إقـــرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

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

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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.

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The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges

(Case Study on Islamic University of Gaza "IUG")

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المخاوف والتحديات من تبني تقنية الحوسبة السحابية في مؤسسات التعليم العالي
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The Adoption Of Cloud Computing Technology In Higher Education Institutions: Concerns And Challenges
Case Study On Islamic University Of Gaza-IUG

وبعد المناقشة التي تمت اليوم السبت 06 شعبان 1434 هـ، الموافق 2013/06/15م الساعة الحادية عشرة صباحاً، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

"وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيلًا "

صدق الله العظيم

(سورة الإسراء : آية 85)

ABSTRACT

Research title: The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges (Case Study on Islamic University of Gaza "IUG")

Cloud Computing is a term that refers to sources and computer systems available on demand through the internet , which can provide a number of integrated computer services without being bound by local resources in order to make it easier for the user, and those resources include storage space, data backup, and self-synchronization. Also it includes processing capabilities software, scheduling of tasks, push e-mail, and remote printing. And the user can control when it is connected to the network in these resources through a simple software interface simplifies and ignores a lot of details and internal operations. This research aims at showing the concerns and challenges of the adoption of Cloud Computing technology in Higher Education Institutions, case study Islamic university of Gaza (IUG). Using the descriptive analytical method to study the effects of the main five dimensions (Top management support, Support and integration with university Services, Skills of IT human resources, Security effectiveness and Cost reduction) on the adoption of Cloud Computing technology. This research focuses on IUG as a case study of the academic institutions of Palestine which is the first from among other universities in terms of modern technology utilizing in its operations. Moreover, it's used several services of Cloud Computing technology for example IUG Gmail, Facebook, Fliker, and IUG Tube …etc.

The researcher used a questionnaire as a data collection tool. The research population was (95) of the IUG employees whose qualifications is related to computers and IT. (82) Questionnaires were recollected out of (95) questionnaires that were distributed and were analyzed by SPSS program for statistical analysis.

The results showed that there is a significant relationship between the adoption of Cloud Computing and the five independent variables; (Top management support, Support and integration with university Services, Skills of IT human resources, Security effectiveness and Cost reduction) at level of significance $\alpha = 0.05$.

The research recommended that IUG can adopt Cloud Computing technology in its operations, if it is interesting on the side of IT human resource through training, scientific missions, and innovations,..etc. In addition, interesting on the side of security through putting the non-critical application and data in the cloud, or through creating hybrid cloud which consists of public cloud for non critical applications like e-mail and private cloud for critical and sensitive applications and data. Without a doubt, the top management has vital role in the adoption of this technology in its operations though its decisions and facilities … etc.

ملخص الدراسة

عنوان الرسالة :" المخاطر والتحديات من تبني تقنية الحوسبة السحابية في مؤسسات التعليم العالي: دراسة حالة الجامعة الإسلامية بغزة"

يشير مصطلح الحوسبة السحابية إلي المصادر والأنظمة الحاسوبية المتوفرة تحت الطلب عبرشبكة الإنترنت والتي تستطيع توفير عدد من الخدمات الحاسوبية المتكاملة دون التقيد بالموارد المحلية بهدف التيسير على المستخدم وتشمل تلك الموارد مساحة تخزين البيانات والنسخ الاحتياطي والمزامنة الذاتية كما تشمل قدرات معالجة برمجية وجدولة للمهام ودفع البريد الإلكتروني والطباعة عن بعد، ويستطيع المستخدم عند اتصاله بالشبكة التحكم في هذه الموارد عن طريق واجهة برمجية بسيطة تُبَسِّطُ وتتجاهل التفاصيل والعمليات الداخلية.هذه الدراسة هدفت إلى توضيح المخاطر والتحديات من تبني تقنية الحوسبة السحابية في الجامعة الإسلامية بغزة ، وذلك باستخدام أسلوب التحليل الوصفي لتوضيح مدى تأثير خمسة من المتغيرات وهم (دعم الإدارة العليا، تكامل ودمج الخدمات الحالية مع السحابة، مهارات موظفي تكنولوجيا المعلومات ، فعالية الأمان ، تخفيض التكاليف) على تبني تقنية الحوسبة السحابية. هذه الدراسة ركزت على الجامعة الإسلامية كحالة دراسية لأنها المؤسسة الأكاديمية الفلسطينية الأولى التي تستخدم التقنيات الحديثة في عملياتها، وأيضا تستخدم العديد من خدمات الحوسبة السحابية مثل الايميل، والفيس بوك ،والفيديو ...الخ.

استخدم في البحث الاستبانة كأداة لجمع البيانات، وكان مجتمع الدراسة يتكون من (95) موظف من الموظفين ذوي المؤهلات التي تتعلق بمجال الكمبيوتر وتكنولوجيا المعلومات. تم استرداد (82) استبانه من أصل (95) تم توزيعها وتم تحليلها باستخدام برنامج التحليل الإحصائي (SPSS)

وتوضح نتائج التحليل أن هناك علاقة ذات دلالة إحصائية بين تبني الحوسبة السحابية وبين المتغيرات الخمسة وهم (دعم الإدارة العليا، تكامل ودمج الخدامات الحالية مع السحابة، مهارات موظفين تكنولوجيا المعلومات ، فعالية الأمان ، تخفيض التكاليف) عند مستوى دلالة $\alpha=0.05$.

أما عن توصيات الدراسة، فإنها توصي بان الجامعة الإسلامية بإمكانها تبني الحوسبة السحابية في عملياتها، إذا وجد اهتمام بموظفي تكنولوجيا المعلومات من خلال تدريبهم، وإرسالهم لبعثات علمية وغيرها، وأيضا إذا وجد اهتمام بالأمان من خلال وضع التطبيقات والبيانات الغير حساسة في السحابة، او من خلال إنشاء سحابة هجينة تتكون من السحابة العامة لوضع البيانات والتطبيقات الغير حساسة ومن سحابة خاصة لوضع البيانات والتطبيقات الحساسة. وبدون شك ان دعم الإدارة له دور حيوي في تبني الحوسبة السحابية في عملياتها من خلال القرارات والتسهيلات وغيرها

DEDICATION

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

To my dear brother and sister as well as all my friends.

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

Researcher

Ahmed J. Mansour

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ABBREVIATION

Abbreviation	Description
API	Application Programming Interface
ARPANET	Advanced Research Projects Agency Network
ASP	Azure Services Platform
AWS	Amazon Web Services
CapEx	Capital Expenditure
CIO	Chief Information Officer
EC2	Elastic Compute Cloud
ENISA	European Network and Information Security Agency
ERP	Enterprise Resource Planning
FERPA	Family Educational Rights and Privacy Act
GAE	Google Apps Education
Gmail	Google Mail
HES	Higher Education Sector
HIPAA	Health Insurance Portability and Accountability Act
HP-UX	Hewlett-Packard UniX
IaaS	Infrastructure as a Service
IBM	International Business Machines Corporation
ICT	Information and Communication Technologies
IM	Instant Messaging
IMAP	Internet Message Access Protocol
IT	Information Technology
IUG	Islamic University of Gaza
LAN	Local Area Network
MIT	Massachusetts Institute of Technology
MoHE	Ministry of Higher Education
NIST	National Institute of Standards and Technology
OpEx	Operational Expenditure
SPSS	Statistical Package for the Social Sciences
VCL	Virtual Computing Lab
BCS	Business Critical Systems
EaaS	Education as a Service
PaaS	Platform as a Service
IaaS	Infrastructure as a Service
SaaS	Software as a Service
VM	Virtual Machine

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Chapter 1
General Introduction

Chapter Outline:

1.1 Introduction
1.2 Research Problem Statement
1.3 Research Question
1.4 Research Hypotheses
1.5 Research Variables
1.6 Research Objective
1.7 Research Importance
1.8 Research Structure
1.9 Scope and Limit of Research
1.10 Data Resources

1.1 Introduction:

Nowadays, the term “Cloud Computing” has been an important term in the world of Information Technology (IT). Cloud Computing, or the use of internet-based technologies to conduct business, is recognized as an important area for IT innovation and investment (Armbrust et al., 2010; Goscinski et al., 2010; Tuncay, 2010). Higher educational institutions can benefit from using of Cloud Computing by increasing the computing performance, storage capacity, universal accessibility and cost reduction. This can help most of the institutions in terms of fixed and maintenance cost reduction in the IT investment of both hardware and software as well as computer services.

In the other words, Cloud Computing is a kind of computing which is highly scalable and use virtualized resources that can be shared by the users. Users do not need any background knowledge of the services. Moreover, a user on the Internet can communicate with many servers at the same time and these servers exchange information among themselves (Hayes, 2008). Basically, data and applications on Cloud Computing are available through the internet, so it can be accessed from everywhere.

Additionally, Shalini (2012) mentioned that the Internet is the "cloud" of applications and services that are available for access to subscribers utilizing a modem from their computer. With Cloud Computing, businesses may prevent financial waste, better track employee activities, and avert technological headaches such as computer viruses, system crashes, and loss of data. When Cloud Computing are used in education, this will likely have a significant impact on teaching and learning environment. According to Spreeuwenberg (2012) ,with Cloud Computing it becomes easier to access data with several devices. Especially for mobile devices this can be really useful since the only thing that is needed, is an Internet connection. In figure 1.1 a diagram is shown of a cloud based solution.

Figure 1.1 shows different devices like notebooks, desktops, smart phones, tablets, servers and databases that are connected to the Internet. Storing data and running applications will be done in such a way that they can be used by devices that are connected to the Internet (Spreeuwenberg, 2012).

Figure 1.1: Cloud Computing diagram (Spreeuwenberg, 2012)

Nevertheless, The biggest benefit for IT departments is that you don't "buy" the cloud. Much like a common utility, you just pay for what you use, when you use it, and then turn it off when you're done. Think about situations in which your normally smooth-running servers can be inundated with data requests, such as at student registration time. You could invest thousands of dollars in additional servers and staff to handle that load, but if those servers sit unused for most of the time, it's a waste of money. "The ability to have that server somewhere, to not have to worry about it, turn it up as you need it, and pay for only what you use is really attractive to a lot of people ," says Mike Richwalsky, assistant director of public affairs at Allegheny College (Pa.) (Tim, 2009).

On the other side, higher education plays vital role in developing the social, political and economical situation of the Palestinian people, it is considered as the main wealth of the Palestinian people in the absence of the other natural resources (Habayeb, 2005). According to Ministry of Higher Education (2013), there are 7 universities in Gaza Strip that grant four years bachelor degree; in addition to, 19 technical & community colleges offer two years diploma; moreover, the e-learning institutions.

Depending on the previous information, the Cloud Computing topic is a new trend among businesses and institutions and particularly in higher education communities. Therefore, it should be studied and examined further. The IUG is one of the most important educational institutions in Gaza Strip. The objective of this research is to find out the suitability for the adoption of Cloud Computing in IUG. So the IUG has been chosen to be the case study of this thesis. Then, the main findings of this research will be withdrawn to other institutions.

1.2 Research Problem Statement:

The process of purchasing, maintaining, and administering computing assets requires a large investment of financial and manpower resources for a business, government, or university. One option that centralizes computing assets and can lower costs and manpower requirements for these organizations is the use of centralized computing assets provided as Cloud Computing.

Cloud Computing is nowadays a trendy topic. Currently, many institutions are interested in using Cloud Computing capabilities, but they do not know where to expect changes when choosing for the Cloud Computing concept (Joint, 2009). This need is mainly urgent in the Cloud area where most studies are currently dealing with Cloud Computing technologies. As (Marston, 2011) stated "While a lot of research is currently taking place in the technology itself, there is an equally urgent need for understanding the business-related issues surrounding Cloud Computing." (Mary and Rodrigues, 2011)

In practice, academic research on the adoption of Cloud Computing and in particular the building of customer trust is minimal and profuse. Some work has been done on the models of trust and adoption strategies for Cloud Computing. Security and the costs of migrating to Cloud Computing are topics that is receiving increasing focus as adoption of Cloud Computing is considered (Faith, 2010) . In addition, when it is more clear for organizations what the impact of Cloud Computing is, and how this could be tackled, organizations could make a more informed choice about using Cloud Computing for certain functionality (Heffner, 2010).

This dissertation attempts to identify of concerns and challenges for higher education institutions, practically IUG, when deciding about adopting Cloud Computing technology.

1.3 Research Question

The study will deal with the concerns and challenges which affect the adopting of the Cloud Computing technology in higher education institutions.

Hence, the research question will be:

What are the main concerns and challenges observed by IUG considering the adoption of Cloud Computing into their IT operations ?

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

The sub research questions are:

- What is Cloud Computing?
- To what extent IUG is aware of Cloud Computing?
- what are the key barriers to Cloud Computing adoption?
- what are the benefits of Cloud Computing adoption?
- What are the factors which organizations take into account when deciding about adopting Cloud Computing and how important are these factors?
- What are the costs of this technology?
- Is it suitable for IUG to adopt of Cloud Computing?

1.4 Research Hypotheses:

There are two main hypotheses for this research:

1. There is a significance effect between independent variables and Cloud Computing Adoption in IUG (at level of significance $\alpha = 0.05$).

From this main hypothesis the following sub hypotheses result:

a) There is a statistical significant relation between top management support and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

b) There is a statistical significant relation between support and integration with University Services and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

c) There is a statistical significant relation between skills of IT human resources and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

d) There is a statistical significant relation between security effectiveness and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

e) There is a statistical significant relation between cost reduction and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

2. There are significant differences among respondents at ($\alpha = 0.05$) towards the Cloud Computing & its concerns and challenges observed by IUG due to personal traits (Gender, Age, Qualifications, Type of Position, Position and Years of Experience).

1.5 Research Variables:

The dependent variable:

- Cloud Computing Adoption.

The independent variable:

- Top management support.
- Support and integration with university Services.
- Skills of IT human resources.
- Security effectiveness.
- Cost reduction .

1.6 Research Objectives:

Inspired by the Cloud Computing technology diffusing all over the world, the present work intends to focus on what is happening with this technology within higher education institutions.

The purposes of this research are as follows:

- To identify whether IUG is aware of the potential that Cloud Computing might present to its operations.
- To recognize the concerns and challenges of the adoption of Cloud Computing.
- To know the importance of Cloud Computing in IT operations.
- Identify the main factors that influence the IUG adoption of Cloud Computing.

1.7 Research Importance:

The importance of this study deals with a subject of important issues which is " *The main concerns and challenges observed by IUG considering the adoption of Cloud Computing into their IT operations* ", where the Cloud Computing is nowadays a trendy topic, which is important in different sides of life, practicallyin higher education institutions , and its importance appeared from benefits that returned on both the researcher, universities, researchers and those interested in society.

❖ ***First: IUG***

- IUG can develop its processes, reduce its costs, and minimize the waiting time for students to get on the services this will influence the image of the IUG, and give it a competitive advantage among the other universities in the Gaza Strip.
- Provide the IT department in IUG recommendations and proposals are documented about the adoption of Cloud Computing.
- This study adds to the Palestinian university libraries specialized study in the Cloud Computing technology, which this work enriched the library applied research.
- It is important for IT Human resource and interested people in the institutions to be aware of the importance of Cloud Computing.

❖ ***Second: Society***

- This study is the first one in Palestine, it will open many chances for future studies which can participate in improving the IT usage in universities in the Gaza strip.
- IUG adoption of Cloud Computing can open co-operations with universities all over the world, which can open a lot of opportunities to work internationally.

❖ ***Third: Researchers and Interested***

- This study may contribute to draw the attention of researchers and interested to do many of the studies and research in the Cloud Computing.
- There is no studies focused in the subject of Cloud Computing in Palestine.

❖ ***Fourth: Researcher***

- Expand the circle of knowledge and consolidate information to the researcher, by doing the research and exploration information from primary and secondary sources

1.8 Research Structure

This study was divided into Five chapters as follows:

1) Chapter One: General Introduction
2) Chapter Two: Research Background.
3) Chapter Three: Review of Literature.
4) Chapter Four: Research Methodology.
5) Chapter Five: Results, Recommendations and Future Studies.

1.9 Scope and Limit of Research

The scope of research is limited to higher education institutions practically in IUG. The population of study consists of academic and administrative staff who's concern in IT.

1.10 Data Resources:

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

a) Primary Data

- Questionnaire survey to the criteria and sub-criteria which will be developed to collect information from its resources to answer the research questions and testing hypotheses.
- Pair-wise comparison questionnaire to compare each pair of the criteria and sub-criteria used in the supplier selection, to identify to what extent one criterion is more/less important/preferred to another. The respondents to this questionnaire are experts in the field of public purchasing.

b) Secondary Data

- This research depends on the previous studies conducted on supplier selection, published researches, papers, documents and other related literature.

Chapter 2
Research Background

Chapter Outline:

Section 1: Cloud Computing.

Section 2: Cloud Computing in Education.

Section 3: Higher Education Sector in Gaza Strip.

Section 4: Islamic University of Gaza (IUG).

Introduction:

Despite the attention of many researchers studying the adoption of Cloud Computing technology in the institutions, and its benefits, concerns, challenges, factors and opportunities on IT operations in these institutions, there is relative scarcity, especially in the studies which focus on the adoption of Cloud Computing technology on these institutions in Arab countries.

So, this chapter is grounded in the array of reviewing:

- **The most important concepts of the Cloud Computing technology.**
- **Higher Education Sector in the Gaza Strip.**
- **Islamic University of Gaza (IUG).**

Section 1

Cloud Computing

2.1.1 Introduction

2.1.2 Definition

2.1.3 Internet vs. Cloud Computing

2.1.4 Phases of Computing Paradigms

2.1.5 Characteristics

2.1.6 Service/delivery models

2.1.7 Deployment Models of the Cloud

2.1.8 Drivers for adoption and benefits of Cloud Computing

2.1.9 Factors to be Considered in Cloud Computing Adoption

2.1.10 Cloud Economics

2.1.11 Where to adopt the Cloud

2.1.12 Where NOT to adopt the Cloud

2.1.13 Related Works

2.1.1. Introduction

In recent years, the advent of Cloud Computing has excited an interest from different organizations, institutions and users. This is a result of the new economic model for the Information Technology (IT) department that Cloud Computing promises. The model promises a shift from an organization required to invest heavily for limited IT resources that are internally managed, to a model where the organization can buy or rent resources that are managed by a cloud provider, and pay per use. Cloud Computing also promises scalability of resources and on-demand availability of resources (Shimba, 2010).

However the term Cloud Computing is fairly new since its emergence in the computing world (Luis et al.,2008). Although the term is new, its concepts are not new. Cloud Computing borrows terms and concepts from other computing paradigms such as utility computing, grid computing, service oriented architecture among others (Luis et al., 2008, Wang and Laszewski, 2008, Geelan, 2009, Buyya et al., 2008). This new computing paradigm called Cloud Computing has also brought challenges to the organization seeking to adopt it. The challenges that are raised are: trust, security, legal, compliance and organizational challenge (Shimba, 2010).

This section provides the background material for the remainder of this dissertation. It provides the definition of Cloud Computing, a brief history of Cloud Computing, its benefits for institutions and students, underlying technologies, service and delivery models offered by Cloud Computing, characteristic, factors to be consider in cloud adoption, where and where not to adopt cloud, economics of cloud, drives for adoption, and cloud in small organizations.

2.1.2. Definition

As the previous section has shown that Cloud Computing is not a new idea, but it has already existed through borrowed terms and concepts from other computing paradigms, so the definition of Cloud Computing is also "cloudy" as it has been defined differently by different industry experts and researchers alike.

- The concept of computing as a utility had first been mentioned by MIT Professor John McCarthy in a speech for MIT's 1961 Centennial when he famously said: "*computing may someday be organized as a public utility just as the telephone system is a public utility.... The computer utility could become the basis of a new and important industry*". (Kleinrock, 2005).
- In 1969, Leonard Kleinrock, a scientist of the Advanced Research Projects Agency Network (ARPANET) which created the foundation of the Internet, said: "*we will*

probably see the spread of 'computer utilities' which, like present electric and telephone utilities, will service individual homes and offices across the country" (Kleinrock, 2005).

- The European Network and Information Security Agency (ENISA) has defined Cloud Computing as "*on-demand service model for IT provision, often based on virtualization and distributed computing technologies"*(Catteddu and Hogben, 2009).

- Other common academic and scholarly definitions defines Cloud Computing as " *cloud 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 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 customised SLAs*" (Luis et al., 2008).

- Other common academic and scholarly definitions are as follows: according to (Buyya et al., 2008) Cloud Computing is *"a type of parallel and distributed system consisting of collection of interconnected and virtualized computers that are dynamically provisioned and present as on or more unified computing resource based on service-level agreements established through negotiation between service provider and customer"*

- Also the J. Kaplan (2008) has defined the Cloud Computing as "*a broad array of the web-based services aimed at the allowing users to obtain a wide range of functional capabilities on a 'pay-as-you-go' basis that previously required tremendous hardware/software investment and professional skills to acquire*"(Geelan, 2009).

- While B. Martin (2008) propose the following definition of Cloud Computing *" Cloud Computing really comes into focus only when you think about what IT always needs: a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software"* (Geelan, 2009)

- Another common academic definition (K. Sheynkman) defines Cloud Computing as *" the 'cloud' model initially focused on making hardware layer consumable as on-demand compute and storage capacity. ... to harness the power of the cloud, complete application infrastructure needs to be easily configured, deployed,*

dynamically scaled and managed in these virtualized hardware environments"(Geelan, 2009).

- According to (MISEVIČIENĖ et al., 2011) the definition of Cloud Computing is "*Cloud Computing technology is a way to provide computer applications to users without the need to purchase, install, or support software on their local computers and/or servers*".
- The most widely used and normative definition is that issued by the US National Institute of Standards and Technology (NIST): *"Cloud Computing is a model for enabling convenient, on- demand network access to a shared pool of configurable computing resources (e.g., network, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics and three service models and four deployment models"* (Mell and Grance, 2009b, Mell and Grance, 2009a). Figure 2-1 shows the framework of the NIST definition of Cloud Computing.

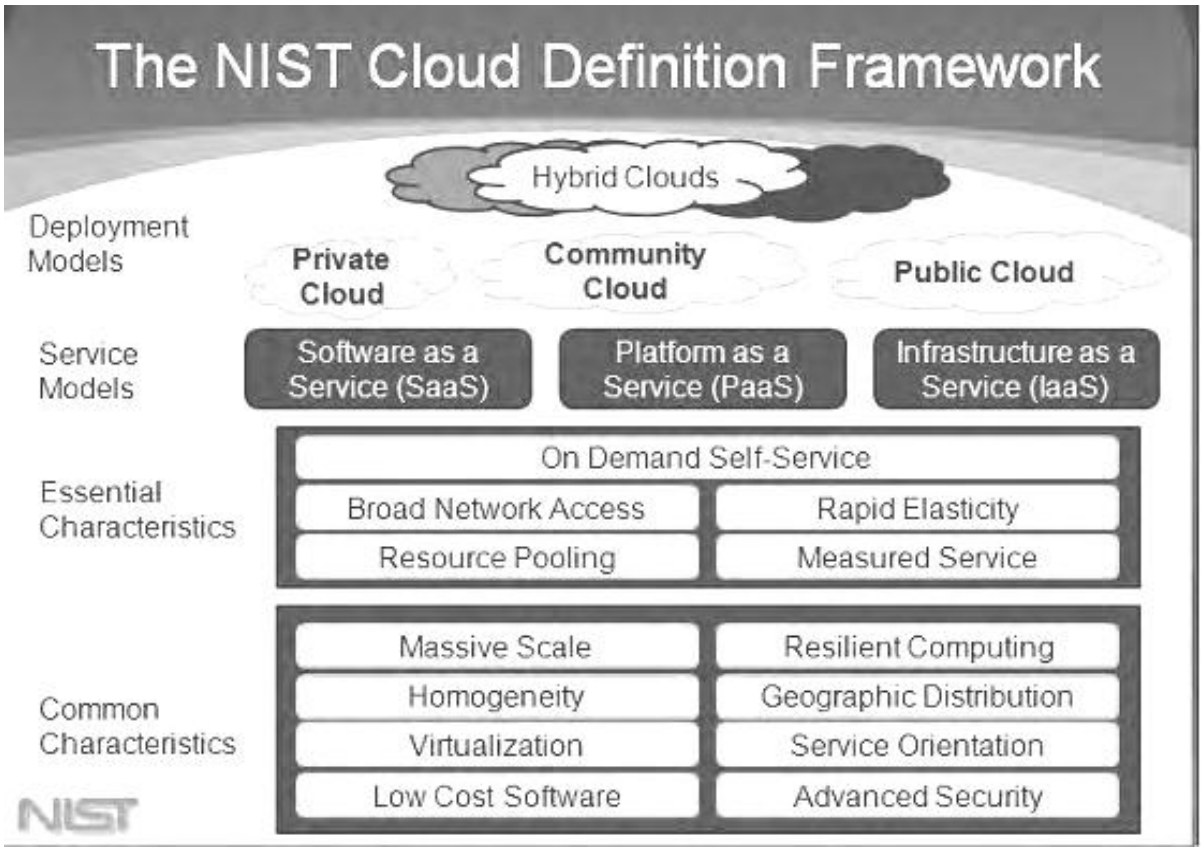

Figure 2.1: Cloud Computing Definition (Grance, 2010).

These different definitions is from the different perspectives of different stakeholders such as; academicians, architects, consumers, developers, engineers and managers (CSA, 2009).

After a thorough review of existing Cloud Computing definitions and the computing paradigms from which Cloud Computing borrows terms and concepts, so the Cloud Computing can be defined in this dissertation as the following " *Cloud is the combination of both applications delivered as services over the internet, and data centers hardware and software that provide those services, and the users can use those services by on-demand service model and a "pay as you go" payment method where the users use the service when they need it and pay only for what they used of computing resources ,also users can access everything on the cloud by PC's, Laptops, Smart phones, PDAs …* ".

2.1.3. Internet vs. Cloud Computing

Internet is a network of networks, which provides software/hardware infrastructure to establish and maintain connectivity of the computers around the world, while Cloud Computing is a new technology that delivers many types of resources over the Internet. Therefore Cloud Computing could be identified as a technology that uses the Internet as the communication medium to deliver its services. Cloud services can be offered within enterprises through LANs but in reality, Cloud Computing cannot operate globally without the Internet (Indika, 2011).

2.1.4. Phases of Computing Paradigms

There are six phases of computing paradigms, from dummy terminals/mainframes, to PCs, networking computing, to grid and Cloud Computing (Singh and Hemalatha, 2012). These phases are clarified in Figure 2.2.

- **In phase 1:** Many users shared powerful mainframes using dummy terminals.
- **In phase 2:** Stand-alone PCs became powerful enough to meet the majority of users' needs.
- **In phase 3:** PCs, laptops, and servers were connected together through local networks to share resources and increase performance.
- **In phase 4:** Local networks were connected to other local networks forming a global network such as the Internet to utilize remote applications and resources.
- **In phase 5:** Grid Computing provided shared computing power and storage through a distributed computing.

- **In phase 6:** Cloud Computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet).

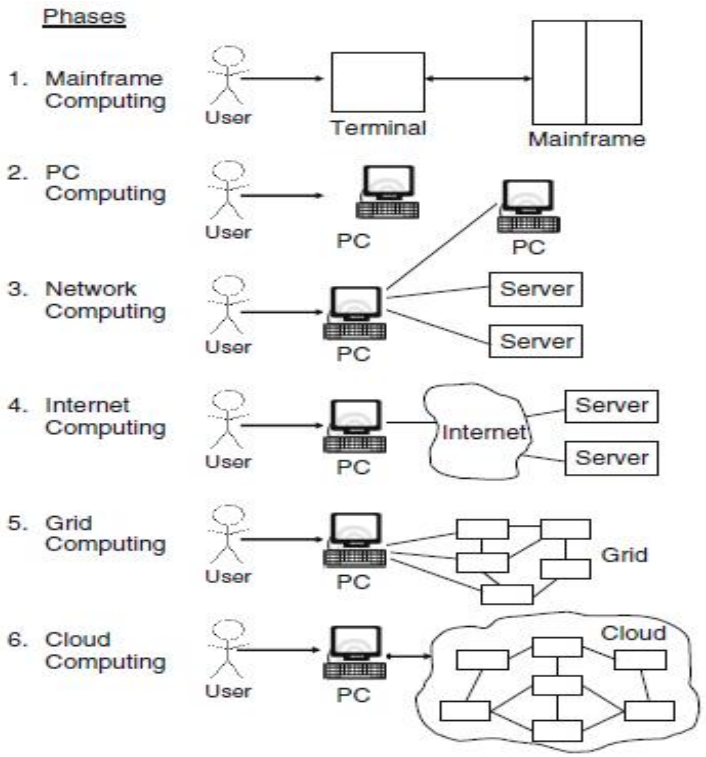

Figure 2.2: Six Computing Paradigms (Singh and Hemalatha, 2012)

2.1.5. Characteristics

Cloud Computing has a number of characteristics that distinguishes it from other computing paradigms. These characteristics can be categorized as essential characteristics and common characteristic. The NIST has identified five essential characteristics (Plummer et al., 2009) and eight common characteristics of Cloud Computing (Grance, 2010, Mell and Grance, 2009a).

The essential characteristics are:

A. **On Demand Self-Service:** Allows for provisioning of computing resources automatically as needed.

B. **Broad Network Access:** Access to cloud resources is over the network using standard mechanisms provided through thin or thick clients in a heterogeneous manner. For example through Smartphone's, mobile phones and laptop computers. Moreover Cloud Computing provide the users with variety of services on the network with broader data spaces, multiple value added services, many new software, many advanced processing techniques and much more accessibility to a highly rich and capable network. This is very important characteristic for the entrepreneur to think out of box for their business growth.

