).

$H2_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Qualification).

$H3_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Age).

$H4_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Specialty).

$H5_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Experience years).

$H6_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Position Title).

1.8. Thesis Structure

This thesis consists of five chapters:

Chapter One is an introductory chapter that covers the background, problem statement, research objectives, research questions, research hypotheses, and thesis Structure.

Chapter two provides a literature review of the state of art in Cloud Computing. First, we defined Cloud Computing, and then we explore the history of Cloud Computing. After that, essential characteristics of Cloud Computing, service models, deployment models, benefits, risks will be discussed.

Chapter three clarifies the research methodology, research design, instrumentation, procedure, data processing, research population and research sample. In addition, chapter three discusses research tool, reliability and validity. Furthermore, it addresses the ethical considerations of the research and research procedure.

Chapter four discusses data analysis, statistical methods, answering research questions, testing research hypotheses and proposing a conceptual framework.

The last chapter is about conclusions and recommendations. It explores the research limitation and future studies.

Chapter Two
Literature review

Chapter Two
Literature review

2.1. Overview

This chapter introduces the reader to the main concepts in the area of Cloud Computing. This includes cloud computing definitions, its essential characteristics, service models, deployment models, general benefits, and risks in addition to an overview of cloud computing in the public sector and in developing countries.

2.2. Cloud Computing Definitions

Cloud computing is a phenomenon that affects the users, vendors and companies as a whole. It is considered as a strong and important force to change the way we manage and consume information services. The idea itself describes the computer as a service, and offers this service in the form of platforms, software and complete infrastructure, so cloud computing is not a particular technology, but a model where the most computation is beyond the organization's boundaries and uses internet shared computer resources on a pay per use basis (Prince, 2011).

Gartner, a leading computer market analyst firm, considers that the impact of the cloud model will be "no less influential than e-business" (Stevens & Pettey, 2008). Cloud computing was ranked as the first subject in terms of interest among the managers in the field of information technology, where this result appeared in the survey conducted by CIO research on the executives of information technology (Johnson, 2009).

So what is cloud computing? Cloud computing is a wide range of services that can be hosted in a variety of manners. The basic idea behind cloud computing is that anything that can be done in computing, both on a single computer or in a data center, can be switched to the cloud. Cloud computing provides us with a new concept on how to communicate, collaborate and work. Therefore, as long as you can access to the Internet, you will be able to work when and where you wish. With a fast and reliable Internet connection and computer power, it does not matter where the document, e-mail or data which the user sees on the screen comes from, so the main idea of the cloud is that the end user is unaware of the geographical location and configuration of the cloud (Ulanoff, 2009).

For users, cloud computing means accessing e-mail, photo sharing and productivity of software; many of them are free. For organizations, switching to the cloud means having the ability to contract for computing services on-demand instead of investing to host all the necessary hardware, software and support staff necessary to provide a certain level of services. In addition, for governments, the cloud computing has special attractive because of the presence of both changes requirements for Information Technology and challenges economic situations (Armbrust et al., 2010).

Many researchers in the commercial and academic fields have attempted to define exactly what “Cloud computing” is and what unique characteristics presents. Buyya et al. (2009) have defined it as follows: “Cloud is a parallel and distributed computing system consisting of a

collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers."

Vaquero et al. (2008) have stated that the "Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized Service Level Agreements."

Recently, Forrest and Barthold (2009) have claimed that "Clouds are hardware based services offering compute, network, and storage capacity where hardware management is highly abstracted from the buyer; buyers incur infrastructure costs as variable Operational Expenditures, and infrastructure capacity is highly elastic."

Cisco (which is one of the largest companies in the world in the field of networking equipment) defined cloud as the "Cloud computing is a broad term, but in our view maps to methods that deliver infrastructure, services, and software via the network on demand, and at scale. Cloud is based on a foundation of virtualization in which pools of (virtualized) resources are dynamically organized for the benefit of software

applications and services. This will change the way that applications are written and delivered." (Craig et al., 2009). In a more generic definition, Fox et al. (2009) defined cloud as the "Data center hardware and software that provide services." Similarly, Sotomayor et al. (2009) pointed out that "Cloud is more often used to refer to the IT infrastructure deployed on an Infrastructure as a Service provider data center".

There are a large number of definitions, but it seems that there are common characteristics between these definitions: the cloud should include pay as much as use, flexible and ability, infinite resources, self-service interface and resources that are extracted or virtualized, so the goal of cloud is to allow the customers to run their everyday IT operation "in the cloud".

Cloud computing can change the way organizations access and use of information technology services, so instead of owning and managing IT products and services, organizations that use cloud computing services can meet their ICT requirements using a flexible, on-demand, and rapidly scalable model requiring neither ownership on their part, nor provision of dedicated resources by the cloud services provider (Rountree & Castrillo, 2014).

It is also important to identify the major driver of cloud computing which is that the large data centers have thousands of servers which usually do not operate at full capacity creating a surplus of computing resources. By using these resources more efficiently, cloud computing enables greater returns on data center investments (Goscinski et al., 2010).

2.3. History of cloud computing and the technologies that have related and contributed to the advent of cloud computing

Back to the 1970s, everyone had "dumb terminals" and was connected to a mainframe where data and processing were done, In the 80s-90s, users and organizations moved to a decentralized model where a great potential for creativity and individuality was noticed by having powerful processors and storage at each of our PCs. Now, shifting back to the cloud, by moving our data to the cloud, it brings us back to the old model: Everything is on the "mainframe" or in the "cloud", and we just access the processing or data we need, so why do we return to the old model? What's new? New is the great development of the Internet where the world has become a small village in addition to the development of information technology (Esteves & Rong, 2010).

Figure (2.1) shows that the roots of Cloud computing back to the early 1990s in the time of emergence of grid computing through which many computing devices were networked together to work on a single problem usually scientific in nature which require very high levels of parallel computing. Grid computing had led to utility computing which attempted to provide computing services as if it were a utility. Utility computing led to Software as a Service (SaaS) which allows users to access available software online instead of using it locally and charging service fees instead of selling licensed applications (Craig et al., 2009).

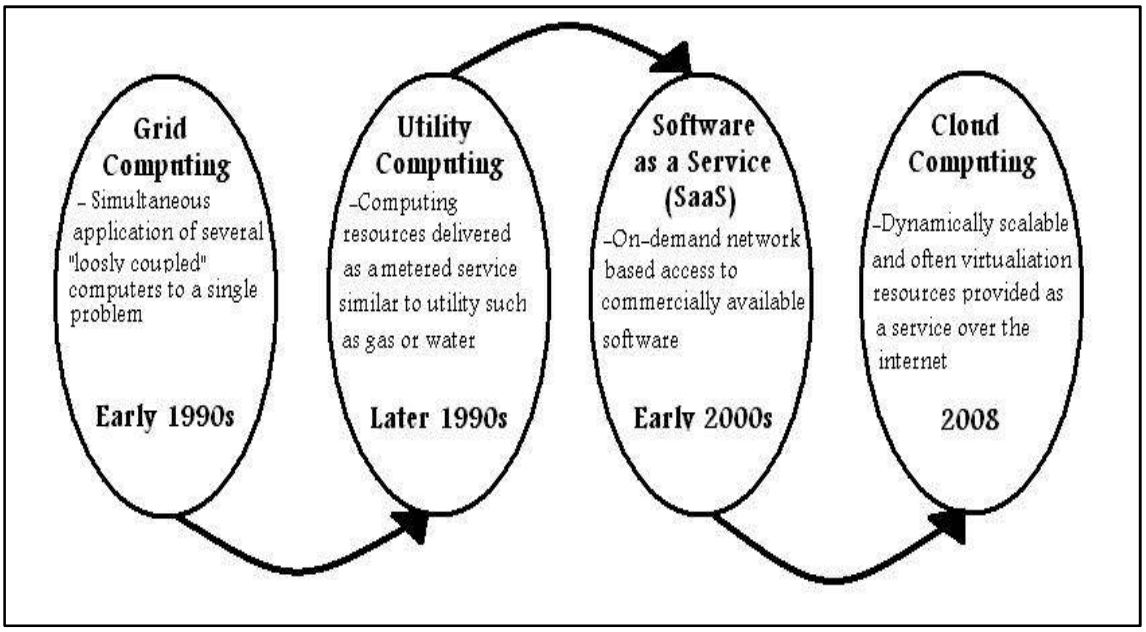

Figure (2.1): Roots of Cloud Computing, Adapted from Craig et al. (2009).

The roots of cloud computing can be traced through monitoring the progress of many of the technologies especially in hardware (virtualization), Internet technologies (Web services), distributed computing (Multi-Tenancy), and systems management (autonomic computing) (Voorsluys et al., 2011).

Thus, in order to provide a clearer picture of cloud computing, a closer look should be taken at the technologies that form the basis of Cloud Computing.

2.3.1. Hardware Virtualization

The consolidation of several individual and heterogeneous workloads onto a single physical platform which in turn can be configured independently, leads to better system utilization and lower operational cost (Uhlig et al., 2005).

Virtualization has created the foundation for the cloud computing movement. In fact, virtualization is currently a major driver of cloud deployment across all sectors (Parri, 2011).

The traditional IT infrastructure runs many of applications such as email, web applications, and files servers, and dedicates physical server to each task. This approach is costly and may not be the best use of resources as many applications are not performing at a peak rate 100% of the time. A portion of this utilization issue was addressed with the adoption of virtualization where multiple physical systems were migrated onto a single physical machine (Van Doorn, 2006).

2.3.2. Multi-Tenancy

Multi-tenancy is an architecture in which a single instance of a software application or IT resources serves multiple customers which results in a cost effective service model. Each customer is called a tenant. Tenants may be given the ability to customize some parts of the application.

In cloud computing, the meaning of multi-tenancy architecture has expanded because of new service models that take advantage of virtualization and remote access. A provider can run one instance of its application on one instance of a database and provide web access to multiple customers, so each customer's data is isolated and remains invisible to other customers (Azeez et al., 2010).

2.3.3. Web Services

This is defined as a software system used to enable information from one application to be made available to others, and enable internal applications to be made available over the Internet. Cloud Computing uses Web Services for connections (Barry, 2003).

2.3.4. Autonomic computing

Increasing complexity of computing systems has led to increased research on autonomic computing which seeks to improve the systems by reducing the degree of human intervention in the operation (Parashar & Hariri, 2005).

Autonomic systems rely on monitoring probes and gauges (sensors), on an adaptation engine (autonomic manager) for computing optimizations based on monitoring data, and on effectors to carry out changes on the system. The large data centers of cloud computing providers must be managed in an efficient way (Kephart et al., 2007).

2.4. The impact of cloud computing on society

Cloud computing added significant value to our global society. There is an inflection point in the evolution of computing. The history of computing consists of a series of these changes: from the era of the mainframe to the advent of the personal computer (and now to mobile devices and tablets), from the client server model to the networked model, and from the age of isolation to the age of the Internet. Soon, our work and

our personal lives will be very different because of the emergence of cloud computing (Wyld, 2010).

Cloud computing leads to a large amount of innovation with enormous, social, scientific and commercial benefits leading to change the way people, in the fund projects, launch the business, and work together. Easy access to cloud computing is allowing each of large and small companies with limited resources to test their discoveries. The real impact of the cloud is about democracy and equality (McEleney, 2011).

2.5. Cloud computing essential characteristics

According to Mell and Grance (2011) the term “Comprehensive Cloud Offering” should only be used for cases where a cloud has all these essential characteristics:

2.5.1. On-demand self service

The consumer can unilaterally control computing capabilities such as server time and network storage as needed automatically without requiring human interaction with each service's provider (Mell & Grance, 2011).

On-demand self-service refers to the service provided by cloud computing providers that enables the provision of cloud resources on demand whenever they are required. In on-demand self-service, the user accesses cloud services through an online control panel.

On-demand self-service resource sourcing is a prime feature of most cloud offerings where the user can scale the required infrastructure up to a substantial level without disrupting the host operations (Brian et al., 2008).

2.5.2. Broad network access

The service is made available via a network independently of the user end device. The network connection must be of sufficiently high performance and available for that particular service (Mell & Grance, 2011).

Broad network access refers to resources hosted in the cloud network that are available for access from a wide range of devices such as tablets, PCs, Macs and smart phones. These resources are also accessible from a wide range of locations that offer online access; companies that have broad network access within a cloud network need to deal with certain security issues that arise (Jackson, 2011).

2.5.3. Resource pooling

The p1rovider's resources are pooled to serve multiple consumers with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. The customer generally has no control or knowledge over the exact location of the provided resources. Examples of resources include storage, processing, memory, network bandwidth, and virtual machines (Mell & Grance, 2011).

Resource pooling is an IT term used in cloud computing environments to describe a situation in which providers serve multiple customers with provisional and scalable services. These services can be adjusted to suit each customer's needs without any changes being apparent to the client or end user. The provider makes the necessary resources available to multiple consumers using technologies such as virtualization (Goscinski et al., 2010).

2.5.4. Rapid elasticity

Capabilities can be quickly and elastically conditional, in some situations automatically, to quickly expand and quickly released. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time (Mell & Grance, 2011).

Rapid elasticity is the ability to provide scalable services. The resources necessary can be provisioned rapidly and released without manual intervention when no longer needed (Jackson, 2011).

2.5.5. Measured service

Cloud systems automatically control and optimize the use of resources by taking advantage of the capabilities of measurement in some level of abstraction appropriate to the type of service (storage, processing, and bandwidth). Can monitor, control, and report the use of resources to

provide transparency for both the service provider and the consumer of the service (Mell & Grance, 2011).

A service consumed must be measurable for various reasons including: billing, effective use of resources, or overall predictive planning (Jackson, 2011).

2.6. Service models of Cloud Computing

According to the above NIST definition (Mell & Grance, 2011), service models describe what kind of services can be obtained from the cloud. Three main service classes are distinguished: SaaS (Software as a Service), PaaS (Plat-form as a Service), and IaaS (Infrastructure as a Service). Depending on the model selected, the provider delivers different services. These services are generally classified according to the level of the IT architecture they reside on, the abstraction level of the capability provided and the service model of providers (Armbrust et al., 2010).

2.6.1. Software as a Service (SaaS)

In Software as a Service, a service provider hosts the application at its data center on a cloud and a customer accesses it via a standard Web browser. The consumer does not be able to control the operating system, network, servers, and storage. Examples of SaaS are Google Apps (Gmail, Google Docs), Salesforce (Enterprise cloud computing targeting Customer Relationship Management), and Postini (Email and web security service) (Mell & Grance, 2011; Parri, 2011).

2.6.2. Platform as a Service (PaaS)

The capability provided to the consumer is a computing platform that is rented or delivered as an integrated solution created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications. Examples of PaaS are Azure Services Platform (Microsoft cloud platform offering Windows Azure operating system, SQL Azure and Azure AppFabric), and Google App Engine (Platform for developing and hosting web-applications) (Mell & Grance, 2011; Parri, 2011).

2.6.3. Infrastructure as a Service (IaaS)

The capability provided to the consumer is to deliver computer infrastructure processing, storage, networks, and other computing resources on an outsourced basis to support enterprise operations where the consumer is able to deploy and run software which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components (Buyya et al., 2009; Mell & Grance, 2011).

2.7. Deployment models of Cloud Computing

Regardless of its service class, a cloud can be classified as private, community, public or hybrid based on model of deployment (Mell & Grance, 2011).

2.7.1. Private Cloud

A private cloud refers to a model of where IT services are provisioned over Private IT infrastructure for the dedicated use of a single organization. A private cloud can be run internally or by a (third-party) provider, and it is usually managed via internal resources (Mell & Grance, 2011; Wyld, 2010).

2.7.2. Community Cloud

A community cloud is a cloud service model that is shared by several organizations and supports a specific community that has shared concerns; it may be managed and secured by all the participating organizations or a third party (Mell & Grance, 2011; Voorsluys et al., 2011).

2.7.3. Public Cloud

A public cloud refers to a computing service model that is available to the general public or a large industry group and owned by an organization selling cloud services. A public cloud facilitates access to IT resources on a "pay as you go" billing manner. A service provider manages a public cloud solution's core infrastructure, software and other back-end architecture in a multi-tenant environment in order to free up the customer from these responsibilities (Brian et al., 2008; Mell & Grance, 2011).

2.7.4. Hybrid Cloud

A hybrid cloud is a cloud computing service model that is combining of two or more clouds' models: private, community, or public combining

their respective advantages and disadvantages. For example, data that need to be protected can reside in a private cloud whereas public data and/or applications can run in the public cloud (Hickey & Rahmouni, 2010; Mell & Grance, 2011).

2.8. Benefits of Cloud computing

Several major benefits arise from adopting and utilizing Cloud Computing based on the opinion of Brian et al. (2008) the most important ones:

- Cloud computing enables economies of scale: Cloud computing can lead to a significant cost savings. This cost savings can only be realized through the use of significant pooling of these "configurable computing resources" or resource pooling. According to NIST, this capability is an essential characteristic of cloud computing. Resource pooling is the ability of a cloud to serve multiple customers using a multi-tenant model with different physical and virtual resources dynamically assigned and reassigned according to demand. On the provider side, this leads to higher productivity in allocation of infrastructure services, and simultaneously, the flexibility to survive higher when difficulties occur. On the side of the user, these economies of scale reduce investment and operating costs. Return on investment is also growing leading to an increase in the level of innovation in general.

- Cloud computing allows organizations to focus on their core business. Therefore, companies that are considered as non-IT-service provider can sustain IT services they need for their business activities.

Cisco (Craig et al., 2009) clarified that the most important benefits of Cloud Computing as follows:

- Cost Savings: Organizations can reduce capital expenditures and operating expenses of ICT so that companies pay only for the services they use by reducing or redeploying of their ICT staffs.

- Ease of Implementation: the organization can apply cloud computing quickly because there was no need to purchase hardware, software licenses, or implementation services.

