Notre Dame University-Louaize
Faculty of Business Administration & Economics
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Bordeaux Management School
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FACTORS INFLUENCING SME ADOPTION OF CLOUD
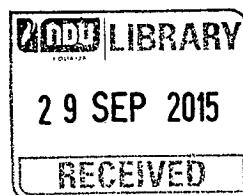COMPUTING BY DECISION MAKERS IN LEBANON

Submitted by: Bouchra Zgheib

Supervised by: Mrs. Viviane Nakhle

**A Thesis Submitted in Partial Fulfillment of the
Requirements for the Joint Degree of the Master of Business
Administration (M.B.A.) and the Master of Science in
International Business (M.I.B.)**

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Approval Certificate

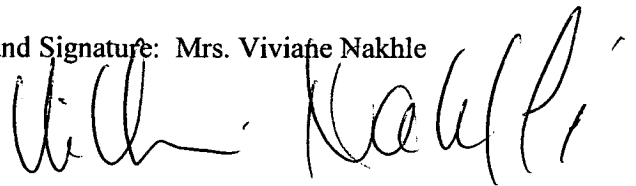# FACTORS INFLUENCING SME ADOPTION OF CLOUD COMPUTING BY DECISION MAKERS IN LEBANON

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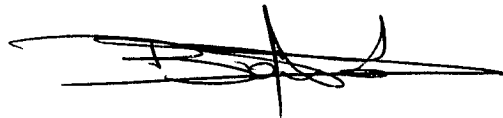**Bouchra Mansour Zgheib**
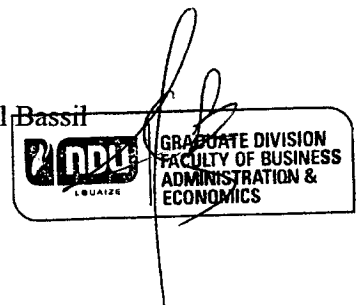
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13/02/2014

DECLARATION

I hereby declare that this Thesis is entirely my own work and that it has not been submitted as an exercise for a degree at any other University.

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Bouchra Mansour Zgheib

ABSTRACT

Purpose – The study provides the vendors with insights on the cloud adoption patterns as well as the perceived barriers of SMEs cloud adoption in Lebanon which may influence the technology. Cloud computing allows you to access software anywhere via the internet instead of from your hard drive or your local computer network.

Design/methodology/approach – A survey was conducted to understand Lebanese SMEs decision makers' perceptions that impact their willingness towards adopting cloud computing technology.

Findings –The findings showed that educational level, type of organization and numbers of employees have no influence on SMEs cloud adoption behavior. Data analysis showed that increased security has a partial significance, as for data availability and reliability showed a great significance on the adoption behavior.

Research limitations/implications – The study digs into organizational adoption behavior and do not include individual behavior. Besides, because of lack of important population elements a cluster or stratified sampling was not able to be created.

Practical implications – This study can be exercised on a larger sample size. Moreover, legal issues can be considered in future research to understand its impact on Lebanese decision to adopt this technology. Further study should examine thoroughly the effect of company size on the decision of cloud computing adoption.

Originality/value – This research provides a better understanding of the factors that most influence SMEs DMs in Lebanon to adopt cloud computing. This knowledge can assist organizations and providers with the critical instruments to tackle organizations concerns in their offerings.

Keywords – Cloud computing, Lebanon, Small and Medium-sized Enterprises, technology adoption, security effectiveness, technology acceptance model.

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LIST OF ABBREVIATIONS

All the abbreviations used in this thesis are placed here in an alphabetical order:

API	Application Programming Interface
Apps	Applications
BYOD	Bring Your Own Device
BYON	Bring Your Own Network
CAPEX	Capital expenditures
CFO	Chief Financial Officer
CIO	Chief Information Officer
CRM	Customer Relationship Management
DM	Decision Makers
DTF	Downtime Failure
EC2	Elastic Compute Cloud
ERP	Enterprise Resource Planning
GAE	Google App Engine
IaaS	Infrastructure as a Service
ISV	Independent Software Vendor
IT	Information Technology
NIST	National Institute of Standards of Technology
OPEX	Operational expenses
PaaS	Platform as a Service
PC	Personal Computer

PEOU	Perceived Ease of Use
PU	Perceived Usefulness
ROI	Return on investment
SaaS	Software as a Service
SB	Small Businesses
SDK	Sales Development Kit
SLA	Service Level Agreement
SMEs	Small and Medium-sized Enterprises
SP	Service provider
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UCaaS	Unified Communications as a Service
VM	Virtual Machine

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Table of Contents

Chapter 1. INTRODUCTION

The use of Internet has opened up an undefined path for the way businesses use information technology and has played a major role in emerging markets and the increase of global competition. Today, this need for internet computing is conduced to the innovation of cloud computing.

This chapter introduces cloud computing and shed the light on the different aspects that govern the era of cloud computing. It provides understanding of cloud computing characteristics, different models and structure along to identifying the cloud types. The chapter discusses the function that brings your own device, in addition to some security consideration with respect to the cloud service level agreement.

1.1. Cloud Computing Overview

Cloud computing has become an area of concern to every organization and individual; many factors are influencing decision makers to positively move towards cloud computing which will result in a rapid growth of clouds services worldwide. It serves in increasing productivity in everyday business activities and heightening global collaboration for better use of available resources at a minimum cost. While Cloud computing offers great added values to organizations by offering outsourced services that meet various demands; however, cloud is creating headaches to most executives and chief information officers (CIO) that want to take business advantage of the latest technologies but want to remain in control on both internal and external data, ensuring IT security and reducing complexity. In addition, CIOs are concerned about managing expectations as they still struggle to prove their relevance and worth to the business. The section that follows defines cloud computing and its characteristics as a first step before embarking, on further analysis of the topic at play.

1.1.1. Definition

Cloud computing is all about rendering hosted services over the internet to individuals and businesses of all size through their computing resources (network, servers, storage, applications and services) on a pay per use service. It is on demand delivery of applications or infrastructure as standardized IT services that are transforming the way IT serves businesses. Cloud computing is formed by three essential entities, the software, hardware and the network.