C. **Resource Pooling:** The vendors' resources are capable of being pooled to serve multiple clients using a multi-tenant model, with different physical and virtual resources in a dynamic way. The pooling and assigning of resources is done based on the changing needs of clients or consumers. Example of resources include; computation capabilities, storage and memory.

D. **Rapid Elasticity:** Allows for rapid capability provisioning, for quick scaling out and scaling in of capabilities. The capability available for provisioning to the client seems to be unlimited and that it can be purchased as demanded.

E. **Measured Service**: It can be provided as much service as needed to the customer through usage of Cloud Computing technology. You can get the specified number of user license for any type of the software. You can get a definite data space and network bandwidth which is suitable to your demands. And it allows monitoring, control and reporting of usage. It also allows for transparent between the provider and the client. This characteristic makes this service very well defined and predictable cost.

In conjunction with the essential characteristics as identified by NIST, there are other Cloud Computing characteristics (GNI, 2009, Miller, 2008, Luis et al.,2008, Vouk, 2008, Grance, 2010). These characteristics are such as: massive scale availability of computing and storage capabilities, homogeneity, use of virtualization technology, resilient computing, and pay-as- you go model. Low or no up-front IT infrastructure costs, geographical distribution of clouds, low overhead costs for IT and administration personnel.

These characteristics make Cloud Computing attractive to business organizations and government agencies.

2.1.6. Service/delivery models

Cloud Computing services are provided in many forms to customers according to their specific needs and these models are clarified in figure 2.3 with the possible deployment models (Ahronovitz et al, 2010). There are three common service models for offering Cloud Computing services. These models are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

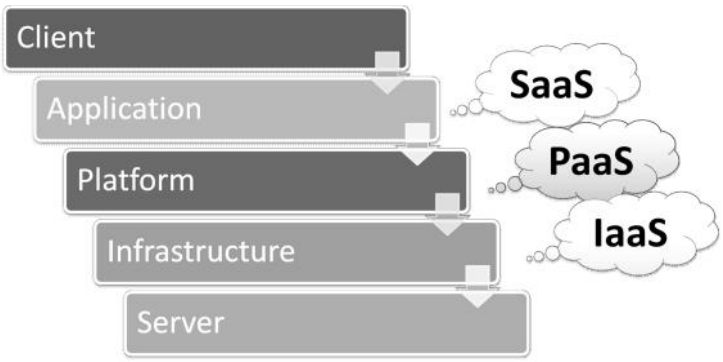

Figure. 2.3: Cloud Computing layers (Ahronovitz et al, 2010).

A. Software as a Service (SaaS)

In Software as a Service, the client would use a web- browser to access software that others have developed, maintain and offer as a service over the web. However in this delivery model the client does not have control or manage the infrastructure through which the applications are running (CSA, 2009, Mell and Grance, 2009a).

Examples of SaaS providers are salesforce.com, Gmail, Netsuite and Oracle CRM on Demand.

B. Platform as a Service (PaaS)

In Platform as a Service, the client has the ability to deploy on the cloud his/her own created applications or software using programming languages and tools supported by the provider. This model offers some control to the user which is related to the deployed applications but not to the cloud infrastructure (CSA, 2009, Mell and Grance, 2009a).

Examples of Paas services are Google Application Engine, Azure, force.com and cloud 9 Analytics.

C. Infrastructure as a Service (IaaS)

The third delivery model for Cloud Computing is Infrastructure as a Service (IaaS). In this service model dedicated resources are offered to a single tenant or client and do not allow sharing of dedicated resources to unknown third parties. The model provides the customer with ability to deploy applications on the cloud infrastructure. The applications may include operating systems and other applications. However, the customer does not have control over the infrastructure but may control the deployed applications and operating systems, storage and selected network components (Mell and Grance, 2009a). However, flexibility comes with a cost and users are responsible for updating and patching the operating system at the IaaS level (Murphy et al., 2009)

Examples of Iaas services are Amazon Web Services' EC2 and S3.

2.1.7. Deployment Models of the Cloud

There are four models for Cloud Computing service deployment, regardless of the service or delivery model (IaaS, PaaS, or SaaS) adopted. These deployment models may have different derivatives which may address different specific needs or situations (Dustin Amrhein et al., 2010, CSA, 2009). The basic deployment models are public cloud, private cloud, community cloud, and hybrid cloud (CSA, 2009, Dustin Amrhein et al., 2010, Grance, 2010, Mell and Grance, 2009a, Catteddu et al., 2009).

A. Public cloud

In this deployment, public cloud applications, storage, and other resources are made available to the general public by a service provider. These services are free or offered on a pay-per-use model of payment. The cloud resources are accessible via the internet and the provider is responsible for ensuring the economies of scale and the management of the shared infrastructure. and provide their clients with control mechanisms to allow access to their data In this model clients can choose security level they need, and negotiate for Service Levels Agreement (SLA) "See (WIKISPACES, 2013)". Public clouds make for a cost-effective and flexible means to deploy solutions. The first and most used type of this offering is the Amazon Web Services EC2. Figure 2.4 show the structural formation of a public cloud.

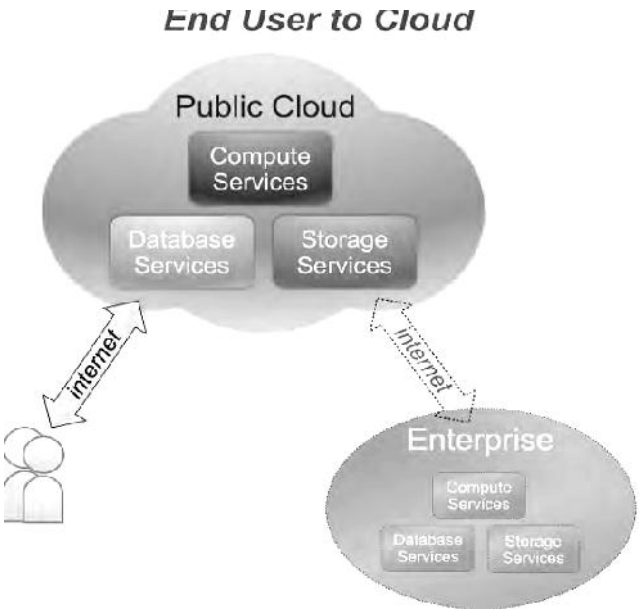

Figure 2.4: Public Cloud (Dustin Amrhein et al., 2010).

In this type of cloud, the organization does not access or use the public cloud which is accessible to the general public (Shimba, 2010).

B. Private cloud

It is another deployment model for cloud services. In this model the cloud resources are not shared by unknown third parties. The cloud resources in this model may be located within the client organization premises or offsite. In this model the clients security and compliance requirements are not affected though, this offering does not bring the benefits associated with reduced capital expenditure in IT infrastructure investments. Figure 2.5 shows the structural formation of a private cloud.

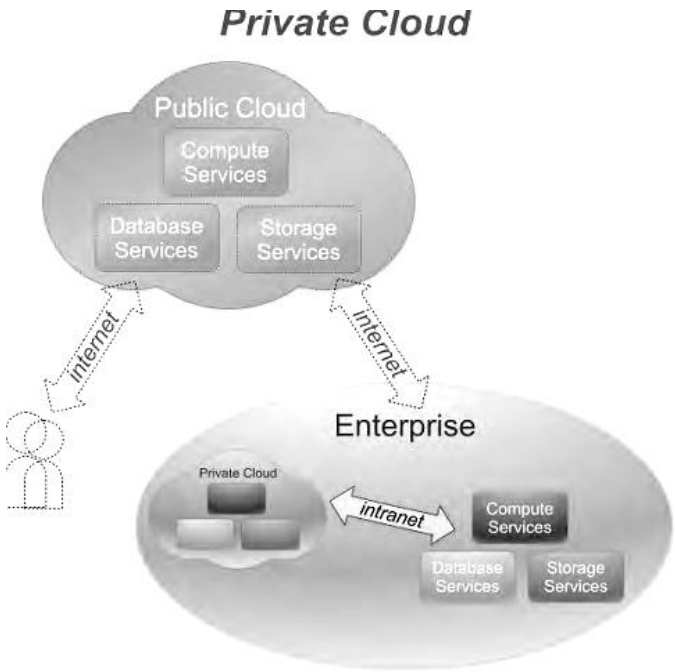

Figure 2.5: Private Cloud (Dustin Amrhein et al., 2010)

In this type of cloud the general public does not have access to the private cloud neither does the organization use the public cloud (Shimba, 2010). So private clouds can offer the provider and user greater control, security, and resilience than public cloud.

C. Hybrid cloud

As its name implies is a model of deployment which combines different clouds for example the private and public clouds. In this model the combined clouds retains their identities but are bound together "by standardized or proprietary technology" (CSA, 2009). A scenario where it could be suitable to choose this kind of cloud is when the strength of a private cloud in terms of capacity has been depleted and extra capacity must be acquired from somewhere else off-premises. Hybrid clouds lack the flexibility, security and certainty of in-house applications. Hybrid cloud provides the flexibility of in house applications with the fault tolerance and scalability of cloud based services. Figure 2.6 shows the hybrid cloud formation.

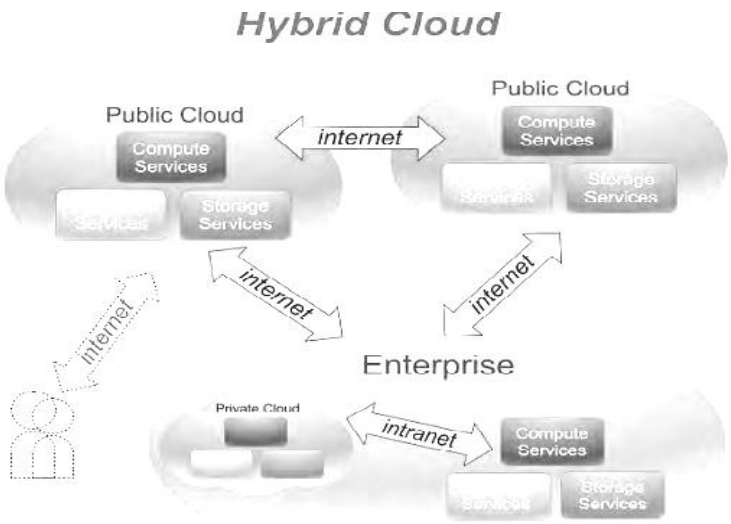

Figure 2.6: Hybrid Cloud (Dustin Amrhein et al., 2010)

In this type of cloud the general public does not have access to the cloud, but the organization uses infrastructure in both the public and private cloud (Shimba, 2010).

D. Community cloud

It is the fourth deployment model that can be used to deliver Cloud Computing services. In this model the cloud infrastructure is shared by multiple organizations or institutions that have a shared concern or interest such as compliance considerations, security requirements. This type of cloud may be managed by the organization or by a third party and may be located on-premises or off-premises. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of Cloud Computing are realized. Figure 2.7 shows the community cloud.

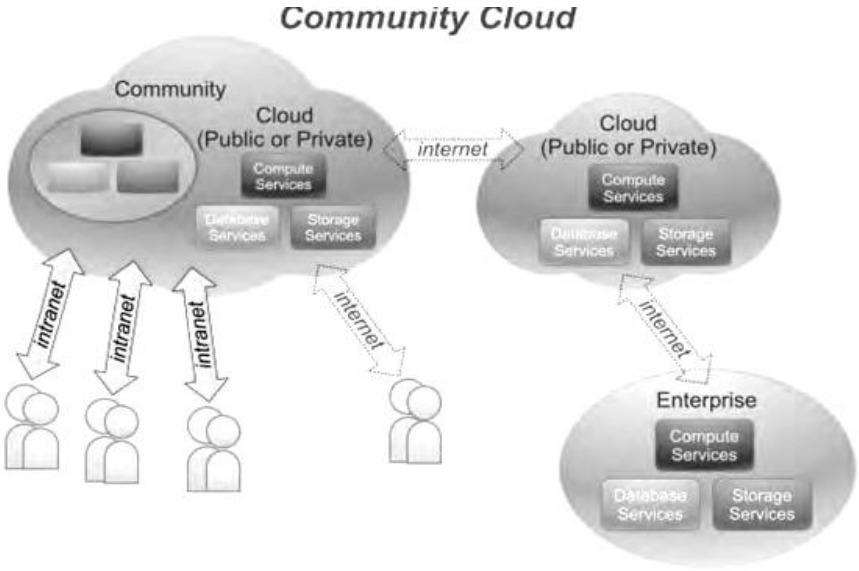

Figure 2.7: Community Cloud (Dustin Amrhein et al., 2010)

In this type of cloud both the public and the organizations forming the community cloud have access to the cloud services offered by the community cloud (Shimba, 2010).

2.1.8. Drivers for adoption and benefits of Cloud Computing

Cloud Computing with its different deployment and delivery models offers a number of benefits to businesses (Voona and Venkantaratna, 2009, Buyya et al., 2008, Miller, 2008, Catteddu and Hogben, 2009, Andrei, 2009, Shalini, 2012).

These benefits are such as:

a) Economies of scale resulting in low-costs of IT infrastructure, low maintenance costs and low IT administration costs.

b) It's offers easier data monitoring.

c) Branding of institute (school, college or university) as we have a custom domain e-Mail Ids with our school/college/university name as suffix (Say our institute's domain name is abcd.edu, then our students will have e-Mail Ids like Student_Name@abcd.edu).

d) Enterprise class hosted E-Mail: the quality of E-Mail service, collaboration tools & storage services are better than any of the available paid on-premise services.

e) Quick & effective Communication with anytime anywhere access.

f) Improved performance as a result of having access to dynamic and scalable computing

g) Collaborate globally: Collaboration tools lead to collective intelligence & creativity as students may work on their project document at the same time.

h) Provide for your system memory and storage capabilities based on demand.

i) Help teachers (& students) in organizing their classroom presentations and schedules.

j) Universal access to computing resources

k) Security will be taken care of by the provider.

l) Privacy: Google Apps is in compliance with FERPA (Family Educational Rights and Privacy Act).

m) Go Green: You'll save on notebooks, papers, printing etc.

n) The removal for the need for specific devices or hardware in-house.

o) Easy to deploy.

p) Finally, we can choose any one of them & our institute will be associating itself with one of the most respected global IT brands.

The key advantages are:

a) No additional cost for procurement of external hardware / software.

b) No burden of paying an enormous amount at one time for procuring the software. Work on a "Pay-as- you go" model.

c) No need to employ any technical person at the Institution as all the technical aspects will be handled by the company concerned.

d) Activities that are managed from central locations rather than at each School's/ Institution's site, enabling students/ parents/ faculty and the management to access applications remotely via the web application delivery that typically is closer to a one-to-many model (single instance, multi-tenant architecture) than to a one-to-one model.

e) Data is highly secured and strong encryption techniques like Asymmetric Key based encryption algorithms are used.

f) Scalability becomes extremely simple and does not involve much additional costs.

The disadvantages are:

Requiring a constant internet connection, can be slow in case of slow internet connections, limited features offering, security might not meet the organization standards, danger of loss of business in case of data loss or cloud vendor filing for bankruptcy (Miller, 2008; Jeffrey, et al., 2009; Ristenpart, et al., 2009).

2.1.9. Factors to be Considered in Cloud Computing Adoption

There are several influential factors of adoption Cloud Computing, the following factors had analyzed and identified the possible risks and opportunities according to thesis of Jlelaty and Monzer (2012):

A. Reliability

An outage is the absence of the cloud service. Kim et al. (2009) stated that an outage is unavoidable and users should take it into account before adopting Cloud Solutions. It might

happen for a short or a long time, a few or many times. Even large companies such as Google and Amazon experienced many similar cases in the past and they will have many more in the future. In short, 100 % availability of the service is impossible.

Consequently, Kim et al. (2009) recommends that critical applications should not be taken into the cloud. Actually, most of the applications hosted in the cloud are currently non-critical such as back up and software testing. Moreover, users who are using Cloud Computing solutions should make sure to have backup of their data in other places. Nowadays, Cloud providers are trying to avoid outage and promise a high level of availability in the Service-Level Agreement (SLA) and try to compensate their users in the case of an outage of the service. This factor represents a risk and it is one of the effective factors in Cloud Computing adoption. It will determine the kind of applications that can be used in the cloud along with its adoption strategy (Kim et al., 2009).

B. Security

Users of Cloud Computing give the cloud provider full control over their data and they should trust that this third party will take care of their business, secure the data, and do backups for them. This issue can be partly solved by Service-Level Agreements (SLA) where the conditions of security issues in the contract will be clarified (Benlian and Hess, 2011).

Benlian and Hess (2011) found that the security issue is one of the biggest doubts when users think about adopting Cloud Computing as the users do not have their own data in their companies anymore. "Our findings suggest that in respect to both SaaS adopters and non-adopters, security threats are the dominant factor influencing IT executives' overall risk perceptions" (Benlian and Hess, 2011).

Marston et al. (2011) asserted the same idea stating that "almost 75 percent of IT executives and CIOs report that security is their primary concern". However, Kim et al. (2009) argue that security issues is a concern in all computer systems not only the cloud hosted ones and achieving a 100% secure computer system is almost impossible as expert hackers will have new ways for breaking the security strategy in any system.

Kim et al. (2009) argue that we can enhance the security of the computer system by hosting it in the cloud as we will have some expert people who will care about securing the server and the computer system which might not be possible for small and medium companies. Moreover, the same technologies which are used for securing the on-premise computer system can be also used in the cloud. Finally, the cloud providers today are employing the

latest technologies and the highest standards in securing their servers and hosted applications. "We believe, however, that the clouds are not less secure than on premises computing systems" (Kim et al., 2009, p. 2). Marston et al. (2011) also agrees that this issue is being enhanced now and it also has some advantages by giving the company more control options over their data.

In conclusion, security issues can be seen as an opportunity and a risk at the same time, but it is mainly a doubt as it is seen by cloud adopters and non-adopters. It plays an important role in determining the kind of applications which are taken into the cloud and the industry type which can adopt cloud solutions. For instance banks, hospitals, and governments are used to avoid adopting cloud solutions because of the security concerns (Benlian and Hess, 2011; Kim et al., 2009 ; Subashini et al., 2011).

C. Performance

The main source of performance problems come from the connection quality between the user and the Cloud Computing server, mainly when more users are connecting at the same time and large amounts of data are transferred between the end user and the cloud server. This results in a slowdown in the cloud service (Kim et al., 2009 ; Benlian and Hess, 2011).

The performance issue is an important factor which companies have to think about when adopting Cloud Computing. Companies should measure their possible current and future bandwidth and processing requirements before they decide to adopt Cloud Solutions. Performance is seen as one of the main risks, and an important opportunity at the same time (Marston et al., 2011).

D. Scalability

Scalability is an important factor that should be taken into account in terms of performance. As the requirements of the Cloud Computing adopters increase, the cloud provider should be able to scale up their resources and infrastructure to satisfy the adopter's new requirements of storage, processing, and connection bandwidth (Kim at al., 2009 ; Benlian and Hess, 2011).

On the other hand, scalability in Cloud Computing is one of the main strength points and constitutes an important opportunity for companies. As these companies' requirements change, their infrastructure will be scaled up or down dynamically providing a high level of strategic flexibility (Benlian and Hess, 2011; Marston, et al., 2011).

E. Compliance and Physical Location

Since Cloud Computing is a fairly young technology, no rules and governmental regulations really exist to set the boundaries and laws regarding the storage of data by enterprises on third-party computing facilities that are shared with others. Moreover, some old regulations already exist concerning the enterprise data privacy, access, and location without taking Cloud Computing into account, and these regulations might be violated by Cloud Solutions (Kim et al., 2009).

For instance, while many countries have regulations concerning the physical location of enterprise data, the cloud providers cannot guarantee the exact physical location of the data, and even some of them have policies to hide such kind of information from the end user. However, some companies are now trying to solve this issue and comply with the local regulations. For example, Amazon Web Services (AWS) has started a new service called the Amazon Virtual Private Cloud which allows users to connect their own infrastructure to AWS computing resources (Marston et al., 2011).

Compliance with regulation is a real risk when adopting Cloud Solutions and it is being handled by cloud providers now. "Perhaps the biggest factor that will impede the adoption of the Cloud Computing paradigm is regulation at the local, national, and international level" (Marston et al., 2011).

F. Integration with other Services

Companies need to adopt different types of applications from different cloud providers and these applications might need to interact with each other. At the same time, some companies might adopt a hybrid strategy of Cloud Solutions as public clouds have different characteristics from that of private clouds.

Consequently, the integration between the data from these different applications needs to be achieved and this issue poses many technical and business challenges for cloud providers and adopters. (Marston et al., 2011 ; Kim et al., 2009). On the other hand, Mashups can be a real opportunity in cloud solutions. Mashups are a web service providing data or functionality relying on different external sources.

Nowadays, we can see new types of Mashups relying on Cloud Services; Integrating two or more Cloud Services into one new service. Amazon's 'GrepTheWeb' is one example of Cloud Mashups (Marston et al., 2011).

G. Environmental Issues

Environmental issues constitute a real concern for companies in this era as more regulations are issued to minimize the carbon footprint organizations leave behind. A previous 'Forrester' survey concluded that most workers in IT departments believe that the efficient use of energy and recycling IT resources are important issues that should be handled properly and these factors constitute the main element of green IT. By migrating the IT functionality into the cloud, companies not only reduce their IT infrastructure but also use the energy in an intelligent way (Marston et al., 2011). However, other researchers suggest that cloud servers are consuming a huge amount of energy and not all cloud providers are following the best standards in energy efficient consumption, consequently, moving to the cloud does not reduce the global CO2 emissions necessarily (Kim et al., 2009).

In conclusion, moving to the cloud can reduce the IT infrastructure by sharing with others and cloud providers can follow best standards in energy efficient consumption which might not be possible for the small companies as a result of the economy scale, but adopters of Cloud Computing should make sure that these providers are applying these environmental standards before adopting their solutions.

H. Cost

Cost is a very important factor and opportunity in Cloud Computing. "Cost advantages are the strongest driver affecting IT executives' perceptions of SaaS opportunities" (Benlian, and Hess, 2011). Marston et al. (2011) stated that companies need to spend a big part of their balance on the IT infrastructure, while less than 10 % of their servers can be really utilized, resulting in a big waste of money. In addition, these servers need to be replaced almost every three years and need to be maintained and administrated, increasing the total cost of IT operations radically. Cloud Computing can reduce these costs remarkably."Economies of scale for datacenters cost savings can lead to a five to seven-time reduction in the total cost of computing" (Marston et al., 2011).

Furthermore, Cloud Computing reduces the cost of entry for small companies and developing countries. By adopting Cloud Solutions, small companies can use expensive business analytic software, which require high level of IT infrastructure to enhance their business at relatively low cost, while this kind of applications was available only for large companies or enterprises before (Marston et al., 2011).

However, other researchers point out some possible economic risks. Benlian and Hess (2011) argued that there is a hidden additional cost in Cloud Solutions more than the anticipated one.

For instance, Cloud Solutions adopters might need to customize these common solutions to fit their specific requirements and consequently they will be responsible for maintaining the customized code and have to pay additional cost more than what they expected at first.

Kim et al. (2009) asserted the same idea and mentioned that adopters of the cloud solutions take the “only pay for what you use” into account and they forget about the other potential hidden costs. Kim et al. (2009) gave an example that adopters cannot totally rely on the providers to administer their solutions and maintain them, they still need to do monitoring of performance and availability of resources in the cloud which require additional time and cost, moreover, they will need to pay for the additional bandwidth they might use in the future. Finally, adopters should choose the suitable pricing strategy for the adopted solutions which fit their needs. For instance they might choose to pay per use, monthly, or yearly.

In conclusion, cost is seen as an opportunity as it reduces cost for Cloud Solution adopters but it still has some potential reasonable economic risks.

I. Innovation

Cloud Computing is considered as an innovative disruptive technology and it results in new types of applications with richer functionality than their in-house counterpart. The service helps IT departments' employees to innovate new core business applications instead of doing the daily backup and maintenance routine tasks. "Cloud Computing can lower IT barriers to innovation" (Marston et al., 2011).

J. IT Department’s Stand and Changes

While many people might see Cloud Computing as an innovative technology simplifying IT operations, some IT specialists might see it as a real challenging threat. They believe that it will be a threat to their job security by outsourcing their daily IT tasks to a third party company. Even some companies might see Cloud Computing as a big change in handling IT operations which is somewhat different from the method they used to follow for a long time in handling these operations (Marston et al., 2011).

Benlian and Hess (2011), confirmed the importance of these psychosocial risks, stating that outsourcing IT operations by adopting Cloud Computing can result in the loss of jobs and seen as a failure of the IT departments in conducting their jobs which would harmfully impact the reputation of the IT managers. Consequently, IT managers might respond negatively to the Cloud Computing technology. These psychosocial issues also affect the adoption decision of Cloud Computing.

K. Cloud Model

The kind of applications that can or cannot be implemented in the public cloud is an important issue that companies should think about when they decide to adopt Cloud Solutions. Companies might have some critical applications which require a high level of availability with sensitive data such as banks and hospitals. These types of applications might be better to be hosted in a private cloud. At the same time, these banks and hospitals have other types of applications which can be taken to the cloud to benefit from its advantages (Marston et al., 2011).

The public cloud applications have different functionality characteristics from its private counterpart. They are generally suitable for the common purposes' applications such as CRM systems, while the private cloud would grant more control to its owner compared to the public cloud, and it will be suitable for customized applications. At the same time, the private cloud can provide some of the advantages of the public one.

"It is also clear that not all applications are currently ripe for moving to the cloud. General-purpose applications (like office, email, collaboration technologies) are prime candidates" (Marston et al., 2011).

In this case we can have a hybrid cloud of private and public model-types depending on the sort of applications. This strategy allows us to use the advantages of the two types and has many other potential capabilities for example when the capacity of the private cloud is exceeded we might start using the public as well by moving the workload from the private to the public cloud.

However, the hybrid cloud can bring some new technical challenges as both clouds will need to have the same hypervisor, file system, and chipsets for their servers (Kim et al., 2009 ; Marston et al., 2011).

L. Time to Market

Another factor which should be taken into consideration prior to the adoption of Cloud Computing is the time to market. Jlelaty and Monzer (2012), states that time to market with Cloud Computing can be reduced from months to weeks or even days for the companies who adopt the solution. The Cloud solution helps by eliminating procurement delays for software and hardware, the upfront capital and time investment for purchasing hardware for proof of concept work, and accelerate computer power for when applications require to run at peak loads.

According to Jlelaty and Monzer (2012), time to market can also be considered a success criteria where an organization can launch new products much faster depending on its goals and culture.

M. Ease of Use

According to a survey conducted by CIO Magazine, one of the top-rated factors when evaluating Cloud Computing technology was ease of use where "senior and mid-level IT managers (both with a 63% incidence) are more likely to feel ease of use is very important when compared to other IT professionals (46%)" (CIO Magazine, 2011).

Moreover, ease of use can be considered an important factor in Cloud solutions as user experience in human-computer interaction is a significant criterion when evaluating whether an application is successful or not. The adoption of Cloud Computing will result in improving user experience unlike traditional systems like grid computing. Therefore, ease of use can be easily achieved because of Cloud Computing and valuable resources can be easily accessed by its adopters (Gong, 2010).

2.1.10. Cloud Economics

Apart from the fact that there are several benefits from the adoption of the Cloud Computing model pointed out by Armbrust et al. (2010) and Talukder et al. (2010), it can be derived that the most important one for an industry is the cost reduction. Obviously, this benefits small firms at initial stages or large firms associating with new IT-related projects. There are several aspects to cover.

First, according to the fact that the cloud services are usage based or pay-as-you-go pricing, both small and large enterprises can initially adjust the usage and cost of their IT-related businesses in an efficient way. This idea is similar to the pricing of public utility such as water, electricity, and gas in which the user only pays for the usage and there is no need for investment in the infrastructure or specific equipment, which may account for a lot of money. Most of the time, the cloud services may be utilized at a lower rate in the beginning and at either higher or lower rate according to the demand. This happens when the business has become standardized or the cloud services have been widely accepted for more business activities and become highly reliable. Therefore, the firm going into the cloud can experience the cost reduction at the beginning and the flexibility of cost management at a later time in its IT-related activities (Keesookpun and Mitomo, 2012).

Second, the preceding usage-based pricing feature of the Cloud Computing model gives rise to the conversion of capital expenditure (CapEx) to operational expenditure (OpEx). Indeed, small enterprises with limited investment ability can save a lot of money in the fixed investment of ICT capital such as computing machine by utilising the cloud services and managing the flexible OpEx. Only a few computers with high-speed Internet connection are sufficient to experience the cloud benefit. For example, the firm can use the Cloud Computing service to accomplish a task taking 10 hours and 5 Virtual Machines (VMs) today and no usage afterwards. The payment to the cloud service provider is calculated from only the 10-hour usage and collected only once until the next usage is generated. The company pays only the usage cost without having to purchase the required potential computers equivalent to 5 VMs and let them go idle after the task is done. Therefore, the company can efficiently manage its OpEx rather than has to stick with the high level of inefficient fixed investment of CapEx (Keesookpun and Mitomo, 2012).