- Flexibility (Elasticity): Cloud Computing can increase staff mobility by enabling access to business information and applications from a wider range of locations and devices.

- Scalability: Organizations using cloud computing are not worried about adding additional hardware and software when the user loads increase, but can instead add and subtract capacity according to new loads.

- Access to Top-end Capabilities of Information Technology: Especially for smaller organizations, cloud computing can allow access to high-caliber devices and software.

- Redeployment of IT Staff: Cloud computing provides organizations with the ability to reduce or eliminate the constant server updates and other computing issues, and reduce the expenses of time and money on application development; organizations can focus ICT staff on higher-value tasks.

- Focus on Core Competencies: the ability to operate data centers, the development and management of software applications are not necessarily the basic work for most organizations. Cloud computing can make it much easier to reduce or shed these functions, and allow organizations to focus on critical issues.

It is important to note that the scale of such benefits, ability to capture them, and cost/benefit ratio achieved depend on many unique factors and will vary significantly. These include where an organization sits in its ICT capital expenditure and systems development cycle, its current hardware and software architecture (for example, many existing applications may not be "cloud-ready"), its staff and management capabilities. In the public sector, legal and policy constraints will be especially important (Goscinski et al., 2010).

2.9. Risks (Disadvantages) of Cloud Computing

Despite the initial success, popularity of cloud computing model, and the availability of a wide range of service providers and tools, a significant number of risks are inherent to this new model of computing. Providers, developers, and end users must consider these risks to take good advantage of cloud computing (Takabi et al., 2010). This section will include the most important and common risks.

- Security and Privacy: Many studies have identified information security as a key issue, for this reason; there are potentially additional

risks to make cloud computing environments as secure as in-house IT systems.

Security and privacy affect the entire cloud computing model because there is a wide use of third-party services and infrastructure that are used to host important data or to perform critical operations. In this scenario, the trust towards providers is essential to ensure the desired level of privacy for applications hosted in the cloud (Fox et al., 2009; Takabi et al., 2010).

Legal and regulatory issues need attention. When transferring data to the Cloud, providers may choose to locate them anywhere on the planet. The geographical 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 (Sen, 2013).

- Availability and Fault-Tolerance: It is expected that users have certain expectations about the level of service provided to them as soon as their applications are moved to the cloud. These expectations include the availability of this service, overall performance, and what are the measures that must be taken when there is something error occurred in the system or its components. In brief, users seek to obtain the warranty before they can move their business to the cloud (Jansen & Grance, 2011).

Service level agreements, which include quality of service requirements, must be signed between customers and providers of cloud computing to act as a guarantee, and SLA specifies the details of the service provided including the availability and performance guarantees. In addition, it must be agreed upon metrics by all parties, and approved on the penalties for violating the expectations (A Vouk, 2008; Takabi et al., 2010).

- Resource Management and Energy-Efficiency: One important challenge faced by providers of cloud computing services is the efficient management of virtualized resource pools. Physical resources such as CPU cores, disk space, and network bandwidth must be sliced and shared among virtual machines running potentially heterogeneous workloads (Voorsluys et al., 2011).

- Vendor lock-in and lack of standards: A major concern of cloud computing users is about having their data locked-in by a certain provider. Users may want to move data and applications out from a provider that does not meet their requirements. However, in their current form, cloud computing infrastructures and platforms do not employ standard methods of storing user data and applications. Consequently, they do not interoperate and user data are not portable (Prince, 2011; Takabi et al., 2010). The answer to this concern is standardization. In this direction, there are efforts to create open standards for Cloud Computing (Sen, 2013).

2.10. Cloud Computing in Public sector

Cloud computing is a technological model that is changing the way public sector organizations consume information and communications technology (ICT), and how they deploy and deliver services to customers (Wyld, 2009).

The public sector has always looked for ways to provide better services within limited budgets. The global recession put additional pressure on these organizations to reduce their expenses. IT managers in government institutions have gone to explore new approaches to increase operational efficiency and productivity, and at the same time maximizing the investment and reduce costs. A cloud computing has emerged as an important strategy for achieving these goals when chosen carefully and implemented properly (Jansen & Grance, 2011).

United States Federal Cloud Computing Strategy claims that “If an agency wants to launch a new innovative program, it can do so by leveraging cloud infrastructure without having to acquire significant hardware, lowering both time and cost barriers to deployment.” (Macias & Thomas, 2011).

The Commonwealth Scientific and Industrial Research Organization (CSIRO) is Australia’s national science agency, one of the largest research agencies in the world. Many sites across the country carried out the stand-alone systems and scientific applications which had to be managed locally creating more work and duplicating expensive resources. CSIRO saw an

opportunity to standardize the infrastructure and consolidate applications so that data could be managed, secured, and shared across all the sites based on industry-standard practices. Now almost 100 percent of CSIRO's business applications are on the cloud, and work is under way to do the same with databases and other critical applications (Catteddu, 2011; Pandey et al., 2010).

Some case studies of governments have adopted cloud computing; for example, United States Government, which has instituted a Cloud First policy, with a significant portion of its annual US$80 billion in ICT spending, devoted to cloud solutions in the future. The federal government planned to use virtualization to consolidate 2000 data centers into about 1200 in the next few years reversing a trend which showed an increase in the number of data centers of only 432 data centers in 1998 (Kundra, 2011). In April, 2011, a Norwich University survey of nearly 650 ICT professionals in municipal state, federal agencies and higher-education institutions in the U.S. found that 46.2% of those responding are in the process of implementing cloud technology (Macias & Thomas, 2011). The Canadian Government, as another case study, announced in August, 2011 that it will shut down more than 90 percent of its 300 data centers as part of a consolidation effort called Shared Services Canada (Henderson, 2011).

Cloud computing is also on the rise in the European Union. The EU's cyber security agency (ENISA) has concluded in a report that private and community clouds best fit the needs of public administrations that want to achieve the highest level of data governance. The report recommends "a

European Governmental cloud as a supra national virtual space where a consistent and harmonized set of rules could be applied both in terms of legislation, security policy, where interoperability and standardization could be fostered." Cloud services in all sectors are expected to generate revenues of about €35 billion (US$50 billion) in Europe by 2014 (Catteddu, 2011).

Cloud computing has also taken place in the Asia Pacific region. According to Chandrasekaran and Kapoor (2011), 21 percent of respondents to a regional survey have adopted clouds in one form or another. China is building a city-sized cloud computing and office complex that will include a "mega" data center. India is looking to extend and improve the nation's education system by moving critical applications such as virtual learning environment (VLE), learning management system (LMS), and student information system (SIS) implementations into an education cloud (Macias & Thomas, 2011).

The United Arab Emirates (UAE) plans to launch a governmental cloud especially for federal and local governmental entities. This cloud should be built as a community cloud model, bundling also existing services. In particular, infrastructure and software shall be provided as a service. The use of cloud computing also fits the strategic plan and vision of the UAE. In there, collaboration between government entities should be fostered, public services should be improved, and the costs of public services should be cut down (Elbadawi, 2011).

In Jordan's e-government strategy (2014-2016) shows that the government is on the verge of launching Jordan infrastructure for cloud computing, this will be available to all government agencies (MoICT, 2013).

Public sector organizations throughout the world look at cloud computing as the natural next step in their shared services approach. Government entities are already accustomed to sharing data and resources, so they are well positioned to take full advantage of cloud infrastructures (Chandrasekaran & Kapoor, 2011).

Cloud services provide all public organizations with convenient, on-demand access to a common pool of configurable computing resources: networks, servers, security, storage, applications, and services. With a cloud implementation, an organization can tap the compute power available over the Internet, reaping the advantages of data center consolidation , shared public and private resources (Jansen & Grance, 2011).

Macias and Thomas (2011) stated that the most important benefits of cloud computing on public sectors are:

- Cost Reduction and Control: The public sector is under intense pressure to cut costs without undercutting critical services. Cloud computing can reduce total cost of ownership (TCO) both directly and indirectly.

- Improved Agility and Adaptability: As the pace of technology quickens, ICT specialists are looking for network solutions that enable

them to react quickly, innovate smoothly and efficiently, and keep growing pains to minimum. Cloud computing can often make change less expensive.

- Better Services and Collaboration: Government at all levels is looking for ways to improve services and justify budgets. These organizations are turning to cloud computing as the foundation for optimizing current and future services.

- Effective Risk Mitigation: Despite some doubts on the part of CIOs and other ICT professionals, cloud computing is not necessarily riskier than conventional computing models. Proven methods and technologies are in place to help ensuring that systems run reliably, and that data and privacy are safeguarded.

Of course, cloud computing is not without its risks, Craig et al. (2009) claims that Risks of Cloud Computing for the public sectors are:

- A service provider residing outside of a government's legal or territorial jurisdiction may put access or security at risk.

- Opening standards and interoperability may not be guaranteed leading to the risk of vendor lock-in.

- Data privacy is a concern when using public clouds. This can be addressed by the development of private clouds.

- Business continuity will continue to be a concern. Cloud computing; however, may also mitigate this risk, as cloud vendors are likely to use

more robust and better-maintained computing platforms that provide more redundancy and are less likely to fail.

- Information is the lifeblood of government, and decisions on how to manage that information can have far-reaching political, social, and economic considerations. Adoption of cloud computing presents many of the same risks and challenges as deciding to use a more traditional outsourcing arrangement. The increased possibility that the service provider may reside outside of a government's legal or territorial jurisdiction; however, can make some of these issues more acute.

2.11. Cloud Computing in Developing Countries

Palestine is considered as a developing country, so like any other developing countries have difficulty in access to computing resources or develop a robust IT infrastructure. Cloud computing as a new computing paradigm can now provide remote access to these resources that were otherwise inaccessible.

Cloud computing will deliver benefits beyond the public sectors of developed countries. Its advantages may be even more pronounced in developing countries that have not yet achieved high levels of public sector computerization, lack of people with adequate ICT skills, or do not have firm legal or cultural requirements regarding data security and privacy. On the positive side, developing countries face less resistance to new computing paradigms that government agencies in developed countries

often exhibit. Cloud computing may enable them to leapfrog a whole generation of government computing bypassing many of the costly challenges (Greengard, 2010; Kshetri, 2010).

Cloud computing promises to bring substantial benefits to how organizations conduct their businesses and the way their services reach out to potential consumers. Cloud computing is a welcome initiative for small businesses that cannot afford to invest in ICT infrastructure but need to benefit from the rewards of conducting business online. In developing economies, there are challenges that face cloud services providers and their consumers. Broadband network access was identified as the main essential service for a successful cloud computing offering (Goundar, 2010; Mujinga & Chipangura, 2011).

Furthermore, the public sector in developing countries will be able to adopt advanced applications more quickly and economically using cloud-based infrastructures in much the same way that phone users in those countries were able to leap directly to new-generation mobile communications and thus avoid the need for an expensive landline infrastructure (Wyld, 2009).

Chapter Three

Research Methodology

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Research Methodology

3.1. Overview

This chapter discusses the research design and the participants in the study. This is followed by an explanation of the instrumentations that were used in the study and procedures. In addition, it discusses how the data was analyzed; furthermore, validity and reliability will be discussed. Finally, it discusses the ethical considerations of the research.

3.2. Research Design

Research design is used to integrate the various components of the study, is also used as a guideline for data collection and analysis. According to Robson (2002) the most familiar types of research design are:

- Descriptive research design: used to obtain information on the current status for a certain phenomenon, and to study the relationships between variables.
- Exploratory research design: used to obtain basic information about a particular topic.
- Causal research design: used to understand a particular issue by establishing cause and effect relationships between variables.

Since the purposes of this research are to assess the possibility of Cloud Computing adoption in the Palestinian public sector and to identify

the Opportunities and Challenges of the adoption of the Cloud Computing in Palestine public Sector. Therefore, the research type of this study is mainly to be exploratory in addition to descriptive analysis.

To answer the research questions in this study, the researcher adopted three plan phases: the first phase is an exploratory research used though Literature review which reviewed previous studies, article, journal papers, books conferences and internet. The second phase is a descriptive analytical approach by using quantitative survey which tries to assess the possibility of cloud computing adoption in Palestinian public sector in addition to identify all potential opportunities and challenges for switching from existing computing arrangements to cloud services. The third phase is another descriptive analytical approach by using semi-structured interviews to double check the result that produced from the survey.

3.3. Settings and Participants

The nature of the Palestinian public sector hierarchy is centralized, and most of Information Technology (IT) staff exists in the main headquarters of the ministries, so the targeted population is only exists in the headquarters of the ministries in Ramallah.

According to the Palestinian cabinet, there are 21 ministries in the Palestinian public sector (PalestinianCabinet, 2014)

The population for the questionnaire in this study consists of all staff of information technology (IT) in the ministries of public sector including

the following Job Titles: Director, IT Manager, System Admin / Engineer, Network Admin / Engineer, Security officer, Database Administrator, and Technical Support. Researcher failed to get an official document which shows the size of this population, so he had to get these figures in an oral manner. (Appendix A) shows the number of IT staff in each ministry, and thus the size of the population in this research is about 253.

Sample size for the questionnaire was calculated based on the size of the sample on the web calculator (Systems, 1982) with 95% confidence level and confidence interval 5, the required sample size is 153, but what was collected is 152 which is an excellent number.

In terms of qualitative data by semi structure interviews, the researcher conducted eleven successful interviews which is an enough number according to McCracken (1988), who clarified that at least eight successful interviews are required for thematic analysis.

3.4. Instrumentation

There are many tools that could be used in order to accomplish data collection of research study. However, Questionnaire survey, and Semi-Structure interviews were the main tools used to collect data.

3.4.1. Questionnaire Design and Content

The researcher used questionnaire because it’s the best way to gather numerical data and the most appropriate tool for this research which could

be used to confirm hypotheses. In addition, questionnaire is a simple and rapid tool for collecting data in a reasonable time with a reasonable effort.

The researcher designed two versions of the questionnaire, the first version in English and the second in Arabic, to ensure getting highest response rate.

The researcher started preparing the questionnaire by identifying the two main research objectives (mentioned in chapter 1), and the second step was to identify proper variables that should be studied and analyzed carefully to achieve the objectives. After setting forth these variables, the third step was to develop questionnaire items to assess each variable.

The questionnaire is composed of three parts as follows:

- First Part: General Personal Information which consists of (6) items.
- Second Part (First objective): It assess the possibility of cloud computing adoption in Palestinian public sector so as to measure the application agreement of them using five point Likert scales. "1" Strongly disagree, "2" Disagree, "3" Neutral, "4" Agree, "5" Strongly Agree (Likert, 1974), this part consists of six variables as follows:
  - Top management support: The level of support provided by the top-level management in the Palestinian public sector for cloud computing adoption which consists of (7) items.
  - Financial resources: the availability of financial budget needed for cloud computing adoption which consists of (5) items.

- Infrastructure's support and integration: IT infrastructure assessment in ministries and government agencies which consists of (6) items.
- Experience and support of IT human resources: the professionalism and expertise owned by people working in both public and private sector. In addition, the needed technical support provided by those people for the Palestinian government which consists of (5) items.
- Awareness: the level of understanding the benefits and objectives of Cloud Computing adoption which consists of (4) items.
- Collaboration across ministries: the level of coordination and cooperation among different government agencies which consists of (3) items.

- Third Part: (Second objective) identifies all potential opportunities and challenges for switching from existing computing arrangements to cloud services so as to measure the application's importance of them using five point Likert scales. "1" Unimportant, "2" Of little importance, "3" Moderately important, "4" Important, "5" Very important (Likert, 1974), this part consist of three variables as the follows:
  - Business driver which consists of (7) items.
  - Benefits which consists of (16) items.
  - Challenges which consists of (13) items.

During the preparing of this questionnaire, it was taken into account that the questions cover all aspects of the literature review, and meet all the variables that affecting the research objectives, and was also taken into account that most of the questions are clear for ease of answer and analysis. Most of questionnaires were distributed by hand to the sample members in order to explain the questionnaire and to answer any queries.

3.4.2. Semi-Structure interviews Design and Content

To double check the result that produced from the survey, the researcher used semi-structured interviews with the sample from the public sector, which is one of the most common methods of qualitative research (Ritchie et al., 2013). The Sample contains 11 experts including 4 general managers, 4 directors and 3 senior employees (see Appendix D).

3.5. Procedure

The study was conducted from July 2013 to November 2014, but the questionnaire distribution and interview period was from March 2014 to June 2014. The study was applied on all ministries of public sector.

For applying questionnaire's distribution and interview, the researcher followed these procedure's steps as shown in Figure (3.1):

- First, obtaining the approval of the supervisor about the questionnaire after making modifications requested.

- Second, distributing the questionnaire to group of experts consists of (3) experts, having experiences in the subject of research inside and outside the public sector. (see appendix E)

- Then, preparing the final version of the questionnaire based on the observations of the experts group. see (Appendix B)

- The questionnaire was translated into Arabic. Then, distributing the Arabic version of the questionnaire to the experts, and then preparing the final form of the Arabic version of the questionnaire based on the vision of the experts group. (Appendix C)

- The questionnaire has been published on Google Documents as an online survey.

- Obtaining a recommendation paper from the faculty of the higher education – An Najah National University to facilitate the mission of the researcher in the distribution of questionnaires, and conducting the interviews.

- All ministries in the sample were visited, given information about the objective of the research, and they were promised for confidentiality of information. Then, the IT department in each ministry was asked if they are willing to fill in the questionnaire and conduct an interview.

- The researcher distributed the questionnaire by hand and online using Google docs; some ministries refused filling more than one questionnaire. Other ministries refused to conduct an interview and

accepted to fill the questionnaires, and others refused receiving questionnaires.

- The researcher distributed 138 questionnaires by hand, but only 121 valid questionnaires were returned in addition to 31 online. Hence, the total response rate for this questionnaire was 87% which is an acceptable response rate.

- Finally, all data were extracted from the questionnaires that have been retrieved from the respondents, and were entered to the computer using SPSS software to be analyzed.