Cloud computing can be easily accessed with minimal management effort or service provider interaction. Users do not need to get into cloud computing technicality and operation; they should only understand its different functions and usability.

Many researchers and scientists have dug into utility computing vision, cluster computing, grid computing, and recently cloud computing (Armbrust, 2009).

Berkeley RAD defined Cloud computing as follows:

"The datacenter hardware and software is what we call a cloud. When a cloud is made available in a pay as you go manner to the general public, we call it a Public cloud; the service being sold is utility computing. We use the term Private cloud to refer to internal datacenters of a business or other organization, not made available to the general public" (Ibid).

Although cloud computing adoption is growing at a fast pace, however, businesses may have different comfort levels as organizations management experience various concerns related to cloud computing services. Cloud services depend on reliable internet connectivity, businesses experience a downtime when the internet connection is offline. In addition, data security is one of the biggest concerns; businesses will remain reluctant in storing sensitive data over the internet. Cloud computing is a great opportunity for businesses, however, it should be tailored upon each business size and computational need, in the aim of reducing Information Technology (IT) management cost, provide a centralized security for consolidate applications and process large parallel computing job. The figure below shows cloud computing architecture.
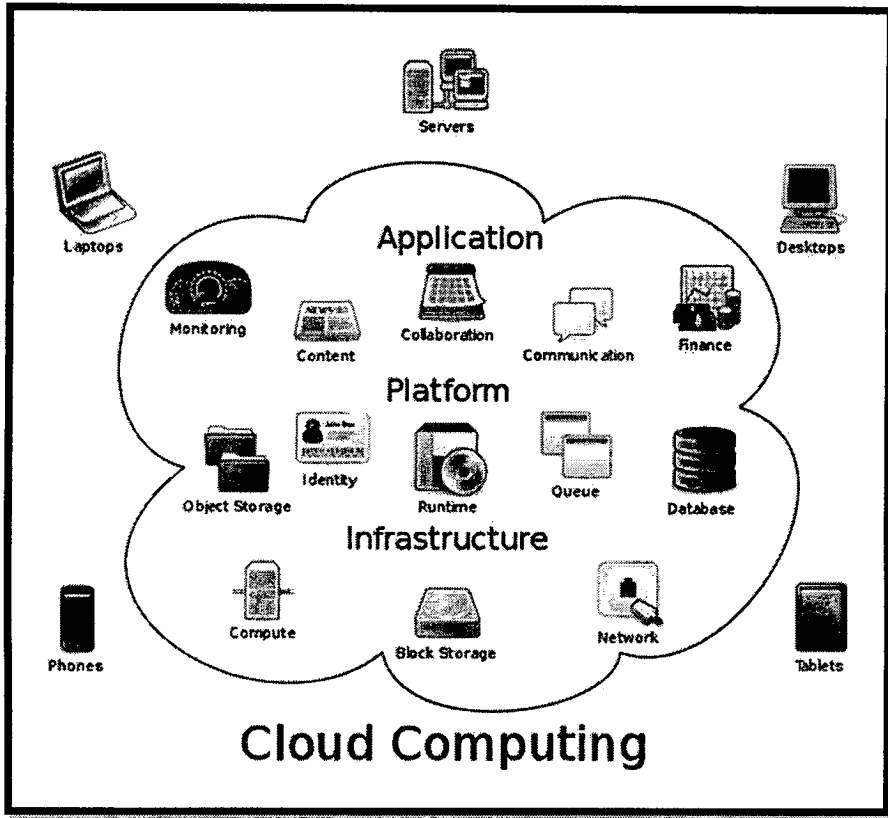
Figure 1: Cloud Computing Architecture

(Scudder, 2011)

1.1.2. Cloud Computing Characteristics

Based on the National Institute of Standards and Technology (NIST) publication (Mell, 2011) Cloud computing enable on demand network access to a shared pool of configurable computing resources; NIST lists the following five essential characteristics of cloud computing:

1) On-demand self-service

Consumers have access to scalable computing capability available when needed and as needed automatically without the interference of a service provider SP.

2) Broad network access

It is the computing capability available over the network whether accessed through mobile phones, tables, laptops or workstations.

3) Resource pooling

It is the resource that serves multiple consumers using multi-tenant model assigned as per each consumer demand, such as storage processing, memory and network bandwidth.

4) Rapid elasticity

It is measured as per consumer demand, scale rapidly outward and inward which enable capturing any quantity at any time.

5) Measured service

It allows automatic control and measure of resource usage, through monitoring, reporting and providing transparency for both the provider and the consumer.

1.1.3. Cloud Computing Models

Service Providers (SPs) render through internet interface three service models. Stanoevska and Wozniak have described these services in their book *Grid and Cloud Computing* as the Three Layers of Cloud Computing that form the IT infrastructure (Katarina Stanoevska-Slabeva, 2009), see figure 2 below.
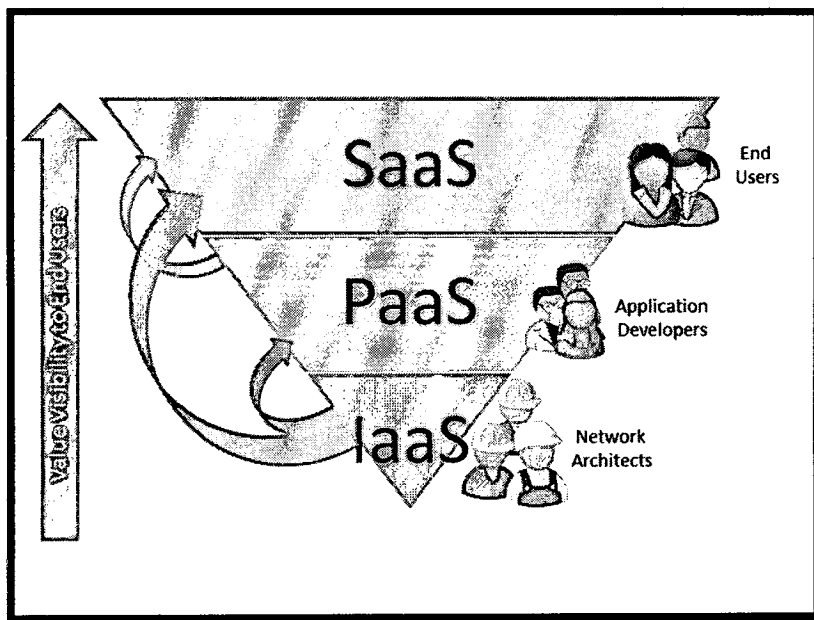
Figure 2: Service Models of Cloud Computing