Third, the cost reduction comes from the elimination of high costs of hardware investment and software license fee as well as computer service-related burden such as upgrade and maintenance. Under the Cloud Computing model, the cloud service provider is the one who is responsible for such the burden to ensure customers reliability and stability of the developing computing facilities. The company can witness this direct benefit immediately after the adoption of the Cloud Computing. In fact, it can direct the investment to the all-in-one computing usage without concerns over issues such as hardware and software associated costs and systems maintenance. A higher number of VMs on the cloud is charged according to the usage without other financial and service-related burdens such as purchases of on-premise computers and the required software such as operating systems, office software, and security packages along with the update (Keesookpun and Mitomo, 2012). All the economic benefits of the Cloud Computing are summarised in Figure 2.8.

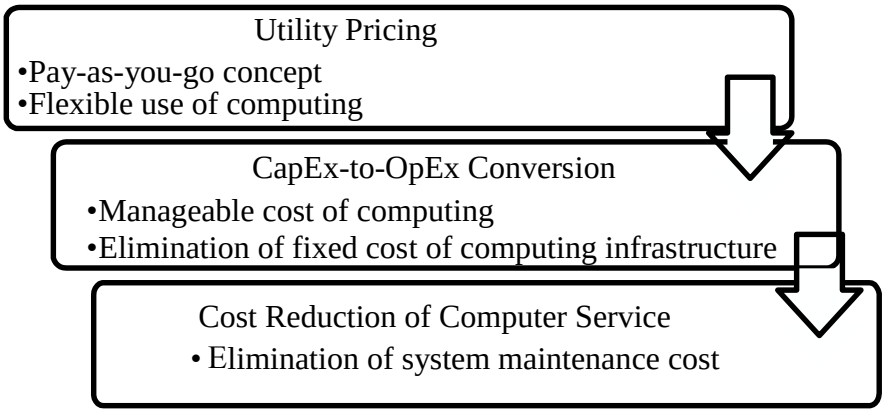

Figure 2.8: Cloud Adopter Cost Advantage (Keesookpun and Mitomo, 2012).

A good example case where the cost reduction is experienced is the decision to go into the cloud by New York Times senior software engineer Derek Gottfrid. His project, Times Machine, previously succeeded in converting TIFF images to PDF and made them available for the articles from 1851 to present. However, as the volume grew vastly, the internal facilities were not sufficient. Besides, it is more convenient and efficient to have pre-generated PDF files rather than convert them from the image files. Hence, he decided to use Amazon's Elastic Compute Cloud (EC2) and Simple Storage Service (S3) to handle the task. With the parallel computing ability, the company could handle 4 Terabyte of data in a short time. The whole process of uploading the files to S3, reading and converting them in EC2, and storing them back to S3 could be accomplished in 36 hours (Gottfrid, 2007). The company can save a lot of money from using the cloud service. It can eliminate the high fixed capital investment and engage in low and adjustable operational expenses, which are likely to occur randomly. There is no additional investment in the hardware and software because only the usage is charged. The company can also bypass the maintenance problems and continue with its core business activity (Keesookpun and Mitomo, 2012).

2.1.11. Where to adopt the Cloud

Christian (2010), submitted that's possible scenarios where Cloud Computing implementation makes sense are, for example, in a case where an application needs to be developed and deployed for an explicit short period of time. Hence, the organization suppresses the initial capital cost for provisioning the hardware needed to run it.

Whenever an application is running, scale requirements tend to vary in different ways. Sometimes demand variability can be anticipated and predicted; let us say for example, a financial or trading application that experiences demand bursts whenever market opens and closes. Another typical situation where web sites endure high traffic is during seasonal shopping periods, such as Christmas or the following days of Thanksgiving. These fluctuations require additional capacity should applications can perform seamlessly guaranteeing average performance to all its visitors. To make this point clear, let us show in (Figure 2.9 and Figure 2.10) the traffic curves of two online e-commerce applications, based on the number of visits during the last six months (Christian, 2010).

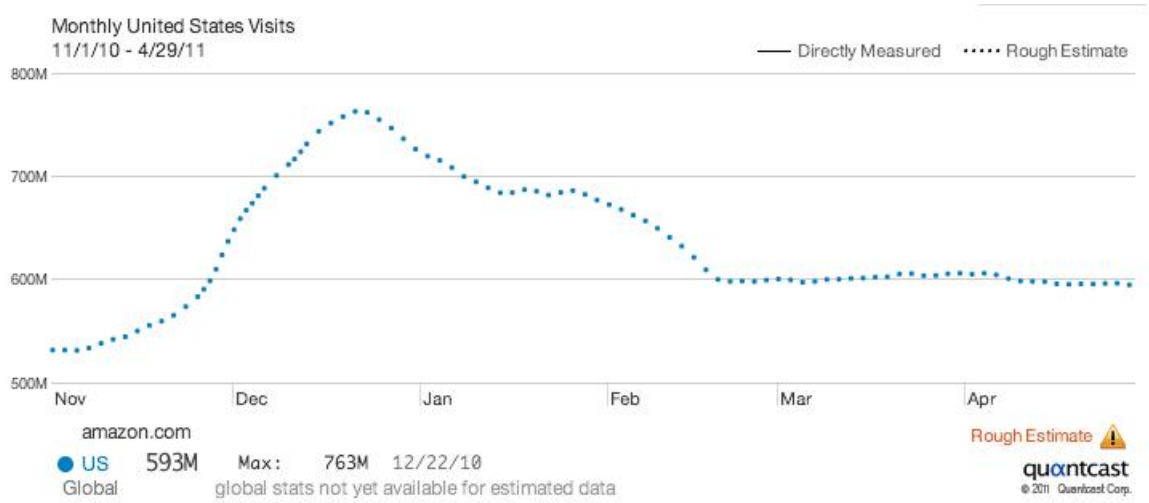

Figure 2.9: Traffic curve A (Christian, 2010).

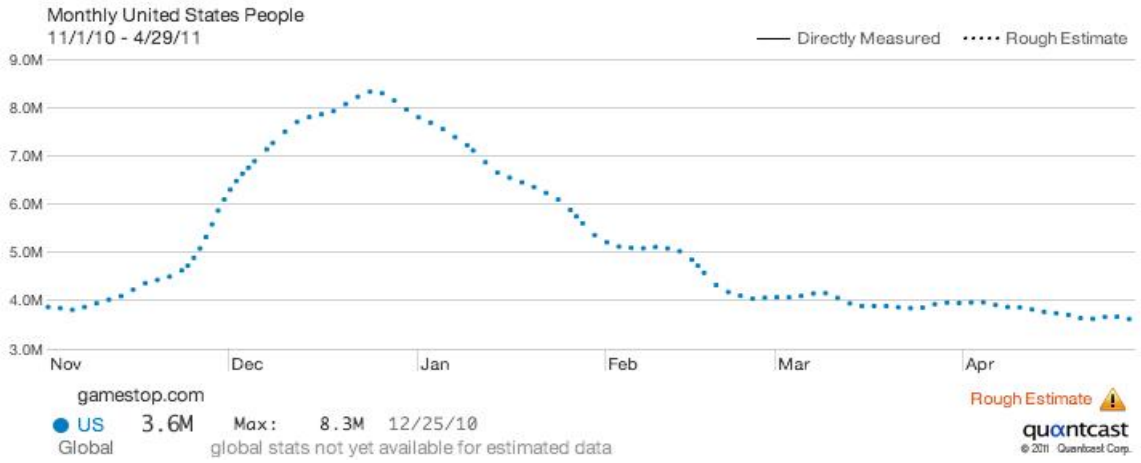

Figure 2.10: Traffic curve B (Christian, 2010).

In case you consider to provision adequate infrastructure to handle peaks, the costs incurred will increase by the same factor of the capacity excess. Efficiency is the first advantage gained by purchasing large volumes of infrastructure; however, compared to the general size of the demanded investment to cope with the peaks, benefits are minimal. Let us analyze this statement; whenever a traffic burst (peak) appears, the whole underlying infrastructure will reach maximum utilization rates for the application (website) on demand, but, as soon as the peak flattens the extra infrastructure will remain idled or underutilized (Christian, 2010).

Nonetheless, when it comes to Cloud Computing model, an organization can handle predictable peaks without incurring in unnecessary additional costs. When traffic flux arises,

you can activate as many complimentary virtual images to cope with excess loads. What is great about this approach is that you only have to pay for the time these instances are performing online (active) (Christian, 2010).

It is true that not every peak burst can be predicted easily. Spikes can occur due to several different factors, such as unexpected events with null (or little) warning, as the case of a natural disaster; this might lead to halting applications and systems whenever the surge overwhelms available capacity (Christian, 2010).

An enterprise can gain an economical leverage in a situation where non-critical applications can be deployed into the cloud, in other words, systems that are not strategic to the overall business. Within an organization there are component applications that serve internal purposes, which are perfect candidates to be migrated into a cloud environment, thus saving limited IT resources. To mention an example, backup storage systems are imperative for daily operations and consume valuable IT resources to maintain them functioning; to alleviate this, a backup system can be procured directly from a cloud service provider. In turn, the backup solution is a core competency of the provider, who can perform that task in a more economical and efficient manner than using the client organization's IT resources. Freed internal resources then can be focused on more strategic business projects (Christian, 2010).

2.1.12. Where NOT to adopt the Cloud

Although Christian (2010), mentioned in his paper that high expectancies are still upon Cloud Computing, this technology is not suitable in every environment. Following, some discussion situations where it is better not to adopt the cloud.

As mentioned before, legacy systems do not adapt seamlessly to cloud requirements. Data centers designed for Cloud Computing are built on commodity infrastructure (hardware and software), thus, applications running on them are specifically designed with that purpose in mind. Standardization is in site with virtual machines running Linux or Windows as the operating system. Legacy applications, on the contrary, are deployed on very specific operating systems, such as VMS or HP-UX. Legacy applications were designed long before the appearance of Cloud Computing and with no further vision on preparing them to migrate to another infrastructure different from its proprietors", hence, considerable efforts have to be done if you want them to be converted into cloud compliant applications. It is recommendable to analyze the remaining life of these systems and whether they are potential candidates to operate in the cloud, if so, the recommendable option is to redesign and codify them from the ground up (Christian, 2010).

For applications serving real-time data with a high level of criticality, such as real-time image processing (e.g. Magnetic Resonance Images) are doubtfully potential candidates to rely on connectivity over public cloud environments even if the application can deliver full uptime. Cloud Computing services are yet delivered up to date under the best provider's efforts; in other words, the possibility of poor performance can occur (Christian, 2010).

Other category of systems that must be treated with cautious are those that process confidential or high-sensitive information, such as the ones used in healthcare sector, where privacy compliance is exceptionally delicate and is regulated, in the United States, by the HIPAA (Health Insurance Portability and Accountability Act). No matter when this kind of sensitive data is expected to be migrated, special care and extra security measures must be taken to assure its protection as it is done with information contained in the internal IT infrastructure (Christian, 2010).

For example, how to guarantee proper deletion of confidential information contained in digital format? In general, whenever digital information is erased from a disk it is not precisely deleted, but rather tagged for a deletion operation. Then, let us say, when another application running in the system needs to save data onto the same disk, the possibility that this new data overwrites the previous information contained in that same position, previously marked as deleted, the former data is then truly destroyed. In case you have direct control or ownership over the disk you can choose to reformat the disk to ensure proper deletion of previous data; however, for information contained in a cloud infrastructure, it is stored on disks shared with other tiers. Thereby, certain level of control is lost over how to properly deal with data delet ion, in other words, you can command to delete a certain file, although there is no way to certificate the data was entirely eliminated (Christian, 2010).

2.1.13. Related Works

A. Mobile Cloud Computing

The Mobile Cloud Computing Forum defines MCC as follows (Dihn et al., 2011 ; tantow, 2011) :

“Mobile Cloud Computing at its simplest refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just Smartphone users but a much broader range of mobile subscribers”.

Mobile Cloud Computing will provide many benefits for Cloud Computing, mobile network operators, such as increased reach, reduced costs, improved reliability, ease of access and development, extending battery lifetime for mobile devices, store/access the large data, and reduced reliance on hardware and software equipment.

However, there are still many obstacles for MCC, including service availability, mobility management, security, privacy, energy efficiency, etc. These problems must be carefully addressed before MCC could become completely operational (Kitanov and Davcev, 2012).

B. Web-Based technologies

Definition of Web-Based technologies: it use of a browser (thin client) to access a software application over the Internet to perform work.

Web-Based technologies have been in the press for many years so they are not as “in vogue” as cloud technologies. Key differences between web and cloud are:

a) Web-Based technology relates to software while cloud-based technology has been applied to a wider range of computing resources such as hardware, storage, and software.

b) Cloud technology can be employed without the use of web-based software.

The benefits of using web-technologies are: no client software install, no client software maintenance, real-time data, access from anywhere, cross platform compatibility (Djohnson, 2010).

Section 2

Cloud Computing in Education Institutions

2.2.1 Introduction

2.2.2 Educational Cloud Computing Providers

2.2.3 Cloud Computing Based (Google or Microsoft) for Education Institutions

2.2.4 Opportunities of Cloud Computing in Higher Education

2.2.5 Conclusion

2.2.1. Introduction

Cloud Computing technology is a way to provide computer applications to users without the need to purchase, install, or support software on their local computers and/or servers. Educational institutions are beginning to take the advantages of existing applications hosted on a 'cloud'. Today the cloud based platforms provide no cost services (Jones and Sclater, 2010) to educational institutions like mail, messaging and collaboration tools (e-mail, contacts, and calendars), office applications (document storage, creation and sharing documents) and platform applications (the ability to create websites or learning management systems).

In recent days, many research institutes are struggling to adapt Cloud Computing for solving problems that are continuous increasing computing and storage. There are three main factors interests in Cloud Computing:

1. Rapid decrease in hardware cost and increase in computing power and storage capacity and the advent of multi-core architecture and modern supercomputers consisting of hundreds of thousands of cores (Erkoç and Kert, 2011);
2. The exponentially growing data size in scientific instrumentation/simulation and Internet publishing and archiving (Erkoç and Kert, 2011).
3. The wide-spread adoption of Services Computing and Web 2.0 applications (Foster et al., 2008).

The Cloud Computing trend of replacing software traditionally installed on campus computers (and the computers themselves) with applications delivered via the internet is driven by aims of reducing universities' IT complexity and cost (Sasikala and Prema, 2010) . Cloud Computing could be a technological innovation that both reduces IT costs for the college and eliminates many of the time-related constraints for students, making learning tools accessible for a larger number of students (Behrend et al., 2011) . There are many benefits of Cloud Computing for educational institutes and below a few of them are listed:

1. With Cloud Computing, universities can open their technology infrastructures to businesses and industries for research advancements (Erkoç and Kert, 2011).
2. The efficiencies of Cloud Computing can help universities keep pace with ever-growing resource requirements and energy costs (Erkoç and Kert, 2011).
3. The extended reach of Cloud Computing enables institutions to teach students in new, different ways and help them manage projects and massive workloads (Erkoç and Kert, 2011).

4. When students enter the global workforce they will better understand the value of new technologies (IBM, 2011).
5. Cloud Computing allows students and teachers to use applications without installing them on their computers and also allows access to saved files from any computer with an Internet connection (Siegle, 2010).
6. It offers a range of online tools and services that provide secure communication and collaboration capabilities. (Jones and Sclater, 2009).

2.2.2. Educational Cloud Computing Providers

According to Alshwaier et al. (2012), the trend of educational Cloud Computing has been adopted by many leading IT companies. Google Apps education in Cloud Computing is available at no cost to colleges, universities and educationally focused groups. Microsoft software and services strategy are about the power of choice-a hybrid model of resources that enables the students and researcher to move as much or as little as they want to the cloud. Amazon Web Service has provided the universities and institutions of all sizes with an infrastructure web services platform in the educational cloud. The IBM Cloud Academy provides an application for educational institutions that are actively integrating IBM Cloud Computing technologies into their infrastructures for production and technical projects. The following are case studies for educational clouds provided by the most popular cloud providers:

A. Google Education Cloud

Google Apps Education (GAE) in Cloud Computing available at no cost to colleges, universities and educationally focused groups. GAE includes the following applications: Google Mail (also known as Gmail), Google Sites, Google Video for education, Google Calendar, Google Talk and Google Docs Package (Documents, Spreadsheets and Presentations) allow workflow to proceed seamlessly among different types of documents. Each of these applications is entirely web-based, although there are client applications that supply additional functionality. Because all of these applications are web-based, each Google App is inherently cross platform; a modern Cloud Computing web browser might be supported by the computing platform to provide compatibility, scalability and essentially virtualized models (Herrick, 2009). Google Apps generally sets the standard for Cloud Computing interoperability; each App was designed to interoperate with the suite of Google's offerings. The GAE suites (Google website, 2013) include the following apps:

- **Google Mail:** one of the key components to Google Apps is Google Mail, also called Gmail which are administered by the organization's IT administrator in the institution, schools and universities. It has 7GB of storage per user, built-in chat, and IMAP capability that frees students from concerns about email quotas or spam.
- **Google Sites:** easy-to-use web publishing tools let students on campus create and publish information and media, without having to learn any programming languages.
- **Google Video:** provides secure and private video sharing for faculty and students.
- **Google Calendar:** is a shared calendar management that puts everyone on campus "on the same page" when it comes to organizing schedules.
- **Google Talk:** is the Instant Messaging (IM) component of Google Apps. IM is helpful for immediate, limited conversation with a colleague in a remote location in the classroom.
- **Google Docs Package:** a real-time collaboration on documents, spreadsheets, and presentations that lets researchers and students work together across campus or around the world.

As a goal of replacing old application hosting solution with an outsourced hosting solution for students, the transition to Google Apps has been very productive. In general, students, researchers and faculty are very satisfied with the variety and consistency of service offerings. It is also best viewed as one of a suite of tools that campus IT can provide to its students and faculty. Because of the low cost factor, Google Apps are used as a supplementary technology and as the primary technology for any or all of its applications. The cost savings of implementing Google Apps to replace a student application server and a desktop office suite are huge. Although the cost is extremely competitive with some educational Cloud Computing, GAE is a clear choice which is considered a success at some universities and institutions around the world and is recommended as a complement to or a replacement for existing collaboration and communication systems which may already be in place. Table 2.1 illustrates the features of GAE as an education edition.

Table 2.1: Features of GAE (Alshwaier et al., 2012)

Feature	Education Edition
Support	Phone support; 24 hours
Service 1	Resource scheduling
Service 2	3rd party applications
Service 3	Google Video
Cost	Free
Storage	Same storage space as gmail.com
Users	No limit

B. Microsoft Education Cloud

The Microsoft educational cloud enables researchers to flow workloads across the infrastructures and complement their existing IT assets with Web-based services (Microsoft website, 2013a). Microsoft cloud services for education offers great programs such as Microsoft Live@edu at no cost to education accounts. Additionally, all services offer greater financial flexibility to educational institutions and enable lower costs to develop, scale, operate and migrate the systems that are distributed between the cloud and the datacenter (Techrepublic website , 2013). The workplace is changing and the desktop applications that researchers and students use today will evolve to desktop applications combined with technical services. Moreover, Educators prepare workforce to partner with Microsoft for example, that can give them affordable access to those tools. Microsoft Live@edu is an application that provides students, researchers, staff, faculty with long-term, primary e- mail addresses and other applications that can offer flexibility, collaboration and online communication all at no cost to education institutions (Alshwaier et al., 2012). Table 2.2 shows features of Microsoft Live@edu.

Table 2.2: Features of Microsoft Live@edu (Alshwaier et al., 2012).

Microsoft Live@edu
• Website Creation • File sharing • Word processing and presentation • Desktop sharing • Resource scheduling • VOIP

Microsoft products will be used by the students similar to those used in many workplaces that assist to prepare them for jobs after college (Microsoft website,2013b). Thus, Microsoft education Cloud Computing considers the following needs:

- Instant Message, Email and Educational Calendar.
- Academic productivity such as document sharing and creation.
- Flexibility and collaboration.
- On demand resources for free.
- Identity and relationship management.
- Coordinating collaborative program development projects that consists of multiple departments.
- Creating applications that can be shared by many students simultaneously
- Developing social networks or communities according to grade, school, or study area.
- Porting on-premise, line-of-education software to the cloud.
- Testing Web services quickly.
- Providing Mashups of data to meet accountability and assessment needs.
- Hosting public web sites.
- Evaluating risk and making informed decisions about the use of educational Cloud Computing.
- Testing and deploying large-scale applications in different environment.

Microsoft's Cloud Computing solution is also called Windows Azure (Microsoft website, 2013c), an operating system that permits institutions, schools and universities to run Windows applications and stores data by Microsoft server. Moreover, the Azure Services Platform (ASP) is basically offered as services that allow the students and researchers to establish user identities, manage workflows, execute other functions such as Microsoft's online computing platform (Alshwaier et al., 2012).

C. Amazon Web Services (AWS) Cloud

According to Alshwaier et al. (2012), AWS has provided the universities and institutions of all sizes with an infrastructure web services platform in the educational cloud. With AWS students, researchers and faculty can requisition compute power, storage, number of users and other services-obtaining access to a suite of elastic IT infrastructure services as an education demand. With AWS, students, researchers, and faculty have the flexibility to select whichever development service or model of programming makes the most sense for finding the solutions for any problem. With AWS, they can take advantage of Amazon global computing infrastructure that is the backbone of Amazon multi-billion retail business and transactional enterprise whose scalable, flexible, reliable, and secure distributed computing infrastructure has been ameliorated for over a decade (Amazon website, 2013). AWS provides a variety of benefits for educational institutions, IT organizations and developers alike as the following:

- **Flexible:** to build any application, control the resources and fit them into any application using any platform or any programming model.
- **Comprehensive:** The AWS gives a number of services that students, researchers and faculty can incorporate into them to develop applications.
- **Dependable:** The AWS cloud is a distributed, secure, resilient, reliable, and massively scalable.

AWS enables the academic community to inexpensively and rapidly build on global computing infrastructure to seek course material such as projects and intensify their productivity and results of research, while enjoying the same benefits of flexibility, reliability, elasticity, and cost effectiveness used by industry. The AWS in Education program provides (Amazon website, 2013):

- Access to selected course content resources.
- Teaching Grants for faculty based on AWS.
- Research Grants for academic researchers using AWS in their work.
- Project Grants for student organizations pursuing entrepreneurial endeavours
- Tutorials for students that want to use AWS for self-directed learning

Solutions for institution administrators looking to use educational Cloud Computing to provide efficient and cost-effective services in the institution's IT Infrastructure (Table 2.3). AWS also manages the infrastructure that enables students, researchers and faculty to deploy highly scalable and reliable IT solutions.

Table 2.3: Efficient and cost effective services of AWS (Alshwaier et al., 2012)

Efficient services of AWS
• No contracts • No hidden fees • Better economics • Time management • Better environment

Although AWS consists of more than a collection of infrastructure services, educator can save time by incorporating compute, storage, database, messaging, payment and other services that will give educators a head start on delivering for their business. All AWS services can be used independently or deployed together to create a complete computing platform in the cloud. Some comprehensive Cloud Computing platforms of AWS are the following:

- **Amazon CloudFront:** is a web service that offers a high performance and globally distributed content delivery. The distribution stream content to the users can be easily generated with low latency, high data transfer speeds and no commitments.
- **Amazon Elastic Compute Cloud (Amazon EC2):** is a web service that generates resizable compute capacity in the educational cloud. Virtual Amazon EC2 environment can be generally defined to the educators with the operating system, services, databases and application platform stack required for hosted applications. Amazon EC2 also provides a full management console and APIs to manage the data resources. It presents a true virtual computing environment, allowing the educators to use web service interfaces for launching instances with a different of systems, load them into the environment with the custom application, manage the network's access permissions, and run the image using as many or few systems (Amazon website ,2013). Some features of Amazon EC2 are illustrated in table 2.4.

- **Virtual Computing Laboratory (VCL):** is an open source implementation of a secure production level on-demand utility computing and services oriented technology for accessing wide-area to solutions based on virtualized resources including computational resources, storage and software. VCL pilots are implemented with a number of universities around the world. The VCL implementation (VCL Website, 2013) has most of the characteristics and functionalities and is considered desirable in an educational Cloud Computing. Functionally, it has a large intersection with Amazon Elastic Cloud (Vouk, 2008).

Table 2.4: Features of Amazon EC2 (Alshwaier et al., 2012)

Features of Amazon EC2
• Flexible • Elastic • Completely controlled • Inexpensive • Secure Reliable

D. Salesforce.com Education Cloud Platform

The Salesforce.com platform provides all the tools needed for the educational institutions to instant scalability, ease of configuration and support for multiple functional roles. It enables comprehensive oversight of operations and applications allowing students, researchers and faculty to track, analyze and refine every aspect of their efforts. The Salesforce.com platform can also assists educators manage their services more efficiently from application to graduation while tracking individual details such as study abroad term, participation in campus organizations, study groups and other operations (Salesforce website, 2013a). This platform can also share and mobilize information about students cross functionally between academic departments and housing. It can also support services to enhance the educational experience and support student success. The Salesforce Foundation's products provide faculty with the opportunity to organize information in a way that allows the alumni, admissions and our student advisors to effectively carry out their responsibilities. This direct development is critical to support the leadership in interdisciplinary research, urban engagement and the

integration of classroom learning with real-world experience (Salesforce website, 2013b). Services provided by Salesforce cloud for Education includes: Constituent Relationship, Alumni Advancement, Student Recruiting, Knowledge Management, Alumni and Applicant Portals, Student Retention, Faculty Collaboration, Student Tracking, and Study Abroad.

E. IBM Cloud Academy

The benefit of IBM Cloud Academy form access to a broad portfolio of IBM Cloud Computing projects, offerings and services that are designed for education and learning. Their researchers can innovate on the next generation of Cloud Computing technologies. They can collaborate with peer member institutions, as well as with the IBM research and development community, to create new approaches and strategies to improve educational services through Cloud Computing. The higher educational institutions pursue Cloud Computing initiatives, develop skills and share best practices for reducing operating costs while improving quality and access to education. According to IBM: "Cloud Computing makes it easier for those in the education environment such as students, faculty and administrators", to gain immediate access to a wide range of new educational resources and research software and tools. IBM Cloud Academy members also can (IBM, 2011):

- Implement IBM cloud technologies solutions for education based on our world-class cloud technology for public and private clouds.
- Participate cloud services and technologies for IBM faculty, researchers, developers and partners in the definition of emerging cloud technologies.
- Collaborate with peers and developers-work with colleagues from around the globe in an accessible cloud-based collaboration forum to share good practices, ideas and insights.

The IBM solution divides IT workloads with many different services that make implementation and development easier. This gives academic institutions and universities an accessible indication for transitioning campuses over to the cloud. Each of these services is powered by IBM techniques and results in new benefits such as connecting and empowering the academic life (IBM, 2010). Some IBM cloud education services are:

- **IBM LotusLive collaboration:** LotusLive offers easy-to-use communication and collaboration tools that connect students, colleagues, researchers and

administrative staff for collaborative learning inside or outside campus. Silanis and IBM have joined together to integrate e-SignLive with Lotus-Live. These Cloud Computing services enable students, researchers and faculty to electronically sign document deals, legal contracts and other documents over the internet to reduce the time and cost (IBM, 2010).

- **Virtual Computing Lab (VCL) education solution:** VCL provides open source software and a technical infrastructure trim for the needs of educational institutions. VCL provides solutions for many problems such as reduced cost, increased power cuts, application contention and the demand for learning software (IBM, 2010).
- **IBM Smart Analytics system:** delivers query response times that are faster and better in quality than old systems and a single source of secure data for intelligence workloads (IBM, 2010).
- **IBM Smart Business desktop cloud:** allows virtualized schools and universities access environment. Thin clients and Internet devices have full access to platform independent, hosted applications and full client images (IBM, 2010).

2.2.3. Cloud Computing Based (Google or Microsoft) for Education Institutions:

Educational institutions make an effort to find the best methodologies for making web-based learning more effective. Different forms of web-based learning such as multimedia CD, distance study courses, interactive entertainment activities, etc., are proposed to the learners (Tankelevic˘iene˙, 2011).

Higher Educational Institutions often use Cloud Computing services provided by Google or Microsoft companies. Microsoft and Google are in hot competition as the main rivals. Both companies are happy to give educational institutions free cloud email and collaboration services. Both Google and Microsoft offer free of charge email services to the educational sector in many countries. Google Apps for Education and Microsoft Live@edu contain other communication tools such as instant messaging along with contact management and calendar software. Also there are document creation applications allowing the production of word processed documents, spreadsheets and presentations as well as the ability to create websites. These can all be collaboratively edited with other users. Significant storage space for documents of all types is offered to the users (Sclater, 2010).

One of the latest additions of these tools is a free plug-in for the Moodle learning management system, providing access to many of the Live@edu services.

Table 2.5 compares only Cloud Computing based Google or Microsoft services that providers use free of charge for educational purposes. It lists some of the differences between Live@Edu and Google Apps for collaboration applications, document storing and sharing based on internet publications (MISEVIC˘IENE˙ et al. ,2011).