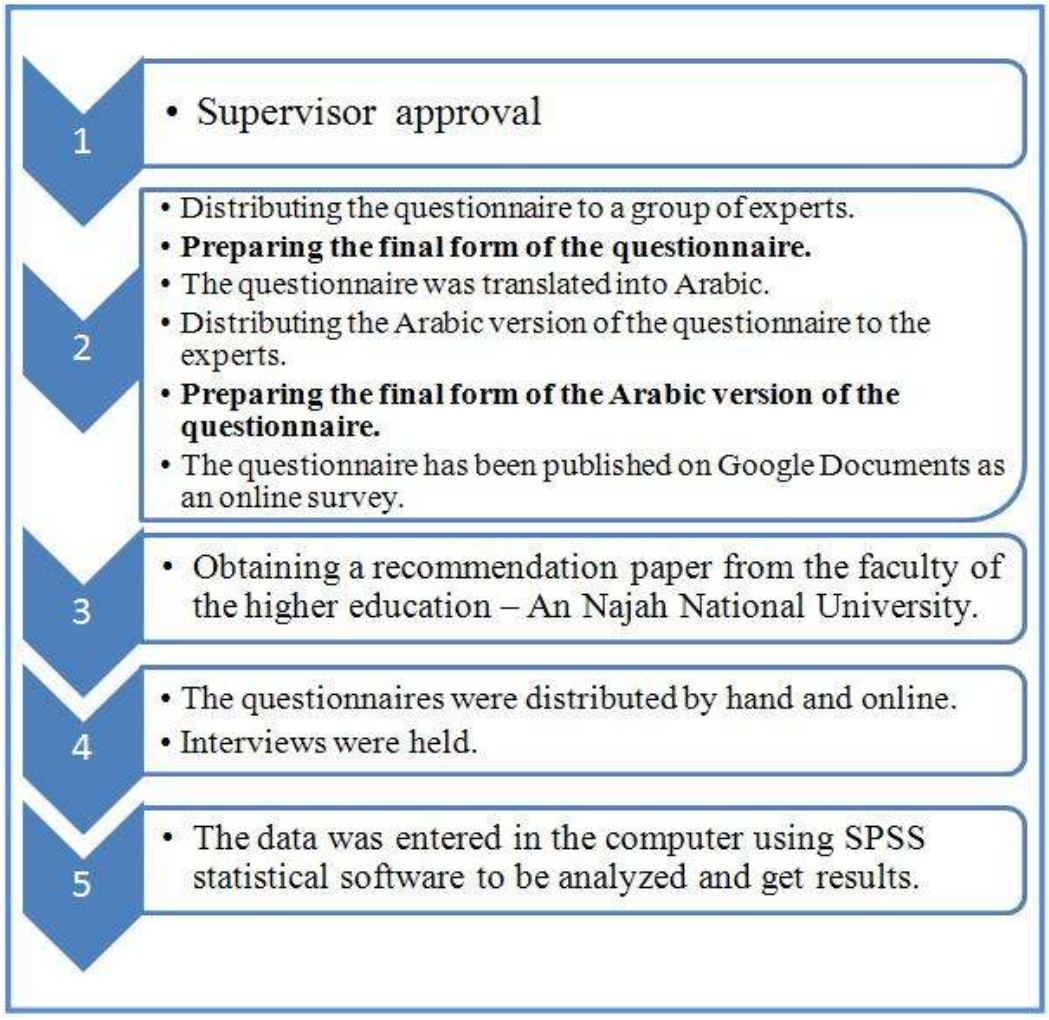

Figure (3.1): Research procedure.

The researcher conducted all interviews personally in interviewees' offices, the duration of each meeting is about 30 minutes. All interviews have been documented by written notes. After the end of all the interviews, all notes were re-written in a standard format to be used in the analysis.

3.6. Data processing and Analysis

In this research, the researcher utilized both primary and secondary data sources.

- Secondary Data Resource: To address the theoretical aspects of the Cloud Computing, the research uses the secondary data resource which consists of all sources of published data including: previous studies, books, journals, articles and websites related to the Cloud Computing.

- Primary Data Resource: because this research uses qualitative and quantitative approaches, there are two sources of primary data, the questionnaire is used to collect quantitative data, and semi-structure interview is used to collect qualitative data.

After the completion of the data collection through questionnaires and interviews, the analysis process started using statistical calculations and thematic analysis.

The researcher used Statistical Package for the Social Sciences (SPSS) to analyze the quantitative data. The following statistical tests were used to analyze the data, answer the questions, and to test the hypotheses:

- Frequencies, descriptive, means, standard deviations and percentages to represent the collected data in a meaningful numbers.
- Independent-Sample T-Test to indicate the significance difference between two level independent variables and to test the hypotheses.
- One-Way ANOVA to indicate the significance difference between more than two level independent variables and test the hypotheses.

The researcher used thematic analysis to analyze the qualitative data that were collected from the interviews. According to Braun and Clarke (2006) thematic analysis is flexible and simple technique used to create new ideas by identifying, analyzing and preparing patterns, these patterns or themes extracted from the data by organizing and describing these data to make sense of the data.

According to Braun and Clarke (2006) main stages of a thematic analysis are:

1. Read the data several times to become familiar to the reader.
2. Generating initial codes by observing the occurrence of patterns.
3. Combining codes in themes that depict the data accurately.
4. Reviewing the themes to ensure that these themes support the study.
5. Defining and naming the themes.
6. Validating the chosen themes by building a valid argument.

Researcher follow these stages in this study, where the researcher started by reading the texts of interviews several times to become familiar with him, then generating the codes, then collecting the similar codes into issues, then combining the similar issues in themes, and finally defining the themes.

3.7. Validity of Research Tools

It is important to check the validity of research tools before starting data analysis; Validity of research tool refers to the degree to which the research tool measures what is supposed to be measure. Validity has a number of various assessment approaches. Statistical validity is used to evaluate research validity which includes internal validity and structure validity (Thompson, 2002).

To insure the validity of the questionnaire, Pearson test was used to measure the correlation coefficient. So for each item or variable:

- If p-values (Sig.) < 0.05: Then the correlation coefficient of this item or variable is significant at $\alpha = 0.05$.
- If p-values (Sig.) > 0.05: Then the correlation coefficient of this item or variable is insignificant at $\alpha = 0.05$.

3.7.1. Internal Validity of the Questionnaire

Internal validity of the questionnaire is used by calculating the correlation coefficients between each item in one variable and the whole

variable. This test applied to the second and third parts of questionnaire which represent the main objectives of the research; Firstly, doing the internal validity on each variable of part two of the questionnaire i.e."Assessing the possibility of Cloud Computing adoption in Palestinian public sector" by calculating the correlation coefficients between each item in one variable and the total of this variable.

Table (3.1) shows that the correlation coefficients for this variable are significant at $\alpha = 0.05$, so it can be concluded that the items of the variable "Top management support" are consistent and valid to measure what they were set for.

Table (3.1): Correlation coefficient of each item of the variable "Top management support" and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Top management supports everything new in IT field such as Cloud Computing Technology.	.645	.000
2	Top management has an interest in Cloud Computing adoption in the Palestinian public sector.	.553	.000
3	Top management provides the staff with necessary training for any new technology.	.556	.000
4	Palestinian public sector has already used Cloud Computing in some new applications.	.472	.000
5	In top management plan there is an intention to adopt Cloud Computing.	.660	.000
6	Palestinian government studied and analyzed some case studies of countries that have already adopted Cloud Computing.	.679	.000
7	Palestinian public sector already has a management plan which is designed to resolve the resistance to change when adopting Cloud Computing.	.655	.000

Table (3.2) shows that the correlation coefficients for this variable are significant at α = 0.05, so it can be concluded that the items of the variable “Financial resources" are consistent and valid to measure what they were set for.

Table (3.2): Correlation coefficient of each item of the variable “Financial resources” and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	There is an annual budget dedicated for purchasing new hardware and software in the Palestinian public sector.	.472	.000
2	There is an annual budget dedicated for IT training in the Palestinian public sector.	.588	.000
3	Palestinian public sector focuses on attractive economic options which aim to reduce costs.	.475	.000
4	There is an adequate budget to adopt Cloud Computing in the Palestinian public sector.	.513	.000
5	Cost Saving: The most important feature of Cloud Computing is converting the capital expenditure (Purchase of fixed assets) to ongoing expenses.	.412	.000

Table (3.3) shows that the correlation coefficients for this variable are significant at α = 0.05, so it can be concluded that the items of the variable “Infrastructure’s support and integration" are consistent and valid to measure what they were set for.

Table (3.3): Correlation coefficient of each item of the variable "Infrastructure's support and integration" and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Applications and Systems at the Palestinian public sector are continuously updated to keep pace with technological development.	.546	.000
2	The possibility of moving existing applications and services provided by IT departments to the cloud "cloud-ready".	.604	.000
3	The current IT infrastructures in the Palestinian public sector support the adoption of Cloud Computing.	.658	.000
4	Applications and services in the public sector are flexible.	.456	.000
5	There are technical problems which may hinder the adoption of Cloud Computing in the Palestinian public sector.	.489	.000
6	Infrastructure and services in all ministries are almost similar.	.160	.049

Table (3.4) shows that the correlation coefficients for this variable are significant at $\alpha = 0.05$, so it can be concluded that the items of the variable "Experience and support of IT human resources "are consistent and valid to measure what they were set for.

Table (3.4): Correlation coefficient of each item of the variable "Experience and support of IT human resources" and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Palestinian public sector provides training programs for employees i.e. related to new technologies (such as Cloud Computing).	.577	.000
2	Training available to staff in the field of information technology is enough, and makes them look forward to some extent to the latest technology.	.715	.000
3	There are enough trained experts on Cloud Computing in the Palestinian public sector.	.703	.000
4	There is an exchange of knowledge and cooperation between the Palestinian public sector and private sector companies.	.699	.000
5	IT staff needs training on Cloud Computing.	.549	.000

Table (3.5) shows that the correlation coefficients for this variable are significant at α = 0.05, so it can be concluded that the items of the variable “Awareness" are consistent and valid to measure what they were set for.

Table (3.5): Correlation coefficient of each item of the variable “Awareness” and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Top management was aware of ongoing developments on Cloud Computing technology and the importance of its use.	.534	.000
2	IT staff is aware of the importance of the adoption of Cloud Computing in the public sector.	.551	.000
3	Palestinian public sector continuously holds workshops and conferences to increase the awareness of the benefits of Cloud Computing.	.599	.000
4	There is an enough awareness of the objectives and benefits of Cloud Computing.	.764	.000

Table (3.6) shows that the correlation coefficients for this variable are significant at α = 0.05, so it can be concluded that the items of the variable “Collaboration across ministries" are consistent and valid to measure what they were set for.

Table (3.6): Correlation coefficient of each item of the variable “Collaboration across ministries” and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Palestinian government encourages cooperation between all public sector agencies.	.801	.000
2	There are some projects which are shared between different Ministries in Palestinian public sector.	.817	.000
3	There is a methodology for exchanging data among different Palestinian governmental agencies.	.773	.000

Secondly, doing the internal validity on each variable of third part of the questionnaire i.e. "Identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services" by calculating the correlation coefficients between each item in one variable and the total of this variable.

Table (3.7) shows that the correlation coefficients for this variable are significant at $\alpha = 0.05$, so it can be concluded that the items of the variable “Business drivers" are consistent and valid to measure what they were set for.

Table (3.7): Correlation coefficient of each item of the variable “Business drivers” and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Enable business continuity.	.499	.000
2	Achieve greater flexibility.	.714	.000
3	Improve customer support or services.	.759	.000
4	Reduce resource waste.	.605	.000
5	Enable innovation.	.810	.000
6	Need for real-time information.	.753	.000
7	Expand revenue opportunities.	.685	.000

Table (3.8) shows that the correlation coefficients for this variable are significant at $\alpha = 0.05$, so it can be concluded that the items of the variable “Benefits" are consistent and valid to measure what they were set for.

Table (3.8): Correlation coefficient of each item of the variable "Benefits" and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Increases collaboration	.660	.000
2	Transforms high fixed-capital costs to lower variable and operating expenses	.672	.000
3	Ability to grow and shrink IT capacity on demand	.598	.000
4	Ability to rapidly launch new products and services	.560	.000
5	Operational cost savings	.616	.000
6	Hardware and Software cost savings	.642	.000
7	Hardware utilization	.749	.000
8	Ease of access to hardware and software	.617	.000
9	Better data security	.582	.000
10	Data is better organized	.585	.000
11	Data is more under control	.653	.000
12	Easier to partner with other organizations	.388	.000
13	Improved information sharing and collaboration	.640	.000
14	Need for less IT staff to support systems	.568	.000
15	Reduced system administration	.485	.000
16	Easier to recover after a disaster	.300	.000

Table (3.9) shows that the correlation coefficients for this variable are significant at $\alpha = 0.05$, so it can be concluded that the items of the variable "Challenges" are consistent and valid to measure what they were set for.

Table (3.9): Correlation coefficient of each item of the variable "Challenges" and the total of this variable

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Concerns about data security or data privacy	.569	.000
2	Reduces the performance and availability of services or data.	.541	.000
3	Lack of Integrity of services and data	.579	.000
4	Less Confidentiality of corporate data	.619	.000
5	Not enough major suppliers yet	.455	.000
6	Loss of control of services and data	.712	.000
7	Inconsistency between trans national laws and regulations	.735	.000
8	Unclear scheme in the pay per use approach	.683	.000
9	Uncontrolled variable cost	.614	.000
10	Cost and difficulty of migration to the cloud (legacy software etc...)	.679	.000
11	Hard to integrate with in-house ICT.	.663	.000
12	Not enough ability to customize.	.755	.000
13	Bringing back in-house may be difficult.	.709	.000

3.7.2. Structure Validity of the Questionnaire

Structure validity of the questionnaire is used by calculating the correlation coefficients between each variable and all the variables of the questionnaire. Since the second and third parts of questionnaire have different level of Likert scale, this test applies separately on these parts.

Table (3.10) shows that the correlation coefficients for this part are significant at $\alpha = 0.05$, so it can be concluded that the variables of the second part of the questionnaire i.e. "Assessing the possibility of Cloud Computing adoption in Palestinian public sector" are consistent and valid to measure what they were set for.

Table (3.10): Correlation coefficient of each variable of the second part of the questionnaire i.e. "Assessing the possibility of Cloud Computing adoption in Palestinian public sector" and the total of this part

#	Items	Pearson Correlation	Sig. 2-tailed)
1	Top management support.	.557	.000
2	Financial resources	.619	.000
3	Infrastructure's support and integration	.597	.000
4	Experience and support of IT human resources	.714	.000
5	Awareness	.494	.000
6	Collaboration across ministries	.614	.000

Table (3.11) shows that the correlation coefficients for this part are significant at $\alpha = 0.05$, so it can be concluded that the variables of the second part of the questionnaire i.e. "Identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services" are consistent and valid to measure what they were set for.

Table (3.11): Correlation coefficient of each variable of the third part of the questionnaire i.e. "Identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services" and the total of this part

#	Items	Pearson Correlation	Sig. (2-tailed)
1	Business drivers	.669	.000
2	Benefits	.647	.000
3	Challenges	.653	.000

Therefore, the researcher proved that the questionnaire was valid to measure what it was set for.

3.8. Testing Reliability

It is important to check the reliability of data before starting data analysis in order to determine the credibility of results. According to Thompson (2002), the reliability of the search tool is the consistency of this tool to measure what it is supposed to measure. In other words, the research

tool is considered to have a high reliability if it produces similar results under consistent conditions (Gliem & Gliem, 2003).

For this study the researcher used Cronbach's coefficient alpha test to check the reliability of the questionnaire through the SPSS software. However, there are different views of what are acceptable scores for assessing internal consistency. Based on recommendations from Cortina (1993), several studies have accepted reliability greater than 0.6. The researcher followed the recommendation by Cortina, and suggest alpha greater than 0.6 as acceptable.

Table (3.12) shows the values of Cronbach's Alpha for each variable of the questionnaire and the entire questionnaire. It's clear that all the questionnaire's variables are above 0.6 as well as the total reliability of the questionnaire is (0.871). Therefore, the research data is reliable.

Table (3.12): Cronbach's Alpha for each variable of the questionnaire

#	Items	# of Items	Cronbach's Alpha
1	**Part Two:** Assessing the possibility of Cloud Computing adoption in Palestinian public sector	30	0.828
1.1	Top management support.	7	0.818
1.2	Financial resources	5	0.821
1.3	Infrastructure's support and integration	6	0.821
1.4	Experience and support of IT human resources	5	0.817
1.5	Awareness	4	0.823
1.6	Collaboration across ministries	3	0.821
2	**Part Three:** Identify all potential opportunities and challenges for switching from existing computing arrangements to cloud services	36	0.881
2.1	Business drivers	7	0.877
2.2	Benefits	16	0.877
2.3	Challenges	13	0.874
	All items of the questionnaire	66	0.871

3.9. Ethical Considerations

The researcher followed ethical standards in all research stages:

- Recommendation paper to every ministry which has taken from the Faculty of Higher Education – An Najah National University.
- Ensuring that the questionnaire is acceptable from the public sector.
- The interviews were confidential and generalized without any indication to the interviewee or place of work.
- The questionnaire did not have any indication to person who fills the questionnaire.
- Confidentiality was maintained in all process and procedures.

Chapter Four

Research Findings, Analysis and Discussion

Chapter Four
Research Findings, Analysis and Discussion

4.1. Overview

The previous chapter outlined the research methodology. The measuring instrument was discussed and an indication of the method of statistical analysis was given.

Qualitative and quantitative researches provide different perspectives and complement each other. Moreover, utilizing both techniques improves the research validity and reliability. Therefore, as mentioned previously in the methodology chapter, this research used both the quantitative research through the survey and the qualitative research through the semi-structured interviews.