(Colo and Cloud PaaS , 2012)

1.1.3.1. Infrastructure as a Service (IaaS)

IaaS providers offer economies of scale to users through their large duplicated data centers collocation facilities; that provide the necessary hardware system required to access efficiently the stored network resources on the cloud. Providers use duplicate off-site servers or disk storage devices to expeditiously manage the system, eliminate the risk of downtime failure (DTF) and distribute the workload.

Furthermore, users pay only for the resources they need; through a pay as you go scalability with a flexible on demand storage instead of paying huge cost of dedicated datacenters which require high maintenance; high speed redundant internet service; adequate cooling system; in addition to an advanced uninterrupted power supply and a fire suppression system.

Moreover, IaaS constitute a load balanced system, sharing the requests across multiple servers and offering an inexpensive data redundancy and initiative cloud based network attached storage for over precise data synchronization and replication.

IaaS environment offers different server types:

- Physical server dedicated to a customer use.
- Dedicated virtual server that exist on a physical server that might have other virtual servers.
- Shared virtual server that exist on a physical server and that can be shared with other users

Companies benefit from IaaS to reduce the cost of hardware, IT staff, administration and management in addition to the possibility to apply hoc test over the cloud.

According to an article published by network world in 2012, the most powerful IaaS public cloud services provider is Amazon web services via the Virtual machine (VM) Elastic Compute Cloud (EC2) both through the market share and mindshare leader at competitive prices. Amazon is growing vigorously its partner's ecosystem around public cloud and offers high level of security and compliance certifications through world wide data center coverage (Christine Burns, 2012).

1.1.3.2. Platform as a service (PaaS)

PaaS is the combination of hardware and software resources available for developers to develop and deploy applications directly on the cloud and make sure it is running correctly. PaaS offers different sets of software development kit or tool (SDK) which can be used easily without the need to worry about the infrastructure and supports different platforms whether Windows, Mac OS X or Linux (Kris Jamsa , 2009). PaaS provides a faster, more responsive and more efficient application development as well as application testing.

PaaS offers scalability, companies pay only for the used resources scaled up or down based on application demand; it provides significant flexibility for companies that update or change workloads frequently. In addition to the application development environment, storage and persistence; PaaS also allow savings in the cost of hardware by eliminating the need of private data centers; PaaS spare companies from the administrative overhead as users are not involved in the virtualized hardware environment directly, the whole management of virtual servers and operating system is managed by the SPs. However, data security stills an area of concern plus the risk of breach by the PaaS provider.

SPs offer different types of PaaS solutions (Colo and Cloud PaaS , 2012):

1) Stand Alone Business Application Platforms: SDK used to design and deploy software.
2) Social Application Development Platforms used to build applications for social websites as Facebook.
3) Web Based Application Add-on Platforms used to allow users to alter and add features to their SaaS solutions.
4) Open Computing Platform supports applications written in different codes and that use any type of database, operating system and server.

Many companies offer PaaS solution on an advanced level such as Amazon Beanstalk, Google's App Engine, Microsoft Azure, Cloud Foundry and Force.com...etc.

Google App Engine (GAE) is a PaaS solution that enables developers to run their web applications on Google infrastructure. GAE are easy to build and scale as

applications demand grows (Google, 2013). App Engine provides many features such as Dynamic web serving with full support for common web technologies, persistent storage with queries and scheduled tasks. It allows automatic scaling and load balancing, in addition to application programming interface (API) for authenticating users and sending email using Google Accounts. Developers benefits from a fully features local development environment that simulates GAE on their computers.

1.1.3.3.   Software as a Service (SaaS)

SMEs are shifting from traditional packaged software, hosted internally, to the use of on demand hosted software over the internet that are provided by third-parties such as Software as a service which is a hosted delivery model for deploying enterprise services. Speed of implementation and low up-front costs for acquisition and deployment are the best characteristics of SaaS (Strategy Analytics , 2011).

It helps organization to reduce cost as the service is paid incrementally which allows organization to save money while increasing their storage as needed. In addition, enterprises are benefiting from SaaS through application availability from anywhere along with seamless updates and upgrades rendered by providers.

Nowadays, companies require a more mobile infrastructure due to the increase need of mobile applications such as access to company e-mail, customer relationship management (CRM) systems, databases, etc. accessed through the use of smart phones and portable computers. Mobile devices are increasingly becoming a critical component of the SMEs communications infrastructure as more applications are developed that were traditionally only accessible via laptop computer such as access to CRM systems (Ibid).

SaaS are used by companies to access business applications through CRM sales tools, Collaboration tools, Enterprise resource planning (ERP) systems, business analytics tools, human resource, marketing and financial apps.

According to a report published by Strategy analytics in 2011 below points are the main key shifts driving and underscoring the evolution of SaaS in SMEs in the next five years (Ibid).

Transition from an IT to business value proposition

Service providers' initial concerns were to remove IT hurdles and help SMEs to bridge the software gap. SPs newly focus more on offering a complete solution with the best seen value proposition; by providing more business process expertise with minimum resources.

- Development of SaaS ecosystem

All vendors have built SaaS ecosystems while using an economy of scale infrastructure that provides affordable SMEs solutions, which serve to streamline shopping and selection on the front end, and integration on the backend, so that more SMEs can use SaaS solutions in an incremental, yet integrated manner.