Table 2.5: Google Apps vs. Microsoft Live@Edu for Education (MISEVIC˘ IENE˙ et al. ,2011)

Applications	Google Apps	Microsoft Live@Edu
Email and Calendar	**Gmail** Gmail 7GB of storage per user, built- in chat, and IMAP capability frees from concerns about email quotas or spam, shared calendar management.	**Outlook Live** E-mail service built on Exchange 2010, free 10 GB mailbox, e-mail forwarding to Windows Mobile or iPhone, calendar, and contacts.
Communications	**Google Talk** Chatting from a desktop, sending and receiving files, using PC only.	**Windows Live Messaging** Live chat, voice, and video communication on PC and mobiles
Websites	**Google Sites** Create Web sites and incorporate photos, videos, calendars	**Spaces** Online workspace for collaboration, blogging, discussion groups, etc.
Document creating and sharing	**Google Docs** Real-time online collaboration sharing documents, spreadsheets, presentations, drawings and forms.	**Office Live** For collaborative document editing. Works with the programs Microsoft Outlook, Word, Excel, PowerPoint and OneNote.
Virtual hard disc on the Web	----------	**SkyDrive** Store, access, and share files up to 25GB of free online storage on windows live Skydrive.
Groups	Organize with favorites and folders, choose to follow along via email, and quickly find unread posts	Enable users to create their social groups for sharing, discussion and coor- dination
File types	Only Google Documents, but many for- mats can be imported from, and ex- ported to.	All file types in SkyDrive and MS Office files in Office Live.
Learning manage ment system.	----------	Moodle learning management system

2.2.4. Selecting a Cloud Partner

According to Doug (2011) that one of the most important decisions your enterprise might make as part of your cloud adoption strategy is the selection of a vendor. An appropriate selection process necessitates comprehensive due diligence and the investigation of potential risk factors. For example, the following risks must be identified and mitigated:

a) Data location risk (policies and government regulations)
b) Data loss risk (backup and restore capability)
c) Data security risk (intrusion detection, virus protection, etc.)
d) Vendor viability risk

The breadth of cloud services and service models as well as infrastructure options must also be appraised and weighted based on your organization's requirements. As already determined, experience managing applications and infrastructure on an outsourcing basis, end-to-end continuous support and transition services, and the availability of secure and redundant data centers and public cloud options are also critical selection factors. Additionally, organizations should determine if the vendor can assist in the development of a cloud strategy and roadmap.

Determine if the vendor offers readiness services such as application rationalization, virtualization, modernization, infrastructure consolidation, and data center rationalization. Most significantly, establish if the vendor uses a cloud adoption framework and best practices, has a track record of successful transitions, incorporates a suite of tools, and offers complete transparency, detailed reporting, and frequent communications. Of course, any vendor should enable real cost savings and high-level business case modeling to demonstrate the cost/ benefit trade-offs. Finally, look for the availability of a "toe in the water" cloud point solution such as Quality Assurance and Testing. (Doug, 2011)

2.2.5. Opportunities of Cloud Computing in Higher Education

Higher education institutions progressively are turning to Cloud Computing to lower cost and take advantage of the latest technology (Workday, 2011). The benefits of cloud applications or the educational sector are numerous as demonstrated in Table 2.6: Cloud Applications vs. On-Premise – One-to-One Comparison.

The cloud simplifies and enhances IT, enables IT to discharge non-essential processes, and allows IT to refocus on driving the primary mission and objectives of higher education institutions. Using the cloud greatly rises IT agility and allows institutions to pay for only the IT services they use, enabling better resource tracking, more foreseeable costs, improved budget estimating, and faster return on investment.

Table 2.6: Cloud Applications vs. On-Premise–One-to-One Comparison (Workday, 2011)

	On-Premise	**Cloud**
Software	Perpetual license model (capital cost)	Utility subscription model (operational cost)
Implementation	Higher cost, Higher risk	Lower cost, faster to deploy
Maintenance	An additional ~22% of license fees per year	Part of subscription costs
Updates/Upgrades	Additional cost and risk	Part of subscription costs
Training	ERP user experience; extensive training is required	Consumer-Internet user experience; limited training is required
Infrastructure: Hardware/ Software	Customer responsible for infrastructure; significant additional cost and risk	Infrastructure outsourced to cloud provider; built into subscription costs
Security/Contingency	Data privacy/security,	Data privacy/security,
availability, performance backup, disaster recovery managed by customer at significant additional cost and risk	Planning	availability, performance, backup, disaster recovery managed by cloud provider; built into subscription costs

Workday's whitepaper (2011) affirms that educational institutions using cloud technology are able to take advantage of the newest innovations, fast implementations, and immediate updates with the newest functionality. Packaged integrations, lower operating costs, better service levels, and comprehensive security complete the list of added benefits of cloud over on-premise systems.

Section 3

Higher Education Sector in Gaza Strip

"Islamic University of Gaza (IUG)"

2.3.1. Introduction

2.3.2. Higher Education Sector (HES)

2.3.3. Introduction to IUG

2.3.4. Facts and Structures

2.3.5. IUG Internationally

2.3.6. IUG Top Management

2.3.7. Information Technology at IUG

2.3.8. Existing Cloud Computing Services at IUG

2.3.1. Introduction:

Organizations continue to realize the significant impact that information and communication technologies (ICTs) have on their day-to-day business processes. In educational institutions, access to learning resources, real-time communication, and access to research sources can be simplified by using these technologies (Kruger, 2010).

Moreover, these educational institutions can enhance using the technology by adopting the Cloud Computing technology into traditional approaches in IT's operations in the institutions, so this section will define the IT at IUG, and services provided to the students and staff.

2.3.2. Higher Education Sector (HES):

The education in the Palestinian territories refers to the educational system in Gaza and the West Bank administered by Ministry of Higher Education (MoHE). MoHE has a responsibility for the whole education sector from pre-primary to higher education and it is also in charge of managing governmental educational institutions and supervising private educational institutions.

University Education in Palestine consists of 4 years of college education to obtain bachelor's degree, additional 2 years for a master's degree, and 3 more years to obtain a doctorate. Thus the Palestinian educational system is compatible with the continuous process which makes it easier to internationalize (Saffarini, 2010).

Table 2.7 :List of Universities and Colleges at HES in the Gaza Strip

No.	Name	Type		No.	Name	Type
Universities						
1.	The Islamic University of Gaza	Public		5.	Gaza University	Private
2.	Al-Azhar University of Gaza	Public		6.	Al-Quds Open University	Public
3.	Al-Aqsa university	Governmental		7.	Ummah University	Private
4.	University of Palestine	Private				
Colleges						
1.	The University College of Applied	Public		11.	Intermediate Studies College	Public
2.	Arab Community College	Public		12.	Gaza Community College for Tourist Studies	Private
3.	Al-Zaytona College for Science &	Private		13.	Applied Future Polytechnic	Private
4.	Palestine Applied Polytechnic	Private		14.	College of Dar El-Dawa & Human Science	Private
5.	Nama'a College of Science and	Private		15.	Gaza Training College	UNRWA
6.	Khan Younis Training College	UNRWA		16.	Capacity Development College	Red Crescent
7.	College of Science and Technology	Governmental		17.	Palestine Technology College	Governmental
8.	Palestine College of Nursing	Governmental		18.	Abd Almohsen Hammouda Alshrey Institute	Governmental
9.	Al-Aqsa Community College for	Governmental		19.	Islamic Studies College-D/Balah	Governmental

Source: MoHE (2013)

According to the MoHE (2013), there are 7 universities in Gaza Strip that offer four years bachelor degree (3 private, 3 public, and 1 governmental). Additionally, there are 19 technical & community colleges that offer two years diploma programs (3 public, 6 private, 2 UNRWA, 1 Red Crescent, and 6 governmental) that mainly offer courses in technical and different specializations. Table (2.7) illustrates the universities and colleges in the Gaza Strip.

2.3.3. Introduction to IUG:

In 1967, it was deemed necessary to a group of academics to establish a higher education institution in Gaza Strip to serve thousands of students and help them save their time, money and efforts. On that account, the establishment of Islamic University (IUG) was in 1978. Starting with three faculties only, IUG developed its facilities and academic departments to have ten faculties at the moment to offer BA, B.Sc., MA, M.Sc., Diploma and higher Diploma in different disciplines. Through sincere and continuous efforts and because of its highly qualified graduates, IUG has won both national respect and international fame.

Nowadays IUG is an independent academic institution located in Gaza. IUG is a home to the well-planned programs, a way to the different community levels and a place for researchers and good teachers. IUG is a member of four associations: International Association of Universities, Community of Mediterranean Universities, Association of Arab Universities and Association of Islamic Universities.

IUG strives to be the leading Palestinian University working to develop educational and cultural standards in the Palestinian society according to professional values and principles. That is considered the vision of IUG. For its mission, IUG tries very hard to provide high quality education to students, particularly those living in Gaza Strip. Also, it encourages academic and scientific research to meet the challenges. In addition, IUG tries to participate effectively in developing the Palestinian community as well as, to promote knowledge and professional skills and science advancement (IUG website, 2013).

IUG management puts number of strategic goals to achieve the university vision and mission. IUG endeavors to advance learning, foster the expansion of knowledge through teaching and research and encourage community service. In fulfillment of this purpose, the management holds the following strategic plans at the heart of our endeavor. The first strategy is encouraging scientific research. Second is promoting academic cooperation in different fields with the local and foreign institutions. Then, the strategy is developing the

use of IT in teaching and designing distance learning courses. In addition, the IUG is enhancing the quality of education in terms of upgrading instructors, updating curricula and improving teaching-learning facilities. Finally, one of the IUG strategies is reinforcing fieldwork and the practical skills of learning and searching through graduation projects, training and practice (IUG Website, 2013).

2.3.4. Facts and Structures

IUG is supervised and run by several bodies: Board of Trustees, University Council, Representatives Council, Academic Council, Faculty Councils, and Department Councils. In addition to taking decision, these bodies are responsible for planning and administering the entire activities in the university.

According to Employees Affairs 2012, there are two categories of staff at IUG, the first one is administrative staff; including almost (474) administrative staff by qualification and (62) administrative staff by position, and the second one is academic staff; including (393) academic staff by scientific degree, and (98) academic staff by position. Table (2.8) organizes data indicating the number of academic and administrative staff members and employees holding administrative positions at IUG.

Table 2.8: Academic and Administrative Staff

Classification of Administrative Staff by Qualification					
Master	43	Bachelor	192	Diploma	130
Less than grade 12	109				
Total of Administrative Staff by qualification					**474**
Classification of the Administrative Staff by Position					
Head Department	29	Assistant director	11	Director	22
Total of the administrative staff by position					**62**
Classification of Academic Staff by Scientific Degree					
Assistant professor	130	Associate Professor	77	Professor	69
Demonstrator	21	Teacher	85	lecturer	11
Total of academic staff by scientific degree					**393**
Classification of Academic Staff by Position					
Head Department	53	Vice Dean	20	Dean	19
				Director(Center /Unit)	6
Total of academic staff by position					**98**

Source: Template done by the researcher and was filled by Employees Affairs at IUG 2013

According to Quality Unit 2012, there are almost (20,909) students at IUG; including (18,799) undergraduates, (1,656) postgraduates and the rest is diploma. IUG graduates are among the most employable in Gaza Strip. In the academic year 2010-2011, (6,807) of undergraduates are studying at the Faculty of Education, (2,399) at the Faculty of Engineering, (2,265) at the faculty of Commerce and (1,945) at the Faculty of Shara'a & Law. The rest number is studying at the rest of the ten faculties. IUG offers students a unique learning experience. Undergraduates attend lectures, make projects and prepare a research paper in the final year. The number of graduates at IUG has more than doubled in 30 years, from (3) in 1982 to (3,329) in 2007. Using one of the most recent admissions systems, staff at IUG works very hard guiding students and serving the whole community as possible as they can.

2.3.5. IUG Internationally

According to External Relations Unit of IUG, the University has many regional and international relations with different institutions and universities all over the world. Most importantly, IUG is a member of International Association of Universities and of Community of Mediterranean Universities. Through the External Relations Office, IUG has developed several academic links and signed several agreements of academic cooperation with American, European and Arab Universities.

2.3.6. IUG Top Management

Top management is the management team in generally a team of individuals at the highest level of institutional management who have the day-to-day responsibilities of managing the institutions. They hold specific powers and authority. There are most often higher levels of responsibility. They are referred to executive management, senior management, upper management, or higher management.

The study will focus on the top management of IUG. They are the main members in decision making process in IUG. They are represented by Presidency of IUG, the vice- president members for different affairs; the administrative, the academic, the scientific research, and the external affairs. Moreover, any decision makers in any department, deanship or unit in IUG. These all members of top management are responsible for the decision making process, and supporting decisions which return benefit to institution.

2.3.7. Information Technology at IUG:

The existence of Information Technology at IUG is very important. IUG gives this field wide interest through an IT administrative structure. There is a vice president of Information Technology; his duties are planning, supervising, developing IT operations, and provision of related reports on IT to the university president (IUG website, 2013). There are also two vice president assistants for Information Technology:

- Assistant of vice president for Information Technology- technical and administrative services.
- Assistant of vice president for Information Technology- Academic field.

IT affairs at IUG undertake the following duties (IUG website, 2013):

- Development of IT strategies for the university to employ technology in both the academic and administrative fields.
- Development of policies related to IT usage in the university.
- Provision and development of IT related services.
- Computerize the academic and administrative systems in place at the university.
- Provide all technical and IT services to staff and students.
- Provide administrative and academic technical solutions.
- Represent the university at conferences and exhibitions specialized in IT.

In addition, the administration of IT affairs serves many of the fields at IUG, which are clarified in the following points (Almasri, 2007):

A. Academic field:

IT aims to develop E-learning and increase its integration in the university, especially in the academic field. E-learning will be an effective part of the academic process at the university, specifically for training academic staff to use modern technology in educational processes, and the creation of web pages for students and staff on the university website. In addition, this field focuses on working toward the development of electronic libraries and participates in scientific conferences and symposia through close circle TV - video conference.

B. Administrative Field

The administrative of the IT affairs develop and support the administrative field through the computerization of academic and administrative systems which depend on its management. These systems include admission registration, and financial department programs, etc.

C. Development Field:

The Development Field aims to:

- Establish agreement contracts with international companies in order to open branches in the university like Intel Corporation.
- Improve the habilitation of technical college graduates, and work to create job opportunities in the IT field through the establishment of IT incubators.
- Boost interest to increase the provision of financial support for projects related to IT in the university.

D. Service Field

The service field offers the following IT administration services:

- Renewal and development of computer devices and their peripherals, management of the Computer network and servers, and sustain maintenance services to computer devices and their peripherals.
- Provides technical support for students and staff in the IT field.
- Provides internet, email, and data backup services for students and staff.
- Provides electronic publishing services such as web page design for academic staff which are posted on the university website.

a) IT Affairs Hierarchy:

IT administration consists of six main departments that are vital to its operation; these departments are highlighted below (IUG website, 2012).

First: IT Infrastructure Department:

The duties of the IT infrastructure department are building, development, operation, and maintenance of IT infrastructure which include: networking, database application development, and the supervision of servers and operating systems (OS). The Infrastructure department includes sub-departments specialized in specific fields to provide better service to staff and students. This department also includes an advisory services department for all relevant fields at the university.

The IT Infrastructure department is divided into four categories:

A. Network Management:

Network Management regulates the operation of special equipment to ensure proper connection of computer devices to their peripherals. This section also plans and manages the

network infrastructure on campus, follows up with internet services and internet provider, monitors the wireless network inside the campus, and also monitors the network's performance through special software.

B. Computer System Management:

Computer system management supervises the delivery of different network services (i.e., files, internet, email, wireless network, and hosting services) for administrators, academic staff, and students.

This department has various duties that are summarized in the following points:

- Support, development and implementation of operating systems and software for network infrastructure and related services.
- Follow new technological developments of servers to improve network services provided to users.
- Follow modern software and updated versions of the currently used software in order to integrate them into the existing work environment.
- Apply security policies for the network and monitor any misuse of network resources.

C. User Accounts Management:

User Accounts Management provides immediate technical support for everything related to user accounts. This section provides technical support and advisory services to staff and student users of systems and networks to ensure appropriate operation and optimum usage. User Accounts Management also manages network accounts for university employees (create new accounts - Operations related accounts list), email accounts for staff and students, internet subscriptions, permissions, backs up files beneficial to the work, monitors technical notes and errors that prevent proper handling and proposes possible solutions. In addition, they prepare information systems indicative advertisement to raise the level of performance and usage efficiency, especially with with the new coming from it.

D. Communication Management:

Communication Management supervises technical devices at the university that are associated with IT services, such as:

- Supervision of the university switchboard and ensure its work and functions development.

- Supervision of visual communication systems.
- Supervision of electronic security systems.
- Support for Short Message Service (SMS).
- Maintenance and installation of all related audios at the university.

Table (2.9) shows the human and technical capabilities available to the administration of Information Technology affairs at the IUG

Table 2.9: Available capabilities for IT affairs at the IUG

#.	Item	Number
1	Number of employees in IT	41
2	Number of servers in the university	40
3	Number of network points in the university	5466
4	Number of internet subscribers in the university	965
5	Number of available computer devices in the university	1328
6	Number of computer laboratories in the university	60
7	Number of email users- employees	2547
8	Number of email users- students	41

Source: Interview with the administrator of IT affairs at IUG 2013.

Table (2.10) shows the available servers in the administrative IT affairs at IUG.

Table 2.10: Available servers in the university

.#	Operating System / Program	Service Provided
1	Microsoft Windows server 2003	Operating System
2	Microsoft Windows server 2008	Operating System
3	Microsoft Exchange 2010	E- mail service
4	Microsoft TMG Forefront 2010	Internet service
5	Microsoft ISA 2006	Internet service
6	Oracle 10g Data Base	Database
7	Linux Centos 5	Operating System
8	VMware ESX 4	Virtual Operating System
9	Nod Antivirus	Antivirus
10	Kaspersky	Antivirus
11	Microsoft IIS 7	Web server
12	Apache + PHP 5	Web server
13	pfsense Hotspot System	Wireless internet service
14	Aseel	Financial and accountant service

Source: Interview with the administrator of IT affairs at IUG 2013.

Second: Programming department:

The Programming Department focuses on the creation and development of support programs for academic processes and assists the administrative departments with the completion and electronic delivery of its services. The department supervises the database production of programs in it. By creating this department the university aims to develop software and applications for the production of a comprehensive electronic system in all departments and faculties.

The programming department is working to computerize many systems and convert many of the manual administrative procedures to computerized systems. The programming department consists of two main sections:

A. The programming section

This section handles the supervision of the program's different groups listed in table(2.11).

Table 2.11: Internal Programming Systems at IUG

No	Program name	No	Program name	No	Program name
1	Students affairs	8	Medical Dep.	15	Salaries
2	Student Volunteer Program	9	Maintenance programs	16	Admission and Registration
3	Field training	10	Soil Lab	17	Academic affairs
4	Medical Service program	11	Employees Union	18	Procurement and Stores
5	Continuing Education	12	Central Library	19	Employee affairs
6	Questionnaire assessing staff	13	Postgraduate Studies	20	Employee service over internet
7	Book private Hall	14	Medical Analysis	21	Students financial

Source: Interview with the administrator of IT affairs at IUG 2013.

B. Electronic Publishing section

This section handles the supervision of a group of websites that are illustrated on the table (2.12).

Table 2.12 : Websites that are supervised by Electronic Publishing at IUG

No	Website name	No	Website name	No	Website name
1	IUG website	6	Units websites	11	Academic Affairs website
2	Personal websites	7	E-mail website	12	Administrative Affairs website
3	Faculty websites	8	Centers websites	13	University magazine website
4	Deans' websites	9	IT affairs website		
5	E-employment website	10	Scientific research website		

Source: Interview with the administrative of IT affairs at IUG 2013.

Third: Technical supporting services department:

This department aims to support the education process and scientific research, provide IT services to academic and administrative staff and students, provide suitable solutions in IT fields, provide information awareness to the community, provide services in the IT field by supporting the environment of university work, and provide modern Hardware and software.

This department is working to support and provide maintenance services for the university's devices and their peripherals and to also provide the best ways to service staff. It consists of the following four sections:

A. Technical Support section:

The duties of this section are summarize in developing user devices with a focus on the use of brand name computers, work to minimize disruption to user devices and to provide suitable alternatives as quickly as possible, and provide fast maintenance for devices in the workshop computer, as well as focus on self-learning for users, and easing the pressure on the phone lines, in addition provide only technical support work's programs.

B. Software Support and Training section:

This section provides many technical and electronic services to the staff and students of the university, such as laptop maintenance, staff training to create their personal WebPages on the word press system, technical support to staff of on their WebPages, training and technical support for staff on library forums and mailing lists, as well as supervision of graduate students' training in administrative IT affairs.

C. Laboratories and scientific programs section:

The Laboratories and scientific programs section is considered the interface of the Technical Services department in dealing with the university's students. This section supervises ten computer labs with each lab containing approximately thirty computers, and serves the students who make use of those available computers at the university. This department follows up with the maintenance of devices and works regularly to maintain and prevent any malfunctioning within labs to ensure no disruption to lectures carried out in the labs, prepares computer labs for the registration process each semester, receives new student applications requesting to join the University, as well as the set up of labs and installation of software needed to teach in the laboratory during the semester, and supervises free lab training for all students.

D. Information Technology needs Section:

This section provides technical consultancy in the field of Information Technology, hardware and software, to all departments, faculties, students and staff, as well as company contacts with competence to exchange experiences and bring bids for equipment and software needed by the university. This section focuses on the characterization of required equipment and the development of solutions that fit the work of the departments and faculties of Information Technology combined with technical testing for equipment supplied by the supplier company.

Fourth: Network security Department:

The Network Security department aims to achieve a set of objectives that are summarized in the following points:

- Secure electronic services, the exchange of data and access for users.
- Integrate the concepts of information security in the culture and daily activities at the university.
- Provide mechanisms to protect and monitor the performance of networks and systems.
- Develop security policies in accordance with international standards.

Fifth: Department of E-learning:

The Department of E-learning joined traditional learning methods and the use of modern technology to strengthen the education process by training teachers to effectively use modern technologies to aid them in simplifying the course. This department is continually working to further develop educational methods and enhance the educational process through the provision of necessary technologies.

Sixth: Information Technology Incubator:

It works on the completion of projects with a special feature in the computer field by taking advantage of graduate students from the faculties of Information Technology and Engineering, specifically students who are talented and have creative ideas for implementation to featured projects. The incubator is working to provide a practical experience for those graduates to enable them to attain jobs in domestic and foreign markets.

2.3.8. Existing Cloud Computing Services at IUG

The IUG have services at Cloud Computing in different forms. These forms are as follows:

a) IUG Tube
b) IUG Facebook Page
c) IUG Flickr Page
d) IUG Gmail

In the following few sections, to make a clear background for the reader, the researcher gathered some information are about each form.

a) IUG Tube

YouTube is a form of Cloud Computing services, YouTube is one of the examples of software as a service (SAAS) model, where the displaying video at the YouTube page is like application uploaded on the cloud, whereby you can access all existing videos, but you cannot change anything on the page.

YouTube offers free statistical data, time of access, access regions, age, or gender. YouTube also maximizes the effects of communications (LEE, 2010). YouTube was created in 2007, and now it has over 30,000 partners from 27 countries around the world. There are 60 hours of video uploaded every minute. Also, over 4 billion videos are viewed a day, and over 500 links of YouTube video are watched every day on Facebook, and over 700 YouTube videos are shared on Twitter each minute. Also, 100 million people take a social action on YouTube such as; likes, shares, comments, etc every week. An auto-shared tweet results in 6 new youtube.com sessions on average, and more than 500 tweets per minute containing a YouTube link, and over 800 million unique users visit YouTube each month. Over 3 billion hours of video are watched each month. YouTube is localized in 39 countries and across 54 languages. In 2011, YouTube had more than 1 trillion views or almost 140 views for every person on earth. Some videos of YouTube are available in High Definition (HD) technique (YouTube, 2012).

Al-Kahlout (2012) submitted in her thesis that's IUG used YouTube website to benefit from its facilities on internationalizing or publishing the university news and achievements around the world. The establishing of IUGTube Page was in 2007. The administration duties for this page were from Public Relations Unit. IUG uses this page to publish videos and photos about its achievements, its news, its events, its conferences and scientific discussions.

In 2008-2009, there were 100 videos. Then, the videos increased to be around 100 videos in 2009-2010 and it is increasing continuously. According to interview with Public Relations Unit, the interactions with IUGTube were increasing after the Israeli War on Gaza in 2008-2009. The materials of IUGTube page were arranged according to some categories such as Faculties, Public Relations, Units and Centers, and general. Also there are some materials for academic departments and administrative departments. The admin of the page are Mr. Bilal Alnabris, the system administrator, and Mr. Mohammed Alhelo, the system moderator, in addition to the general monitoring of Public Relations Unit (IUGTube Website, 2013).

The advantage of using the facilities of YouTube for the Islamic University, in addition to the publishing the university material, is the interactions with the public wherever from inside Gaza Strip or from outside. The YouTube facilities allow public to show the video and interact with it through writing comments, sharing with others via social networks websites, downloading, adding to playlist, or adding to favorite. In addition, there are extra facilities for searching and uploading (IUGTube Website, 2013).

IUG and its Public Relations Unit can use these facilities in some statistics which are used as indicators in the management processes in general levels of the university and in particular in the senior management activities. YouTube facilities allow the admin to know the showing times which is a good indicator for the publishing. Regarding to that, the IUGTube page provides the management with the ranks of viewing videos, the ranks of evaluating videos, the higher numbers of comments, and the distinctive videos. All of these are considered good indicators to measure the public interactions with the IUG and its achievements, news and events (Al-Kahlout, 2012).

b) IUG Facebook Page

There is no doubt that Facebook today has become a typical example of how a small start-up can grow into a household brand. However, few realize that Cloud Computing played a significant part in Facebook's rapid growth. Cloud technology did not only encourage the expansion of Facebook, but constantly contributed to the social network company's environmental conservation policies.

Facebook is example of platform as a service (PAAS), it provides social network for employees at institution instead of using special program on the internal network to exchange their opinions and ideas which related to work, or exchange important work files, Simply just a company has page on Facebook is like application of Cloud Computing.

Al-Kahlout (2010) mentioned in her thesis that's Facebook has become the most

widely recognized name in social networks. Social networks allow people to join and friend members or invite others to join and then share and exchange information. Facebook continues to grow in popularity with businesses and institutions to the point where it is no longer a matter of "if" you should be utilizing this platform as "how". Facebook is generally deemed more useful for the small business than other social media tools, such as Twitter. The Facebook platform and applications are such that a business could feasibly build its entire web presence there .

Facebook, specifically, has been found to be used to reinforce current off line relationships. As previous communication technologies have been integrated into the way we teach and administer in our institutions. Facebook has quickly become the social network site of choice by students and management. Since its 2004 inception, virtually all colleges in the United States have designed networks within the site. In addition to the incredible usage rate among students, there are a number of unique featured such as bulletin boards, instant messaging, email, and the ability to post videos and pictures. Most notably, anyone can post information and collaborate within the system (Munoz & Towner, 2009).

The admin of IUG Facebook page, Facebook is used in IUG as a tool to connect with public and to publish IUG news and achievements. IUG's Public Relations Unit created a personal profile in 2007 because they realized what a great tool Facebook is for keeping up with students and public or sharing details about new achievements and news or the new advertisements. In addition, the updates and posts are published on the university Facebook page. In the first year of using Facebook, the number of subscribers reaches 600 subscribers. The number is increasing by time and now it reaches to 31,900 subscribers. They include students, public and organizations from inside or outside Gaza (Public Relations Unit, 2013).

c) IUG Flickr Page

Flickr is another application of Cloud Computing, it is a website that allows people store, sort, search, and share their photos online. The free version of Flickr allows uploading up to 20MB of photos each month. In addition to being a place to host your images, Flickr is also a community site. All images uploaded to Flickr that have not been marked as private can be searched using the tags associated with them. User can also search for and join groups to view photos from other users that match the interests. Flickr has a section for photos that have been shared with a Creative Commons license. This type of license that allows teachers to use images found on Flickr in classroom projects (LAPTOP Initiative, 2012).

Flickr is a photo sharing site with social networking features, where users can create friend relationships with one another and share photos. Users can create networks of friends, join groups, send messages to other users, comment on photos, tag photos, and choose their favorite photos. To use most of these features, users must create a Flickr account and they must be logged-in to Flickr. Flickr provides users with privacy control over photos they upload, allowing photos to be classified as either private, visible only to their friends, or, the default, public. Flickr allows users to create two types of links: links to favorite photos (called favorites in Flickr) and links to other users (called contacts in Flickr). Like bookmarks, users may –favorite-mark‖ a photo to archive and share interesting photos with others. The list of a user's favorite photos and the list of a user's contacts are both available from a user's profile page (Cha et al, 2009).

d) IUG Gmail

Gmail is a free, advertising-supported email service provided by Google. Users may access Gmail as secure webmail. Gmail was launched as an invitation-only beta release on April 1, 2004, and it became available to the general public on February 7, 2007, though still in beta status at that time. The service was upgraded from beta status on July 7, 2009, along with the rest of the Google Apps suite. On April 24, 2012, Gmail announced the increase of free storage in Gmail from 7.5 GB to 10 GB ("and counting") as part of the launch of Google Drive. As of June 2012, it is the most widely used web-based email provider with over 425 million active users worldwide

Gmail offers 25GB of storage per user, powerful spam filtering and a 99.9% uptime SLA. All hosted by Google - there's no cost, and no ads for students, faculty or staff. Gmail is designed to make everyone more productive. 25GB of storage means no need to delete anything, powerful search means everything is in each reach, and labels and filters help your users stay organized. Gmail is securely powered by the web, so students and faculty can be productive at home, on the road, or on their mobile devices. The inbox isn't just about messages, it's about people too. Text, voice, and video chat means that students and teachers can see who is online and connect instantly. Don't want your students using chat? Want to limit who can send emails to whom? It's all in the administrator's control.