This chapter comprises of four parts: the first part presents and discusses findings from the returned questionnaires and testing research hypotheses, the second part discusses findings from the semi-structured interviews to double check the survey results, the third part answers research questions, and the last part proposes a conceptual framework for adopting Cloud Computing in the public sector in the developing countries.

4.2. Part I: Questionnaire Analysis

The researcher designed the questionnaire which consists of three parts: the first part contains general personal information, the second part is designed to assess the possibility of Cloud Computing adoption in the

Palestinian public sector and the third part is designed to identify all potential opportunities and challenges for switching from existing computing arrangements to Cloud Computing. The results and analysis for these parts are provided in the following sections.

4.2.1. Sample Characteristics

Based on the information gathered from the respondents in the first part of the questionnaire, the frequency analysis was used to determine the characteristics of the respondents.

4.2.1.1. *Gender*

Table (4.1): Respondents' Gender representation

Gender	Frequency	Percent
Male	120	78.9%
Female	32	21.1%
Total	152	100%

Table (4.1) shows that most of responders are males with (78.9%) of the population and (21.1%) of the population are females. According to General Personnel Council, the majority of public sector employees are males (GPC, 2009).

4.2.1.2. *Qualification*

Table (4.2): Respondents' Qualification representation

Qualification	Frequency	Percent
Diploma or less	17	11.2%
Bachelor	127	83.6%
Higher Education	8	5.3%
Total	152	100%

Table (4.2) shows that most of the respondents have a Bachelor degree (83.6%), and (5.3%) have a higher Educational degree while (11.2%) have a diploma or less which means that all respondents are educated and the most of them have at least a Bachelor degree where the majority of the population work in technical or administrative positions, which don't require having a higher Education in these positions.

4.2.1.3. *Age*

Table (4.3): Respondents' Age representation

Age	Frequency	Percent
30 years or less	66	43.4%
30 - 40 years	71	46.7%
40 - 50 years	9	5.9%
More than 50 years	6	3.9%
Total	152	100%

Table (4.3) shows that most of the respondents are between (30) & (40) years (46.7%), (43.4%) of the respondents are 30 years old or less, (5.9%) of the population are between (40) & (50), and (3.9%) of the population are of (50) years and Older which means that most of respondents are youth; this is because that the staff who work in the field of Information Technology are usually youth (less than 40 years).

4.2.1.4. *Specialty*

Table (4.4): Respondents' Specialty representation

Specialty	Frequency	Percent
Administration	8	5.3%
Engineering	67	44.1%
IT	77	50.7%
Total	152	100%

Table (4.4) shows that more than half of the respondents have a specialty in Information Technology (IT) as (50.7%), and less than half of them are engineers as (44.1%) while the last respondents have administration specialties as (5.3%). This indicates that the sample covers the targeted population of the study.

4.2.1.5. *Experience Year*

Table (4.5): Respondents' Experience representation

Experience Year	Frequency	Percent
2 years or less	15	9.9%
3 - 5 years	59	38.8%
6 - 10 years	44	28.9%
More than 10 years	34	22.4%
Total	152	100%

Table (4.5) shows that the respondents include all the varied experiences; there are (38.8%) of the respondents who have 3-5 years of experience while (28.9%) have 6-10 years of experience, (22.4%) have more than 10 years of experience while the last respondents have 2 years of experience or less as (9.9%). This means that the respondents have a good experience in their working field, and were able to give value perceptions enriching the research.

4.2.1.6. *Position Title*

Table (4.6): Respondents' Position Title representation

Position Title	Frequency	Percent
Director	15	9.9%
IT Manager	18	11.8%
System Admin/Engineer	18	11.8%
Network Admin/Engineer	25	16.4%
Security Officer	8	5.3%
Database Administrator	7	4.6%
Technical Support	36	23.7%
Programmer	25	16.4%
Total	152	100%

Table (4.6) shows that the respondents are from different positions of ICT departments; there are (23.7%) of the respondents are technical support, (16.4%) of respondents are network admin/engineer, (16.4%) of the respondents are programmer, (11.8%) of the respondents are IT manager, (11.8%) of the respondents are system admin/engineer, (9.9%) of the respondents are director, (5.3%) of the respondents are security officer, and (4.6%) of the respondents are database administrator. This indicates that the sample covers most of the IT positions.

4.2.2. Assessing the possibility of Cloud Computing adoption in the Palestinian public sector

This is the second section of the questionnaire; the outputs of analyzing this section should assess the possibility of Cloud Computing adoption in the Palestinian public sector.

The second part of the questionnaire has thirty (30) items addressing six main variables that affected the adoption of Cloud Computing in the Palestinian public sector, and these variables are:

1. Top management support.
2. Financial resources.
3. Infrastructure's support and integration.
4. Experience and Support of IT human resources.
5. Awareness.
6. Collaboration across Ministries.

To analyze these variables, descriptive statistics are used in order to get Means, Standard deviation (S.D.), and application degree for each item and for the whole variable.

Likert scales is used to measure the application Agreement (Likert, 1974), the following table (4.7) clarifies 1-5 Likert scale for this section:

Table (4.7): Likert Scale (Application Agreement)

Scale	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Degree	5	4	3	2	1

The application degree of each item or variable was identified by classifying the response averages into five degrees based on what was agreed with the arbitrators, ranging from Strongly Disagree to Strongly Agree.

These degrees, which are based on five intervals, were calculated as follows: The interval length was calculated by dividing the response range

(5 which corresponds to Strongly Agree minus 1 which corresponds to Strongly Disagree) by the number of intervals which is 5, as following: (5-1)/5 = 0.8. Table (4.8) shows the intervals and there represented scaling degrees used in this section of the research.

Table (4.8): Scaling degrees (Application Agreement)

Interval	Degree
1.00-1.80	Strongly Disagree
>1.80 – 2.60	Disagree
>2.60 – 3.40	Neutral
>3.40 – 4.20	Agree
>4.20 – 5.00	Strongly Agree

To assess the possibility of Cloud Computing adoption in the Palestinian public sector, the six variables were studied.

4.2.2.1. *Top Management Support*

This variable is used to examine the level of top management's interest in Cloud Computing adoption, and the level of support provided by the top management for the adoption of Cloud Computing technology in the Palestinian public sector. Table (4.9) clarifies the Means, Standard deviation (S.D.), and application degree for each item of the variable: "Top Management Support" and the total of this variable.

- The Mean values of items #1, 2, and 3 are between 2.60 and 3.40, so in this case we conclude that the respondents neither agreed nor disagreed with these items.

- The Mean values of items #4, 5, 6, and 7 are between 1.80 and 2.60, so in this case we conclude that the respondents disagreed with these items.

- It can be noticed that the total Mean response for the variable: “Top Management Support” was (2.56) out of (5.00) which is considered as “Disagree”, so we conclude that the respondents disagreed with the variable: “Top Management Support”.

Table (4.9): Means, Standard deviation (S.D.), and application degree for each item of the variable: "Top management support" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	Top management supports everything new in IT field such as Cloud Computing Technology.	152	3.2	1.038	Neutral
2	Top management has an interest in Cloud Computing adoption in the Palestinian public sector.	152	2.98	1.101	Neutral
3	Top management provides the staff with necessary training for any new technology.	152	2.93	0.991	Neutral
4	Palestinian public sector has already used Cloud Computing in some new applications.	152	2.43	1.034	Disagree
5	In top management plan there is an intention to adopt Cloud Computing.	152	1.95	0.882	Disagree
6	Palestinian government studied and analyzed some case studies of countries that have already adopted Cloud Computing.	152	2.13	1.034	Disagree
7	Palestinian public sector already has a management plan which is designed to resolve the resistance to change when adopting Cloud Computing.	152	2.26	0.85	Disagree
	Total	**152**	**2.56**	**0.597**	**Disagree**

4.2.2.2. *Financial Resources*

This variable is used to examine the availability of financial resources that are needed for Cloud Computing adoption. Table (4.10) clarifies the Means, Standard deviation (S.D.), and application degree for each item of the variable: "Financial resources" and the total of this variable.

- The Mean values of items #1, 2, and 5 are between 3.40 and 4.20, so in this case we conclude that the respondents agreed with these items.
- The Mean value of item #3 is between 2.60 and 3.40, so in this case we conclude that the respondents neither agreed nor disagreed with this item.
- The Mean value of item #4 is between 1.80 and 2.60, so in this case we conclude that the respondents disagreed with this item.
- It can be noticed that the total Mean response for the variable: “Financial Resources” was (3.41) out of (5.00) which is considered as “Agree”, so we conclude that the respondents agreed with the variable: “Financial Resources”.

Table (4.10): Means, Standard deviation (S.D.), and application degree for each item of the variable: "Financial resources" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	There is an annual budget dedicated for purchasing new hardware and software in the Palestinian public sector.	152	3.95	0.684	Agree
2	There is an annual budget dedicated for IT training in the Palestinian public sector.	152	3.78	0.863	Agree
3	Palestinian public sector focuses on attractive economic options which aim to reduce costs.	152	3.32	1.07	Neutral
4	There is an adequate budget to adopt Cloud Computing in the Palestinian public sector.	152	2.31	0.855	Disagree
5	Cost Saving: The most important feature of Cloud Computing is converting the capital expenditure (Purchase of fixed assets) to ongoing expenses.	152	3.66	0.781	Agree
	Total	**152**	**3.41**	**0.438**	**Agree**

4.2.2.3. *Infrastructure's support and Integration*

This variable is used to examine the level of Infrastructure's support and its integration that are needed for Cloud Computing adoption; table (4.11) clarifies the Means, Standard deviation (S.D.), and application degree for each item of the variable: "Infrastructure's support and Integration" and the total of this variable.

- The Mean value of item #5 is between 1.80 and 2.60. Since this item is negatively-keyed item, it must be "reverse-scored" by transforming "Disagree" on this item to "Agree", so in this case we conclude that the respondents agreed with these items.

- The Mean values of items #1, 4 and 6 are between 2.60 and 3.40, so in this case we conclude that the respondents neither agreed nor disagreed with these items.

- The Mean values of item #2 and 3 are between 1.80 and 2.60, so in this case we conclude that the respondents disagreed with these items.

- It can be noticed that the total Mean response for the variable: "Infrastructure's support and its integration" was (2.59) out of (5.00) which is considered as "Disagree", so we conclude that the respondents disagreed with the variable: "Infrastructure's support and its integration".

Table (4.11): Means, Standard deviation (S.D.), and application degree for each item of the variable: "Infrastructure's support and its integration" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	Applications and Systems at the Palestinian public sector are continuously updated to keep pace with technological development.	152	2.91	0.876	Neutral
2	The possibility of moving existing applications and services provided by IT departments to the cloud "cloud-ready".	152	2.35	0.93	Disagree
3	The current IT infrastructures in the Palestinian public sector support the adoption of Cloud Computing.	152	2.12	0.821	Disagree
4	Applications and services in the public sector are flexible.	152	2.65	0.816	Neutral
5	There are technical problems which may hinder the adoption of Cloud Computing in the Palestinian public sector.	152	2.45	1.072	Agree*
6	Infrastructure and services in all ministries are almost similar.	152	3.11	0.932	Neutral
	Total	**152**	**2.59**	**0.438**	**Disagree**

*** Negatively-keyed item**

4.2.2.4. *Experience and Support of IT human resources*

This variable is used to examine the experience owned by people working in public and private sector. In addition, the needed technical support are provided by those people for the Palestinian public sector for Cloud Computing adoption; table (4.12) clarifies the Means, Standard deviation (S.D.), and application degree for each item of the variable "Experience and Support of IT human resources" and the total of this variable.

- The Mean value of item #5 is between 1.80 and 2.60. Since this item is negatively-keyed item, it must be "reverse-scored" by transforming "Disagree" on this item to "Agree", so in this case we conclude that the respondents agreed with these items.

- The Mean values of items #1, 2, 3 and 4 are between 1.80 and 2.60, so in this case we conclude that the respondents disagreed with these items.

- It can be noticed that the total Mean response for the variable: "Experience and Support of IT human resources" was (2.38) out of (5.00) which is considered as "Disagree", so we conclude that the respondents Disagreed with the variable: "Experience and Support of IT human resources".

Table (4.12): Means, Standard deviation (S.D.), and application degree for each item of the variable: "Experience and Support of IT human resources" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	Palestinian public sector provides training programs for employees i.e. related to new technologies (such as Cloud Computing).	152	2.55	0.837	Disagree
2	Training available to staff in the field of information technology is enough, and makes them look forward to some extent to the latest technology.	152	2.49	0.899	Disagree
3	There are enough trained experts on Cloud Computing in the Palestinian public sector.	152	2.49	0.949	Disagree
4	There is an exchange of knowledge and cooperation between the Palestinian public sector and private sector companies.	152	2.59	1	Disagree
5	IT staff needs training on Cloud Computing.	152	1.8	0.892	Strongly Agree*
	Total	**152**	**2.38**	**0.596**	**Disagree**

* Negatively-keyed item

4.2.2.5. *Awareness*

This variable is used to examine the level of understanding the benefits and objectives of Cloud Computing adoption; table (4.13) clarifies the Means, Standard deviation (S.D.), and application degree for each item of the variable "Awareness" and the total of this variable.

- The Mean value of item #2 is between 3.40 and 4.20, so in this case we conclude that the respondents agreed with this item.

- The Mean values of items #1, 3 and 4 are between 1.80 and 2.60, so in this case we conclude that the respondents disagreed with these items.

- It can be noticed that the total Mean response for the variable: "Awareness" was (2.59) out of (5.00) which is considered as "Disagree", so we conclude that the respondents disagreed with the variable: "Awareness".

Table (4.13): Means, Standard deviation (S.D.), and application degree for each item of the variable: "Awareness" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	Top management was aware of ongoing developments on Cloud Computing technology and the importance of its use.	152	2.32	0.909	Disagree
2	IT staff is aware of the importance of the adoption of Cloud Computing in the public sector.	152	3.61	0.892	Agree
3	Palestinian public sector continuously holds workshops and conferences to increase the awareness of the benefits of Cloud Computing.	152	2.12	0.853	Disagree
4	There is an enough awareness of the objectives and benefits of Cloud Computing.	152	2.31	0.964	Disagree
	Total	**152**	**2.59**	**0.556**	**Disagree**

4.2.2.6. *Collaboration across Ministries*

This variable is used to examine the level of coordination and cooperation among different government agencies, and the possibility of efficiently exchanging data among these different agencies; table (4.14) clarifies the Means, Standard deviation (S.D.), and application degree for

each item of the variable: “Collaboration across Ministries” and the total of this variable.

- The Mean values of items #1 and 2 are between 3.40 and 4.20, so in this case we conclude that the respondents agreed with these items.
- The Mean value of item #3 is between 2.60 and 3.40, so in this case we conclude that the respondents neither agreed nor disagreed with this item.
- It can be noticed that the total Mean response for the variable: “Collaboration across Ministries” was (3.54) out of (5.00) which is considered as “Agree”, so we conclude that the respondents agreed with the variable: “Collaboration across Ministries”.

Table (4.14): Means, Standard deviation (S.D.), and application degree for each item of the variable: “Collaboration across ministries” and the total of the variable

#	Items	N	Mean	S.D.	Application Degree
1	Palestinian government encourages cooperation between all public sector agencies.	152	3.59	0.924	Agree
2	There are some projects which are shared between different Ministries in Palestinian public sector.	152	3.67	0.779	Agree
3	There is a methodology for exchanging data among different Palestinian governmental agencies.	152	3.36	0.88	Neutral
	Total	**152**	**3.54**	**0.686**	**Agree**

4.2.3. Identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services

This is the third section of the questionnaire; the outputs of analyzing this section should identify all potential opportunities and challenges for switching from existing computing arrangements to Cloud Computing.

The third part of the questionnaire has thirty six (36) items addressing three main variables that identifying all potential opportunities and challenges for switching to Cloud Computing in the Palestinian public sector, and these variables are:

1. Business drivers.
2. Benefits.
3. Challenges.

To analyze these variables, descriptive statistics are used in order to get Means, Standard deviation (S.D.), and application degree for each item and for all variables.

Likert scales is used to measure the application importance (Likert, 1974); the following table (4.15) clarifies 1-5 Likert scale for this section:

Table (4.15): Likert Scale (Application importance)

Scale	Very important	Important	Moderately important	Of little importance	Unimportant
Degree	5	4	3	2	1

Table (4.16) shows the intervals and there represented scaling degrees used in this section of the research.

Table (4.16): Scaling degrees (Application importance)

Interval	Degree
1.00-1.80	Unimportant
>1.80 – 2.60	Of little importance
>2.60 – 3.40	Moderately important
>3.40 – 4.20	Important
>4.20 – 5.00	Very important

To identifying all potential opportunities and challenges for switching from existing computing arrangements to cloud services, the three variables were studied.

4.2.3.1. *Business drivers for switching from existing computing arrangements to Cloud Computing*

This variable is used to examine the importance of business drivers to invest in Cloud computing technology; table (4.17) clarifies the Means, Standard deviation (S.D.), application degree, and the Rank for each item of the variable: "Business drivers" and the total of this variable.

- The Mean values of items #2, 3, 5 and 7 are between 3.40 and 4.20, so in this case we conclude that the respondents considered these items as important items.

- The Mean values of items #1, 4, and 6 are between 4.20 and 5.00, so in this case we conclude that the respondents considered these items as very important items.

- It can be noticed that the total Mean response for the variable: “Business drivers” was (4.16) out of (5.00) which is considered as important, so we conclude that the respondents considered the variable: “Business drivers” as important variable.