- Emergence of more varied, flexible and affordable pricing options

Although SaaS norm is a monthly subscription per user model; nevertheless, vendors present alternative models such as free ad funded offer, subsidized services and transaction based models. This causes a downward price pressure on the offerings and increase the number of SMEs adopters of SaaS solutions.

- Conferencing

The increase need of web conferencing solutions, audio and video with the objective of cost cutting put the light on the growing need for unified cloud as a service (UCaaS) as an alternative to premises based on unified cloud (UC) platforms for improving productivity, processes and workflow.

- Industry-specific SaaS Solutions

Vendors with industry specific solutions are catering to the needs, particularly among midsize firms, for solutions tailored to different vertical segments; such as financial solutions, property management solutions, wholesale and distribution, software and services industries (Ibid).

1.1.4. Types of Cloud

Four deployment models:

1.1.4.1. Private cloud

Private cloud is the use of dedicated resources specific for each organization such as datacenters available inside the organization only for internal business usage and that are not made available to the public known as on-premises cloud services, built prevailingly upon a virtual environment.

A private cloud also known as internal cloud shares the same characteristics of public cloud such as on demand self-service, resource pooling, rapid elasticity and measured services with the additional control and customization available from dedicated resources.
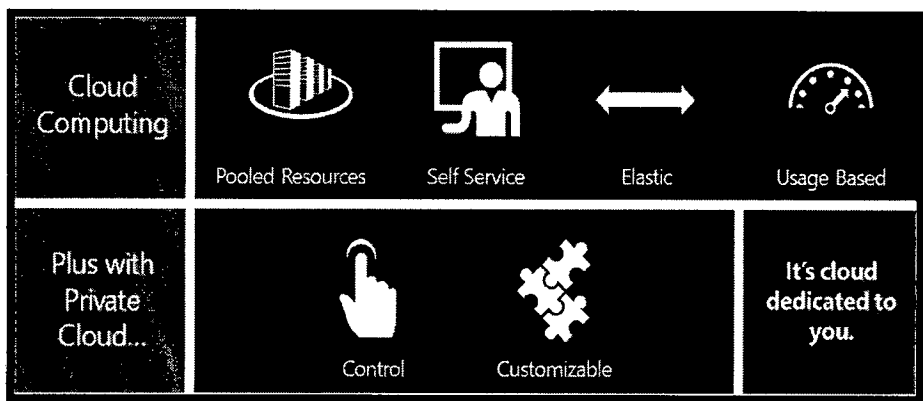
Figure 3: Private Cloud Attributes

(Microsoft, 2012)

Private cloud plays an important attribute in cost effectiveness if used with a fully virtualized infrastructure; attaining an improved agility and responsiveness, increased business alignment and focus as well as an efficient use of computing resources (Ibid).

1.1.4.2. Community cloud

Community Cloud is multi subscription infrastructure apportioned among various organizations that has common computing interests such as hosting applications or high performance requirements (Rouse, 2012).

Community cloud is to make the benefits of a public cloud clear to organizations, such as multi-tenancy and scalability through pay as you go billing system while at the same time keeping high level of privacy and security. However, the benefits of a community cloud are not yet fully exploited by businesses such as

public cloud. It is expected that in the future, providers will focus their efforts on community cloud offerings distinguished for specific industries.

1.1.4.3. Public cloud

A Public cloud is available to a large user base; it is when a datacenter hardware and software is available in pay as you go manner to the public; the service being sold is utility computing (Armbrust, 2009).

The most benefit of public cloud computing is on demand scalability, flexibility, economics and promise significant competitive advantage.

1.1.4.4. Hybrid cloud

The Hybrid cloud is a combination of the private and public clouds. The challenge is to leverage your existing investments, infrastructure, and skill sets to build the right mix of private and public cloud solutions for your business – one that will work for you today and in the future (Microsoft, 2012).

In the future, most businesses will be using hybrid cloud that mix between private and public cloud that serve their different requirements.

1.1.5. Benefits of Cloud

1.1.5.1. Economy of Scale

The technology in computing keeps on evolving day after day with new offerings and new methods of computing services. This use of computing power is supplied from large datacenters that are maintained by vendors and located elsewhere as a remote network known as "the Cloud". The internet use became essential not only for communication and data processing but also for storage. Large datacenters undergo economies of scale. It can combine all costs between various users, such as power which is one of the primary datacenters cost; because of their size they can purchase power or any other cost at a very competitive rate than other smaller data centers. In addition SPs uses virtual services through SaaS or IaaS data centers that includes multiple users in order to reduce cost and reach efficiency of resource usage. Consequently, vendors are able to offer reliable and more powerful services through these very large datacenters which efficiently provide economy of scale and

forcefully guarantee a cost effectiveness of energy usage through the decrease in electricity cost and usage, decrease in network bandwidth, lower cost per server use of computing power and flexibility to pay as you go.

In his book Kris Jamsa, in 2009, researched the cloud business model and its economic opportunities for all businesses. Jamsa analyzed businesses cost savings by relating Moore law to the cloud. He concluded that hardware cost has a very short life expectancy, therefore, companies who use cloud computing resources benefit from the cloud services as a commodity and save the cost of own data center. In addition, Jamsa discussed the total cost of ownership for an IT solution along with a comparison of capital expenditures (CAPEX) and operational expenses (OPEX) of an IT solution, by studying the costs of software, hardware, network equipment, maintenance and administration. Jamsa research proved that due to the cloud service provider's economies of scale, businesses using cloud resources have lower CAPEX than OPEX (Kris Jamsa , 2009).

Thus, Organizations are shifting from storing data in their own server computers towards the use of cloud based services operational expenses to eliminate the need for internal data centers that require high capital expenditure.

Cloud services increase organizational benefits by providing rapid scalability, reduced total cost of ownership, improved business continuity and disaster recovery, increased cost controls, enhance ability to scale resource use up or down to align with demand (Ibid).