Recently IUG was transferring students' accounts from old system to new system in the Google cloud, which called Gmail, with Gmail IUG save efforts and cost of the servers that takes place in server room, and also save the accessories that needed to power on this server from electricity, UPS, Cables, and Switches.

Chapter 3
Literature Review

Chapter Outline:

Section 1: Previous Studies.

Section 2: Commentary.

Introduction:

Cloud Computing has been examined from different perspectives and through different research strategies. In this chapter, we will shed more lights on some of significant studies that took place in different countries in the world; many other studies were referred to and linked with through the thesis:

3.1. Previous Studies:

1) Wu, (2013) titled " Learning Attitude and Its Effect on Applying Cloud Computing Service to IT Education "

Computer Classrooms are always the major place where the education of information technology (IT) is executed in school. However, there exists a major problem that students were unable to practice after school with the same environment and there was no appropriate space to save their files for students, so it was not convenient for students' learning attitude of computer. The service of private Cloud Computing was adopted in this paper to establish the education environment of IT for resolving these problems.

The quasi-experimental method was applied to the study of 110 fifth grade students who were selected from Tunglo Elementary School in Miaoli County, Taiwan. The technology acceptance model was adopted as the theoretical basis of research framework in this paper.

The experiment results showed that students' acceptance for the environment of IT educational of Cloud Computing in elementary school was much better after the teaching. Besides, there was a positive correlation between user behavior and learning achievement for Cloud Computing service.

2) Rajpal, (2012) " Elucidating the impact of Cloud Computing in education sector: Benefits and Challenges"

This research aims toward a comprehensive literature review for the analysis of how the cloud helps ensure that students, teachers, faculty, parents, and staff have on demand access to critical information using any device from anywhere. This review of the literature and concurrent widespread discussions with IT leaders suggests that Cloud Computing is an important development with the shift from mainframe to client server based computing.

The objective of this research is to study and analyze Cloud Computing and how it is important for the education sector. In simple terms Cloud Computing enables you to access software applications, hardware, data and computer processing power on the web, rather than loading software onto your own computer or school server.

The final result that the several CIOs have predicted that higher education institutions will get out of the game of running the monolithic enterprise systems and will move the finance, human resources, and student systems into the cloud over the next five to ten years . And the use of Cloud Computing in schools and universities substantially increases availability of necessary educational computing services and applications to students and educators through the infrastructure it provides.

3) Angela, et al. (2012) " Cloud Computing as an innovation: Perception, attitude, and adoption "

This study aims to investigate how Cloud Computing is understood by IT professionals and the concerns that IT professionals have in regard to the adoption of cloud services. The study was carried out in Taiwan and used a survey by interview approach to understand IT professionals' understandings and concerns about Cloud Computing.

The findings of the study suggest that while the benefits of Cloud Computing such as its computational power and ability to help companies save costs are often mentioned in the literature, the primary concerns that IT managers and software engineers have are compatibility of the cloud with companies' policy, IS development environment, and business needs; and relative advantages of adopting cloud solutions. The findings also suggest that most IT companies in Taiwan will not adopt Cloud Computing until the uncertainties associated with Cloud Computing, e.g. security and standardization are reduced and successful business models have emerged.

The conclusion of this paper investigates IT professionals perceptions and attitudes towards adopting Cloud Computing in Taiwan. Despite the efforts made by providers such as HP and IBM the interview data suggests that many IT professionals do not have an in-depth understanding of the cloud nor are they aware of its benefits to businesses. Their main concerns revolve not around the complexity and effort that will be required but around the business applications of the cloud. Companies will wait until more sustainable business models and more successful cases of cloud adoption emerge before they make their decision.

4) Gupta, (2012) " Cloud Computing in Education in Current Financial Crisis "

The objective of this paper is to study the impact of Cloud Computing on the modern education. Further, the study also attempts to answer whether the services of Cloud Computing are significant in the education sector. Educational institutions are under increasing pressure to deliver more for less, and they need to find ways to offer rich, affordable services and tools. Both public and private institutions can use the cloud to deliver better services, even as they work with fewer resources. By sharing IT services in the cloud, our educational institutions can outsource non-core services and better concentrate on offering students, teachers, faculty, and staff the essential tools to help them succeed.

Through the conclusion from this paper, We see that 40% of online Indians use webmail services, store data online, or use software programs such as word processing applications whose functionality is located on the web. Online users who take advantage of cloud applications say they like the convenience of having access to data and applications from any Web-connected device. But Cloud Computing can be used to address tactical problems with which IT continually deals, like resource availability.

5) Chutipong, et al. (2012) " Cloud Computing Adoption and Determining Factors in Different Industries: A Case Study of Thailand "

This paper provides some basic knowledge about Cloud Computing and discusses the greatest benefit which is cost reduction in fixed ICT capital and services. With such the benefit, this study attempts to find the determining factors for cloud computing adoption in various industries and proposes some policy recommendations accordingly in order to facilitate the diffusion of the innovative computing model as well as the extensive realisation of its benefit. Thailand is selected as ground for investigation. The discrete choice model of logistic regression is selected as an econometric tool to extract the relationships of different attributes and the probability of Cloud Computing adoption in 206 industries.

The results point out significant determining factors categorised into Internet and technology; cost; and some difficulties in ICT usage. Hence, some policy implications in order to increase the possibility of adoption include an effort to improve internet capability of employees; provide some investment incentives such as tax reduction and low-cost loans for initial set-ups of Cloud Computing systems; and develop reliable internet network with advanced capability and low cost of use.

6) Deepa et al. (2012) titled " The Cloud and the Changing Shape of Education – Eaas (Education as a Service) "

Cloud computing in education gives better choice and flexibility. The software and platform in education can be on- premises, off-premises, or a combination of both, depending on the educational institution's needs. EaaS are used to deliver advanced software, computer lab resources as services to students, researchers, faculties at schools, colleges and universities This paper explains how EaaS can provide affordable and high end educational services which leads to the transformation from traditional education to cloud service. From a user's point of view, a cloud can provide services available in such a way that the user does not have to be concerned with where the services originate or even where the services are running. Eaas (Education as a service) delivers a virtualization education environment as a service. Rather than purchasing softwares, software licenses, education providers buy those resources as a fully outsourced service on demand and minimize cost by pay per usage. Generally EaaS can be obtained as public or private cloud or a combination of the two. Public clouds may offer low-cost services, but in return they may not provide needed assurances of security for those services. Private clouds, sometimes also referred to as community clouds, seek secure collaboration with external providers.

7) Alvarez, (2011) "Cloud Computing: Concerns and challenges for its adoption in SMEs and large companies in Japan"

This work intends to gain an insight and see what is happening in the case of Japanese market towards adoption of Cloud Computing nascent technology. A certain level of awareness is already present among Japanese companies. Security portrays itself as the barrier for firms looking to incorporate cloud services. Early adopters identify some elements worth mentioning for this technology to become more attractive and as part of its constant evolution.

An online questionnaire was launched aiming at Japanese companies listed in the JASDAQ document as of November 2010. The results obtained are in correspondence to those watched in similar studies performed for other markets (i.e. USA, Europe). Security concerns are still the main obstacles for adopting Cloud Computing technology, although some companies recognized their lack of savvy in this field. For early adopters the panorama looks more promising, with results showing that some companies have

entrusted part of their business critical systems (BCS) to be deployed into the cloud. Also, firms are using mainly solutions in the application layer of the cloud called software-as-a-service (SaaS). The future of Cloud Computing technology looks bright for the Japanese market.

8) Low, et al. (2011) "Understanding the determinants of Cloud Computing adoption"

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

A questionnaire-based survey was used to collect data from 111 firms belonging to the high-tech industry in Taiwan. Relevant hypotheses were derived and tested by logistic regression analysis. The findings revealed that relative advantage, top management support, firm size, competitive pressure, and trading partner pressure characteristics have a significant effect on the adoption of Cloud Computing.

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

9) Mircea, et al. (2011) "Using Cloud Computing in Higher Education: A Strategy to Improve Agility in the Current Financial Crisis"

The objective of this paper is to find alternatives to the use of IT, while leading universities to improve agility and obtain savings. The research methodology consisted in a rigorous analysis of the latest research on Cloud Computing as an alternative to IT provision, management and security. It also took into account the best practices for Cloud Computing usage within universities, plus the authors' experience in IT and higher education. The article begins with a brief introduction to Cloud Computing in universities, referring to the most important results obtained so far. Further, a starting point for universities to use Cloud Computing is provided, by proposing an adoption strategy. The strategy includes five stages, with emphasis on the evaluation of data and

processes/functions/applications from several major universities based on some key criteria, while creating a correspondence between these aspects and the models/services/applications that exist on the Cloud market.

The results obtained are encouraging and support the use of Cloud solutions in universities by improving knowledge in this field and providing a practical guide adaptable to the university's structure. In order to be applicable in practice, the proposed model takes into account the university's architecture and criteria such as mission, availability and importance of applications and also the data's mission, sensitivity, confidentiality, integrity and availability.

10) Abdulsalam et al. (2011) "Cloud Computing: Solution to ICT in Higher Education in Nigeria"

This paper explores the application of Cloud Computing in higher education in Nigeria, issues with ICT in Nigeria and touches upon some aspired benefits as well as expected limitations of Cloud Computing.

One main result that we draw from this research is that Cloud Computing may have considerable potential in improving the ICT application and infrastructure at higher education institutions. However, since this field is still relatively young, it is strongly recommended that early University adopters, plan the transition carefully and keep in close contact with organizations that establish industry standards, such as NIST, in order to ensure a uniform and smooth transition. Another outcome is that it may be practical to follow a hybrid approach whereby, depending on the evaluation of the factors outlined above, university ICT management and administration may decide to pursue a hybrid approach thus transitioning some application and data to Cloud Computing while leaving others to be served in-house.

The conclusion show that Cloud Computing technology is still relatively young in terms of maturity and adoption. The expectation is that it will undergo several changes in the future, in terms of resources, issues, risks, and ultimately best practices and standards. However, there are some sought of greet advantages it can potentially provide value for institutions of higher education. On-demand services can reverberate positively with the current university tight budgets across the nation and other parts of the world.

11) Tuncay, E. (2010)"Effective use of Cloud Computing in educational institutions"

In this paper, review what the Cloud Computing infrastructure will provide in the educational arena, especially in the universities where the use of computers are more intensive and what can be done to increase the benefits of common applications for students and teachers.

The conclusion of this study show that Cloud Computing as an exciting development is a significant alternative today's educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. This automatically reduces the cost of organizational expenses and offers more powerful functional capabilities. Beginning with the outsourcing of email service seems attractive. The gradually removal of software license costs, hardware costs and maintenance costs respectively provides great flexibility to the university/corporate management.

From the points of advantages provided by cloud, there is a great advantage for university IT staff to take them away the responsibility of the maintenance burden in the university. Cloud provides instant global platforms, elimination of H/S capacities and licenses, reduced cost, simplified scalability. Adopting cloud network redundancy eliminates disaster recovery risks and its high costs. There can always be new tools and applications to improve IT features.

There are of course some disadvantages too. The Cloud Computing services needed to deliver the majority of IT services needed by customers do not yet exist. There are still problems and constraints with application offerings, service-level agreements, more importantly security issues. All of the cloud providers do not have the same capability for their technological levels.

12) Shimba, (2010) " Cloud Computing: Strategies for Cloud Computing Adoption"

This is a result of the new economic model for the Information Technology (IT) department that Cloud Computing promises. The model promises a shift from an organization required to invest heavily for limited IT resources that are internally managed, to a model where the organization can buy or rent resources that are managed

by a cloud provider, and pay per use. Cloud Computing also promises scalability of resources and on-demand availability of resources.

Although, the adoption of Cloud Computing promises various benefits to an organisation, a successful adoption of Cloud Computing in an organisation requires an understanding of different dynamics and expertise in diverse domains. Currently, there are inadequate guidelines for adopting Cloud Computing and building trust. Therefore, this research project aims at developing a roadmap called ROCCA (Roadmap for Cloud Computing Adoption), which provides organisations with a number of steps for adopting Cloud Computing and building trust. An associated framework called ROCCA Achievement Framework (RAF) is also proposed. RAF is a framework that uses the criteria in the ROCCA to build a framework for measuring the adherence level to the proposed roadmap.

This dissertation focuses on a range of strategic issues from a broad cross section of areas of expertise required to ensure a successful Cloud Computing adoption. It presents in detail the technological factors key to a successful Cloud Computing adoption, and it introduces the technology underlying Cloud Computing, and describes different Cloud Computing delivery and deployment models.

It explains how an emphasis on collaboration between clients and vendor is essential for successful adoption of Cloud Computing. If the organization feels free, confident and secure to use cloud services then it is more likely that the adoption rate will increase. By following the guidelines outlined, organizations can ensure that their adoption of Cloud Computing are effective, efficient and provides a high degree of satisfaction.

13) Virginia, (2010) titled " Factors Influencing The Adoption of Cloud Computing by Decision Making Managers "

Cloud Computing is a growing field, addressing the market need for access to computing resources to meet organizational computing requirements. The purpose of this research is to evaluate the factors that influence an organization in their decision whether to adopt Cloud Computing as a part of their strategic information technology planning. Factors related to Cloud Computing being considered include its cost-effectiveness, the need for Cloud Computing, its reliability, and the perceived security effectiveness of Cloud Computing. This dissertation addresses these factors from the viewpoint of decision- making professionals that determine information technology policy for

organizations. Each independent factor or variable was analyzed directly in comparison to the management interest in adopting Cloud Computing. A strong positive relationship was found between each of these four independent variables: cost-effectiveness, the need for Cloud Computing, its reliability, and the perceived security effectiveness of Cloud Computing; and the dependent variable: the management interest in adopting Cloud Computing technology.

14) Rimal et al. (2010) titled " A Taxonomy, Survey, and Issues of Cloud Computing Ecosystems "

It's provides not only an overview of the Cloud Computing architecture, but also detailed explanations of each of the components consisting of modes of Cloud Computing services, virtualization management, core services, security, data governance, and management services. Their work contributes a great deal of better understanding of the classification of the Cloud Computing and its applications to further research of similar issue including this study.

3.2. Commentary :

The following can be concluded from the previous mentioned studies and the others discussed studies through this thesis:

1 This topic of Cloud Computing is still new in the Arab countries, and most of these studies took place in foreign countries

2 There is no published paper or academic research dedicated in Palestine, which deals with the topic of Cloud Computing.

3 Cloud Computing can be applied in educational institutions using different deployment and technology models.

4 Cost of organizational expenses is reduced and more powerful functional capabilities can be offered.

5 There are a lot of services that will be available, when IUG adopt the Cloud Computing technology.

6 There have been several successful implementations of Cloud Computing in higher education institutions.

7 There are some barriers that prevent institutions from adopting Cloud Computing, which are trust and security.

8 Some studies focus on the decision of adopting Cloud Computing ,and other studies going into determination of important and effective factors of adopting Cloud Computing, and others looking for risk and benefit of adoption.

9 Institutions must know, when deciding to adopt Cloud Computing, that all of the cloud providers do not have the same capability for their technological levels.

Chapter 4
Research Methodology

Chapter Outline:

Section 1: Methodology and Methods.

Section 2: Analysis of the Population Characteristics.

Section 3: Statistical Analysis For Each Dimension of The Questionnaire.

Section 4: Analyzing Hypotheses.

Introduction:

This chapter describes the methodology that is used in this research. The adopted methodology to accomplish this research consists of the following four sections:

- **First Section:** The research methodology and methods, where this section will describe the methodology used, the methods of data collection, identify the research population. In addition to explaining the steps for setting up a research tool, which are represented in the questionnaire distributed to members of the selected population, and measuring the validity and reliability of this questionnaire in order to ensure the safety and clarity of its paragraph, so as to enhance confidence and precision in the results that will be obtained. Also this section will determine the statistical methods and tests, that will be used in analyzing the research results, and in testing their hypotheses.

- **Second Section:** Analysis of the population characteristics. This section will discuss the analysis of the population characteristics that have been studied, and which data were collected in the first part of the questionnaire

- **Third Section:** This section describes statistical analysis for each dimension of the questionnaire, where we'll display the results and analysis of the research hypotheses and analyze the responses of research population members on the scale used by the statistical system SPSS, which is related to each individual's hypothesis and to achieve the objectives of the research.

- **Fourth Section:** This section deals with the test of research hypotheses.

Section 1

Methodology and Methods

4.1.1 Introduction

4.1.2 Data Resources

4.1.3 Research Population

4.1.4 Questionnaire Design and Content

4.1.5 Data Measurement

4.1.6 Research Procedure

4.1.7 Statistical Analysis Tools

4.1.8 Test of Normality for each field

4.1.9 Validity of Research Tool

4.1.10 Reliability of the Research

4.1.1 Introduction

Since the purpose of this research is to identify the concerns and challenges of the adoption of the Cloud Computing in higher education institutions; which is applied in Islamic university of Gaza (IUG), the descriptive analytical approach is used in this research.

4.1.2 Data Resources

The data resources can be classified as secondary or primary.

A. Secondary Data Resource

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

B. Primary Data Resource

In order to analyze the qualitative and quantitative data of the research, the questionnaire is used as a main tool for collecting primary data. And is analyzed through SPSS statistical software.

4.1.3 Research Population.

The research population consists of staff with academic and administrative positions. The staff have relations in computer and IT fields at IUG (Dean, Vice Dean, Head of Department, Director, Assistant Director, Lecturer, Engineer, and Programmer), also the questionnaires are distributed to this population which represent the research population.

The research population is identified in terms by the method of the population selection and its size, as follows:

A. Population Selection:

The population of this research is selected by using a comprehensive survey of population, by means all of the members of the staff with academic and administrative positions, who have relations in the computer and IT fields at IUG are included in this research. The researcher finds that suitable because the number is not large. Table (4.1) shows the latest statistics of the number of the employees who are qualified in computer or IT field. This statistic is taken in April, 2013 (Personnel Affairs IUG, 2013).

Table(4.1): Research Population at IUG

Population	Distributed Questionnaire	Retrieved Questionnaire	Percentage %
Dean	**1**	**1**	**100.00**
Vice Dean	**1**	**1**	**100.00**
Director	**7**	**7**	**100.00**
Assistant Director	**3**	**3**	**100.00**
Head of Department	**13**	**11**	**84.62**
Lecturer	**26**	**24**	**92.31**
Engineer	**17**	**15**	**88.24**
Programmer	**13**	**12**	**92.31**
Others (1 of Vice assistant president of IT Affairs, 4 of IT employees distributed in different offices at IUG, and 3 Lab supervisors)	**14**	**8**	**57.14**
Total	**95**	**82**	**86.32**

Source: Personnel Affairs IUG (2013)

B. Population Size:

The research population includes a study of each of the Dean, Vice Dean, Director, Assistant Director, Head of Department, Lecturer, Engineer, Programmer, and others of IT employees at IUG, The population is selected according to the research variables. Where (95) questionnaires are distributed, (82) are retrieved; as the result, the percentage of responses is (86.32%).

4.1.4 Questionnaire Design and Content

After reviewing the literature and interviewing the specialists, the questionnaire is the most appropriate tool for this research. The questionnaire is designed in the Arabic language (see Appendix A), and then it is translated into English (see Appendix C). The questionnaire is provided with a cover letter which explains the purpose of this research, the aim of the research and the privacy of the information in order to encourage high response. The questionnaire is composed of three parts as follows:

- **First Part:** General Personal Information, which consists of (6) items.
- **Second Part:** The adoption of Cloud Computing technology, which consists of (9) items.

- **Third Part:** consist of five sections as the follows:

  - ☒ **First section:** Top management support of the Cloud Computing technology. It consists of (12) items.
  - ☒ **Second section:** Support and integration of university Services with Cloud Computing. It consists of (12) items.
  - ☒ **Third section:** Skills of IT staff at the university. It consists of (12) items.
  - ☒ **Fourth section:** Security effectiveness in adoption of Cloud Computing. It consists of (12) items.
  - ☒ **Fifth section:** Cost Reduction Through The Adoption of Cloud Computing. It consists of (11) items.

In the development of this questionnaire, it takes into account the questions formulation covering all aspects of literature review, and meeting all the requirements and variables affecting the research hypotheses, taking into account that most of the questions are clear and their endings are closed for ease and speed of answer and ease of analysis. The majority of questionnaires were distributed personally to population members, in order to explain the questionnaire and to clarify any ambiguity in it taking into account the seriousness in answering it.

4.1.5 Data Measurement

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is an appropriate method that can be applied rather than others. In this research, ordinal scales are used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement degree (1,2,3,4,5), do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Based on Likert scale we have the following table (4.2):

Table (4.2): Likert Scale Degrees

Respondent	Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
Degree	5	4	3	2	1

4.1.6 Research Procedure:

- First, Identify main fields of the questionnaire and items for each field, and then prepare a preliminary questionnaire for use in the data and information collection.
- Then, take into account the rules of scientific research from objectivity and comprehensiveness in the preparation of this questionnaire.
- Then, show questionnaire to the supervisor, in order to test their suitability for data collection, and then modify the questionnaire primarily according to the vision of the supervisor.
- Then, distribute the questionnaire to the referees, the population consists of (11) referees working in management and IT fields inside and outside the IUG. (see appendix D)
- Then, prepare the final form of the questionnaire according to the vision of the referees. see (Appendix C)
- Then, obtain the formal book from the Islamic University of Gaza to facilitate the task of the researcher in the distribution of questionnaires, and conduct the study on the research population.
- Then, distribute the questionnaire to (95) in the duration from 28 April to 13 May 2013. Questionnaire were retrieved from (82), in addition to that there are some of research population members who did not fill the questionnaire that were distributed to them, because some of them have heavy work and they have no enough time for filling questionnaire, and some of them are outside Gaza, The researcher tried to distribute some questionnaire by email but there were no responses, and there is no existence of errors in the recovered questionnaires due to the educational and professional level of the research population.
- Finally, enter the data of retrieved questionnaires from the respondents and discharged in the computer using SPSS statistical software to analyze their data statistically and get results.

4.1.7 Test of Normality for each field:

Table (4.3) shows the results for Kolmogorov-Smirnov test of normality. From Table (4.3), the p-value for each field is greater than 0.05 level of significance and closer to 1, then the distribution for each field is normally distributed. Consequently, Parametric tests will be used to perform the statistical data analysis.

Table (4.3): Kolmogorov-Smirnov test

No.	Field	No. of Items	Kolmogorov-Smirnov	
			Statistic	P-value
1	The Adoption of Cloud Computing Technology	**9**	**1.240**	**0.092**
2	Top Management Support of the Cloud Computing Technology	**12**	**0.751**	**0.625**
3	Support and Integration of University Services with Cloud Computing	**12**	**0.776**	**0.583**
4	Skills of IT Staff at The University	**12**	**0.614**	**0.845**
5	Security Effectiveness in The Adoption of Cloud Computing	**12**	**0.824**	**0.506**
6	Cost Reduction Through The Adoption of Cloud Computing	**11**	**0.728**	**0.665**
All paragraphs of the questionnaire		**68**	**0.547**	**0.926**

4.1.8 Statistical Analysis Tools

To achieve the research goal, The researcher would use data analysis both qualitative and quantitative data analysis methods. The Data analysis will be made utilizing (SPSS 20). The researcher would utilize the following statistical tools:

1) Kolmogorov-Smirnov test of normality.
2) Pearson correlation coefficient for Validity.
3) Cronbach's Alpha for Reliability Statistics.
4) Frequency and Descriptive analysis.
5) Parametric Tests (One-sample T test, Independent Samples T-test , Analysis of Variance- ANOVA).

- **One-Sample T-test:** It is used to determine if the mean of a paragraph is significantly different from a hypothesized value 3 (Middle value of Likert scale). If the P-value (Sig.) is smaller than or equal to the level of significance, $\alpha = 0.05$, then the mean of a paragraph is significantly different from a hypothesized value 3. The sign of the Test value indicates whether the mean is significantly greater or smaller than hypothesized value 3. On the other hand, if the P-value (Sig.) is greater than the level of significance $\alpha = 0.05$, then the mean a paragraph is insignificantly different from a hypothesized value 3.

- **The Independent Samples T-test**: It is used to examine if there is a statistical significant difference between two means among the respondents toward the adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges due to (Gender).

- **The One-Way Analysis of Variance (ANOVA)**: It is used to examine if there is a statistical significant difference between several means among the respondents toward the The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges due to (Age, Qualifications, Type of Position, Position and Years of Experience).

4.1.9 Validity of Research Tool:

It means the validity of questionnaire to measure the questionnaire questions, which are developed to measure it. There are two methods to ensure the validity of questionnaire

A. **Validity of Referees:**

The initial questionnaire has been given to a group of referees (see appendix D) to judge its validity according to its content, the clearness of its items meaning, appropriateness to avoid any misunderstanding and to assure its linkage with the research of objectives and hypotheses.

B. **Validity of Questionnaire:**

Validity refers to the degree to which an instrument measures what it is supposed to be measuring. Validity has a number of different aspects and assessment approaches. Statistical validity is used to evaluate instrument validity, which includes internal validity and structure validity.

To insure the validity of the questionnaire (internal validity and structure validity), Personal test was used to measure the correlation coefficient between each paragraph in one field and the whole field.

1. **Internal Validity:**

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

Table (4.4) clarifies the correlation coefficient for each paragraph of the " The adoption of Cloud Computing technology " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to measure what it was set for.