Table (4.17): Means, Standard deviation (S.D.), application degree, and the rank for each item of the variable: "Business drivers" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree	Rank
1	Enable business continuity.	152	4.22	.663	Very important	3
2	Achieve greater flexibility.	152	4.14	.662	Important	5
3	Improve customer support or services.	152	4.15	.679	Important	4
4	Reduce resource waste.	152	4.43	.616	Very important	1
5	Enable innovation.	152	4.05	.901	Important	6
6	Need for real-time information.	152	4.32	.750	Very important	2
7	Expand revenue opportunities.	152	3.83	.820	Important	7
	Total	152	4.16	.507	Important	

4.2.3.2. *Benefits for switching from existing computing arrangements to Cloud Computing*

This variable is used to examine the importance of the benefits for switching from existing computing arrangements to cloud services; table (4.18) clarifies the Means, Standard deviation (S.D.), application degree, and the Rank for each item of the variable: "Benefits" and the total of this variable.

- The Mean values of items #1, 2, 4, 8, 9, 10, 11, 12, 13, 14 and 15 are between 3.40 and 4.20, so in this case we conclude that the respondents considered these items as important items.

- The Mean values of items #3, 5, 6, 7 and 16 are between 4.20 and 5.00, so in this case we conclude that the respondents considered these items as Very important items.
- It can be noticed that the total Mean response for the variable "Benefits" was (4.08) out of (5.00) which is considered as important, so we conclude that the respondents considered the variable: "Benefits" as important variable.

Table (4.18): Means, Standard deviation (S.D.), application degree, and the rank for each item of the variable: "Benefits" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree	Rank
1	Increases collaboration	152	4.05	.808	Important	10
2	Transforms high fixed-capital costs to lower variable and operating expenses	152	4.09	.700	Important	9
3	Ability to grow and shrink IT capacity on demand	152	4.20	.684	Very important	5
4	Ability to rapidly launch new products and services	152	4.11	.682	Important	7
5	Operational cost savings	152	4.32	.647	Very important	1
6	Hardware and Software cost savings	152	4.30	.726	Very important	2
7	Hardware utilization	152	4.24	.671	Very important	4
8	Ease of access to hardware and software	152	4.12	.996	Important	6
9	Better data security	152	3.97	.758	Important	12
10	Data is better organized	152	3.93	1.014	Important	14
11	Data is more under control	152	3.94	.985	Important	13
12	Easier to partner with other organizations	152	4.03	.690	Important	11
13	Improved information sharing and collaboration	152	4.10	.726	Important	8
14	Need for less IT staff to support systems	152	3.66	1.030	Important	16
15	Reduced system administration	152	3.82	.675	Important	15
16	Easier to recover after a disaster	152	4.28	.776	Very important	3
	Total	152	4.08	.441	Important	

4.2.3.3. *Challenges for switching from existing computing arrangements to Cloud Computing*

This variable is used to examine the importance of challenges for switching from existing computing arrangements to cloud services; table (4.19) clarifies the Means, Standard deviation (S.D.), application degree, and the Rank for each item of the variable "Challenges" and the total of this variable.

- The Mean values of items #2, 3, 11, 12 and 13 are between 2.60 and 3.40, so in this case we conclude that the respondents considered these items as moderately important items.
- The Mean values of items #1, 4, 5, 6, 7, 8, 9 and 10 are between 3.40 and 4.20, so in this case we conclude that the respondents considered these items as important items.
- It can be noticed that the total Mean response for the variable: “Challenges” was (3.48) out of (5.00) which is considered as important, so we conclude that the respondents considered the variable: “Challenges” as important variable.

Table (4.19): Means, Standard deviation (S.D.), application degree, and the rank for each item of the variable: "Challenges" and the total of the variable

#	Items	N	Mean	S.D.	Application Degree	Rank
1	Concerns about data security or data privacy	152	4.03	1.082	Important	1
2	Reduces the performance and availability of services or data.	152	3.30	1.122	Moderately important	10
3	Lack of Integrity of services and data	152	3.20	1.332	Moderately important	11
4	Less Confidentiality of corporate data	152	3.59	1.100	Important	5
5	Not enough major suppliers yet	152	3.53	1.054	Important	6
6	Loss of control of services and data	152	3.70	1.140	Important	3
7	Inconsistency between trans national laws and regulations	152	3.72	1.105	Important	2
8	Unclear scheme in the pay per use approach	152	3.61	1.087	Important	4
9	Uncontrolled variable cost	152	3.41	.959	Important	8
10	Cost and difficulty of migration to the cloud (legacy software etc...)	152	3.49	1.042	Important	7
11	Hard to integrate with in-house ICT.	152	3.17	1.265	Moderately important	12
12	Not enough ability to customize.	152	3.32	1.137	Moderately important	9
13	Bringing back in-house may be difficult.	152	3.14	1.182	Moderately important	13
	Total	152	3.48	.721	Important	

4.2.4. Testing and Analyzing of research Hypotheses

The research hypotheses are examined to explore any possible significant differences among respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to personal characteristics: (Gender, Qualifications, Age, Specialty, Years of Experience and Position Title).

For each personal characteristic there are two hypotheses:

- Null hypothesis: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to personal characteristics.
- The alternative hypothesis: There are statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to personal characteristics.

If the value of (Sig.) is greater than 0.05, that it cannot reject the null hypothesis, so in this case there are no statistically significant differences towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to personal characteristic. On other hand, if the value of (Sig.) is less than 0.05, that it cannot accept the null hypothesis, so in this case there are statistically significant differences at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to personal characteristic.

Below are the main hypotheses:

$H1_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Gender)

Table (4.20) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" **is greater** than the level of significance □ =0.05, thus **we cannot reject** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Gender)", so we conclude that the respondents' Gender **has no effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. This is due to the fact that Cloud Computing is a new technology which is targeting the employee in general, so it is not a condition to be male or female to affect the adoption of Cloud Computing technology.

Table (4.20): ANOVA test for Gender $H1_0$

#	Variables	F	Sig.	Male	Female
1	Top management support.	2.385	.125	2.52	2.70
2	Financial resources	5.243	.023*	3.37	3.57
3	Infrastructure's support and integration	.586	.445	2.58	2.65
4	Experience and support of IT human resources	.062	.804	2.38	2.41
5	Awareness	.152	.697	2.60	2.55
6	Collaboration across ministries	2.541	.113	3.49	3.71
	All variables in Section 2	2.685	.103	2.82	2.93

* Means differences are significant at α = 0.05

$H2_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Qualification)

Table (4.21) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" **is smaller** than the level of significance □ =0.05, thus **we cannot accept** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Qualification)", so we conclude that the respondents' Qualification **has effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. This is due to the fact that most employees who have received a degree of higher Education work in management positions; therefore, they have a wider view than other employees.

Table (4.21): ANOVA test for Qualification $H2_0$

#	Variables	F	Sig.	Diploma or less	Bachelor	High Education
1	Top management support.	1.947	.146	2.46	2.55	2.95
2	Financial resources	1.730	.181	3.58	3.38	3.53
3	Infrastructure's support and integration	.186	.831	2.57	2.61	2.52
4	Experience and support of IT human resources	1.670	.192	2.32	2.37	2.75
5	Awareness	4.058	.019*	2.68	2.55	3.09
6	Collaboration across ministries	4.743	.010*	3.80	3.47	4.09
	All variables in Section 2	4.258	.016*	2.90	2.82	3.15

*** Means differences are significant at α = 0.05**

$H3_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Age)

Table (4.22) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" **is smaller** than the level of significance □ =0.05, thus **we cannot accept** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Age)", so we conclude that the respondents' Age **has an effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. This is due to the fact that most employees who are between the ages of 40-50 years work in management positions; therefore, they have a broader perspective of the other employees.

Table (4.22): ANOVA test for Age $H3_0$

#	Variables	F	Sig.	30 years or less	30 - 40 years	40 - 50 years	More than 50 years
1	Top management support.	11.223	.000*	2.39	2.57	3.44	2.98
2	Financial resources	2.122	.100	3.43	3.36	3.74	3.40
3	Infrastructure's support and integration	2.656	.051	2.55	2.61	2.96	2.44
4	Experience and support of IT human resources	3.708	.013*	2.42	2.30	2.93	2.13
5	Awareness	1.790	.152	2.64	2.57	2.72	2.13
6	Collaboration across ministries	5.096	.002*	3.76	3.40	3.30	3.06
	All variables in Section 2	**4.378**	**.006***	**2.87**	**2.80**	**3.18**	**2.69**

*** Means differences are significant at α = 0.05**

$H4_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Specialty)

Table (4.23) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" **is smaller** than the level of significance □=0.05, thus **we cannot accept** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Specialty)", so we conclude that the respondents' Specialty **has an effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. This is due to the fact that most employees who are working in management positions have a wider view than other employees.

Table (4.23): ANOVA test for Specialty $H4_0$

#	Variables	F	Sig.	Administration	Engineering	IT
1	Top management support.	7.778	.001*	3.32	2.48	2.55
2	Financial resources	1.595	.206	3.53	3.34	3.46
3	Infrastructure's support and integration	1.801	.169	2.88	2.60	2.57
4	Experience and support of IT human resources	1.002	.370	2.60	2.42	2.33
5	Awareness	.334	.717	2.72	2.60	2.56
6	Collaboration across ministries	1.957	.145	4.00	3.52	3.51
	All variables in Section 2	**4.306**	**.015***	**3.17**	**2.83**	**2.83**

*** Means differences are significant at α = 0.05**

$H5_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Experience years)

Table (4.24) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" **is smaller** than the level of significance =0.05, thus **we cannot accept** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Experience years)", so we conclude that the respondents Experience years **has an effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. The existence of this result is due to the employees who have 2 years or less of Experience where most of them are young. They grew up on the use of information technology in general, computer applications and software in particular.

Table (4.24): ANOVA test for Experience years $H5_0$

#	Variables	F	Sig.	2 years or less	3 - 5 years	6 - 10 years	More than 10 years
1	Top management support.	7.899	.000*	2.46	2.37	2.56	2.94
2	Financial resources	3.715	.013*	3.65	3.31	3.38	3.53
3	Infrastructure's support and integration	2.290	.081	2.82	2.52	2.58	2.66
4	Experience and support of IT human resources	7.732	.000*	2.85	2.19	2.32	2.59
5	Awareness	4.553	.004*	3.03	2.46	2.59	2.62
6	Collaboration across ministries	2.638	.052	3.89	3.56	3.56	3.31
	All variables in Section 2	**7.522**	**.000***	**3.12**	**2.73**	**2.83**	**2.94**

*** Means differences are significant at α = 0.05**

$H6_0$: There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Position Title)

Table (4.25) shows that the p-value (Sig.) for the total of section two of the questionnaire "Assessing the possibility of cloud computing adoption in Palestinian public sector" is greater than the level of significance =0.05, thus **we cannot reject** the null hypothesis "There are no statistically significant differences between respondents at (α= 0.05) towards assessing the possibility of Cloud Computing adoption in the Palestinian public sector due to (Position Title)", so we conclude that the respondents' Position Title **has no effect** on assessing the possibility of Cloud Computing adoption in the Palestinian public sector. The existence of this result is because the Cloud Computing is a new technology which is targeting all different types of positions. It seems logical from the researcher's point of view that the type of position does not affect the adoption of Cloud Computing technology.

Table (4.25): ANOVA test for Experience years $H6_0$

#	Variables	F	Sig.	Director	IT Manager	System Admin/Engineer	Network Admin/Engineer	Security officer	Database Administrator	Technical Support	Programmer
1	Top management support.	4.428	.000*	3.12	2.82	2.41	2.22	2.41	2.43	2.57	2.55
2	Financial resources	2.723	.011*	2.55	3.43	3.43	3.36	3.42	2.98	3.89	3.47
3	Infrastructure's support and integration	1.471	.182	2.41	2.77	2.70	2.45	2.56	2.69	2.63	2.61
4	Experience and support of IT human resources	.464	.859	2.37	2.38	2.48	2.31	2.35	2.69	2.41	2.29
5	Awareness	2.105	.047*	2.60	2.42	2.57	2.62	2.34	2.86	2.81	2.38
6	Collaboration across ministries	.842	.554	3.49	3.30	3.54	3.71	3.25	3.62	3.54	3.64
	All variables in Section 2	**1.103**	**.365**	**2.90**	**2.85**	**2.84**	**2.79**	**2.65**	**3.03**	**2.90**	**2.80**

* Means differences are significant at $\alpha = 0.05$

4.3. Part II: Interviews Analysis

The researcher used semi-structured interviews to double check the result that is produced from the survey and obtain more information that are difficult to be explored through questionnaires; the researcher used semi-structured interviews with the sample from the public sector where the sample contains 11 experts including 4 general managers, 4 directors and 3 senior employees. Thematic analysis has been applied to analyze the data based on the guidelines of Braun and Clarke (2006) noting that eleven-interviews are valid for thematic analysis in order to produce perceptive

themes according to McCracken (1988); Table (4.26) provides a summary of all generated codes, issues and the final themes.

Table (4.26): Summary of Identified codes, Issues, and the final themes

Codes	Issues discussed	Themes
Hardware & software	Infrastructure Support	Possibility of Cloud Computing adoption in the public sector
Cloud models	Applications Integration	
Providers	Staff Experience	
Third Party	Adequate budget	
	Choose appropriate Deployment Model	
	Choose appropriate provider	
Opportunities	Cost-saving	Potential opportunities of adopting Cloud Computing in the public sector
Benefits	Easy Access	
Importance	Information exchange	
	Disaster Recovery Plan	
	Capacity Plan	
	Hardware utilization	
Challenges Concerns	Occupation Security and Privacy	Potential Challenges from the adoption of Cloud Computing in the public sector
Obstacles	Performance, Connection Speed and Internet Connection	
	Who is the Leader? Data Control, Permissions and Authorities	
	Regulations	
	Electronic signature	
	Difference settings	
Solutions	Top management commitment	Requirements for adoption of Cloud Computing
Requirements	Administrative decisions	
	Increase the awareness	
	Analyze some case Studies	
	Policies	
	Training	
	Plan to resolve resistance to change	
	Framework	
Technology	Virtualization	The current state of Technology in the public sector
Problems	Web services	
Clients	Software	
	Portal	
	X-Road Project	
	Emails Systems	
	Decentralization	
	High Expenses	
	High Licenses cost	
	Multiple databases	
	No Backup Site	

The results from the semi-structured interviews were classified into five themes. The five themes emerged from the semi-structured interviews are presented below:

4.3.1. Theme 1: Possibility of Cloud Computing adoption in the public sector

This theme is aimed at assessing the possibility of Cloud Computing adoption in the public sector where most interviewees agreed on the importance of Cloud Computing, but they believed that it is difficult to adopt Cloud Computing in the Palestinian public sector where most of them consider that the Infrastructure for Ministries does not Support switching to cloud services despite of using modern technology and the availability of an annual budget that is dedicated for purchasing new hardware and software. This could be due to the lack of enough awareness about Cloud Computing and the lack of top management support. Also they clarified that there are still some old applications that are difficult to integrate in the cloud. Finally, interviewees pointed out that the staff needs to be trained on Cloud Computing and need a top management support to make Cloud Computing adoption possible. The researcher also noted a lack of Cloud Computing understanding and familiarity with Cloud Computing deployment models.

4.3.2. Theme 2: Potential opportunities of adopting Cloud Computing in the public sector

This theme is aimed at identifying all potential opportunities or benefits for switching from existing computing arrangements to Cloud

Computing; interviewees identified many benefits that can be gained by the Palestinian public sector from the adoption of Cloud Computing.

Most interviewees considered that operational cost-saving is the most important opportunity from the adoption of Cloud Computing because they believed that the public sector can reduce their operating cost of ICT by paying only for the services they use.

Another important opportunity from the adoption of Cloud Computing is Capacity Plan. They stated that the implementation of Cloud Computing makes the public sector not worried about adding additional hardware and software when the user loads increase, but it can instead add and subtract capacity according to new loads.

Another important opportunity from the adoption of Cloud Computing is Information exchange; some of interviewees stated that the public sector is suffering from a problem in the exchange of information between Ministries, and they believed that Cloud Computing can solve this problem.

Easy Access, Disaster Recovery Plan and Hardware utilization are other important opportunities that can be gained by the Palestinian public sector from the adoption of Cloud Computing according to the interviewees.

4.3.3. Theme 3: Potential Challenges from the adoption of Cloud Computing in the public sector

This theme is aimed at identifying all potential challenges or risks for switching from existing computing arrangements to Cloud Computing, interviewees identified many challenges that can be faced by the Palestinian public sector from the adoption of Cloud Computing.

All interviewees agreed that the occupation is the most important challenges facing the public sector when adopting Cloud Computing where the security conditions will remain unstable due to the presence of the occupation.

Most interviewees believed that the Security and Privacy is the second important challenge that can be faced by the Palestinian public sector; some interviewees believed that in the case of adoption of Cloud Computing, all data will be transferred to the outside of the Ministries, and this is considered a threat to this data, but this perception is wrong and reflects a lack of awareness of Cloud Computing.

Other important challenges from the adoption of Cloud Computing are “Performance, Connection Speed and Internet Connection” where interviewees explained that the situation of Internet and data connections in Palestine is bad, and would be a barrier to the adoption of Cloud Computing.

Other important challenges from the adoption of Cloud Computing are “Who is the Leader? Data Control, Permissions and Authorities”; some

of the interviewees showed a fear on their authority where there is a conflict on the permissions and authorities within the Ministries, and it would be an obstacle to Cloud Computing adoption.

Regulations, Electronic signature and Difference settings are other important opportunities that can be gained by the Palestinian public sector from the adoption of Cloud Computing according to the interviewees.

4.3.4. Theme 4: Requirements for adoption of Cloud Computing

This theme is aimed at identifying the requirements for adoption of Cloud Computing where most of Interviewees considered that the most important requirements are the top management commitment, and administrative decisions; most of interviewees believed that it is impossible to adopt Cloud Computing without the support of top management where the support of top management will help in providing all the requirements for the adoption of Cloud Computing.

Increasing the awareness, training, need for policies and plans to resolve resistance to change are other important requirements to adopt Cloud Computing in the Palestinian public sector according to the interviewees.