1.1.5.2.   Mobility: Bring Your Own Device trends

Nowadays, employees are requiring a more flexible mobile access to company data and information wherever they are, from home or from personal devices such as their Smartphone, tablet, laptop and USB rives rather than having to remain at their desks. Companies are shifting towards the use of hybrid mobile deployments where employees can use both organization dedicated devices as well as they personally owned devices (AirWatch, 2012).

These trends, known as bring your own device (BYOD) or bring your own network (BYON) are raising a wide range of security threats in organizations, where

these devices are connected to the corporate network with lack of control and visibility into who has access to the data. Therefore, some organizations attempt to use BYOD policies to minimize the risk. BYOD helps employees to be more productive and increase their level of satisfaction (Staff, 2013).

However, vendors claims that cloud computing offers a safe environment and minify the risks through security as a service products, it allows flexible access more than past computing methods while ensuring data compliance using folder redirection and remote desktop services with application streaming through proper authentication and monitoring.

The Cloud infrastructure acts as an active gateway in securing BYOD/BYON implementation, it allow the use of a controlled and managed virtual desktop infrastructure with roaming profiles and virtualization so that employees access corporate data and applications from any device securely. The desktop virtual technology also provide a higher business service level, an easier and faster application deployment and allows to quickly replace lost or stolen PC without losing personal settings and productivity. Cloud providers offer a highly automated environment; therefore, IT personnel will be free to focus on innovation rather than worrying about constant server and software updates (Sampson, 2012).

1.1.6. Service Level Agreement consideration

As the adoption of cloud computing increases, customers require a greater assurance over cost reduction and security effectiveness which led to Service Level Agreement (SLA). Presently most SPs provide a SLA, which is a contractual agreement between the cloud provider and the customer regarding the level of service provided. The SLA includes various parameters that govern the offerings .conditions agreed on between the customer and the vendor such as functional capabilities, regulatory compliance and response time; but most importantly it covers system availability and data security. SMEs should ask the vendor to specify clear informative answers for the following questions in the SLA:

What security features are supported?

Does the contract require an upfront long-term commitment?

Where is the data stored? Does the vendor operate multiple data center?

How easy is it to change the number of users? What penalties or per-user price changes are associated with these changes?

What options and penalties does the vendor provide if you terminate the service? For instance, if you terminate the contract, how do you get your data back?

Does the SLA supporting the uptime guarantee for these business-critical applications of at least 99.5%?

Note that SPs usually commit to an annual uptime percentage of confidence interval (CI) from 99.95% to 99.99% in a year; which can be hardly achieved in internal data centers. Organizations entrust more, providers who are able to confer a high quality of services and availability guarantees.

In addition SMEs should investigate cloud vendor's disaster recovery and business continuity plans to insure the safety of their data. Furthermore, SMEs who require high level of customization may need to consider a package software solution for the ability to reduce the cost. SMEs require solutions that enable them to meet their business goals while at the same time reduce ongoing costs and economize capital. Cloud computing business solutions are specifically tailored to help organizations to achieve these requirements and provide flexibility to scale as business demands require (Aggarwal & McCabe, 2009).

Recently, many `Storage Cloud' providers that provide Internet-enabled content storage and delivery capabilities in different locations, have emerged offering SLA-backed performance and uptime promises for their services. These services form a utility computing model that charge customers only for the storage used and transfer of content while providing low cost pricing in the order of cents per gigabyte (GB) and easy to scale storage services convenient for small organizations. Most commonly seen providers are Amazon Simple Storage Service, Nirvanix Storage Delivery Network (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009).

In summary, cloud computing serve organizations with limited resources by replacing the need of internal IT infrastructure or individual software application. SPs takes full responsibility of IT infrastructure in terms of hardware, software,

operating systems, backup, database, migration, system security as well as power and cooling, etc. and the management of the whole system.

The following paragraph describes the context of the study which relates to cost savings and economic conditions through the use of technology in day to day business while organizations work hard to sustain their business.

1.2. Lebanon Overview

Lebanon is located in the Western Asia, East Mediterranean; it's the crossroad of trade of the Mediterranean Basin. Lebanon has played a big role in commerce and trade due to its geographic region and its rich history. Lebanon is divided into six governorates: Beirut, Mount Lebanon, North, South, Nabatiye and Beqaa. Following the war in Lebanon of 1975-90, the government undertook the reconstruction of telecommunication infrastructure and had considerably improved the satellite services. Lebanon is among the first countries in the region to go online. The internet pushed Lebanese businesses to be more competitive and played a major role in stimulating the economy; yet the country is still not ahead against the required information technology that companies and individuals need in the day to day business and life. Many service providers in Lebanon offer internet connection, broadband connection and wireless; however, they also promote spam and a limited bandwidth.

1.3. Context of the study

Small and medium sized enterprises confront a challenging economic climate in Lebanon and the surrounding region. As a result, companies strive to sustain their survival through optimized operational decisions to manage efficiently available resources and make smart decisions to achieve business growth. Start ups companies and existing SMEs are interested in how cloud computing can help in reducing the CAPEX by cutting down upfront infrastructure expenses, and OPEX by removing ongoing maintenance expenses through reduced energy consumption and greater utilization for green computing.

SMEs are the driving force in the Lebanese economy. They account for 97 % of total enterprises in Lebanon and estimates reveal that they employ more than 51% of the working population. The top three sectors that govern the Lebanese market are retail sale 44%, Sale and maintenance of vehicles, machines and motor bicycles 11% and Services to individuals 5.5%. With the increased globalization and knowledge driven world, Lebanese SMEs search to be more competitive; therefore, their interest in innovation and green technology has risen (Ministry of Economy and Trade, 2013).

Different studies researched cloud computing adoption in various locations; however, none of the studies embraces the Lebanese market. Therefore, the following paragraph is set to examine the need for this study and its objectives by concentrating on empirical understanding of cloud adoption and the factors influencing SMEs decision makers in Lebanon to use cloud services.