Table (4.4): Correlation coefficient of each paragraph of " The Adoption of Cloud Computing Technology " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	Cloud Computing technology is an attractive technological option to the university.	**0.728**	**0.000***
2	Cloud Computing technology is an attractive economic option to the university.	**0.466**	**0.000***
3	The university Focuses on new IT system projects, which aim to increase the efficiency and quality of services provided for the beneficiaries.	**0.713**	**0.000***
4	The university Focuses on new IT system projects, which aim to maintain competitive advantage.	**0.697**	**0.000***
5	The university has high speed internet lines, and uninterrupted services.	**0.552**	**0.000***
6	The university Focuses on new IT system projects, which aim to increase students satisfaction.	**0.732**	**0.000***
7	The university Focuses on new IT system projects, which aim to increase employees satisfaction.	**0.698**	**0.000***
8	The university Focuses on new IT system projects, which aim to increase data and information security.	**0.623**	**0.000***
9	The adoption of Cloud Computing technology in IT operations will support the learning process.	**0.572**	**0.000***

* Correlation is significant at the 0.05 level

Table (4.5) clarifies the correlation coefficient for each paragraph of the " Top management support the adoption of the Cloud Computing technology " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.5): Correlation coefficient of each paragraph of " Top Management Support The Adoption of The Cloud Computing Technology " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	Top management informed of ongoing developments of Cloud Computing technology and the importance of its use	**0.737**	**0.000***
2	Top management concerns to provide the staff with the needed trainings and skills for any new technology so as to keep up with development.	**0.729**	**0.000***
3	Top management develops plans which are flexible enough to accommodate any changes required by the adoption of Cloud Computing technology	**0.829**	**0.000***
4	Top management supports the new technologies which serve the learning process, and the university students.	**0.767**	**0.000***
5	Top management seeks to maintain competitive advantage through the adoption of new technologies, and its uses in its operations	**0.670**	**0.000***
6	There is a support from top management in IT field to adopt everything new such as Cloud Computing technology.	**0.777**	**0.000***
7	Top Management has a future plan to adopt Cloud Computing, and its uses in IT operations	**0.847**	**0.000***
8	Top management has plans to get rid of obstacles that hinder the use of any new technology at the university such as Cloud Computing technology.	**0.746**	**0.000***
9	Top management provides the support and the needed requirements to adopt Cloud Computing technology.	**0.828**	**0.000***
10	The adoption of Cloud Computing technology is included in Strategic Plan for IT Center.	**0.609**	**0.000***
11	The administration's decision is wise in the use one of Cloud Computing applications (e.g. IUG Gmail) at the University.	**0.441**	**0.000***
12	Top management supports a shift policy in all or some of the IT operations towards Cloud Computing technology.	**0.800**	**0.000***

* Correlation is significant at the 0.05 level

Table (4.6) clarifies the correlation coefficient for each paragraph of the " Support and integration of university Services with Cloud Computing " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.6): Correlation coefficient of each paragraph of " Support and integration of university Services with Cloud Computing " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	The possibility of moving existing applications and services provided by IT Department at the university to the	**0.638**	**0.000***
2	Systems, technological services and applications at the university are continuously updated to keep pace with technological development.	**0.734**	**0.000***
3	Technological services and applications at the university characterized by sufficient flexibility.	**0.575**	**0.000***
4	The adoption of Cloud Computing technology at the University helps to activate new services.	**0.759**	**0.000***
5	The adoption of Cloud Computing technology at the University helps to improve quality of its services.	**0.778**	**0.000***
6	The adoption of Cloud Computing technology at the university helps in distinguishing the university in its provided services, which is different from that provided by other universities.	**0.750**	**0.000***
7	The adoption of Cloud Computing technology at the university helps to improve the performance of currently university services.	**0.603**	**0.000***
8	The transfer of e-mail service from the old system to one of Cloud Computing applications (Gmail) easily without suffering.	**0.703**	**0.000***
9	The facilities of integration services and IT applications with the services provided by Cloud Computing (e.g.	**0.711**	**0.000***
10	Cloud Computing providers offer free services to students, to help them in the learning process by providing disk service to store and share data, e-mail and others.	**0.558**	**0.000***
11	Cloud Computing provides working environment for students to conduct their scientific experiments that need special devices they cannot provide.	**0.635**	**0.000***
12	It's possible to access to the services provided in the cloud from anywhere and any device.	**0.505**	**0.000***

* Correlation is significant at the 0.05 level

Table (4.7) clarifies the correlation coefficient for each paragraph of the " Skills of IT staff at the university " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.7): Correlation coefficient of each paragraph of " Skills of IT staff at the university " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	Cloud Computing technology helps on the development of IT staff abilities and skills .	**0.729**	**0.000***
2	Training provided to staff in the field of IT enough, and makes them sophisticated and look forward to some extent to the latest technology.	**0.797**	**0.000***
3	Cloud Computing technology helps on the development of the spirit of creativity and innovation.	**0.734**	**0.000***
4	The University provides training programs for employees relating to the new technologies (such as Cloud Computing Technology)	**0.762**	**0.000***
5	IT staff realize the importance of the adopting of Cloud Computing at the university.	**0.741**	**0.000***
6	IT Management staff continuously on the lookout for new technological developments (such as Cloud Computing Technology)	**0.610**	**0.000***
7	The staff is sent to scientific missions to take advantage of technological developments surrounding	**0.596**	**0.000***
8	The staff dissatisfaction and disability to change is one of the challenges that hinder the adoption of any new technology (such as Cloud Computing Technology)	**0.228**	**0.021***
9	I do not need high effort to inquire or to identify any new technology such as Cloud Computing Technology.	**0.349**	**0.001***
10	Technological developments encourage positive competition among staff to motivate them to serve the general interest of the institution.	**0.556**	**0.000***
11	The university holds meetings, lectures and materials for the definition of human resources the importance and the use of Cloud Computing Technology.	**0.674**	**0.000***
12	IT staff needs training in the Cloud Computing, especially in the (construction, development, deployment) cloud services.	**0.265**	**0.008***

* Correlation is significant at the 0.05 level

Table (4.8) clarifies the correlation coefficient for each paragraph of the " Security effectiveness in adoption of Cloud Computing " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha=0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.8): Correlation coefficient of each paragraph of " Security Effectiveness in Adoption of Cloud Computing " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	The data security is the biggest challenges facing the university to adopt any new technology.	**0.387**	**0.000***
2	We must know where the data is stored in the Cloud Computing.	**0.401**	**0.000***
3	The strength of data security depends on the strength of service provider in terms of security.	**0.698**	**0.000***
4	It can be considered a contract agreement between the university and the service provider as a safety and reliability of the data.	**0.652**	**0.000***
5	There is confidence in new technologies and the providers of these services (e.g. Google, Microsoft, Amazon, ...)	**0.618**	**0.000***
6	The adoption and use of Cloud Computing Technology Lead to develop a plan to protect the security and confidentiality of the information.	**0.684**	**0.000***
7	The confidence increases with companies Cloud Computing service providers in the event of clear agreements related to hacking and electronic security breaches.	**0.735**	**0.000***
8	The Cloud Computing service provided by Google Inc., which is the e-mail service (Gmail) used in the university safer than the old system.	**0.753**	**0.000***
9	The services and applications of Cloud Computing provided by service providers companies (e.g. Google, Amazon, Microsoft, ...) are difficult to hack and piracy.	**0.586**	**0.000***
10	The cloud for students is safer than traditional methods (flash, the device profile, ...) in putting their researches, reports and homework .	**0.702**	**0.000***
11	The things that will help the university to overcome fears of safety is not put sensitive data or applications in the cloud.	**0.542**	**0.000***
12	Could be the university a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data.	**0.581**	**0.000***

* Correlation is significant at the 0.05 level

Table (4.9) clarifies the correlation coefficient for each paragraph of the " Cost Reduction Through The Adoption of Cloud Computing " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.9): Correlation coefficient of each paragraph of " Cost Reduction Through The Adoption of Cloud Computing " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	The university focuses on modern IT system projects, which aim to reduce costs.	**0.559**	**0.000***
2	Transfer the operations and services of university to the cloud will reduce costs.	**0.772**	**0.000***
3	The service of Cloud Computing provided by Google Inc., (e.g. an e-mail service - Gmail) at the University is less expensive than the old system.	**0.501**	**0.000***
4	Many Cloud Computing service providers offer free services to higher education institutions.	**0.550**	**0.000***
5	There are free services in the cloud help students to communicate with each other, save and share data and others.	**0.570**	**0.000***
6	The Cloud Computing helps to reduce the expenses that go to buy hardware, servers, software or maintenance.	**0.770**	**0.000***
7	The most important feature of Cloud Computing, is the ability to control costs by use.	**0.568**	**0.000***
8	The most important feature of Cloud Computing, is getting rid of unnecessary costs (place - electricity - air ... etc.).	**0.574**	**0.000***
9	The Cloud Computing Technology provides innovative university services without increasing the cost or the price of the service.	**0.563**	**0.000***
10	The cloud provides the needs of lab such as(special specifications of high expensive computers , or scientific applications), which it needs to work for a few hours or days continuously to bring out the desired results.	**0.647**	**0.000***
11	When to adopt Cloud Computing Technology, the cost is greatly reduced and capital expenditure is converted in the IT operations to ongoing expenses.	**0.645**	**0.000***

* Correlation is significant at the 0.05 level

2. Structure Validity of the Questionnaire:

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

Table (4.10) clarifies the correlation coefficient for each field and the whole questionnaire. The p-values (Sig.) are less than 0.05, so the correlation coefficients of all the fields are significant at $\alpha = 0.05$, so it can be said that the fields are valid to measure what it was set for to achieve the main aim of the research.

Table (4.10): Correlation coefficient of each field and the whole of questionnaire

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1	The Adoption of Cloud Computing Technology	**0.771**	**0.000***
2	Top management support of the Cloud Computing technology	**0.771**	**0.000***
3	Support and integration of university Services with Cloud Computing	**0.880**	**0.000***
4	Skills of IT staff at the university	**0.872**	**0.000***
5	Security effectiveness in adoption of Cloud Computing	**0.799**	**0.000***
6	Cost Reduction Through The Adoption of Cloud Computing	**0.690**	**0.000***

* Correlation is significant at the 0.05 level

4.1.10 Reliability of the Research:

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring (Polit & Hunger,1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same population of people on two occasions and then the obtained scores are compared by computing a reliability coefficient (Polit & Hunger, 1985).

After applying the questionnaire and treating the data by SPSS program, the researcher calculates the reliability of the questionnaire by using Cronbach's coefficient alpha Method through the SPSS software.

- **Cronbach's Coefficient Alpha:**

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. The Cronbach's coefficient alpha was calculated for each field of the questionnaire.

Table (4.11) shows the values of Cronbach's Alpha for each field of the questionnaire and the entire questionnaire. For the fields, values of Cronbach's Alpha were in the range from 0.827 and 0.924. This range is considered high; the result ensures the reliability of each field of the questionnaire. Cronbach's Alpha equals 0.961 for the entire questionnaire which indicates an excellent reliability of the entire questionnaire.

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

No.	Paragraph	Cronbach's Alpha
1	The Adoption of Cloud Computing Technology	**0.847**
2	Top management support of the Cloud Computing technology	**0.924**
3	Support and integration of university Services with Cloud Computing	**0.873**
4	Skills of IT staff at the university	**0.827**
5	Security effectiveness in adoption of Cloud Computing	**0.843**
6	Cost Reduction Through The Adoption of Cloud Computing	**0.837**
All paragraphs of the questionnaire		**0.961**

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

Section 2

Analysis of the Population Characteristics

4.2.1 Introduction

4.2.2 Personal Data

4.2.1 Introduction:

According to a general information which is collected from the respondents in the first section of the questionnaire, and by using statistical repetitions, the population characteristics was determined in order to identify the characteristics of the respondents in terms of the structure of scientific, practical and social.

The repeatability distributions of some of these variables are presented to the following arrangement : Gender , Qualification, Age, Type of Position, Position, Years of Experience.

4.2.2 Personal Data

Here, in this section the personal traits are characterized as the following:

a) Gender

Table (4.12) shows the gender distribution among the population.

Table (4.12): Illustrates Population Distribution According to Gender

Gender	Frequency	Percent
Male	**70**	**85.4**
Female	**12**	**14.6**
Total	**82**	**100.0**

The statistics show that the majority of responders are males at (85.4%) of the population and (14.6%) of the population are females. According to Personnel Affairs of IUG the majority of IUG employees are males. Regarding to Palestinian central bureau of statistics PCBS 2011, the females' contributions in the workforce are limited, and males' contributions exceed 4 times of females' contributions (Palestinian Central Bureau of Statistics: 2011). This is due to (work chances are for males, the women work fields are limited, the culture of the society is an essential reason in decreasing the women contribution in work, women's obligations and responsibilities toward their homes and families).

b) Qualification

Table (4.13) shows qualification distribution among population.

Table (4.13): Illustrates Population distribution according to qualification

Qualification	Frequency	Percent
Bachelor	**51**	**62.2**
Master	**21**	**25.6**
P.H.D	**10**	**12.2**
Total	**82**	**100.0**

The statistics show that the majority of population is Bachelor holders at (62.2%), and (25.6%) of the population is Master holders, while (12.2%) of the population is PHD holders. According to Personnel Affairs of IUG, the majority of IUG employees in the field of computer and IT are Bachelor holders, also the majority of Bachelor holders work in administrative positions, which not required to have high education in this positions like academic positions.

c) Age

Table (4.14) shows the age distribution among the population.

Table (4.14): Illustrates population Distribution According to Age

Age	Frequency	Percent
Below 30 years	**34**	**41.5**
From 30 – below40	**27**	**32.9**
From40 –below50	**17**	**20.7**
Above 50 years	**4**	**4.9**
Total	**82**	**100.0**

The statistics show that (41.5%) of the population are Less than (30) years old, (32.9%) of the population are between (30) and (40), This is due to the staff who works in the field of computer and IT are youth (less than 40 years) according to the Personnel Affairs of IUG. And (20.7%) of the population are between (40) and (50), and (4.9%) of the population are of (50) years and Older. This percent low, because it represents the population who holds PHD in the field of computer and IT field, according to Personnel Affairs of IUG the number of them are low.

d) Type of Position

Table (4.15) shows the type of position distribution among the population.

Table (4.15):Illustrates Population Distribution According to Type of Position

Type of Position	Frequency	Percent
Administrative	**50**	**61.0**
Academy with administrative position	**6**	**7.3**
Academy	**26**	**31.7**
Total	**82**	**100.0**

The statistics show that the majority of the population is administrative at (61%), and (31.7%) of the population is Academy, while (7.3%) of the population is Academy with administrative. According to Personnel Affairs of IUG, the majority of population works in administrative positions at IT administrative affairs , Registration and Admission department… etc.

e) Position:

Table (4.16) shows the position distribution among the population.

Table (4.16):Illustrates population Distribution According to Position

Position	Frequency	Percent %
Dean	**1**	**1.22**
Vice Dean	**1**	**1.22**
Director	**7**	**8.54**
Assistant Director	**3**	**3.66**
Head of Department	**11**	**13.41**
Lecturer	**24**	**29.27**
Engineer	**15**	**18.29**
Programmer	**12**	**14.63**
Others (1 of Vice assistant president of IT Affairs, 4 of IT employees distributed in different offices at IUG, and 3 Lap supervisors)	**8**	**9.76**
Total	**82**	**100.0**

The results in table (4.16) show that the responses are from different categories of IUG employees. The researcher make comprehensive study of all staff whose qualifications relate to computer and IT fields in IUG. So the researcher's distributed (95), and retrieved (82) questionnaires were filled with percent (86.32%). This is due to some of employees who are busy because of their duties and heavy works so not all of them filled the questionnaire, and some apologized because they do not have enough time to fill the questionnaire. In addition, the questionnaire was distributed in the end of second semester 2012/2013, so the researcher faced a problem in accessing them in their offices during work times.

The retrieved questionnaires are distributed as following: (1.2%) of the population Dean of IT College, (1.2%) of the population is vice dean of IT college, (8.5%) of the population are director, (2.4%) are assistant director, (13.4%) are Heads of Departments, (31.7%) of the population are lecturers, (15.9%) of the population are engineer. (12.2%) of the population are programmers, and (13.4%) of the population are the others, which consist of (one of the vice president assistant of IT Affairs, four of the lab supervisors, three works on registration and admission, three of computer technical).

f) Years of Experience

Table (4.17) shows the years of Experience distribution among the population.

Table (4.17):Illustrates Population Distribution According to Years of Experience

Years of Experience	Frequency	Percent
Less than 5 years	**38**	**46.3**
5 – Less than 10 years	**19**	**23.2**
10 years and more	**25**	**30.5**
Total	**82**	**100.0**

The statistics show that (46.3%) of the population are Less than (5) years old, (23.2%) of the population are between (5) and (10), and (30.5%) of the population are of (10) years and more.

We conclude from the table that there are more than 53.7% have more than 5 years experience, The majority of population (53.7%) has years in their Experience between (5) and (10) years and followed by the category the years of experience more than (10) years, which that mean the employees are familiar about the nature of IUG, and were able to give a value perceptions enrich the research.

Section 3

Statistical Analysis for Each Dimension of Questionnaire

4.3.1 Introduction

4.3.2 The Adoption of Cloud Computing Technology

4.3.3 Top Management Support The Adoption of Cloud Computing Technology

4.3.4 Support and Integration of University Services with Cloud Computing

4.3.5 Skills of IT Staff at The University

4.3.6 Security Effectiveness in Adoption of Cloud Computing

4.3.7 Cost Reduction Through The Adoption of Cloud Computing

4.3.1 Introduction

In order to test the fields of research tool (questionnaire), and paragraphs analysis, parametric tests were used (One-sample T test, Independent Samples T-test , Analysis of Variance- ANOVA), These tests are considered appropriate in the case show that the distribution of the data follow a normal distribution.

Testing paragraphs of each research variables about the average score equal to answer neutrality (degrees approval medium).

- **Null hypothesis:** test the average answer degree is equal to 3, which in conversely equal with "Agree" by the user Likert scale.
- **The alternative hypothesis:** The average score answer is not equal to 3

If the Sig.>0.05 (Sig. greater than 0.05), according to SPSS program results , it cannot reject the null hypothesis, so in this case the average views of respondents on the phenomenon under study does not differ materially from "Agree" which is 3 in Likert scale. On other hand, if the Sig.<0.05 (Sig. less than 0.05), that it can reject the null hypothesis, and accept the alternative hypothesis that the average views of respondents varies materially from the medium approval degree "Agree". So in this case, can determine if the average answer increases or decreases significantly than the degree of "Agree".

4.3.2 The Adoption of Cloud Computing Technology

This field is used to know in general to what extend can IUG adopt a new technology like Cloud Computing technology in its operations. So the T test is used to know if the mean of respondent degree reached to medium degree of agree, which it's 3 or not. The results are shown in the table (4.18).

- The mean of paragraph #5 “The university has high speed internet lines, and uninterrupted services” equals 4.09 (81.71%), Test-value = 9.41, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.
- The mean of paragraph #2 “Cloud Computing technology is an attractive economic option to the university” equals 3.76 (75.25%), Test-value = 7.02, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of the field "The Adoption of Cloud Computing Technology" equals 3.89 (77.77%), Test-value = 14.11, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of "The Adoption of Cloud Computing Technology ".

Table (4.18):Means and Test values for "The Adoption of Cloud Computing Technology"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Cloud Computing technology is an attractive technological option to the university.	**3.89**	**77.78**	**8.68**	**0.000***	**4**
2.	Cloud Computing technology is an attractive economic option to the university.	**3.76**	**75.25**	**7.02**	**0.000***	**9**
3.	The university Focuses on new IT system projects, which aim to increase the efficiency and quality of services provided for the beneficiaries.	**3.95**	**78.99**	**9.98**	**0.000***	**3**
4.	The university Focuses on new IT system projects, which aim to maintain competitive advantage.	**3.88**	**77.56**	**9.03**	**0.000***	**5**
5.	The university has high speed internet lines, and uninterrupted services.	**4.09**	**81.71**	**9.41**	**0.000***	**1**
6.	The university Focuses on new IT system projects, which aim to increase students satisfaction.	**3.81**	**76.30**	**9.26**	**0.000***	**6**
7.	The university Focuses on new IT system projects, which aim to increase employees satisfaction.	**3.77**	**75.31**	**9.03**	**0.000***	**8**
8.	The university Focuses on new IT system projects, which aim to increase data and information security.	**4.06**	**81.23**	**13.74**	**0.000***	**2**
9.	The adoption of Cloud Computing technology in IT operations will support the learning process.	**3.79**	**75.75**	**7.99**	**0.000***	**7**
	All paragraphs of the field	**3.89**	**77.77**	**14.11**	**0.000***	

* The mean is significantly different from 3

In general, the analysis result shows (77.77%) of the population agree in general about the idea of the adoption of Cloud Computing in IUG operations. From the researcher point of view that the population knows the benefits which will return to IUG in the Cloud Computing adoption

4.3.3 Top Management Support of The Adoption of Cloud Computing Technology

This field is used to know the top management support of the adoption of Cloud Computing technology in university's operations. So the T test is used to know if the mean of respondent degree reached to "Agree" medium degree of agree in Likert scale, which it's 3 or not. The results are shown in the table(4.19).

- The mean of paragraph #11 “The administration’s decision is wise in the use one of Cloud Computing applications (e.g. IUG Gmail) at the University” equals 3.84 (76.79%), Test-value = 8.96 and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of paragraph #9 “Top management provides the support and the needed requirements to adopt Cloud Computing technology” equals 2.73 (54.50%), Test-value = -2.51, and P-value = 0.007 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this paragraph is significantly smaller than the hypothesized value 3. We conclude that the respondents disagree to this paragraph.

- The mean of paragraphs #1,3,6,7,8 and10 is insignificantly different from 3, which P-value is greater than the level of significance $\alpha = 0.05$, so in this case the average views of respondents on the phenomenon under study does not differ materially from "Agree" which it's 3 in Likert scale. In the other hand, the mean of other paragraphs is significantly different from 3.

- The mean of the field “Top management support of the adoption of Cloud Computing technology” equals 3.16 (63.19%), Test-value = 2.13, and P-value=0.018 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of “Top management support of the adoption of Cloud Computing technology".

Table (4.19):Means and Test values for "Top management Support of The Adoption of Cloud Computing Technology"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Top management informed of ongoing developments of Cloud Computing technology and the importance of its use.	**3.10**	**61.95**	**0.85**	**0.199**	**7**
2.	Top management concerns to provide the staff with the needed trainings and skills for any new technology so as to keep up with development.	**3.28**	**65.61**	**2.89**	**0.002***	**4**
3.	Top management develops plans which are flexible enough to accommodate any changes required by the adoption of Cloud Computing technology.	**3.06**	**61.22**	**0.59**	**0.278**	**8**
4.	Top management supports the new technologies which serve the learning process, and the university students.	**3.51**	**70.24**	**5.87**	**0.000***	**3**
5.	Top management seeks to maintain competitive advantage through the adoption of new technologies, and its uses in its operations.	**3.52**	**70.37**	**5.78**	**0.000***	**2**
6.	There is a support from top management in IT field to adopt everything new in general, and the Cloud Computing technology in particular.	**3.14**	**62.72**	**1.33**	**0.094**	**6**
7.	Top Management has a future plan to adopt Cloud Computing, and its uses in IT operations	**2.78**	**55.56**	**-1.79**	**0.039***	**11**
8.	Top management has plans to get rid of obstacles that hinder the use of any new technology at the university in general, and Cloud Computing technology in particular.	**2.85**	**57.04**	**-1.56**	**0.061**	**9**
9.	Top management provides the support and the needed requirements to adopt Cloud Computing technology.	**2.73**	**54.50**	**-2.51**	**0.007***	**12**
10.	The adoption of Cloud Computing technology is included in Strategic Plan for IT Center.	**2.84**	**56.88**	**-1.38**	**0.085**	**10**
11.	The administration's decision is wise in the use one of Cloud Computing applications (e.g. IUG Gmail) at the University	**3.84**	**76.79**	**8.96**	**0.000***	**1**
12.	Top management supports a shift policy in all or some of the IT operations towards Cloud Computing technology.	**3.20**	**64.05**	**1.98**	**0.026***	**5**
	All paragraphs of the field	**3.16**	**63.19**	**2.13**	**0.018***	

* The mean is significantly different from 3

The analysis result shows that (63.19%) of the population members at IUG agreed but with low percent, about the top management support to adopt Cloud Computing Technology in IUG operations. This reveals that the top management are not completely aware of the benefits of Cloud Computing technology to IUG operations, that shows that there is no future or strategic plans to adopt Cloud Computing, however the most famous international university adopt this technology. So the adoption of Cloud Computing comes by top management support and encouragements, through financial support and provision of necessary requirements for the adoption.

This research is consistent with the findings of the research (Chinyao et al.,2011), Which concluded that the top management support is critical for creating a supportive climate and for providing adequate resources for the adoption of new technologies (Lin and Lee, 2005; Wang et al.,2010). As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation (Lee and Kim, 2007; Pyke, 2009). Top management plays an important role because Cloud Computing implementation may involve integration of resources and reengineering of processes. Moreover, some empirical studies have indicated that there is a positive relationship between top management support and adoption of new technology (Pan and Jang, 2008; Zhu et al., 2004).

4.3.4 Support and Integration of University Services with Cloud Computing

This field is used to know the Support and integration of university Services with Cloud Computing. So the T test is used to know if the mean of respondent degree reached to medium degree of agreement, whether it's 3 or not. The results are shown in the table (4.20):

- The mean of paragraph #12 “It’s possible to access to the services provided in the cloud from anywhere and any device” equals 4.09 (81.71%), Test-value = 12.71, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of paragraph #1 “The possibility of moving existing applications and services provided by IT Department at the university to the cloud” equals 3.28 (65.61%), Test-value = 2.33, and P-value = 0.011 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

Table (4.20):Means and Test values for "Support and Integration of University Services with Cloud Computing"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	The possibility of moving existing applications and services provided by IT Department at the university to the cloud.	**3.28**	**65.61**	**2.33**	**0.011***	**12**
2.	Systems, technological services and applications at the university are continuously updated to keep pace with technological development	**3.65**	**72.93**	**6.76**	**0.000***	**7**
3.	Technological services and applications at the university characterized by sufficient flexibility.	**3.46**	**69.27**	**4.71**	**0.000***	**10**
4.	The adoption of Cloud Computing technology at the University helps to activate new services.	**3.85**	**77.04**	**10.09**	**0.000***	**4**
5.	The adoption of Cloud Computing technology at the University helps to improve quality of its services.	**3.93**	**78.52**	**10.59**	**0.000***	**2**
6.	The adoption of Cloud Computing technology at the university helps in distinguishing the university in its provided services, which is different from that provided by other universities.	**3.91**	**78.29**	**8.02**	**0.000***	**3**
7.	The adoption of Cloud Computing technology at the university helps to improve the performance of currently university services.	**3.83**	**76.54**	**8.35**	**0.000***	**5**
8.	The transfer of e-mail service from the old system to one of Cloud Computing applications (Gmail) easily without suffering.	**3.60**	**72.05**	**5.72**	**0.000***	**9**
9.	The facilities of integration services and IT applications with the services provided by Cloud Computing (e.g. Gmail)	**3.76**	**75.12**	**8.15**	**0.000***	**6**
10.	Cloud Computing providers offer free services to students, to help them in the learning process by providing disk service to store and share data, e-mail and others.	**3.64**	**72.84**	**6.75**	**0.000***	**8**
11.	Cloud Computing provides working environment for students to conduct their scientific experiments that need special devices they cannot provide.	**3.38**	**67.56**	**3.55**	**0.000***	**11**
12.	It's possible to access to the services provided in the cloud from anywhere and any device.	**4.09**	**81.71**	**12.71**	**0.000***	**1**
	All paragraphs of the field	**3.69**	**73.90**	**10.58**	**0.000***	

* The mean is significantly different from 3

- The mean of the field “Support and Integration of University Services with Cloud Computing” equals 3.69 (73.90%), Test-value = 10.58, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of “Support and Integration of University Services with Cloud Computing ".

The analysis result shows (73.90%) of the population members at IUG agreed about the support and integration of university services with Cloud Computing. whereas this agreement come from the successful experiment that comes from transferring email service from old system (local server at IUG) to new system (Gmail service applied from Google Cloud).

This research is consistent with the findings of the research (Chinyao et al.,2011), Which concluded that the technology is recognized as compatible with work application systems, firms are usually likely to consider the adoption of new technology.

4.3.5 Skills of IT Human Resource

This field is used to know the Skills of IT staff at the university. So the T test is used to know if the mean of respondent degree reached to medium degree of agree, which it's 3 or not. The results are shown in the table (4.21):

- The mean of paragraph #12 “IT staff needs training in the Cloud Computing, especially in the (construction, development, deployment) cloud services” equals 3.95 (79.01%), Test-value = 12.45, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of paragraph #4 “The University provides training programs for employees relating to the new technologies (such as Cloud Computing Technology)” equals 2.76 (55.19%), Test-value = -1.92, and P-value = 0.029 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this paragraph is significantly smaller than the hypothesized value 3 . We conclude that the respondents disagree to this paragraph.

Table (4.21): Means and Test values for "Skills of IT Human Resource"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Cloud Computing technology helps on the development of IT staff abilities and skills .	**3.83**	**76.59**	**8.75**	**0.000***	**2**
2.	Training provided to staff in the field of IT enough, and makes them sophisticated and look forward to some extent to the latest technology.	**3.23**	**64.69**	**2.05**	**0.022***	**9**
3.	Cloud Computing technology helps on the development of the spirit of creativity and innovation.	**3.60**	**71.95**	**5.75**	**0.000***	**6**
4.	The University provides training programs for employees relating to the new technologies (such as Cloud Computing Technology).	**2.76**	**55.19**	**-1.92**	**0.029***	**12**
5.	IT staff realize the importance of the adopting of Cloud Computing at the university.	**3.58**	**71.65**	**5.07**	**0.000***	**7**
6.	IT Management staff continuously on the lookout for new technological developments (such as Cloud Computing Technology)	**3.64**	**72.75**	**6.52**	**0.000***	**4**
7.	The staff is sent to scientific missions to take advantage of technological developments surrounding.	**2.80**	**56.05**	**-1.54**	**0.064**	**11**
8.	The staff dissatisfaction and disability to change is one of the challenges that hinder the adoption of any new technology (such as Cloud Computing Technology).	**3.45**	**69.00**	**3.82**	**0.000***	**8**
9.	I do not need high effort to inquire or to identify any new technology such as Cloud Computing Technology.	**3.61**	**72.20**	**5.64**	**0.000***	**5**
10.	Technological developments encourage positive competition among staff to motivate them to serve the general interest of the institution.	**3.70**	**74.07**	**8.10**	**0.000***	**3**
11.	The university holds meetings, lectures and materials for the definition of human resources the importance and the use of Cloud Computing Technology.	**2.96**	**59.25**	**-0.31**	**0.380**	**10**
12.	IT staff needs training in the Cloud Computing, especially in the (construction, development, deployment) cloud services.	**3.95**	**79.01**	**12.45**	**0.000***	**1**
	All paragraphs of the field	**3.43**	**68.53**	**6.72**	**0.000***	

* The mean is significantly different from 3

- The mean of paragraphs #7 and 11 is insignificantly different from 3, which P-value is greater than the level of significance $\alpha = 0.05$, so in this case the average views of respondents on the phenomenon under study does not differ materially from "Agree" which it's 3 in Likert scale. In the other hand, the mean of other paragraphs is significantly different from 3.

- The mean of the field “Skills of IT staff at the university” equals 3.43 (68.53%), Test-value = 6.72, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of “Skills of IT staff at the university ".

The analysis result shows (68.53%) of the population members at IUG agreed but it's closed to number 3 in Likert scale "agree", there is skills in IT staff at the university to adopt Cloud Computing Technology . This less agreement is due to that the IUG doesn't provide training programs for employees or sending them to scientific missions about the new technologies (such as Cloud Computing Technology). also there is a little encouragement on competition among staff to motivate them to serve the general interest of the institution. In addition there is no enough aware among IT staff about this technology.

This research is consistent with the findings of the research (Angela et al.,2012), Which concluded that many IT professionals do not have an in-depth understanding of the cloud nor are they aware of its benefits to businesses.