4.3.5. Theme 5: The Current State of Technology in the public sector

This theme is aimed at analyzing the current state of Technology in the public sector; most of the interviewees pointed out that the public sector uses the latest technologies such as Virtualization and Web services.

They also pointed out that the public sector work on some projects that are shared between different Ministries in the public sector for exchanging data among different Ministries such as X-Road Project.

They also clarified that the public sector has problems in Emails Systems, so many users are using external e-mails like Google or Yahoo in addition to problems such as multiple databases, No Backup Site, High Licenses cost and Decentralization.

They also clarified that the public sector has problems in interruptions of provided services and slow in the network which affects the quality of provided services.

4.4. Answers of research's Questions

From the previous results and analysis of the questionnaire and interviews, the researcher can answer the research's questions, and compare the results with other related work; the research's questions are presented below:

4.4.1. Research's first question:

Is it possible to adopt Cloud Computing in the Palestinian public sector?

This question is affected by these six variables: Top management support, Financial Resources, Infrastructure's support and integration, Experience and Support of IT human resources, Awareness and

Collaboration across Ministries. To answer this question, the researcher studied these variables using the output of analyzing the second part of the questionnaire. In addition, the researcher used the output of analyzing the interviews to double check the results.

Top Management Support

According to table (4.9), it's clear that the respondents at the Palestinian public sector disagreed with the level of top management support to adopt Cloud Computing Technology in the Palestinian public sector. This reveals that the level of Top Management's interest in Cloud Computing adoption and their support are low. Thus, we can conclude that the Top management is not aware of the benefits that can be gained by the public sector from the adoption of Cloud Computing technology; this is obvious by the absence of intention to adopt Cloud Computing in the top management plan.

It appears clearly that the top management support is an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 4: "Requirements for adoption of Cloud Computing", most of interviewees considered that the top management commitment is one of the most important requirements for Cloud Computing adoption. According to theme No. 1: "Possibility of Cloud Computing adoption in the public sector", interviewees pointed out that the top management support is important to make the adoption of Cloud Computing possible.

This is consistent with the findings of Lumsden and Anabel (2013) research which concluded that the support of top management has a significant impact on the adoption of new innovations of information technology such as Cloud Computing. According to Borgman et al. (2013), the top management support can contribute to the adoption of Cloud Computing by providing a suitable environment and by providing the necessary resources.

Financial Resources

According to table (4.10), it's clear that the respondents at the Palestinian public sector agreed with the availability of financial resources that are needed for Cloud Computing adoption. This can be justified due to the existence of an annual budget dedicated for purchasing new hardware and software in addition to an annual budget dedicated for IT training in the Palestinian public sector. On the other hand, there is no adequate budget to adopt Cloud Computing in the Palestinian public sector. Thus, we can conclude that the financial resources are available, but they need a decision from the top management to allocate adequate budget for the adoption of Cloud Computing where the most important feature of Cloud Computing is the costs saving, and this was confirmed by most of respondents.

This is consistent with the findings of Craig et al. (2009) research which concluded that Cloud Computing can reduce capital expenditures and operating expenses of ICT so that companies pay only for the services they use by reducing or redeploying of their ICT staffs.

It appears clearly that the financial resources are not an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 1: "Possibility of Cloud Computing adoption in public sector", Interviewees pointed out that the allocation of sufficient budget is important to make the adoption of Cloud Computing possible especially with their emphasis on that there is an annual budget dedicated for IT.

Infrastructure's support and Integration

According to table (4.11), it's clear that the respondents at the Palestinian public sector disagreed with the level of Infrastructure's support and its integration that are needed for Cloud Computing adoption. This reveals that the possibility of moving existing applications and services provided by IT departments to the cloud is difficult because the current IT infrastructures in the Palestinian public sector don't support the adoption of Cloud Computing, and there are technical problems that may hinder the adoption of Cloud Computing in Palestinian public sector.

It appears clearly that the Infrastructure's support and its integration are an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 1: "Possibility of Cloud Computing adoption in the public sector", Interviewees pointed out that the Infrastructure of the Ministries does not support switching to cloud services, and they clarified that there are still some old applications that are difficult to be integrated in the cloud.

According to theme No. 5: “The current state of Technology in the public sector”, most of interviewees clarified that the public sector has problems in Emails Systems, so many users are using external emails like Google or Yahoo.

This is consistent with the findings of Lumsden and Anabel (2013) research which clarified that the technological infrastructure of an organization has an effect on the adoption of new IT innovations; the organizations who have the necessary Infrastructure’s support and Integration are ready for the adoption of Cloud Computing.

Experience and Support of IT human resources

According to table (4.12), it’s clear that the respondents at the Palestinian public sector disagreed with the experience owned by people working in the public & private sector, and the needed technical support provided by those people for the Palestinian public sector for Cloud Computing adoption. This reveals that the training available to staff in the field of information technology is not enough, so the IT staff needs training on Cloud Computing.

It appears clearly that the Experience and support of IT human resources is an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 1: “Possibility of Cloud Computing adoption in the public sector”, interviewees pointed out that the staff need to be trained on Cloud

Computing; The researcher also noted a lack of Cloud Computing understanding and lack of familiarity with Cloud Computing deployment models. According to theme No. 4: "Requirements for adoption of Cloud Computing", most of interviewees considered that the need for training is one of the most important requirements for Cloud Computing adoption.

This is consistent with the findings of Low et al. (2011) research which concluded that the IT human resources have an effect on the adoption of Cloud Computing. The IT human resources provide the necessary skills, experience and knowledge base required to implement and integrate with a new Cloud Computing service.

Awareness

According to table (4.13), it's clear that the respondents at the Palestinian public sector disagreed with the level of understanding the benefits and objectives of Cloud Computing adoption. This reveals that the Top management wasn't aware of the ongoing developments on Cloud Computing technology and the importance of its use where there is no enough awareness of the objectives and benefits of Cloud Computing.

It appears clearly that the Awareness is an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 4: "Requirements for adoption of Cloud Computing", most of interviewees considered that the increase of awareness is one of the most important Requirements for Cloud Computing adoption.

Collaboration across Ministries

According to table (4.13), it's clear that the respondents at the Palestinian public sector agreed with the level of coordination and cooperation among different government agencies. This reveals that the Palestinian government encourages cooperation between all public sector agencies, and there are some projects shared between different Ministries in the Palestinian public sector.

It appears clearly that the Collaboration across Ministries is not an obstacle to the adoption of Cloud Computing. The output of analyzing the interviews agreed with these results where according to theme No. 5: "The Current State of Technology in the public sector", most of interviewees pointed out that the public sector work on some projects that are shared between different Ministries in public sector for exchanging data among different Ministries such as X-Road Project.

4.4.2. Research's second question

What are the most important opportunities and challenges for the adoption of Cloud Computing in the Palestinian public sector?

This question is affected by these three variables: Business drivers, Benefits and Challenges of Cloud Computing adoption. To answer this question, the researcher studied these variables using the output of analyzing the third part of the questionnaire. In addition, the researcher used the output of analyzing the interviews to double check the results.

Business drivers

According to table (4.17), it's clear that the respondents at the Palestinian public sector consider that the most three important business drivers for switching from existing computing arrangements to Cloud Computing are:

1. Reducing resources waste.
2. Need for real-time information.
3. Enabling business continuity.

Benefits

According to table (4.18), it's clear that the respondents at the Palestinian public sector consider that the most five important Benefits (opportunities) for switching from existing computing arrangements to Cloud Computing are:

1. Operational cost savings.
2. Hardware and Software cost savings.
3. Easier to recover after a disaster.
4. Hardware utilization.
5. Ability to grow and shrink IT capacity on demand.

The output of analyzing the interviews agreed with some of these results where according to theme No. 2: "Potential opportunities of

adopting Cloud Computing in the public sector" where most of interviewees considered that Operational cost-saving and Hardware utilization are from the most important opportunities in addition to Easy Access, Information exchange, Disaster Recovery Plan and Capacity Plan.

Challenges

According to table (4.19), it's clear that the respondents at the Palestinian public sector consider that the five important Challenges (Risks) for switching from existing computing arrangements to Cloud Computing are:

1. Concerning about data security or data privacy.
2. Inconsistency between trans-national laws and regulations.
3. Loss of control of services and data.
4. Unclear scheme in the pay per use approach.
5. Less Confidentiality of corporate data.

The output of analyzing the interviews agreed with some of these results where according to theme No. 3: "Potential Challenges from the adoption of Cloud Computing in the public sector" where most of interviewees considered that Occupation is the most important challenges in addition to "Security & Privacy", "Performance, Connection Speed and Internet Connection" and "Who is the Leader?.

4.5. Conceptual Framework

To simplify the findings of the research, and present them in easy form to enable the ICT managers in the public sector to take advantage of them, the researcher proposed a conceptual framework for adopting Cloud Computing in the public sector in the developing countries. This conceptual framework helps ICT managers in public sector to evaluate and adopt Cloud Computing.

The conceptual framework relied mainly on the first objective factors "top management support, financial resources, infrastructure support and integration, experience and support of IT human resources, awareness and collaboration across ministries", which were resulted during the preparation of the literature review which affect the adoption of cloud computing in the public sector.

The conceptual framework relied also on the second objective factors "opportunities and challenges" for switching from existing computing arrangements to cloud services which were resulted from the questionnaire and interviews.

Depending on the findings of the research, the researcher organized the elements of the conceptual framework according to its importance. It was found that top management support factor and the potential opportunities and challenges have the first priority, so they were placed in the first phase as shown in Figure (4.1).

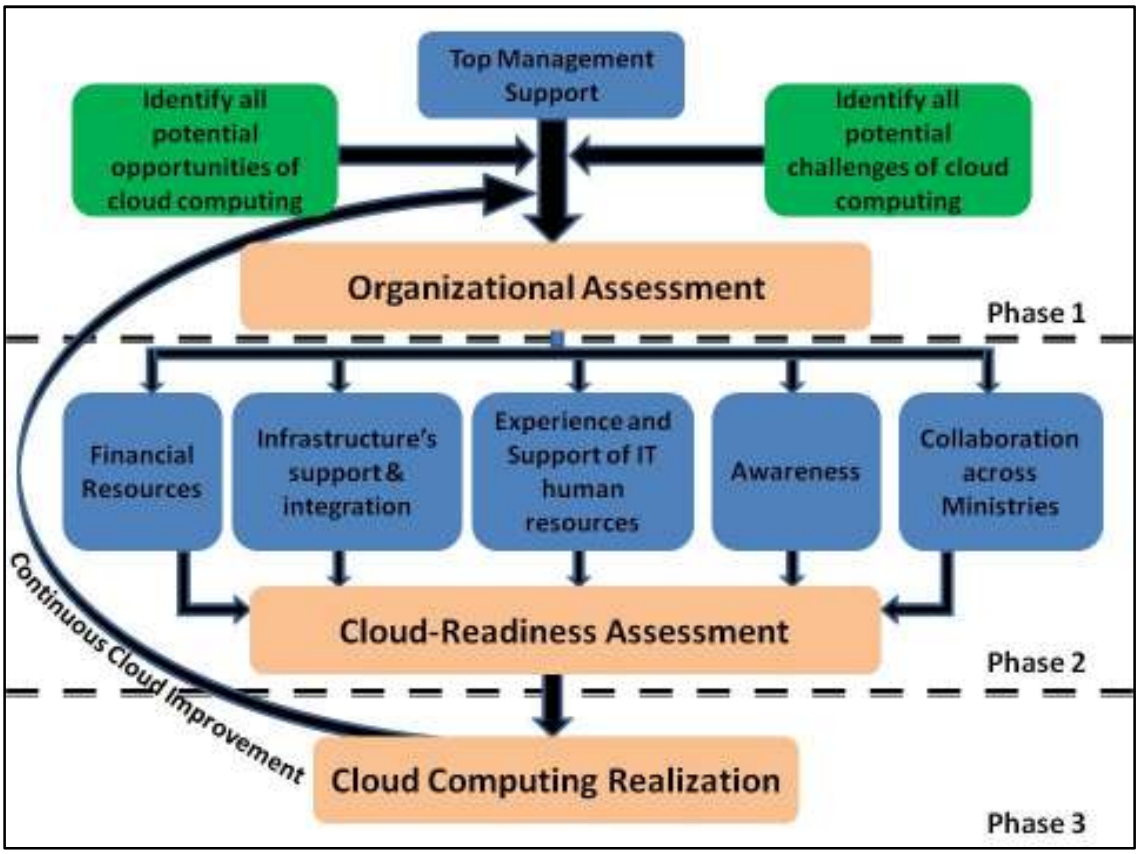

Figure (4.1): Conceptual Framework for adopting Cloud computing in the public sector in the developing countries.

This conceptual framework divided to three phases; the first phase is the "Organizational Assessment", the second phase is the "Cloud-Readiness Assessment" and the third phase is the "Cloud Computing Realization".

4.5.1. Organizational Assessment

The most important factor for the adoption of Cloud Computing is the top management support, so in case there is a commitment from top management, organizational assessment is initiated by conducting an assessment to identify all potential opportunities and challenges, and then conduct an assessment to identify the present IT needs, structure, and capacity utilization.

4.5.2. Cloud-Readiness Assessment

After the organizational assessment finished, these factors “financial resources, infrastructure’s support and integration, experience and support of IT human resources, awareness and collaboration across ministries” must be examined to access the possibility of Cloud Computing adoption in the public sector, IT managers should then conduct an overall cloud readiness assessment to determine if their organization has data and applications that could readily move to a cloud environment, and if a public/private/hybrid cloud would be suitable or usable for these purposes. As this assessment progresses, IT decision makers must focus on establishing decision rules as to which data and applications can - and cannot - be housed in any form of cloud environment.

4.5.3. Cloud Computing Realization

At this stage, it is time to begin using the cloud computing from both organizational leadership and IT staffers. This is where the cloud goes from being a test effort to become more main-stream in the way the organization manages its data, its operations, and its people. It becomes part of “normal” organizational operations. Then the process enters the final stage “continuous cloud improvement” – where the organization continues to move appropriate data and applications to the cloud and back from the cloud to internally hosted operations, if necessary, based on a thorough and continuous assessment of the appropriate use of cloud technologies for the particular organization.

Chapter Five

Conclusions, Recommendations, and Future Studies

Chapter Five
Conclusions, Recommendations, and Future Studies

5.1. Overview

In the previous chapter, the results of the study were tabled and the findings of the study were discussed in detail. This chapter serves as a conclusion for this thesis, where main conclusions, recommendations, research limitation and suggested future work are described.

5.2. Research Conclusions

The researcher started his thesis by introducing research objectives, and defining the problem. He aimed to assess the possibility of Cloud Computing adoption in Palestinian public sector and identify all potential opportunities and challenges for switching from existing computing arrangements to Cloud Computing.

Exploratory and descriptive analysis had been used; the research consists of three parts: the first part is an exploratory research used though Literature review which reviewed previous studies, article, journal papers, books conferences and internet. The second part is a descriptive analytical approach by using quantitative survey which tries to achieve research's objectives. The third phase is another descriptive analytical approach by using semi-structured interviews to validate findings of the survey.

Through discussing the results of the statistical analysis and thematic analysis; Conclusions in this regard are provided under each research objective.

Research objective 1

The first objective of this study was to assess the possibility of Cloud Computing adoption in the Palestinian public sector. The researcher, as presented in Chapter 4, discussed in detail all results and findings pertaining to this research objective.

In conclusion, it was determined that the top management does not support the adoption of cloud computing in the public sector, as a result of insufficient knowledge about the benefits of cloud computing technology, where it was found that there was no desire for the adoption of computing in top management plan. Although the top management support is one of the most important factors for the success of the adoption of cloud computing.

It can be concluded that there is an annual budget dedicated for purchasing new hardware, software and for IT training in the Palestinian public sector because our economy extremely depends on the external financial support, so there were no financial limitations that may hamper Cloud Computing adoption in the Palestinian public sector in case of a decision from the top management to allocate adequate budget for the adoption of Cloud Computing.

Studying the current IT technical infrastructure in the Palestinian public sector showed that there is no opportunity for Cloud Computing adoption because the infrastructure of the public sector does not support

switching to Cloud Computing due to several factors; the most important of these factors is to continue using some of the old programs.

Training available to staff in the field of information technology is not enough where there is a shortage in the number of Cloud Computing experts in both public and private sectors, so there is a problem in the needed experience. This may be a big challenge against Cloud Computing adoption in the Palestinian public sector.

Another challenge that comes against Cloud Computing adoption in the Palestinian public sector is that there is a lack of awareness of the objectives and benefits of Cloud Computing adoption among the Palestinian public sector which may decrease the Palestinian government attitude toward Cloud Computing adoption.

Furthermore, Palestinian government encourages cooperation between all Ministries, and tries to adopt some projects that support data exchange among different Ministries; Cloud Computing helps to enforce cooperation between different government agencies.

The previous conclusions can be summarized as: The Palestinian public sector is not ready to adopt Cloud Computing in its operations. Due to the lack of “top management support”, “awareness”, “Infrastructure’s support”, “experience and support of IT human resources”.

Hypotheses Conclusions:

According to statistical analysis, the research is reached to the following conclusions:

- There are **no** statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Gender).

- There are statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Qualification).

- There are statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Age).

- There are statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Specialty).

- There are statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Experience Year).

- There are **no** statistically significant differences between respondents at (α= 0.05) regarding "Assessing the possibility of Cloud Computing adoption in the Palestinian public sector" due to (Position Title).

Research objective 2

The second objective of this study was to identify all potential opportunities and challenges for switching from existing computing

arrangements to Cloud Computing. The researcher, as presented in Chapter 4, discussed in detail all results and findings pertaining to this research objective.