1.4. Need for the study

This thesis studies the benefits, success factors and challenges of Cloud computing in the Lebanese market. The main objective is to research and explore the SMEs requirements of cloud services in the aim of understanding the added value of Cloud offerings and the contribution to the below multinational concerns:

- Productivity and Scalability of infrastructure
- Business Sustainability
- Social responsibility of Businesses
- Economic contribution

The results of this study might stimulate further research in the adoption of cloud computing and other methods of using a centralized computational source to fulfill the requirements of SMEs in Lebanon.

The contribution to knowledge is a better understanding of the factors that most influence DM in organizations to adopt cloud computing. This knowledge can assist organizations and providers with the critical instruments to tackle organizations concerns in their offerings.

The research main goal is to help service providers understand the factors behind cloud computing adoption in Lebanon whether current or potential users from different industries. This information enables them to make informed decisions about future provided services to meet Lebanon current and future organizational computational resource needs.

1.5. Objectives of the study

The objective from this study is to yield a model that explains Lebanese SMEs attitude towards the adoption of cloud computing and the related benefits or challenges associated with this behavior.

The purpose of this study is to reveal the reasons influencing SMEs in Lebanon to adopt cloud computing. These reasons assist both cloud providers and organizations that look at using cloud computing services to fulfill current and future computing and information management needs.

The thesis also provides insights of Lebanese cloud market in the aim of understanding the contribution of technology to businesses sustainability. It helps to increase the understanding of the cloud adoption patterns in addition to the perceived barriers to SMEs cloud adoption that impact businesses productivity and scalability of infrastructure. The section set forth discusses business suitability and corporate responsibility.

1.6. Business sustainability and corporate responsibility

The interest in business sustainability has greatly increased for organizations and specifically for IT decision makers who are concentrating on long term strategies and sustainable procedures and solutions such as Green computing.

Green Computing is the practice of using computing resources efficiently. Typically, green computing systems or products take into account the triple bottom line of people, planet, and profit. This differs somewhat from standard business practices, as it focuses on the reduction of the use of hazardous materials such as lead

at the manufacturing and recycling stages, maximized energy efficiency during the product's lifetime, and recyclability or biodegradability of both a defunct product and of any factory waste (CloudTweaks, green computing , 2013).

A study was done jointly by Microsoft, WSP and Accenture; to examine the energy use and carbon footprint of cloud offerings compared to on premise deployments. Results showed that companies with 100users are able to reduce energy use and carbon emission by 90 percent when cloud services are used compared to on-premise IT. This reduction is gravely influenced by the following factors:

Dynamic provisioning: through on demand offerings while reducing wasted computing resources.

Multi-tenancy: lowering extreme loads through shared cloud services to a large scale of organizations.

Server utilization: maximum utilization of resources

Data center efficiency: employing advanced data center infrastructure that enable an improving cooling system and power conditioning through the reduction of power loss (WSP, 2010).

1.7. International perspective

Multinational companies compete to deliver the best solutions to their users all over the world as companies hook more on cloud providers who in turn are indoctrinating DM to release their IT legacy and eliminate the fear that is preventing them from early adoption. This computing model affects the service offerings of all companies over the world as agility to meet changing needs becomes crucial; it impacts multinational companies such as Microsoft, Amazon, Google, yahoo and many others as this technology turns large and more complex.

Businesses requirements today are getting more complex; furthermore, acquiring the right information and communication technology that can be integrated with the company legacy system pose a great challenge. CIOs search for service providers

who are able to supply reliable cloud service offerings that fulfill their computational needs and requirements through centralized resources.

This study can be applied in any location around the world to analyze the determinants that leads SMEs cloud adoption behavior and the associated challenges when acquiring this new technology.

1.8. Thesis structure

The first chapter explained what is cloud computing and state the different attributes that define cloud computing components and structure to provide the necessary knowledge about this evolving technology. After going through this chapter you will be able to compare between the available service models of the cloud: IaaS, PaaS and SaaS and choose which service fits your organizational needs. At the same time you will be able to understand the various cloud deployment types: private, hybrid, community and public cloud.

Furthermore, the chapter discusses main cloud advantages of economy of scale and mobility through bring your own device/network possibility; along with a brief description of cloud agreement provided as a guarantee to ensure quality service supplied by the SPs. In addition, the objectives of the study are also included in this chapter along with a consideration to the cloud computing international perspective.

The second chapter examines different theories that indoctrinate the theories and the behavior of users towards new technology and the espousal of change. The chapter also includes previous researches that investigate those theories and shime specific variables that influence user behavior in accepting or rejecting a new technology. The researched model of this thesis is based on the conceptual framework in this chapter;

As for the other chapters it comes in succession to present the research methodology and the process of data collection through a quantitative survey and the data analysis carried out through the Statistical Package for the Social Sciences (SPSS, version 20) that lead to the thesis findings.

Chapter three begins by identifying the research questions and hypothesis, then formulating a research design for data collection.

Chapter four is about the data analysis process and the interpretations of the results and findings.

Finally, chapter five concludes with the implications, limitations and recommendations for future research.

Chapter 2. THEORETICAL FRAMEWORK

This chapter discusses researched theories related to technology adoption and consumer behavior. It synthesizes different variables that seem to affect individual intentional behavior in adopting or rejecting a new paradigm. The section that follows furnishes an overview of the conceptual framework.

2.1. Overview

Even though organizations realize that accepting new technologies plays a remarkable role for its success; resistance to information systems remains a problem. Therefore, research of users' acceptance of new technology has become an important practice of information system.

Theories of adoption has been viewed and elaborated throughout the years in order to examine and understand the behavior of DM and adopters of new technology.

Many researchers and scientists have developed multiple models and theories that analyze the consumers' adoption and barriers of new information technology. However, I will focus on the below theories that have been engraving deeply cloud computing adoption and acceptance of this evolving technology; out of which, I will select specific variables from each theory to further research it and analyze its influence to this study. This chapter discusses the following theories:

1. Theory of Reasoned Action
2. Theory of Planned Behavior
3. Technology Acceptance Model
4. Technology Acceptance Model 2
5. User Acceptance of Virtual Worlds
6. Innovation Diffusion Theory

2.2. Theory of Reasoned Action (TRA)

TRA was developed by Ajzen, it is a psychological model that explains user consciously intended behaviors as determinants of technology acceptance. It states that behavioral intention is formed by both attitude towards behavior and subjective norms which form the level of how much a person is convinced to do an action.