4.3.6 Security Effectiveness in Adoption of Cloud Computing

This field is used to know the Security effectiveness in the adoption of Cloud Computing. So the T test is used to know if the mean of respondent degree reached to medium degree of agree, which it's 3 or not. The results are shown in the table (4.22):

- The mean of paragraph #1 “The data security is the biggest challenges facing the university to adopt any new technology” equals 4.43 (88.64%), Test-value = 17.81, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

Table (4.22):Means and Test values for "Security Effectiveness in Adoption of Cloud Computing"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	The data security is the biggest challenges facing the university to adopt any new technology	**4.43**	**88.64**	**17.81**	**0.000***	**1**
2.	We must know where the data is stored in the Cloud Computing	**3.78**	**75.61**	**6.42**	**0.000***	**6**
3.	The strength of data security depends on the strength of service provider in terms of security.	**4.15**	**82.96**	**13.04**	**0.000***	**2**
4.	It can be considered a contract agreement between the university and the service provider as a safety and reliability of the data.	**3.74**	**74.75**	**7.25**	**0.000***	**8**
5.	There is confidence in new technologies and the providers of these services (e.g. Google, Microsoft, Amazon, ...).	**3.36**	**67.25**	**3.10**	**0.001***	**12**
6.	The adoption and use of Cloud Computing Technology Lead to develop a plan to protect the security and confidentiality of the information.	**3.85**	**77.04**	**8.69**	**0.000***	**4**
7.	The confidence increases with companies Cloud Computing service providers in the event of clear agreements related to hacking and electronic security breaches.	**3.75**	**75.00**	**7.63**	**0.000***	**7**
8.	The Cloud Computing service provided by Google Inc., which is the e-mail service (Gmail) used in the university safer than the old system.	**3.49**	**69.88**	**4.55**	**0.000***	**10**
9.	The services and applications of Cloud Computing provided by service providers companies (e.g. Google, Amazon, Microsoft, ...) are difficult to hack and piracy	**3.41**	**68.10**	**3.88**	**0.000***	**11**
10.	The cloud for students is safer than traditional methods (flash, the device profile, ...) in putting their researches, reports and homework .	**3.63**	**72.66**	**5.41**	**0.000***	**9**
11.	The things that will help the university to overcome fears of safety is not put sensitive data or applications in the cloud	**3.79**	**75.75**	**7.31**	**0.000***	**5**
12.	The university could have a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data.	**3.95**	**79.01**	**11.07**	**0.000***	**3**
	All paragraphs of the field	**3.77**	**75.37**	**12.42**	**0.000***	

* The mean is significantly different from 3

- The mean of paragraph #5 “There is confidence in new technologies and the providers of these services (e.g. Google, Microsoft, Amazon, ...)” equals 3.36 (67.25%), Test-value = 3.10, and P-value = 0.001 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of the field “Security effectiveness in adoption of Cloud Computing” equals 3.77 (75.37%), Test-value = 12.42, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of “Security effectiveness in adoption of Cloud Computing ".

The analysis result shows that (75.37%) of the population members at IUG agreed about Security effectiveness in adoption of Cloud Computing is the biggest challenges and concerns facing the university. The analysis results reveal that there are agreement about two methods. The IUG will overcome this challenge, one of them through the IUG selection of the stronger service provider in terms of security to keep the strength of its data security. And the other methods is that the university could have a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications (email, moodel, …etc) and also from the Private Cloud to maintain the confidentiality and security of data (Registration and admission programs, financial programs,...etc).

This research is consistent with the findings of the research (Christian ,2011), Which concluded that the security issues are considered one of the main obstacles on the adoption of Cloud Computing. Nonetheless, several of these companies recognize that they lack of expertise in such a field of security.

4.3.7 Cost Reduction Through The Adoption of Cloud Computing

This field is used to know the Cost Reduction Through The Adoption of Cloud Computing. So the T test is used to know if the mean of respondent degree reached to medium degree of agreement, whether it's 3 or not. The results are shown in the table (4.23):

- The mean of paragraph #1 “The university focuses on modern IT system projects, which aim to reduce costs” equals 4.02 (80.49%), Test-value = 11.03, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

Table (4.23):Means and Test values for "Cost Reduction Through The Adoption of Cloud Computing"

NO	Paragraph	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	The university focuses on modern IT system projects, which aim to reduce costs**.**	**4.02**	**80.49**	**11.03**	**0.000***	**1**
2.	Transfer the operations and services of university to the cloud will reduce costs.	**3.87**	**77.32**	**11.22**	**0.000***	**4**
3.	The service of Cloud Computing provided by Google Inc., (e.g. an e-mail service - Gmail) at the University is less expensive than the old system**.**	**3.85**	**76.96**	**11.07**	**0.000***	**6**
4.	Many Cloud Computing service providers offer free services to higher education institutions.	**3.58**	**71.65**	**5.66**	**0.000***	**11**
5.	There are free services in the cloud help students to communicate with each other, save and share data and others**.**	**3.85**	**77.04**	**11.09**	**0.000***	**5**
6.	The Cloud Computing helps to reduce the expenses that go to buy hardware, servers, software or maintenance.	**3.98**	**79.51**	**11.25**	**0.000***	**3**
7.	The most important feature of Cloud Computing, is the ability to control costs by use.	**3.73**	**74.57**	**9.27**	**0.000***	**7**
8.	The most important feature of Cloud Computing, is getting rid of unnecessary costs (place - electricity - air ... etc.).	**4.01**	**80.24**	**13.56**	**0.000***	**2**
9.	The Cloud Computing Technology provides innovative university services without increasing the cost or the price of the service.	**3.68**	**73.58**	**8.47**	**0.000***	**8**
10.	The cloud provides the needs of lab such as(special specifications of high expensive computers , or scientific applications), which it needs to work for a few hours or days continuously to bring out the desired results.	**3.67**	**73.33**	**8.09**	**0.000***	**9**
11.	When to adopt Cloud Computing Technology, the cost is greatly reduced and capital expenditure is converted in the IT operations to ongoing expenses.	**3.60**	**72.10**	**7.76**	**0.000***	**10**
	All paragraphs of the field	**3.81**	**76.12**	**15.86**	**0.000***	

* The mean is significantly different from 3

- The mean of paragraph #4 “Many Cloud Computing service providers offer free services to higher education institutions” equals 3.58 (71.65%), Test-value = 5.66, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 3 . We conclude that the respondents agreed to this paragraph.

- The mean of the field “Cost Reduction Through The Adoption of Cloud Computing” equals 3.81 (76.12%), Test-value = 15.86, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3. We conclude that the respondents agreed to field of “Cost Reduction Through The Adoption of Cloud Computing ".

The analysis result shows that (76.12%) of the population members at IUG agreed about cost reduction through the adoption of Cloud Computing technology. The analysis results reveal that there are agreement about the most important feature of Cloud Computing which is getting rid of unnecessary costs (place - electricity - air ... etc.), and reducing the expenses that go to buy hardware, servers, software or maintenance. This lead to cost reduction when to adopt Cloud Computing.

Section 4

Analyzing Hypotheses

4.4.1 Introduction

4.4.2 First Main Hypothesis Test

4.4.3 Second Main Hypothesis Test

4.4.1 Introduction

In order to test the fields of research tool (questionnaire), and paragraphs analysis, parametric tests were used (One-sample T test, Independent Samples T-test , Analysis of Variance- ANOVA), These tests are considered appropriate in the case show that the distribution of the data follow a normal distribution.

There are two main hypotheses for this research:

4.4.2 First Main Hypothesis Test

The main hypothesis stated that there is a significant effect between independent variables (top management support, support and integration with university services ,skills of IT human resources, security effectiveness, cost reduction), and the adoption of Cloud Computing in IUG (at level of significance $\alpha = 0.05$).

By using Stepwise regression the following results were obtained: R Square = 0.572, this means 57.2% of the variation in the adoption of Cloud Computing in IUG is explained by " Support and integration of university services with the adoption of Cloud Computing and Top management support of the adoption of Cloud Computing technology ".

Table (4.24) shows the Analysis of Variance for the regression model. Sig. = 0.000, so there is a significant relationship between the dependent variable " adoption of Cloud Computing in IUG " and independent variables " Top management support of the adoption of Cloud Computing technology and Support and integration of university Services with Cloud Computing ".

Table (4.24): ANOVA for Regression

NO	Paragraph	Sum of Squares	Df	Mean Square	F	Sig.
1.	Regression	15.053	2	7.527	52.705	0.000
2.	Residual	11.282	79	0.143		
	Total	26.335	81			

Table (4.25) shows the regression coefficients and their P-values (Sig.). Based on the Standardized Coefficients, the significant independent variable is " Support and integration of university Services with Cloud Computing and Top management support of the adoption of Cloud Computing technology " .

The regression equation is:

The adoption of Cloud Computing in IUG = 1.183+ 0.491* (Support and integration of university Services with Cloud Computing) + 0.282* (Top management support of the adoption of Cloud Computing technology).

Table (4.25): The Regression Coefficients

NO	Paragraph	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1.	(Constant)	1.183	0.270		4.378	0.000
2.	Support and integration of university Services with Cloud Computing	0.491	0.086	0.512	5.699	0.000
3.	Top management support of the adoption of Cloud Computing technology	0.282	0.076	0.335	3.730	0.000

Test hypotheses about the relationship between two variables of the research variables

- **Null hypothesis:** There is no statistically significant relationship between two variables of the research variables.
- **The alternative hypothesis:** There is statistically significant relationship between two variables of the research variables.

If the Sig.(P-Value) > 0.05 (Sig. greater than 0.05), (according to SPSS program results), that It cannot reject the null hypothesis, so in this case there is no statistically significant relationship between two variables of the research variables. On other hand, if the Sig.(P-Value) <0.05 (Sig. less than 0.05), that it can reject the null hypothesis, and accept the alternative hypothesis that there is statistically significant relationship between two variables of the research variables.

From this main hypothesis the following sub hypotheses result:

a)There is a statistical relation between top management support and the adoption of Cloud Computing (at level of significance α= 0.05).

Table (4.26) shows that the correlation coefficient between top management support and the adoption of Cloud Computing equals 0.629 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α =

0.05. We conclude there exists a significant relationship between Top management support and the adoption of Cloud Computing.

This research is consistent with the findings of the research (Chinyao et al.,2011)

Table (4.26):Correlation coefficient between Top management support and the adoption of Cloud Computing

Hypothesis	Pearson Correlation	P-Value (Sig.)
There is a statistical relation between Top management support and Cloud Computing Adoption.	**0.629**	**0.000***

* Correlation is statistically significant at 0.05 level

b) There is a statistical significant relation between support and integration with University Services and the adoption of Cloud Computing (at level of significance α= 0.05).

Table (4.27) shows that the correlation coefficient between support and integration with university services and the adoption of Cloud Computing equals .704 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05. We conclude there exists a significant relationship between support and integration with university services and the adoption of Cloud Computing.

This research is consistent with the findings of the research (Chinyao et al.,2011).

Table (4.27):Correlation coefficient between support and integration with university services and the adoption of Cloud Computing .

Hypothesis	Pearson Correlation Coefficient	P-Value (Sig.)
There is a statistical relation between support and integration with University Services and Cloud Computing Adoption	**0.704**	**0.000***

* Correlation is statistically significant at 0.05 level

c) There is a statistical significant relation between skills of IT human resources and the adoption of Cloud Computing (at level of significance α= 0.05).

Table (4.28) shows that the correlation coefficient between skills of IT human resources and the adoption of Cloud Computing equals .543 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05. We conclude there exists a significant relationship between skills of IT human resources and the adoption of Cloud Computing.

This research is consistent with the findings of the research (Angela et al.,2012).

Table (4.28):Correlation coefficient between skills of IT human resources and the adoption of Cloud Computing

Hypothesis	Pearson Correlation Coefficient	P-Value (Sig.)
There is a statistical relation between Security effectiveness and Cloud Computing Adoption	**0.543**	**0.000***

* Correlation is statistically significant at 0.05 level

d) There is a statistical significant relation between security effectiveness and the adoption of Cloud Computing (at level of significance α= 0.05).

Table (4.29) shows that the correlation coefficient between security effectiveness and the adoption of Cloud Computing equals .445 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05. We conclude there exists a significant relationship between security effectiveness and the adoption of Cloud Computing.

This research is consistent with the findings of the research (Christian ,2011).

Table (4.29):Correlation coefficient between security effectiveness and the adoption of Cloud Computing

Hypothesis	Pearson Correlation Coefficient	P-Value (Sig.)
There is a statistical relation between security effectiveness and Cloud Computing Adoption	**0.445**	**0.000***

* Correlation is statistically significant at 0.05 level

e) There is a statistical significant relation between cost reduction and the adoption of Cloud Computing (at level of significance α= 0.05).

Table (4.30) shows that the correlation coefficient between cost reduction and the adoption of Cloud Computing equals .427 and the p-value (Sig.) equals 0.000. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05. We conclude there exists a significant relationship between cost reduction and the adoption of Cloud Computing.

Table(4.30) : Correlation coefficient between cost reduction and the adoption of Cloud Computing

Hypothesis	Pearson Correlation Coefficient	P-Value (Sig.)
There is a statistical relation between cost reduction and Cloud Computing Adoption.	**0.427**	**0.000***

* Correlation is statistically significant at 0.05 level

4.4.3 Second Main Hypothesis Test

There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to personal traits (Gender, Age, Qualifications, Years of Experience in IT, Job Title and Department).

f) There are significant differences among respondents at (α= 0.05) towards the adoption of Cloud Computing & its concerns and challenges observed by IUG due to (Gender).

Table (4.31) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the fields "Top management support of the Cloud Computing technology and Security effectiveness in adoption of Cloud Computing", then this is significant difference among the respondents regarding to this field due to Gender. We conclude that the respondents' Gender has significant effect on these fields. Female respondents have more than Male respondents.

Table (4.31) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to these fields due to Gender. We conclude that the respondents' Gender has no effect on these fields.

Table (4.31):Independent Populations T-test of the fields and their p-values for Gender

No.	Field	Test Value	Sig.	Means	
				Male	Femal
1.	The Adoption of Cloud Computing Technology	**-0.124**	**0.902**	**3.89**	**3.91**
2.	Top management support of the Cloud Computing technology	**-2.122**	**0.037***	**3.10**	**3.53**
3.	Support and integration of university Services with Cloud Computing	**-0.872**	**0.386**	**3.67**	**3.83**
4.	Skills of IT staff at the university	**-1.532**	**0.129**	**3.39**	**3.66**
5.	Security effectiveness in adoption of Cloud Computing	**-2.823**	**0.006***	**3.70**	**4.17**
6.	Cost Reduction Through The Adoption of Cloud Computing	**-1.149**	**0.254**	**3.78**	**3.95**
	All fields	**-1.855**	**0.067**	**3.57**	**3.84**

* Means differences are significant at α = 0.05

g) There are significant differences among respondents at (α= 0.05) towards the adoption of Cloud Computing & its concerns and challenges observed by IUG due to Age.

Table (4.32) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for each field, then there is insignificant difference in respondents' answers toward each field due to Age. We conclude that the characteristic of the respondents age has no effect on each field.

The results indicate the absence of the effect of age on the research's hypotheses; It seems logical from the researcher's point of view that the Cloud Computing is new technology, which is targeting all different age categories, so it is not a condition the age must be older or younger to affect on concerns and challenges of the adoption of Cloud Computing technology.

Table (4.32):ANOVA test of the fields and their p-values for Age

No.	Field	Test Value	Sig.	Means		
				Below 30 years	From 30 – below40 years	40years and Above
1.	The Adoption of Cloud Computing Technology	**0.650**	**0.525**	**3.81**	**3.98**	**3.89**
2.	Top management support of the adoption of Cloud Computing technology	**0.435**	**0.649**	**3.20**	**3.20**	**3.04**
3.	Support and integration of university Services with Cloud Computing	**0.165**	**0.849**	**3.68**	**3.75**	**3.65**
4.	Skills of IT staff at the university	**2.238**	**0.113**	**3.55**	**3.44**	**3.22**
5.	Security effectiveness in the adoption of Cloud Computing	**2.403**	**0.097**	**3.86**	**3.83**	**3.54**
6.	Cost Reduction Through The Adoption of Cloud Computing	**0.846**	**0.433**	**3.84**	**3.85**	**3.69**
	All fields	**1.041**	**0.358**	**3.65**	**3.66**	**3.49**

h) There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Qualifications.

Table (4.33) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the fields "Top management support of the adoption of Cloud Computing technology, Skills of IT staff at the university and security effectiveness of the adoption of Cloud Computing ", then this is significant difference among the respondents regarding to this field due to Qualifications. We conclude that the respondents' qualifications has significant effect on these fields. Bachelor respondents have the higher than other qualifications group. This is due to that the majority of Bachelor holders work in administrative fields in IT administrative affairs, which it is the center of technology in IUG.

Table (3.33) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to these fields due to qualifications. We conclude that the respondents' qualifications has no effect on these fields.

The existence of this result is due to the employees who obtained a bachelor's degree, most of them are young. They grew up on the use of information technology in general and computer applications and software in particular.

Table (4.33):ANOVA test of the fields and their p-values for Qualifications

No.	Field	Test Value	Sig.	Means		
				Bachelor	Master	P.H.D
1.	The Adoption of Cloud Computing Technology	**1.721**	**0.186**	**3.93**	**3.93**	**3.58**
2.	Top management support of the adoption of Cloud Computing technology	**3.574**	**0.033***	**3.24**	**3.20**	**2.64**
3.	Support and integration of university Services with Cloud Computing	**1.344**	**0.267**	**3.73**	**3.75**	**3.41**
4.	Skills of IT staff at the university	**5.785**	**0.005***	**3.48**	**3.55**	**2.88**
5.	Security effectiveness in adoption of Cloud Computing	**3.983**	**0.022***	**3.85**	**3.78**	**3.33**
6.	Cost Reduction Through The Adoption of Cloud Computing	**0.995**	**0.374**	**3.84**	**3.81**	**3.62**
	All fields	**4.419**	**0.015***	**3.67**	**3.66**	**3.22**

* Means differences are significant at α = 0.05

i) There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Type of Position.

Table (4.34) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for each field, then there is insignificant difference in respondents' answers toward each field due to Type of Position. We conclude that the characteristic of the respondents Type of Position has no effect on each field.

The results indicate the absence of the effect of job title on the research's hypotheses; so the existence of this result is because the Cloud Computing is new technology. That's targeting all different types of positions (academy or administrative), for academy staff, the IT College began to teach the Cloud Computing as course to their students, on the other hand for administrative staff, their administration gives them intensive training courses about everything new in IT field. It seems logical from the researcher's point of view that type of position does not affect the concerns and challenges of the adoption of Cloud Computing technology.

Table (4.34):ANOVA test of the fields and their p-values for Type of Position

No.	Field	Test Value	Sig.	Means		
				Administrative	Academy with administrative position	Academy
1.	The Adoption of Cloud Computing Technology	**2.097**	**0.130**	**3.98**	**3.94**	**3.70**
2.	Top management support of the adoption of Cloud Computing technology	**0.070**	**0.932**	**3.15**	**3.08**	**3.19**
3.	Support and integration of university Services with Cloud Computing	**0.066**	**0.936**	**3.71**	**3.63**	**3.68**
4.	Skills of IT staff at the university	**0.278**	**0.758**	**3.46**	**3.28**	**3.40**
5.	Security effectiveness in adoption of Cloud Computing	**0.606**	**0.548**	**3.80**	**3.53**	**3.77**
6.	Cost Reduction Through The Adoption of Cloud Computing	**0.019**	**0.981**	**3.81**	**3.77**	**3.80**
	All fields	**0.238**	**0.789**	**3.64**	**3.52**	**3.58**

j) There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Position.

Table (4.35) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for each field, then there is insignificant difference in respondents' answers toward each field due to Position. We conclude that the characteristic of the respondents Position has no effect on each field.

The existence of this result is because that there is no difference in various positions for the staff about the concerns and challenges about adoption of Cloud Computing at IUG. that mean all categories have the same vision about the Cloud Computing Technology, and that the Cloud Computing is new technology.

Table(4.35) : ANOVA test of the fields and their p-values for Position

No.	Field	Test Value	Sig.	Means					
				Head of Dep	Dean and Vice Dean	Lecturer	Engineer	Programmer	Other
1.	The Adoption of Cloud Computing Technology	**1.033**	**0.405**	**3.87**	**4.14**	**3.72**	**3.81**	**3.80**	**4.01**
2.	Top management support of the adoption of Cloud Computing technology	**0.875**	**0.502**	**3.00**	**3.33**	**3.11**	**3.01**	**3.02**	**3.38**
3.	Support and integration of university Services with Cloud Computing	**0.453**	**0.810**	**3.72**	**3.70**	**3.73**	**3.66**	**3.45**	**3.79**
4.	Skills of IT staff at the university	**0.691**	**0.632**	**3.31**	**3.54**	**3.37**	**3.48**	**3.22**	**3.56**
5.	Security effectiveness in adoption of Cloud Computing	**0.473**	**0.795**	**3.73**	**3.65**	**3.77**	**3.75**	**3.66**	**3.93**
6.	Cost Reduction Through The Adoption of Cloud	**0.328**	**0.895**	**3.86**	**3.75**	**3.83**	**3.77**	**3.68**	**3.88**
	All fields	**0.592**	**0.706**	**3.57**	**3.66**	**3.58**	**3.57**	**3.46**	**3.74**

k) There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Years of Experience.

Table (4.36) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the field "Skills of IT staff at the university", then this is significant difference among the respondents regarding to this field due to Years of Experience. We conclude that the respondents' Years of Experience has significant effect on this field. Less than 5 year respondents have the higher than other Years of Experience group. This is due to that 46.3% of the population have experience less than 5 years, which this is make this result logical

Table (4.36) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to these fields due to Years of Experience. We conclude that the respondents' Years of Experience has no effect on these fields.

The results indicate the absence of the effect of years of experience on the research's hypotheses; It seems logical from the researcher's point of view, because this technology is new and targeting all staff in different categories experience years .so it does not depend on the number of experience years in the job.

Table (4.36):ANOVA test of the fields and their p-values for Years of Experience

No.	Field	Test Value	Sig.	Means		
				Less than 5 years	5 – Less than 10 years	15 years and above
1.	The Adoption of Cloud Computing Technology	**0.548**	**0.580**	**3.84**	**3.86**	**3.99**
2.	Top management support of the adoption of Cloud Computing technology	**2.324**	**0.105**	**3.31**	**2.91**	**3.12**
3.	Support and integration of university Services with Cloud Computing	**0.690**	**0.505**	**3.70**	**3.57**	**3.78**
4.	Skills of IT staff at the university	**3.348**	**0.040***	**3.59**	**3.21**	**3.35**
5.	Security effectiveness in adoption of Cloud Computing	**1.164**	**0.317**	**3.87**	**3.67**	**3.69**
6.	Cost Reduction Through The Adoption of Cloud Computing	**0.169**	**0.845**	**3.82**	**3.83**	**3.76**
	All fields	**1.189**	**0.310**	**3.68**	**3.48**	**3.60**

* Means differences are significant at α = 0.05

Chapter 5

Results, Recommendations, and Future Studies.

Section 1: Research Results.

Section 2: Recommendations.

Section 3: Future Research.

Introduction:

The aims of this research are to recognize the concerns and challenges of the adoption of Cloud Computing technology at IUG operations, and to measure the effects of the top management support, support and integration with university services, skills of IT human resources, security effectiveness, and cost reduction. As well as to measure the effects of the demographic factors such as gender, age, qualifications, type of position, position, years of experience.

The findings of applied and field study were obtained through collected questionnaires field study, unloading operations, conduct appropriate statistical hypothesis testing, and extraction and presentation of results. Then make the necessary recommendations and suggestions that would help IUG to take advantage of Cloud Computing Technology to improve and develop their organizations. Finally, setting of proposals for future studies that could be conducted.

5.1 Research Results

Through the results of the statistical analysis of the respondents views, the most important findings of this study could be summarize as following:

5.1.1 Research Variables

A. With regard to "The adoption of Cloud Computing Technology at IUG" .

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

1. There is (81.71%) of the respondents see that the university has high speed internet lines, and uninterrupted services, which is the one of the concerns to adopt Cloud Computing.
2. The university focuses on new IT system projects, where there is an approval by (81.23%) of respondents that these projects aim to increase data and information security. On other hand, there is (78.99%) of respondents expressed that these projects aim to increase the efficiency and quality of services provided for the beneficiaries. And (77.56%) of respondents said that these projects aim to maintain competitive advantage.
3. There is (78.99%) of respondents assure that the Cloud Computing technology is an attractive technological option to the university. In addition, there is (75.25%) of the respondents see that the Cloud Computing technology is an attractive economic option to the university.

4. Also there is (76.30%) of respondents see that these projects aim to increase students satisfaction. In addition, (75.31%) of respondents said that these projects aim to increase employees satisfaction.
5. In general, there is (77.77%) of respondents see that IUG can adopt the idea of the Cloud Computing technology.

B. With regard to " Top Management Support the adoption of Cloud Computing Technology " .

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

1. There is (76.79%) of the respondents see that the administration's decision is wise in the use one of Cloud Computing applications (e.g. IUG Gmail) at the University.
2. There is (70.37%) of respondents view that top management seeks to maintain competitive advantage through the adoption of new technologies, and its uses in its operations.
3. There is an approval between (70.24%) of respondents that the top management supports the new technologies which serve the learning process, and the university students.
4. There is a disapproval among (57.04%) of respondents that the top management has plans to get rid of obstacles that hinder the use of any new technology at the university in general, and Cloud Computing technology in particular. In addition, there is (56.88%) of respondents don't see that the adoption of Cloud Computing technology is included in Strategic Plan for IT Center.
5. There is a disagreement among (54.50%) of respondents that the top management provides the support and the needed requirements to adopt Cloud Computing technology.
6. In general, there is a medium approval among (63.16%) of respondents that the top management support the adoption of Cloud Computing Technology.

C. With regard to " Support and integration of university Services with Cloud Computing Technology" .

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

1. There is (81.71%) of the respondents see that It's possible to access to the services provided in the cloud from anywhere and any device.

2. The adoption of Cloud Computing technology at the University helps to improve the quality of its services and there is (78.52%) of respondents support this. On other hand, there is (78.29%) of respondents voiced that it helps in distinguishing the university in its provided services, which are different from that provided by the other universities. In addition, there is (77.04%) of respondents see that it helps to activate new services.

3. There is an approval among (75.12%) of respondents on the facilities of integration services and IT applications with the services provided by Cloud Computing (e.g. Gmail). On the other side, there is (72.84%) of respondents who agree that the Cloud Computing providers offer free services to students, to help them in the learning process by providing disk service to store and share data, e-mail and others.

4. In general, there is (73.90%) of respondents see that the university can support and integrate of its Services with Cloud Computing Technology.

D. With regard to " Skills of IT staff at the university to adopt Cloud Computing Technology " .

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

1. There is (79.01%) of the respondents see that the IT staff needs training in the Cloud Computing, especially in the (construction, development, deployment) cloud services..

2. As voiced, (74.07%) of respondents view that the technological developments encourage positive competition among staff to motivate them to serve the general interest of the institution.

3. In addition, there is (71.95%) of the respondents see that IT administrative staff are continuously on the lookout for new technological developments (such as Cloud Computing Technology). On the other hand, (78.99%) of respondents express that the Cloud Computing technology helps on the development of the spirit of creativity and innovation.

4. Also There is a disapproval among (56.05%) of respondents that the staff is sent to scientific missions to take advantage of technological developments surrounding. In addition, there is (55.01%) of respondents don't see that the the university provides training programs for employees relating to the new technologies (such as Cloud Computing Technology).

5. In general, there is a medium approval of (68.53%) of respondents that the IT staff at the university has skills to adopt Cloud Computing technology .

E. With regard to " Security effectiveness in the adoption of Cloud Computing " .

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

1. There is (88.64%) of the respondents see that the The data security is the biggest challenge facing the university to adopt any new technology.
2. As voiced, (82.96%) of respondents see that the The strength of data security depends on the strength of service provider in terms of security. On the other hand, there is (79.01%) of the respondents see that the university could have a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data. Also, there is (79.01%) of the respondents support the idea that things which will help the university to overcome fears of safety is not put sensitive data or applications in the cloud.
3. In addition, there is (77.04%) of the respondents see that the adoption and use of Cloud Computing Technology Lead to develop a plan to protect the security and confidentiality of the information.
4. There is (75.61%) of respondents who express that we must know where the data is stored in the Cloud Computing. On the other side, there is (75%) of the respondents see that the confidence increases with companies from Cloud Computing service providers in the event of clear agreements related to hacking and electronic security breaches.
5. In general, there is an approval among (75.37%) of respondents that there is security effectiveness in the adoption of Cloud Computing.

F. With regard to "Cost reduction through the adoption of Cloud Computing technology"

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

1. There is (80.49%) of the respondents see that the university focuses on modern IT system projects, which aim to reduce costs.
2. As voiced, (80.24%) of respondents agree that the most important feature of Cloud Computing is getting rid of unnecessary costs (place- electricity- air…etc)

3. There is an approval between (79.51%) of respondents that the Cloud Computing helps to reduce the expenses that go to buy hardware, servers, software or maintenance.
4. There is (77.32%) of the respondents see that the transfer of the operations and services of university to the cloud will reduce costs.
5. There is a disapproval among (77.04%) of respondents that the Cloud Computing helps to reduce the expenses of buying hardware, servers, software or maintenance. In addition, (76.96%) of respondents don't see that the the service of Cloud Computing provided by Google Inc., (e.g. an e-mail service - Gmail) at the University is less expensive than the old system.
6. In general, there is an approval among (76.12%) of respondents that there is cost reduction through the adoption of Cloud Computing technology.

5.1.2 Relation of Research Variables

A. There is a significant effect between independent variables (top management support, support and integration with university services ,skills of IT human resources, security effectiveness, cost reduction), and the adoption of Cloud Computing in IUG (at level of significance α= 0.05).

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

1. There is a statistical relation between Top management support and Cloud Computing Adoption (at the level of significance α= 0.05).
2. There is a statistical significant relation between support and integration with University Services and the adoption of Cloud Computing (at the level of significance α= 0.05).
3. There is a statistical significant relation between skills of IT human resources and the adoption of Cloud Computing (at the level of significance α= 0.05).
4. There is a statistical significant relation between security effectiveness and the adoption of Cloud Computing (at the level of significance α= 0.05).
5. There is a statistical significant relation between cost reduction and the adoption of Cloud Computing (at the level of significance α= 0.05).

B. There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to personal traits (Gender, Age, Qualifications, Type of Position, Position and Years of Experience in IT).