Adopting Cloud Computing in the Palestinian public sector has the most important following opportunities:

1. Operational cost savings.
2. Hardware and Software cost savings.
3. Easier to recover after a disaster.
4. Hardware utilization.
5. Ability to grow and shrink IT capacity on demand.
6. Easy Access.
7. Information exchange.
8. Disaster Recovery Plan.
9. Capacity Plan.

Adopting Cloud Computing in the Palestinian public sector has also some challenges. The following are the major challenges that may hamper Cloud Computing adoption:

1. Occupation
2. Concerning about data security or data privacy.

3. Inconsistency between trans-national laws and regulations.
4. Loss of control of services and data.
5. Unclear scheme in the pay per use approach.
6. Less Confidentiality of corporate data.
7. Performance, Connection Speed and Internet Connection
8. Who is the Leader?

5.3. Recommendations

Based on the findings of this study and the conclusions drawn above, there are some of the recommendations that can be formulated to adopt Cloud Computing technology at the Palestinian public sector, as the following:

1. The Palestinian public sector should have a future plan to adopt Cloud Computing in its operations which is an attractive technological and economic option.
2. The top management should support IT field by adopting everything new like Cloud Computing technology and providing the needed requirements to adopt this technology.
3. The top management should have plans to eliminate any obstacle that hinder the use of any new technology such as Cloud Computing technology.

4. The Palestinian public sector should dedicate specific budget to adopt Cloud Computing in its operations.

5. IT managers should conduct an assessment of their present IT needs, structure, and capacity utilization, to prepare the IT infrastructures to support the adoption of Cloud Computing.

6. The Palestinian public sector should provide training programs related to Cloud Computing technology for employees.

7. The Palestinian public sector should send IT staff for international workshops and conferences to take advantage of technological developments such as Cloud Computing technology, in addition to studying, analyzing and evaluating of the best practices of many countries that had already adopted Cloud Computing in its operations.

8. The Palestinian public sector should work to improve the awareness of Cloud Computing adoption objectives and benefits among IT staff at all Ministries. This can be achieved by holding meetings, workshops and conferences to IT staff about the definition, the importance and the use of Cloud Computing Technology.

9. The Palestinian public sector can put non-sensitive data or applications in public cloud just to overcome fears of security “Cloud pilot”.

10. The Palestinian public sector can create a hybrid cloud, which consists of a public Cloud to put non-sensitive and public applications. Also

from the Private Cloud to maintain the confidentiality and security of data.

11. The Palestinian public sector should encourages cooperation between all public sector Ministries to work together to develop a special strategic plan for Cloud Computing adoption when the decision is being made by the top management.

5.4. Research Limitations and Challenges

One of the main limitations of this research was the lack of prior research studies on the Cloud Computing which is considered relatively new in Palestine, and on Palestinian public sector. This presents an important opportunity for other researchers interested in the subject to explore the adoption of Cloud Computing from other perspectives.

There is no standard questionnaire meeting the research objectives, so the researcher builds the questionnaire and it takes long time and efforts.

According to the Palestinian cabinet, there are 21 Ministries in the Palestinian public sector (PalestinianCabinet, 2014); all IT related issues and specialists are placed in the headquarters of Ministries, so the targeted population was limited to headquarters in Ramallah.

5.5. Future Work

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. Conducting a study to measure the cost-effectiveness of the adoption of Cloud Computing in the public sector.

2. Conducting a study to measure the effects of Cloud Computing technology on the Private sector.

References

A Vouk, M. (2008). ***Cloud computing–issues, research and implementations.*** **CIT. Journal of Computing and Information Technology,** *16*(4), 235-246.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., . . . Stoica, I. (2010). ***A view of cloud computing***. **Communications of the ACM**, *53*(4), 50-58.

Azeez, A., Perera, S., Gamage, D., Linton, R., Siriwardana, P., Leelaratne, D., . . . Fremantle, P. (2010). **Multi-tenant SOA middleware for cloud computing.** Paper presented at the Cloud computing (cloud), 2010 ieee 3rd international conference on.

Barry, D. K. (2003). **Web Services, Service-oriented Architectures, and Cloud Computing: The Savvy Manager's Guide:** Morgan Kaufmann.

Borgman, H. P., Bahli, B., Heier, H., & Schewski, F. (2013). **Cloudrise: Exploring Cloud Computing Adoption and Governance with the TOE Framework**. Paper presented at the System Sciences (HICSS), 2013 46th Hawaii International Conference on.

Braun, V., & Clarke, V. (2006). ***Using thematic analysis in psychology.*** **Qualitative research in psychology***, 3*(2), 77-101.

Brian, H., Brunschwiler, T., Dill, H., Christ, H., Falsafi, B., Fischer, M., . . . Gutmann, R. (2008). ***Cloud computing.*** **Communications of the ACM,** *51*(7), 9-11.

Buyya, R., Yeo, C. S., Venugopal, S., Broberg, J., & Brandic, I. (2009). ***Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility***. **Future Generation Computer Systems***, 25*(6), 599-616.

Catteddu, D. (2011). ***Security and Resilience in Governmental Clouds.*** **enisa**.

Chandrasekaran, A., & Kapoor, M. (2011). S***tate of cloud computing in the public sector--A strategic analysis of the business case and overview of initiatives across Asia Pacific.*** **Frost & Sullivan.**

Cortina, J. M. (1993). ***What is coefficient alpha? An examination of theory and applications.*** **Journal of applied psychology,** *78*(1), 98.

Craig, R., Frazier, J., Jacknis, N., Murphy, S., Purcell, C., Spencer, P., & Stanley, J. (2009). ***Cloud Computing in the Public Sector: Public Manager's Guide to Evaluating and Adopting Cloud Computing.*** **Cisco**.

Elbadawi, I. (2011). **Cloud computing for e-government in UAE: opportunities, challenges and service models.** Paper presented at the Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance.

Esteves, R. M., & Rong, C. (2010). **Social impact of privacy in cloud computing.** Paper presented at the IEEE Second International Conference onCloud Computing Technology and Science (CloudCom).

Forrest, W., & Barthold, C. (2009). ***Clearing the air on cloud computing.*** **Discussion Document from McKinsey and Company.**

Fox, A., Griffith, R., Joseph, A., Katz, R., Konwinski, A., Lee, G., . . . Stoica, I. (2009). ***Above the clouds: A Berkeley view of cloud computing.*** **Dept. Electrical Eng. and Comput. Sciences, University of California,** Berkeley, Rep. UCB/EECS, 28.

Gliem, J. A., & Gliem, R. R. (2003, October 8-10, 2003). **Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales.** Paper presented at the Midwest Research to Practice Conference in Adult, Continuing, and Community Education, The Ohio State University, Columbus, OH.

Goscinski, A. M., Buyya, R., & Broberg, J. (2010). ***Cloud computing: Principles and paradigms*** (Vol. 87): **John Wiley & Sons.**

Goundar, S. (2010). **Cloud Computing: Opportunities and issues for developing countries**. DiploFoundation: Internet governance research paper.

GPC. (2009). **Annual Report for 2009**. General Personnel Council.

Greengard, S. (2010). ***Cloud computing and developing nations***. **Communications of the ACM,** *53*(5), 18-20.

Henderson, N. (2011). **Canadian Government Releases Data Center**, Email Consolidation Plan. WHIR.

Hickey, M., & Rahmouni, M. (2010). **Modelling cloud computing infrastructure** Mechanisms for Autonomous Management of Networks and Services (pp. 106-109): Springer.

Jackson, K. R. (2011). ***Introduction to Cloud Computing.*** **Lawrence Berkeley National Lab.**

Jansen, W., & Grance, T. (2011). ***Guidelines on security and privacy in public cloud computing***. **NIST special publication,** 800-144.

Johnson, C. (2009). **CIO Technology Survey Results**. CIO.

Kephart, J., Kephart, J., Chess, D., Boutilier, C., Das, R., Kephart, J. O., & Walsh, W. E. (2007). ***An architectural blueprint for autonomic computing.*** **IEEE internet computing***, 18*(21).

Kshetri, N. (2010). **Cloud computing in developing economies.** Computer, 43(10), 47-55.

Kundra, V. (2011). **Federal cloud computing strategy.**

Likert, R. (1974). ***A method of constructing an attitude scale.*** **Scaling: a sourcebook for behavioral scientists.** Chicago: Aldine, 233-243.

Low, C., Chen, Y., & Wu, M. (2011). **Understanding the determinants of cloud computing adoption. Industrial management & data systems***,* 111(7), 1006-1023.

Lumsden, J. R. I., & Anabel, G. (2013, October 17-18 2013). **UNDERSTANDING THE DETERMINANTS OF CLOUD**

COMPUTING ADOPTION WITHIN THE UK. Paper presented at the European, Mediterranean & Middle Eastern Conference on Information Systems, Windsor, United Kingdom.

Macias, F., & Thomas, G. (2011). C**loud Computing Advantages in the Public Sector.** Cisco.

McCracken, G. (1988). **The long interview** (Vol. 13): Sage.

McEleney, J. (2011). ***The cloud's impact on society***. ***Global-ICT.***

Mell, P., & Grance, T. (2011). ***The NIST definition of cloud computing.*** **NIST special publication,** *800*(145), 7.

MoICT. (2013). **e-Government Strategy 2014-2016.** Jordan e-Government Program.

Mujinga, M., & Chipangura, B. (2011). **Cloud computing concerns in developing economies.** Edith Cowan University.

PalestinianCabinet. (2014). Current Government. from http://www.palestinecabinet.gov.ps/ar/Govs/CurrentGovernment.aspx

Pandey, S., Wu, L., Guru, S. M., & Buyya, R. (2010). **A particle swarm optimization-based heuristic for scheduling workflow applications in cloud computing environments.** Paper presented at the Advanced Information Networking and Applications (AINA), 2010 24th IEEE International Conference on.

Parashar, M., & Hariri, S. (2005). ***Autonomic computing: An overview*** **Unconventional Programming Paradigms** (pp. 257-269): Springer.

Parri, J. (2011). **Introduction to Cloud Computing.** Embracing a Disruptive Force.

Prince, J. D. (2011). ***Introduction to cloud computing.*** **Journal of Electronic Resources in Medical Libraries***, 8*(4), 449-458.

Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (2013). **Qualitative research practice: A guide for social science students and researchers:** Sage.

Robson, C. (2002). **Real world research: A resource for social scientists and practitioner-researchers**. 1993. chap*, 12*, 383-385.

Rountree, D., & Castrillo, I. (2014). Chapter 1 - **Introduction to the Cloud. In D. Rountree & I. Castrillo** (Eds.), The Basics of Cloud Computing (pp. 1-17). Boston: Syngress.

Sen, J. (2013). ***Security and Privacy Issues in Cloud Computing.*** **arXiv preprint arXiv***:1303.4814*.

Sotomayor, B., Montero, R. S., Llorente, I. M., & Foster, I. (2009). V**irtual infrastructure management in private and hybrid clouds**. **Internet Computing, IEEE,** 13(5), 14-22.

Stevens, H., & Pettey, C. (2008). **Gartner says cloud computing will be as influential as e-business.** Gartner Newsroom, Online Ed.

Systems, C. R. (1982). Sample Size Calculator. 2014, from http://www.surveysystem.com/sscalc.htm

Takabi, H., Joshi, J. B., & Ahn, G.-J. (2010). ***Security and Privacy Challenges in Cloud Computing Environments.*** **IEEE Security & Privacy,** *8*(6), 24-31.

Thompson, B. (2002). **Understanding Reliability and Coefficient alpha, Really.** Score reliability: Contemporary thinking on reliability issues, 1.

Uhlig, R., Neiger, G., Rodgers, D., Santoni, A. L., Martins, F. C., Anderson, A. V., . . . Smith, L. (2005). **Intel virtualization technology**. Computer, 38(5), 48-56.

Ulanoff, L. (2009). **Google's cloud: 8 key questions**. PC Magazine.

Van Doorn, L. (2006). **Hardware virtualization trends**. Paper presented at the VEE.

Vaquero, L. M., Rodero-Merino, L., Caceres, J., & Lindner, M. (2008). A **break in the clouds: towards a cloud definition**. ACM SIGCOMM Computer Communication Review, 39(1), 50-55.

Voorsluys, W., Broberg, J., & Buyya, R. (2011). **Introduction to cloud computing.** Cloud computing: Principles and paradigms, 2-44.

Wyld, D. C. (2009). **Moving to the cloud: An introduction to cloud computing in government:** IBM Center for the Business of Government.

Wyld, D. C. (2010). ***The Cloudy future of government IT: Cloud computing and the public sector around the world***. **International Journal of Web & Semantic Technology,** *1*(1), 1-20.

Appendices

Appendix A: Overview about Ministers and the number of IT staff in each ministry (PalestinianCabinet, 2014)

# of IT staff	Name	#
7	رئاسة مجلس الوزراء	1
13	وزارة الشؤون الخارجية	2
18	وزارة الداخلية	3
15	وزارة النقل و المواصلات	4
22	وزارة المالية	5
12	وزارة الاقتصاد الوطني	6
8	وزارة العمل	7
10	وزارة الحكم المحلي	8
10	وزارة الأشغال العامة والإسكان	9
7	وزارة السياحة و الآثار	10
15	وزارة الصحة	11
19	وزارة التربية والتعليم والتعليم العالي	12
9	وزارة الأوقاف و الشؤون الدينية	13
25	وزارة الاتصالات وتكنولوجيا المعلومات	14
11	وزارة العدل	15
4	وزارة الزراعة	16
9	وزارة الثقافة	17
8	وزارة الشؤون الاجتماعية	18
9	وزارة شؤون المرأة	19
12	وزارة الاقتصاد الوطني	20
10	وزارة التخطيط	21
253	**المجموع**	

Appendix B: Questionnaire of Adoption of Cloud Computing in the Palestinian Public Sector, Opportunities and Challenges

Dear Sir/Mrs.

The researcher is doing a study on adoption of Cloud Computing in the Palestinian public Sector, Opportunities and Challenges.

In order to achieve that, the researcher designed this questionnaire which is divided into three parts: the first one is personal functional information, the second part aims to assess the possibility of Cloud Computing adoption in the Palestinian public sector where the third part aims to identify all potential opportunities and challenges for switching from existing computing arrangements to cloud services.

I would appreciate your answers to this questionnaire and emphasize that you will present a great service to the research process in the Palestinian universities.

We believe that you are the best source to get the required information which serves our community and its development. We all hope that you will be cooperative through answering the questions contained in this survey. We pledge not to enclose the identity of participants to third party, as well as not use this information in any field except scientific research.

Best Regards,

Researcher

Eng. Shaher Jabi

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Definition of Cloud Computing:

The idea itself describes anything that could be done in Computing as a service, and offers this service in many forms without need to know how to provide such services.

The National Institute of Standards and Technology (NIST) defines Cloud computing as: "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's effort or service provider inter-action".

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. *NIST special publication, 800*(145), 7

<u>Part One:</u> Personal Functional Information

Please put (x) letter in the box that is related to your answer.

1. Gender:

☐ Male ☐ Female

2. Qualification:

☐Diploma or less ☐ Bachelor ☐ Higher Education

3. Age

☐ 30 years or less ☐ 30 - 40 years ☐40 - 50 years

☐More than 50 years

4. Specialty:

☐Administration ☐Engineering ☐IT

☐other (Please specify)…….....

5. Experience's years:

☐2 years or less ☐ 3 - 5 years ☐ 6 - 10 years

☐More than 10 years

6. Position or Job Title:

☐ Director ☐ IT Manager ☐ System Admin/Engineer

☐ Network Admin/Engineer ☐ Security Officer

☐ Database Administrator ☐ Technical Support ☐ Other (Please specify)…….

Part Two: Please indicate the extent to which you agree or disagree with the following statements

	Items	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
	Top Management Support.					
1.	Top management supports everything new in IT field such as Cloud Computing Technology.					
2.	Top management has an interest in Cloud Computing adoption in the Palestinian public sector.					
3.	Top management provides the staff with necessary training for any new technology.					
4.	Palestinian public sector has already used Cloud Computing in some new applications.					
5.	In top management plan there is an intention to adopt Cloud Computing.					
6.	Palestinian government studied and analyzed some case studies of countries that have already adopted Cloud Computing.					
7.	Palestinian public sector already has a management plan which is designed to resolve the resistance to change when adopting Cloud Computing.					
B.	**Financial resources**					
1.	There is an annual budget dedicated for purchasing new hardware and software in the Palestinian public sector.					
2.	There is an annual budget dedicated for IT training in the Palestinian public sector.					
3.	Palestinian public sector focuses on attractive economic options which aim to reduce costs.					
4.	There is an adequate budget to adopt Cloud Computing in the Palestinian public sector.					
5.	Cost Saving: The most important feature of Cloud Computing is converting the capital expenditure (Purchase of fixed assets) to ongoing expenses.					
C.	**Infrastructure's support and Integration**					
1.	Applications and Systems at the Palestinian public sector are continuously updated to keep pace with technological development.					
2.	The possibility of moving existing applications and services provided by IT departments to the cloud "cloud-ready".					
3.	The current IT infrastructures in the Palestinian public sector support the adoption of Cloud Computing.					

	Items	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
4.	Applications and services in the public sector are flexible.					
5.	There are technical problems which may hinder the adoption of Cloud Computing in the Palestinian public sector.					
6.	Infrastructure and services in all ministries are almost similar.					
D.	**Experience and Support of IT Human resources**					
1.	Palestinian public sector provides training programs for employees i.e. related to new technologies (such as Cloud Computing).					
2.	Training available to staff in the field of information technology is enough, and makes them look forward to some extent to the latest technology.					
3.	There are enough trained experts on Cloud Computing in the Palestinian public sector.					
4.	There is an exchange of knowledge and cooperation between the Palestinian public sector and private sector companies.					
5.	IT staff needs training on Cloud Computing.					
E.	**Awareness**					
1.	Top management was aware of ongoing developments on Cloud Computing technology and the importance of its use.					
2.	IT staff is aware of the importance of the adoption of Cloud Computing in the public sector.					
3.	Palestinian public sector continuously holds workshops and conferences to increase the awareness of the benefits of Cloud Computing.					
4.	There is an enough awareness of the objectives and benefits of Cloud Computing.					
F.	**Collaboration across Ministries**					
1.	Palestinian government encourages cooperation between all public sector agencies.					
2.	There are some projects which are shared between different Ministries in Palestinian public sector.					
3.	There is a methodology for exchanging data among different Palestinian governmental agencies.					