Attitude toward behavior is formed via an evaluation of behavioral consequences or feelings arising from a behavior both positive and negative.

Subjective norm is the level of influence exercised by other people such as colleagues or relatives to engage in a course of action.

The finding of the study was an important correlation between attitudes toward behavior and subjective norms that impacts directly the behavioral intention; in addition to a substantial proof for the relationship between behavioral intention and actual performance (Fred, Bagozzi, & Warshaw, 1989). The below figure represents the variables of the theory of Reasoned Action:
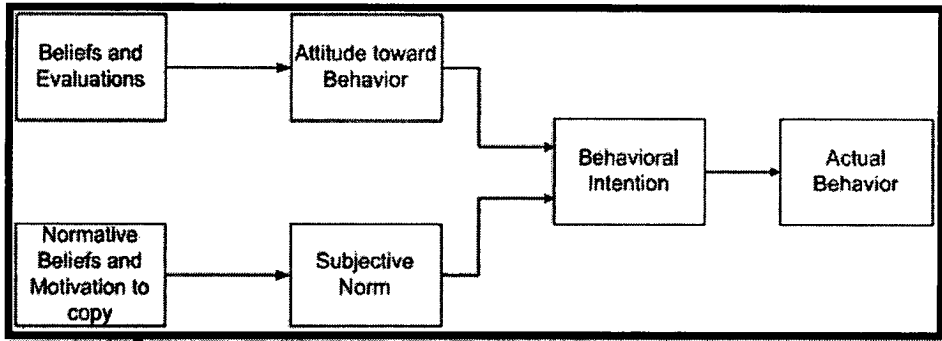
Figure 4: Theory of Reasoned Action

(Fishbein & Ajzen, 1979)

The theory introduces two important variables that affect actual behavior and it is the foundation of many other developed theories that studied human behavior. However, behavioral intention cannot be the only determinant that covers the actual behavior; the theory fails to perceive circumstances that may also affect the intentional behavior and the actual act such as free willingness to do an act or the purpose of doing an act.

For example, if an individual has a negative perception towards the use of cloud computing this will impact negatively his intentional behavior towards using this technology and the result will be to reject the technology. From another point of view, an individual acceptance of cloud computing might be shaped by his need to use this technology and its associated benefits which put the lights on other determinants than behavioral intention and that may also affect individual actual behavior.

On the other hand, potential users might be influenced positively or negatively by their peers or competitors who are already using cloud services. A competitor that uses cloud services might be seen as a threat to an organization that is late in embracing new innovations; as the competitor would have been benefiting early on from the added value associated with the use of this technology.

As a result the organizational intention to use cloud services might be affected by its competitors. Therefore, subjective norms will be included in this study to measure its level of importance and its impact on Lebanese decision makers' intentional use of cloud computing. As for the attitude towards behavior, it will be deeply researched to cover its broader aspect of the assorted factors that influence intentional behavior. Another theory is the planned behavior which is discussed below.

2.3. Theory of Planned Behavior

The Theory of planned Behavior (TPB) came as an extension to TRA which was formed on an assumption that a person behavior intention is free from any limitation. Ajzen, in 1991, added to TRA the perception of internal and external constraints on behavior identified as the Perceived Behavioral Control, which is concerned that behavioral intentions are affected to a certain degree by the existence of constraints such as scarcity of resources or the presence of external restrictions (Willis, 2008).

Perceived behavioral control measures the conviction of the ease of use of the technology and the presence of factors that carry out the performance of the behavior. If moving to cloud computing is perceived to be a complex transition; then the level of adoption will be negatively affected. On the other hand, if the perceived

willingness to adapt to the technology is positive this impacts positively the intentional behavior to use it. The perceived behavioral control will be included in this study to analyze its impact on the behavioral intention to use the technology. Figure 5 represents the diagram of the Theory of Planned Behavior.
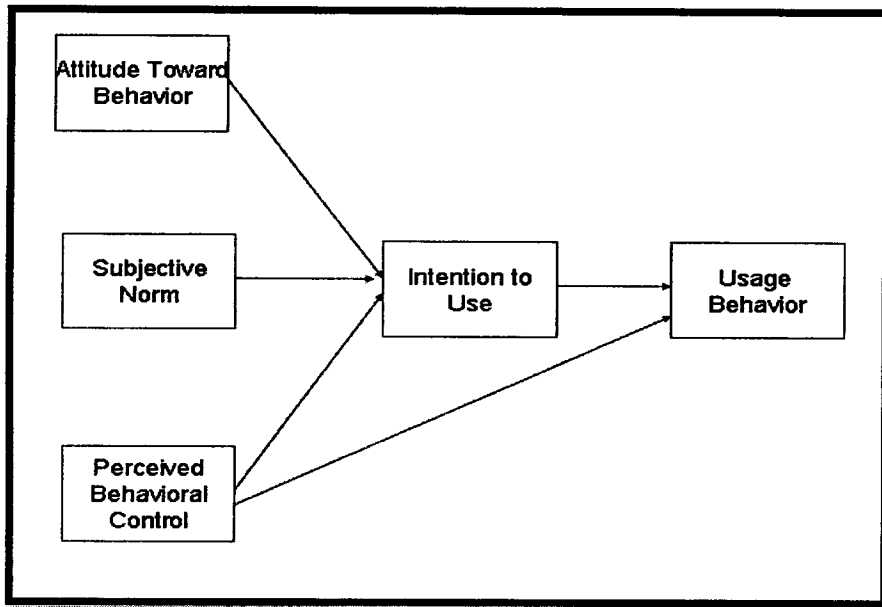
Figure 5: Theory of Planned Behavior

(Fishbein & Ajzen, 1979)

2.4. Technology Acceptance Model

Davis developed the TAM in 1986 to analyze the determinants taken into consideration by technology DM in the adoption of technologies in order to satisfy their organizational computing needs. The purpose from TAM was to provide a model that studies the impact of external factors on internal beliefs, such as attitudes and intentions. Davis used TRA as a basic to correlate between various variables by modeling a theoretical relationship (Fred, Bagozzi, & Warshaw, 1989).