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

1. There are insignificant differences among respondents at (α= 0.05) towards the Concerns and Challenges of the Adoption of Cloud Computing at IUG due to (Gender).
2. There are insignificant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Age.
3. There are significant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Qualifications.
4. There are insignificant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Type of Position.
5. There are insignificant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Position.
6. There are insignificant differences among respondents at (α= 0.05) towards the Cloud Computing & its concerns and challenges observed by IUG due to Years of Experience.

5.2 Recommendations:

Based on previous results reached by the researcher during the field study and statistical analysis, which revealed that there are concerns and challenges from the adoption of Cloud Computing technology at IUG; however, there are some of the recommendations can be formulated to adopt Cloud Computing technology at IUG operations, as the following:

1. The university should adopt Cloud Computing technology in its operations, which it is an attractive technological and economic option to the university.
2. Adopting the Cloud Computing if necessary for a while, for example when the students start to register their courses by using IUG website at the beginning of semester, the university website becomes slow, so to overcome this challenge by

adopting Cloud Computing in this crowded time.

3. The top management should be informed of ongoing developments of Cloud Computing technology and the importance of its use.
4. The top management should develop plans which are flexible enough to accommodate any changes required by the adoption of Cloud Computing technology.
5. The top management should support IT field by adopting everything new like Cloud Computing technology. Just to enhance its competitive advantage among other university
6. Top Management should have a future plan to adopt Cloud Computing, and its uses in IT operations.
7. It's necessary for the top management to have plans to get rid of obstacles that hinder the use of any new technology at the university in general, and Cloud Computing technology in particular.
8. It's necessary for top management to provide the support and the needed requirements to adopt Cloud Computing technology.
9. The adoption of Cloud Computing technology should be included in strategic plan for IT administrative affair.
10. The University should provide training programs, relating to Cloud Computing technology for employees.
11. It's necessary to send the IT staff to scientific missions to take advantage of technological developments surrounding like Cloud Computing technology.
12. The university should hold meetings, lectures and materials to IT staff at IUG about the definition, the importance and the use of Cloud Computing Technology.
13. The university can put non-sensitive data or applications in public cloud just to overcome fears of security.
14. The university can create a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data.
15. Promoting the administrative affairs Information Technology to attract staff with expertise and high efficiency

5.3 Future Research:

The researcher felt that there is a rare research about the Cloud Computing technology in the Arab world in general and Palestine in particular, this is because the Cloud Computing is a new topic in the IT field. So the door is open for more academic research about this technology. The researcher suggested the following topics which may provide good research ideas:

1. Conduct a study to measure the effects Cloud Computing technology has on the education process.
2. Conduct a study to measure the effects Cloud Computing technology has on the Electronic Management.
3. Conduct a study to measure the effects Cloud Computing technology has on the Enterprise Resource Planning (ERP)
4. Conduct a study to measure the effects Cloud Computing technology has on the reengineering process
5. Conduct a study to create a prototype of using Cloud Computing technology in e-government.
6. Conduct a study about the roadmap for the adoption of cloud computing in education process.
7. Conduct a study about the monitoring and tracking all universities activities through using Cloud Computing by Ministry of Higher Education .
8. Conduct a study about the adoption of Mobile Cloud Computing in Learning Process and its effects on students activities.

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Appendices

Appendix A

Questionnaire

(Arabic Version)

الجامعة الإسلامية– غزة
الدراســات العليــا
كليــة التجــارة
قسم إدارة الأعمــال

السادة/ ..... المحترمون

تحية طيبة وبعد:

يضع الباحث بين أيديكم هذا الاستبيان المعد لجمع البيانات حول دراسة بعنوان:

" ***The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges***

(Case Study on Islamic University of Gaza "IUG")."

وهذه الدراسة هي متطلب استكمالا للحصول على درجة الماجستير في إدارة الأعمال.

كلي أمل بكم في التعاون وتقديم المعلومات التي تساعد في إتمام هذه الدراسة, الذي نهدف من خلالها توضيح مامدى تبني الجامعة الاسلامية لتقنية الحوسبة السحابية (Cloud Computing) ومعرفة المخاطر والتحديات, مما يساهم بالارتقاء بالجامعة إلى المستوى العلمي المتميز والأداء المطلوب.

ونظراً لما تتمتعون به من خبرة ومهنية في مجال عملكم, وبحكم موقعكم الوظيفي المتعلق بموضوع الرسالة, فإن الباحث يرجوكم بالتكرم والاطلاع على فقرات هذا الاستبيان بعناية وإجابة جميع أسئلته بموضوعية ومهنية عالية, علما أن المعلومات التي سوف تدلون بها سوف تستخدم لأغراض البحث العلمي فقط.

وتفضلوا بقبول وافر الاحترام والتقدير

الباحث

م. أحمد جميل منصور

☒ تعريف الحوسبة السحابية (Cloud Computing)

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

☒ متغيرات الدراسة:

المتغير التابع

- تبني الحوسبة السحابية

المتغيرات المستقلة

- دعم الادارة العليا
- تكامل ودعم الخدمات الجامعية
- مهارات موظفين تكنولوجيا المعلومات في الجامعة
- فعالية الامان في الحوسبة السحابية
- تخفيض التكاليف

الإستبانة

أولا/ البيانات الشخصية والوظيفية:

يرجى التكرم بوضع إشارة (√) أمام الإجابة المناسبة.

1. الجنس ☐ ذكر ☐ أنثى

2. المؤهل العلمي

☐ بكالوريوس ☐ ماجستير ☐ دكتوراه

3. العمر

☐ أقل من 30 سنة ☐ من 30– اقل من 40 ☐ من 40 – اقل من 50 ☐ 50 سنة فأكثر

4. نوع الوظيفة

☐ إداري ☐ أكاديمي ذو منصب إداري ☐ أكاديمي

5. المسمى الوظيفي

☐ عميد (كلية / عمادة) ☐ نائب عميد ☐ مبرمج ☐ رئيس قسم

☐ مدير ☐ مساعد مدير ☐ محاضر ☐ مهندس

☐ غير ذلك، حدد.....

6. سنوات الخبرة

☐ أقل من 5 سنوات ☐ من5– اقل من 10 سنوات ☐ من10– اقل من 15 سنه ☐أكثر من 15 سنه

	الفقرات	درجة الموافقة				
		موافق بدرجة كبيرة جداً	موافق بدرجة كبيرة	موافق بدرجة متوسطة	موافق بدرجة قليلة	موافق بدرجة قليلة جداً
القسم الاول						
تبني الحوسبة السحابية (Cloud Computing)						
1	تعتبر تقنية الحوسبة السحابية بالنسبة للجامعة خيارا تكنولوجيا جذابا					
2	تعتبر تقنية الحوسبة السحابية بالنسبة للجامعة خيارا اقتصاديا جذابا					
3	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى زيادة كفاءة وجودة الخدمات التي تقدمها للمستفدين					
4	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى المحافظة على الميزة التنافسية					
5	يتوفر في الجامعة خطوط انترنت عالية السرعة، وخدماتها غير متقطعة					
6	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى زيادة رضى الطلاب					
7	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى زيادة رضى الموظفين					
8	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى زيادة حماية المعلومات والبيانات					
9	تبني تقنية الحوسبة السحابية في عمليات تكنولوجيا المعلومات سوف يدعم العملية التعليمية					
القسم الثاني						
اولا / دعم الادارة العليا في تبني الحوسبة السحابية (Cloud Computing)						
1	الادارة العليا على اطلاع مستمر بالتطورات التقنية للحوسبة السحابية وأهمية استخدامها					
2	تهتم الادارة العليا بتزويد العاملين بالتدريب والمهارات اللازمة لاي تقنية جديدة لمواكبة التطور					
3	تضع الادارة العليا خطط تتسم بالمرونة الكافية لاستيعاب أي تغيرات تتطلبها تبني تقنية الحوسبة السحابية					
4	تدعم الادارة العليا التقنيات الحديثة التي تخدم العملية التعليمية، وايضا تخدم الطلبة في الجامعة					
5	تسعى الادارة العليا في المحافظة على الميزة التنافسية من خلال تبني التقنيات الحديثة واستخدامها ضمن عملياتها					
6	يوجد دعم من الادارة العليا في مجال تكنولوجيا المعلومات لتبني كل ماهو جديد مثل تقنية الحوسبة السحابية.					
7	يوجد خطة مستقبلية لدى الادارة العليا لتبني الحوسبة السحابية واستخدامها في عمليات تكنولوجيا المعلومات					
8	الادارة العليا لديها خطط علاجية للتخلص من العقبات التي تعيق استخدام أي تقنية جديدة مثل تقنية الحوسبة السحابية.					

	الفقرات	درجة الموافقة				
		موافق بدرجة كبيرة جداً	موافق بدرجة كبيرة	موافق بدرجة متوسطة	موافق بدرجة قليلة	موافق بدرجة قليلة جداً
9	توفر الادارة العليا الدعم والمتطلبات اللازمة لتبني تقنية الحوسبة السحابية					
10	تبني تقنية الحوسبة السحابية مدرجة ضمن الخطة الاستراتيجية لمركز تكنولوجيا المعلومات					
11	يعتبر قرار الادارة حكيما في استخدام احد تطبيقات الحوسبة السحابية (مثلا البريد الالكتروني Gmail) في الجامعة					
12	تدعم الادارة العليا سياسة التحول في كل او بعض عمليات تكنولوجيا المعلومات نحو تقنية الحوسبة السحابية					
ثانيا/ تكامل ودعم الخدمات الجامعية مع الحوسبة السحابية (Cloud Computing)						
1	امكانية نقل الخدمات والتطبيقات الحالية التي تقدمها ادارة تكنولوجيا المعلومات في الجامعة الى السحابة					
2	يتم تحديث النظم والخدمات والتطبيقات التكنولوجية في الجامعة بصورة مستمرة لمواكبة التطور التكنولوجي					
3	تتسم الخدمات والتطبيقات التكنولوجية بالجامعة بالمرونة الكافية					
4	يساعد تبني تقنية الحوسبة السحابية في الجامعة على تفعيل خدمات جديدة					
5	يساعد تبني تقنية الحوسبة السحابية في الجامعة على تحسين جودة خدمات الجامعة					
6	يساعد تبني تقنية الحوسبة السحابية في الجامعة بتميز الجامعة في الخدمة المقدمة والتي تختلف عما تقدمه الجامعات الأخرى.					
7	يساعد تبني تقنية الحوسبة السحابية في الجامعة على تحسين اداء الخدمات الجامعية الحالية					
8	تم نقل خدمة البريد الالكتروني من النظام القديم الى احد تطبيقات الحوسبة السحابية وهو البريد الالكتروني الخاص بشركة جوجول Gmail بسهولة دون معاناه					
9	سهولة تكامل خدمات وتطبيقات تكنولوجيا المعلومات في الجامعة مع الخدمات التي تقدمها الحوسبة السحابية (مثال البريد الالكتروني Gmail)					
10	يقدم مزودي الحوسبة السحابية خدمات مجانية للطلبة، لتساعدهم في العملية التعليمية من خلال توفير خدمة القرص لتخزين البيانات ومشاركتها والبريد الالكتروني وغيرها					
11	توفر الحوسبة السحابية بيئة عمل للطلبة لاجراء تجاربهم العلمية التي تحتاج منهم لأجهزة بمواصفات خاصة ليس باستطاعتهم توفيرها					
12	بالامكان الوصول الى الخدمات المقدمة في السحابة من أي مكان ومن أي جهاز					
ثالثاً / مهارات موظفين تكنولوجيا المعلومات في الجامعة						
1	تساعد التقنيات الحديثة مثل تقنية الحوسبة السحابية بتطوير قدرات ومهارات موظفي تكنولوجيا المعلومات					
2	التدريب المقدم للعاملين في مجال تكنولوجيا المعلومات كاف، ويجعلهم متطورين ومتطلعين الى حد ما الى اخر ما توصلت اليه التكنولوجيا					

	الفقرات	درجة الموافقة				
		موافق بدرجة كبيرة جداً	موافق بدرجة كبيرة	موافق بدرجة متوسطة	موافق بدرجة قليلة	موافق بدرجة قليلة جداً
3	تساعد تبني التقنيات الحديثة بشكل عام وتقنية الحوسبة السحابية بشكل خاص على تنمية روح الابداع والابتكار					
4	توفر الجامعة البرامج التدريبية للموظفين في الامور المتعلقة بالتقنيات الحديثة (مثل تقنية الحوسبة السحابية)					
5	يدرك العاملون في مجال تكنولوجيا المعلومات باهمية تبني الحوسبة السحابية في الجامعة					
6	موظفو ادارة تكنولوجيا المعلومات على اطلاع مستمر بالتطورات التكنولوجية الجديدة (مثل تقنية الحوسبة السحابية)					
7	يتم ارسال الموظفين الى بعثات علمية للاستفادة من التطورات التكنولوجية المحيطة					
8	عدم رضى وقدرة الموظفين للتغيير يعتبر من التحديات التي تعيق من تبني أي تقنية جديدة مثل تقنية الحوسبة السحابية					
9	لا احتاج الى جهد عالي في الاستفسار او التعرف على أي تقنية جديدة مثل تقنية الحوسبة السحابية					
10	التطورات التكنولوجية تشجيع المنافسة الايجابية بين العاملين الى تحفيزهم بما يخدم المصلحة العامة للمؤسسة					
11	تعقد الجامعة الندوات والمحاضرات والمواد لتعريف الموارد البشرية بأهمية واستخدام تقنية الحوسبة السحابة					
12	يحتاج موظفي تكنولوجيا المعلومات الى تدريب في الحوسبة السحابية وخاصة في (بناء ، تطوير ، نشر) خدمات السحابة.					
رابعاً / فعالية الامان في تبني الحوسبة السحابية (Cloud Computing)						
1	تعتبر سرية وامن البيانات من اكبر التحديات التي تواجها الجامعة في تبني أي تقنية جديدة					
2	لابد من معرفة مكان تخزين البيانات في الحوسبة السحابية					
3	تعتمد قوة الامن للبيانات على قوة مزود الخدمة من الناحية الامنية					
4	يمكن اعتبار عقد الاتفاق بين الجامعة ومزود الخدمة بمثابة موثقية وامان للبيانات					
5	يوجد ثقة بالتقنيات الجديدة وبمقدمي هذه الخدمات من الشركات العملاقة (جوجل ، وميكروسوفت، والامزون، .....)					
6	يؤدي تبني واستخدام تقنية الحوسبة السحابية الى وضع خطط لحماية امن المعلومات وسريتها					
7	تزيد الثقة مع شركات مزودي خدمة الحوسبة السحابية في حال وجود اتفاقيات واضحة تتعلق بالتعديات والمخالفات الامنية الكترونيا					
8	خدمة الحوسبة السحابية المقدمة من شركة جوجل العملاقة وهي خدمة البريد الالكتروني (Gmail) المستخدمة في الجامعة اكثر امانا من النظام القديم					
9	خدمات وتطبيقات الحوسبة السحابية المقدمة من شركات مزودي الخدمة (جوجل ، الامزون ، ميكروسوفت، ...) صعبة الاختراق والقرصنة					

	الفقرات	درجة الموافقة				
		موافق بدرجة كبيرة جداً	موافق بدرجة كبيرة	موافق بدرجة متوسطة	موافق بدرجة قليلة	موافق بدرجة قليلة جداً
10	تعتبر السحابة بالنسبة للطلاب اكثر امانا لوضع ابحاثهم وتقاريرهم وواجباتهم من الطرق التقليدية (الفلاش ، الجهاز الشخصي ، ....)					
11	من الامور التي تساعد الجامعة على تخطي مخاوف الامان هو عدم وضع التطبيقات او البيانات الحساسة في السحابة					
12	يمكن ان يكون للجامعة سحابة هجينة(Hybrid Cloud) تتكون من سحابة عامة (Public Cloud) لوضع التطبيقات العامة والغير حساسة وايضا من سحابة خاصة (Private Cloud) للمحافظة على سرية وامن بياناتها					
سادساً / تخفيض التكاليف من خلال تبني تقنية الحوسبة السحابية (Cloud Computing)						
1	تركز الجامعة على مشاريع انظمة تكنولوجيا المعلومات الحديثة التي تهدف الى خفض التكاليف					
2	نقل العمليات والخدمات الجامعية الى السحابة سيخفض من التكاليف على الجامعة					
3	تعتبر خدمة الحوسبة السحابية المقدمة من شركة جوجل وهي خدمة البريد الالكتروني (Gmail) في الجامعة اقل تكلفة من النظام القديم					
4	العديد من شركات مزودي خدمة الحوسبة السحابية يعرضون خدمات مجانية لمؤسسات التعليم العالي					
5	يوجد خدمات مجانية في السحابة تساعد طلاب الجامعة في التواصل فيما بينهم وحفظ ومشاركة البيانات وغيرها					
6	تساعد الحوسبة السحابية على تخفيض النفقات التي تذهب لشراء الأجهزة أو الخوادم أو البرمجيات أو الصيانة.					
7	من أهم مميزات الحوسبة السحابية، هي إمكانية التحكم بالتكاليف على حسب الاستخدام					
8	من أهم مميزات الحوسبة السحابية ، التخلص من التكاليف غير الضرورية (مكان – كهرباء– تكييف....).					
9	تقنية الحوسبة السحابية توفر خدمات جامعية مستحدثة دون زيادة التكلفة أو زيادة سعر الخدمة.					
10	توفر السحابة على الطلبة احتياجات مختبر من اجهزة كمبيوتر باهضة الثمن بمواصفات خاصة لاجراء تجارب او تطبيقات علمية تحتاج للعمل لعدة ساعات او ايام متواصلة لاخراج النتائج المطلوبة					
11	عند تبني تقنية الحوسبة السحابية، تنخفض التكلفة بصورةٍ كبيرةٍ ويتم تحويل النفقات الرأسمالية في عمليات تكنولوجيا المعلومات إلى مصروفاتٍ جاريةٍ.					

Appendix B

List of Referees

(Arabic)

قائمة بأسماء المحكمين

م	الاسم	المسمى الوظيفي
1	د. وسيم الهبيل	رئيس قسم إدارة الأعمال في كلية التجارة بالجامعة الإسلامية.
2	د. يوسف بحر	محاضر في قسم إدارة الأعمال في كلية التجارة بالجامعة الإسلامية.
3	د. سمير صافي	رئيس قسم الاقتصاد في كلية التجارة بالجامعة الإسلامية.
4	د. توفيق برهوم	عميد كلية تكنولوجيا المعلومات في الجامعة الاسلامية، والمحاضر في قسم نظم تكنولوجيا المعلومات في الكلية.
5	د. ربحي بركة	نائب عميد كلية تكنولوجيا المعلومات في الجامعة الاسلامية، والمحاضر في قسم تطوير البرمجيات في الكلية.
6	د. أيمن ابو سمرة	مساعد نائب الرئيس لشؤون تكنولوجيا المعلومات بالجامعة الاسلامية، والمحاضر في كلية الهندسة.
7	أ.د. محمد حسين	محاضر بكلية الهندسة في الجامعة الاسلامية.
8	د. أشرف العطار	رئيس قسم علم الحاسوب في كلية تكنولوجيا المعلومات في الجامعة الاسلامية
9	م. علاء الشرفا	مدير وحدة تكنولوجيا المعلومات في وزارة الصحة.
10	أ. ياسر صالحة	رئيس وحدة الجودة الأكاديمية بجامعة الأقصى والمحاضر بقسم تكنولوجيا التعليم.
11	أ. ابراهيم صرصور	محاضر بقسم الحاسوب في جامعة الأقصى.

Appendix C

Questionnaire

(English Version)

Islamic University of Gaza

Dean of Postgraduate Studies

Faculty of Commerce

Department of Business Administration

Questionnaire

Dear All…...

The researcher puts in your hands this questionnaire prepared for the collection of data about a study entitled:

" ***The Adoption of Cloud Computing Technology in Higher Education Institutions: Concerns and Challenges***

(Case Study on Islamic University of Gaza "IUG")."

Which this study be submitted in a partial fulfillment of the requirement for MBA degree.

I hope you to cooperate and provide information to assist in the completion of this study, that we aim to illustrate the concerns and challenges the adoption of Cloud Computing in IUG, Thus contribute to the upgrading of the university to outstanding scientific level and the required performance.

As you have the experience and professional in your work field, and also your currently position which related to the subject of the research, the researcher request you to see all questionnaire items in carefully ,and answer all of them in Objectively and high professional. Your feedback and comments would be a matter of interest and they will have great impact regarding the enrichment of this study. Please note that its use will be limited to scientific research purposes. Moreover, the questionnaire will be treated confidentially.

Please accept our best regards

Researcher

Eng. Ahmed J. Mansour

☒ Definition of Cloud Computing:

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

☒ Research Variables:

Dependent Variables

- **The Adoption of Cloud Computing Technology**

Independent Variables

- **Top management support**
- **Support and integration of university Services**
- **Skills of IT staff at the university**
- **Security effectiveness**
- **Cost Reduction**

Questionnaire

First: Personal Functional Information

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

1. **Gender**: ☐ Male ☐ Female
2. **Qualification:**
☐ Bachelor ☐ Master ☐ PHD
3. **Age (in years)**
☐ Below 30 years ☐ From 30 – below40 ☐ From40 –below50 ☐ Above 50 years
4. **Type of Position**
☐ Administrative ☐ Academy ☐ Academy with administrative position
5. **Position**
☐ Dean ☐ Vice Dean ☐ Head of Department ☐ Programmer
☐ Director ☐ Assistant Director ☐ Lecture ☐ Engineer
☐ Other, Define…...
6. **Years of Experience**
☐ Less than 5 ☐ From 5 – less than 10 ☐ From10–less than 15 ☐ Above 15 years

Items		Agreement degree				
		Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
First Section						
The Adoption of Cloud Computing Technology.						
1	Cloud Computing technology is an attractive technological option to the university.					
2	Cloud Computing technology is an attractive economic option to the university.					
3	The university Focuses on new IT system projects, which aim to increase the efficiency and quality of services provided for the beneficiaries.					
4	The university Focuses on new IT system projects, which aim to maintain competitive advantage.					
5	The university has high speed internet lines, and uninterrupted services.					
6	The university Focuses on new IT system projects, which aim to increase students satisfaction.					
7	The university Focuses on new IT system projects, which aim to increase employees satisfaction.					
8	The university Focuses on new IT system projects, which aim to increase data and information security.					
9	The adoption of Cloud Computing technology in IT operations will support the learning process.					
Second Section						
First: Top management support of the Cloud Computing technology.						
1	Top management informed of ongoing developments of Cloud Computing technology and the importance of its use					
2	Top management concerns to provide the staff with the needed trainings and skills for any new technology so as to keep up with development.					
3	Top management develops plans which are flexible enough to accommodate any changes required by the adoption of Cloud Computing technology					
4	Top management supports the new technologies which serve the learning process, and the university students.					
5	Top management seeks to maintain competitive advantage through the adoption of new technologies, and its uses in its operations					
6	There is a support from top management in IT field to adopt everything new such as Cloud Computing technology.					

	Items	Agreement degree				
		Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
7	Top Management has a future plan to adopt Cloud Computing, and its uses in IT operations					
8	Top management has plans to get rid of obstacles that hinder the use of any new technology at the university such as Cloud Computing technology.					
9	Top management provides the support and the needed requirements to adopt Cloud Computing technology.					
10	The adoption of Cloud Computing technology is included in Strategic Plan for IT Center					
11	The administration's decision is wise in the use one of Cloud Computing applications (e.g. IUG Gmail) at the University					
12	Top management supports a shift policy in all or some of the IT operations towards Cloud Computing technology.					
Second : Support and integration of university Services with Cloud Computing						
1	The possibility of moving existing applications and services provided by IT Department at the university to the cloud.					
2	Systems, technological services and applications at the university are continuously updated to keep pace with technological development					
3	Technological services and applications at the university characterized by sufficient flexibility.					
4	The adoption of Cloud Computing technology at the University helps to activate new services.					
5	The adoption of Cloud Computing technology at the University helps to improve quality of its services.					
6	The adoption of Cloud Computing technology at the university helps in distinguishing the university in its provided services, which is different from that provided by other universities.					
7	The adoption of Cloud Computing technology at the university helps to improve the performance of currently university services.					
8	The transfer of e-mail service from the old system to one of Cloud Computing applications (Gmail) easily without suffering.					
9	The facilities of integration services and IT applications with the services provided by Cloud Computing (e.g. Gmail)					
10	Cloud Computing providers offer free services to students, to help them in the learning process by providing disk service to store and share data, e-mai,l and others.					

	Items	Agreement degree				
		Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
11	Cloud Computing provides working environment for students to conduct their scientific experiments that need special devices they cannot provide.					
12	It's possible to access to the services provided in the cloud from anywhere and any device.					
Third: Skills of IT staff at the university						
1	Cloud Computing technology helps on the development of IT staff abilities and skills .					
2	Training provided to staff in the field of IT enough, and makes them sophisticated and look forward to some extent to the latest technology.					
3	Cloud Computing technology helps on the development of the spirit of creativity and innovation.					
4	The University provides training programs for employees relating to the new technologies (such as Cloud Computing Technology)					
5	IT staff realize the importance of the adopting of Cloud Computing at the university					
6	IT Management staff continuously on the lookout for new technological developments (such as Cloud Computing Technology)					
7	The staff is sent to scientific missions to take advantage of technological developments surrounding					
8	The staff dissatisfaction and disability to change is one of the challenges that hinder the adoption of any new technology (such as Cloud Computing Technology)					
9	I do not need high effort to inquire or to identify any new technology such as Cloud Computing Technology					
10	Technological developments encourage positive competition among staff to motivate them to serve the general interest of the institution					
11	The university holds meetings, lectures and materials for the definition of human resources the importance and the use of Cloud Computing Technology					
12	IT staff needs training in the Cloud Computing, especially in the (construction, development, deployment) cloud services.					
Fourth: Security effectiveness in adoption of Cloud Computing						
1	The data security is the biggest challenges facing the university to adopt any new technology					

	Items	Agreement degree				
		Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
2	We must know where the data is stored in the Cloud Computing					
3	The strength of data security depends on the strength of service provider in terms of security					
4	It can be considered a contract agreement between the university and the service provider as a safety and reliability of the data.					
5	There is confidence in new technologies and the providers of these services (e.g. Google, Microsoft, Amazon, ...)					
6	The adoption and use of Cloud Computing Technology Lead to develop a plan to protect the security and confidentiality of the information					
7	The confidence increases with companies Cloud Computing service providers in the event of clear agreements related to hacking and electronic security breaches					
8	The Cloud Computing service provided by Google Inc., which is the e-mail service (Gmail) used in the university safer than the old system.					
9	The services and applications of Cloud Computing provided by service providers companies (e.g. Google, Amazon, Microsoft, ...) are difficult to hack and piracy					
10	The cloud for students is safer than traditional methods (flash, the device profile, ...) in putting their researches, reports and homework .					
11	The things that will help the university to overcome fears of safety is not put sensitive data or applications in the cloud					
12	Could be the university a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data.					
Fifth: Cost Reduction Through The Adoption of Cloud Computing.						
1	The university focuses on modern IT system projects, which aim to reduce costs**.**					
2	Transfer the operations and services of university to the cloud will reduce costs.					
3	The service of Cloud Computing provided by Google Inc., (e.g. an e-mail service - Gmail) at the University is less expensive than the old system.					
4	Many Cloud Computing service providers offer free services to higher education institutions.					

Items		Agreement degree				
		Strongly Agree	Fairly Agree	Agree	Partly Agree	Nearly Agree
5	There are free services in the cloud help students to communicate with each other, save and share data and others.					
6	The Cloud Computing helps to reduce the expenses that go to buy hardware, servers, software or maintenance.					
7	The most important feature of Cloud Computing, is the ability to control costs by use.					
8	The most important feature of Cloud Computing, is getting rid of unnecessary costs (place - electricity - air ... etc.).					
9	The Cloud Computing Technology provides innovative university services without increasing the cost or the price of the service.					
10	The cloud provides the needs of lab such as(special specifications of high expensive computers , or scientific applications), which it needs to work for a few hours or days continuously to bring out the desired results.					
11	When to adopt Cloud Computing Technology, the cost is greatly reduced and capital expenditure is converted in the IT operations to ongoing expenses.					

Appendix D

List of Referees

(English)

List of Referees

No	Name	Position
1	Dr. Wasim Al-Habil	Professor Assistant & Head of Business Administration Department at Commerce College - IUG
2	Dr. Yousef Baher	Professor Assistant in Business Administration Department at Commerce College - IUG
3	Dr. Samir Safi	Associate Professor & Head of Economic Department at Commerce College - IUG
4	Dr. Tawfiq Barhoom	Dean, Faculty of Information Technology - IUG
5	Dr. Rebhi S. Baraka	Vice Dean and head of Software Development Department at the Faculty of Information Technology - IUG
6	Dr. Ayman Abu Samra	Assistant of vice president for Information Technology, and Associate Professor in Computer Engineering Department, Engineer College - IUG
7	Prof.Mohammed Hussein	Professor of Electrical Engineering Department, Engineer College - IUG
8	Dr. Ashraf Alattar	Asst. Professor of Information & Communication Engineering, and Head of C.S. Department, at College of IT- IUG
9	Eng. Alaa Al Shourafa	Head of Information Technology Unit – Ministry of Health
10	Mr. Yasser Salha	Head of Academy Quality Unit, and Lecture in Learning Technology Department – Aqsa University
11	Mr. Ibrahem Sarsour	Lecture in Computer Department – Aqsa University