Part Three:

	Items	Unimportant	Of little importance	Moderately important	Important	Very important
A.	**Business drivers:** How important are the followings as business drivers of investment in Cloud Computing Technology?					
1.	Enable business continuity.					
2.	Achieve greater flexibility.					
3.	Improve customer support or services.					
4.	Reduce resource waste.					
5.	Enable innovation.					
6.	Need for real-time information.					
7.	Expand revenue opportunities.					
B.	**Benefits:** What is your opinion about the importance of each benefit of the Cloud Computing?					
1.	Increases collaboration					
2.	Transforms high fixed-capital costs to lower variable and operating expenses					
3.	Ability to grow and shrink IT capacity on demand					
4.	Ability to rapidly launch new products and services					
5.	Operational cost savings					
6.	Hardware and Software cost savings					
7.	Hardware utilization					
8.	Ease of access to hardware and software					
9.	Better data security					
10.	Data is better organized					
11.	Data is more under control					
12.	Easier to partner with other organizations					
13.	Improved information sharing and collaboration					
14.	Need for less IT staff to support systems					
15.	Reduced system administration					
16.	Easier to recover after a disaster					

	Items	Unimportant	Of little importance	Moderately important	Important	Very important
C.	**Challenges:** Please think about why your organization is not using Cloud Computing, and what are your main concerns in your approach to Cloud Computing?					
1.	Concerns about data security or data privacy					
2.	Reduces the performance and availability of services or data.					
3.	Lack of Integrity of services and data					
4.	Less Confidentiality of corporate data					
5.	Not enough major suppliers yet					
6.	Loss of control of services and data					
7.	Inconsistency between trans national laws and regulations					
8.	Unclear scheme in the pay per use approach					
9.	Uncontrolled variable cost					
10.	Cost and difficulty of migration to the cloud (legacy software etc...)					
11.	Hard to integrate with in-house ICT.					
12.	Not enough ability to customize.					
13.	Bringing back in-house may be difficult.					

Thank you very much for your participation

Appendix C:

إستبانة حول

اعتماد الحوسبة السحابية في القطاع العام الفلسطيني،

الفرص والتحديات

يقوم الباحث بإجراء دراسة حول اعتماد الحوسبة السحابية في القطاع العام الفلسطيني، الفرص والتحديات.

من أجل تحقيق ذلك، صمم الباحث هذه الإستبانة، و هي مقسمة إلى ثلاثة أجزاء، الجزء الأول منها معلومات عامة، و الجزء الثاني يهدف إلى تقييم إمكانية اعتماد الحوسبة السحابية في القطاع العام الفلسطيني، في حين أن الجزء الثالث يهدف إلى تحديد جميع الفرص والتحـــديات المحتملة لعملية التحول من بيئة الحوسبة الحالية للحوسبة السحابية.

نقدر لك إجابتك على هذه الإستبانة، والجهد الذي سوف تقدمه خدمة كبيرة لعملية البحـــث العملي في الجامعات الفلسطينية، و نعتقد أنك أفضل مصدر للوصول إلى المعلومات المطلوبـــة، التي تخدم مجتمعنا وتطوره، حيث أننا نأمل في الحصول على تعاون منك من خلال الإجابة عن الأسئلة الواردة في هذه الإستبانة، ونتعهد لكم بالمحافظة على عدم اظهار هوية المجيب عنها، و عدم استخدامها في اي مجال غير مجال البحث العلمي.

أطيب التحيات

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تعريف الحوسبة السحابية (Cloud Computing):

الفكرة هي ببساطة القيام باستخدام المصادر الحاسوبية (أي شيء يمكن القيام بـــه فـــي مجال الحاسوب) عن طريق الانترنت، مقدّمة بشكل خدمة، هذا يعني القيام باســـتخدام الخدمـــة، دون الاهتمام بالكيفية التي تعمل بها هذه الخدمة.

المعهد الوطني للمعايير والتكنولوجيا (NIST) يعرف الحوسبة الســـحابية كمـــا يلـــي "الحوسبة السحابية تعبر عن نموذج يسمح بوصول الشبكة عند الحاجة وبصورة ملائمـــة إلـــى حزمة من الموارد والمصادر الحاسوبية التشكيلية (والتي منها علـــى ســـبيل المثـــال الشـــبكات (networks)، الخـــواديم (servers)، التخـــزين (storage)، التطبيقـــات (applications) والخدمات (services)) والتي يمكن تمويلها وإطلاقها بسرعة مع أقل حد لجهود الإدارة المبذولة أو تفاعل ممولي الخدمة".

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. *NIST special publication, 800*(145), 7

القسم الأول

البيانات الشخصية والوظيفية:

يرجى التكرم بوضع إشارة (√) أمام الإجابة المناسبة.

1. الجنس:

☐ ذكر ☐أنثى

2. المؤهل العلمي

☐ دبلوم فأقل ☐ بكالوريوس ☐ دراسات عليا

3. العمر

☐ 30سنة أو أقل ☐ 30 – 40 سنة ☐ 40 – 50 سنة

☐ أكبر من 50 سنة.

4. التخصص

☐ إدارة ☐ هندسة ☐ تكنولوجيا المعلومات

☐ غير ذلك (حدد رجاءً .....)

5. سنوات الخبرة

☐ أقل من سنتين ☐ سنتين – 5 سنوات ☐6 – 10 سنوات

☐ أكثر من 10 سنوات

6. المسمى الوظيفي (إختر واحدة فقط رجاءً)

☐ مدير ☐مدير تقني ☐ مدير/ مهندس نظم

☐ مدير/ مهندس شبكات ☐ضابط أمن المعلومات ☐ مدير قواعد البيانات

☐ فني صيانة ☐غير ذلك (حدد رجاءً .....)

القسم الثاني:

يرجى الإشارة إلى أي مدى توافق أو لا توافق على العبارات التالية :

	العبارات	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة
A.	**دعم الإدارة العليا.**					
1.	الإدارة العليا تدعم كل ما هو جديد في مجال تكنولوجيا المعلومات مثل تكنولوجيا الحوسبة السحابية.					
2.	الإدارة العليا لديها إهتمام لإعتماد الحوسبة السحابية في القطاع العام الفلسطيني.					
3.	توفر الإدارة العليا للموظفين التدريب اللازم لأي تكنولوجيا جديدة.					
4.	القطاع العام الفلسطيني يستخدم الحوسبة السحابية بالفعل في بعض التطبيقات الجديدة.					
5.	في خطة الإدارة العليا هناك نية لاعتماد الحوسبة السحابية.					
6.	الحكومة الفلسطينية تدرس وتحلل حالة بعض البلدان التي اعتمدت الحوسبة السحابية.					
7.	القطاع العام الفلسطيني لديه بالفعل خطة إدارية، تهدف إلى حل ظاهرة مقاومة التغيير عند اعتماد الحوسبة السحابية.					
B.	**الموارد المالية**					
1.	هناك ميزانية سنوية مخصصة لشراء معدات وبرمجيات جديدة في القطاع العام الفلسطيني.					
2.	هناك ميزانية سنوية مخصصة للتدريب على تكنولوجيا المعلومات في القطاع العام الفلسطيني.					

	العبارات	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة
.3	يركز القطاع العام الفلسطيني على خيارات اقتصادية مغرية، والتي تهدف إلى خفض التكاليف.					
.4	هناك ميزانية كافية لتبني الحوسبة السحابية في القطاع العام الفلسطيني.					
.5	تخفيض التكاليف : الميزة الأكثر أهمية في الحوسبة السحابية، هو تحويل النفقات الرأسمالية (شراء موجودات ثابتة) إلى نفقات جارية.					
.C	**دعم وتكامل البنية التحتية**					
.1	يتم تحديث التطبيقات والأنظمة في القطاع العام الفلسطيني بشكل مستمر لمواكبة التطور التكنولوجي.					
.2	امكانية نقل التطبيقات والخدمات الحالية التي تقدمها أقسام تكنولوجيا المعلومات إلى السحابة "cloud-ready".					
.3	البنية التحتية لتكنولوجيا المعلومات الحالية في القطاع العام الفلسطيني تدعم اعتماد الحوسبة السحابية.					
.4	التطبيقات والخدمات في القطاع العام تتسم بالمرونة.					
.5	هناك مشكلات فنية قد تعيق اعتماد الحوسبة السحابية في القطاع العام الفلسطيني					
.6	البنية التحتية والخدمات في جميع الوزارات تكاد تكون متشابهة.					
.D	**خبرة ودعم الموارد البشرية في تكنولوجيا المعلومات**					
.1	يوفر القطاع العام الفلسطيني للموظفين البرامج التدريبية المتعلقة بالتقنيات الجديدة (مثل الحوسبة السحابية).					

	العبارات	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة
2.	التدريب المتاح للموظفين في مجال تكنولوجيا المعلومات كافي، ويجعلهم متطلعين إلى حد ما إلى أحدث التقنيات.					
3.	هناك ما يكفي من الخبراء المدربين على الحوسبة السحابية في القطاع العام الفلسطيني.					
4.	هناك تبادل للمعرفة وتعاون بين القطاع العام الفلسطيني وشركات القطاع الخاص.					
5.	يحتاج موظفي تكنولوجيا المعلومات تدريب على الحوسبة السحابية.					
E.	**التوعية**					
1.	الإدارة العليا تدرك التطورات الجارية على تكنولوجيا الحوسبة السحابية وأهمية استخدامها.					
2.	موظفي تكنولوجيا المعلومات تدرك أهمية اعتماد الحوسبة السحابية في القطاع العام.					
3.	يعقد القطاع العام الفلسطيني بشكل مستمر ورش عمل ومؤتمرات لزيادة الوعي بفوائد الحوسبة السحابية.					
4.	هناك ما يكفي من الوعي لأهداف وفوائد الحوسبة السحابية.					
F.	**التعاون بين الوزارات**					
1.	تشجع الحكومة الفلسطينية التعاون بين جميع وزارات القطاع العام.					
2.	هناك بعض المشاريع المشتركة بين الوزارات المختلفة في القطاع العام الفلسطيني.					
3.	هناك منهجية لتبادل البيانات بين مختلف وزارات الحكومية الفلسطينية.					

القسم الثالث :

	العبارات معتدل	غير مهم	قليل الأهمية	معتدل الأهمية	مهم	مهم جدا
A.	**دوافع ومتطلبات العمل:** ما مدى أهمية ما يلي كدوافع و متطلبات العمل للاستثمار في تكنولوجيا الحوسبة السحابية؟					
1.	تمكين استمرارية العمل.					
2.	تحقيق مرونة أكبر.					
3.	تحسين خدمة العملاء أو الخدمات.					
4.	تقليل هدر الموارد.					
5.	تمكين الابتكار.					
6.	الحاجة للحصول على المعلومات بشكل فوري.					
7.	تحسين فرص الإيرادات.					
B.	**الفوائد:** ما هو رأيك في أهمية كل فائدة من فوائد الحوسبة السحابية؟					
1.	زيادة التعاون.					
2.	تحويل النفقات المرتفة على الأصول الثابتة لنفقات تشغيلية منخفضة.					
3.	القدرة على توسيع أوتقليص سعة تكنولوجيا المعلومات حسب الطلب.					
4.	القدرة على إطلاق منتجات وخدمات جديدة بسرعة.					
5.	التوفير في التكلفة التشغيلية.					
6.	التوفير في تكلفة الأجهزة والبرمجيات.					
7.	الإستغلال الأمثل للأجهزة.					
8.	سهولة الوصول إلى الأجهزة والبرمجيات.					
9.	حماية البيانات بشكل أفضل.					
10.	البيانات هي افضل تنظيما.					
11.	البيانات تحت السيطرة بشكل أكبر.					
12.	سهولة الدخول في شراكة مع منظمات أخرى.					

	العبارات معتدل	غير مهم	قليل الأهمية	معتدل الأهمية	مهم	مهم جدا
13.	تحسين تبادل المعلومات والتعاون.					
14.	تحتاج لعدد أقل من موظفي تكنولوجيا المعلومات لدعم النظم.					
15.	تقليل أعباء إدارة النظام.					
16.	سهولة التعافي بعد وقوع الكارثة.					
C.	**التحديات:** يرجى التفكير لماذا لا تستخدم مؤسستك الحوسبة السحابية، وما هي المخاوف الرئيسية لديك في حال تم التوجه إلى الحوسبة السحابية؟					
1.	مخاوف بشأن أمن البيانات أو سرية المعلومات.					
2.	إنخفاض الأداء وتوافر الخدمات أو البيانات.					
3.	قلة النزاهة للخدمات والبيانات.					
4.	تقليل خصوصية البيانات المؤسسية.					
5.	عدم كفاية الموردين الرئيسيين للحوسبة السحابية.					
6.	فقدان السيطرة على الخدمات والبيانات.					
7.	التضارب بين القوانين والأنظمة الوطنية والعالمية.					
8.	عدم وضوح نظام الدفع حسب الإستخدام.					
9.	عدم إنضباط التكاليف المتغيرة.					
10.	التكلفة وصعوبة الترحيل إلى السحابة (مثل البرمجيات القديمة).					
11.	صعوبة الاندماج مع دائرة تكنولوجيا المعلومات والاتصالات.					
12.	عدم المقدرة على تعديل البرمجيات و الخدمات الحالية.					
13.	إحتمالية صعوبة العودة للوضح الحالي.					

ولكم جزيل الشكر و العرفان ،،،

Appendix D:

Demographics of interviewees

#	Job Role
1	Director of Information Technology.
2	Director of Information Technology.
3	Director of Information Technology.
4	Director of Information Technology.
5	Director general for Department.
6	Director of Information Systems Department.
7	Director of e-services, IT Dept.
8	Director of Programming.
9	System Engineer in e-government.
10	System administrator.
11	Support system.

Appendix E:

Experts who reviewed the questionnaire

#	Name	Position
1	Nader Qadah	Head of Programing Section in Palestine Security Exchange
2	Ashraf Khalifa	Head of Network and Support Section in Palestine Security Exchange
3	Abdullah Isaa	Systems Engineer in the Palestinian Ministry of Health

جامعة النجاح الوطنية
كلية الدراسات العليا

الحوسبة السحابية في القطاع الحكومي الفلسطيني، تحديات وفرص

إعداد
شاهر يوسف فضل جابي

إشراف
د. أيهم جعرون

قدمت هذه الأطروحة إستكمالاً لمتطلبات درجة الماجستير في الإدارة الهندسية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

2015م

الحوسبة السحابية في القطاع الحكومي الفلسطيني،

تحديات وفرص

إعداد

شاهر يوسف فضل جابي

إشراف

د. أيهم جعرون

الملخص

تعتبر الحوسبة السحابية من أهم الموضوعات في تكنولوجيا المعلومات في السنوات القليلة الأخيرة. حيث تكون جميع خدمات تكنولوجيا المعلومات متوفرة في أي مكان وفي أي وقت تكون هناك حاجة إليها، فبدلاً من امتلاك الأجهزة والبرمجيات التي تتطلب التركيب والصيانة والتكوين توفر الحوسبة السحابية استخدام تطبيقات السحابة والبنى التحتية على أساس نموذج الدفع لكل استخدام.

يحتاج القطاع الحكومي الفلسطيني لمعرفة إمكانية اعتماد الحوسبة السحابية في عملياته. ويحتاج أيضا إلى معرفة الأهداف والفوائد والمخاوف من اعتماد الحوسبة السحابية. لذلك فإن الأهداف الرئيسية لهذه الدراسة هي تقييم جدوى اعتماد الحوسبة السحابية في القطاع العام الفلسطيني بالإضافة إلى تحديد جميع الفرص والتحديات المحتملة للتحول من ترتيبات الحوسبة القائمة إلى الحوسبة السحابية.

استخدمت هذه الدراسة كلاً من البحوث الكمية والنوعية فالبحث الكمي من خلال الاستبيان والبحث النوعي من خلال المقابلات شبه المنظمة للتحقق من صحة نتائج الاستبيان، تم توزيع الاستبيان على طاقم تكنولوجيا المعلومات في القطاع العام الفلسطيني حيث تم جمع ما مجموعه (152) استبياناً وتم تحليلها من قبل برنامج (SPSS) للتحليل الإحصائي ،ومن ثم تم إجراء إحدى عشرة مقابلة شبه منظمة مع الخبراء من القطاع العام الفلسطيني و تم تحليلها باستخدام التحليل الموضوعي.

وفقاً لنتائج هذا البحث يمكن استنتاج أن القطاع العام الفلسطيني ليس مستعداً لتبني الحوسبة السحابية في عملياته بسبب نقص في دعم الإدارة العليا، إدراك أهداف وفوائد تبني الحوسبة السحابية، دعم البنية التحتية وخبرة الموارد البشرية في تكنولوجيا المعلومات.

وحددت هذه الدراسة أهم الفرص التي يمكن الحصول عليها من قبل القطاع العام الفلسطيني من تبني الحوسبة السحابية و بالإضافة إلى ذلك فقد حددت أهم التحديات التي قد تعيق تبني الحوسبة السحابية في القطاع العام الفلسطيني.

كما خلصت الدراسة إلى توصية القطاع العام الفلسطيني بإعداد خطة مستقبلية لتبني الحوسبة السحابية في عملياته وهو خيار تكنولوجي واقتصادي مفضل بالإضافة إلى إعداد خطط للقضاء على أي عقبة قد تعيق استخدام تكنولوجيا الحوسبة السحابية.