The TAM bridges business and computer science; it has been extensively used as a theoretical framework for studying the influence of users' decision in accepting new information technology based on perceived usefulness (PU) and perceived ease of use (PEOU) as below figure 6 shows (Powelson, 2011).
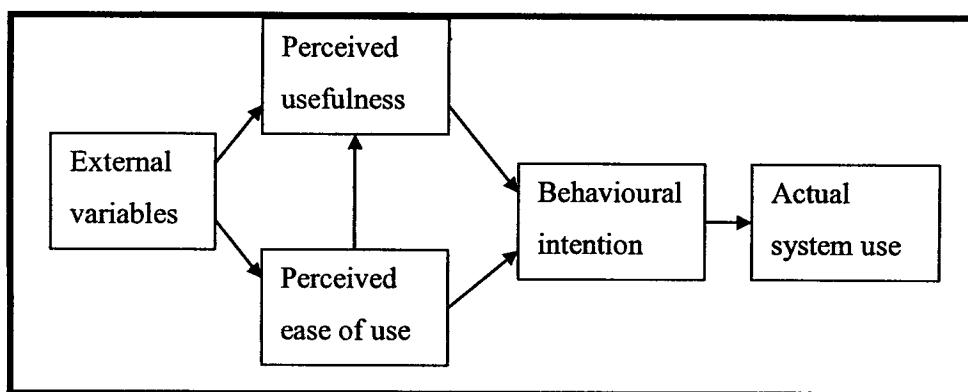
Figure 6: Technology Acceptance Model 1

The theoretical importance of perceived usefulness and perceived ease of use as determinants of user behavior were used in several studies, initialized by Schultz and Slevin in 1975 as Expectancy model; then it was more developed by Robey in 1979 perceived as a use performance contingency.

In 1982 Bandura examined the importance of perceived ease of use and developed a Self-efficacy theory that prospect behavioral efficacy during the execution of potential situations. Bandura considered the "out-come judgment" and self efficacy are best to predict the behavior. Similar to the perceived usefulness, the latter emphasize on the positive relationship of behavior and successful execution with the desired valued outcomes. When a system is seen with high perceived usefulness, the same would be when users maintain a positive user-performance relationship.

In 1989, Davis researched the latter determinants of technology acceptance which he defined as follow:

Perceived usefulness is the degree to which a user believes that a system can help him or her performing better and enhance productivity level. It is the users' perception that the system is advantageous. Therefore, the implications of users to adopt cloud computing will be related to the perceived proposition value of using cloud computing and the gained level of productivity.

Perceived ease of use is defined as the degree to which a user believes a system is easy to use at a minimal effort (Davis, 1989).

The finding of the TAM resulted that there is a positive relationship between PU and PEOU with acceptance of information technology. Gefen and Straub (1997)

have extensively discussed this relationship, proofing that PEOU impact the behavioral intentions of system used via perceived usefulness.

The TAM was originated to forecast who will potentially accept new technology in a workplace. Davis recognized in 1989 that users often adopt a certain technology based on management requirement as part of their duties and might not use it otherwise; therefore, technology acceptance is not solely determined by user's beliefs (Willis, 2008).

The perceived usefulness and ease of use are two important determinants to admit in the research; in order to test their level of influence on the intentional behavior to accept cloud computing technology in an organization along to their relationship with other determinants.

Despite the fact that TAM tackled two important factors in behavioral technology acceptance, PU and PEOU; however, the theory lacks many other determinants that gravely affect the intentional behavior and the actual use of technology such as social cognitive influence and the existence of constraints associated with the action. A further explanation is provided by technology acceptance model which is discussed below.

2.5. Technology Acceptance Model 2

In 2000, further research was added to TAM, known as TAM2 and developed by Venkatesh and Davis. TAM2 introduced a theoretical study on the impact of Social influence processes and cognitive instrumental processes on individuals' behavior towards adopting or rejecting a new technology (Fishbein & Ajzen, 1979).

The social influence processes, which reflect the individual's perception that surrounded people, expect him to perform a certain behavior. It comprises below determinants:

1) Subjective norm

It was included in both TRA and TPB as a direct determinant of behavioral intention. The principal behind subjective norm is that individuals may choose to act upon a certain behavior even if they are not themselves in favor of this behavior

consequence, only if an important referral expects them to do so. However, studies analyzing the direct effect of subjective norm on intention have returned mixed results. The TAM and TRA yielded that the subjective norm does not significantly influence intentions over and above perceived usefulness and ease of use but they did admit the need for additional research the relationship between social influences and usage behavior.

2) Voluntariness and compliance with social influence

Further studies showed that subjective norm had a significant effect on intention mandatory settings rather than voluntary settings; this causal effect is called compliance effect of subjective norm on intention. TAM2 explains that in a technology acceptance context, the direct compliance effect will be mandatory and not voluntary system usage. Hartwich and Barki (1994) has stated that the technology use is been mandated in organizations, users intentions might be different as some users are unwilling to abide with such mandates.

3) Image and social influence

Individuals mainly react to social normative influences to prove or maintain a favorable image among a reference group. In information technology, social influence is perceived to enhance organizational image and social system in terms of high technology and innovation usage.

As for the change in cognitive instrumental processes are influenced by experience. It consists of below determinants:

1) Job relevance

Individuals will continue to balance between their job goals and the consequences of technology usage in terms of behavioral perception.

2) Output quality

The output quality will remain a direct determinant of perceived usefulness over time.

3) Result demonstrability

More research to be done on result demonstrability to understand if the effect on perceived usefulness will become stronger or weaker over time.

4) Perceived ease of use

The effect of perceived ease of use on perceived usefulness has sometimes been found to increase over time and to decrease in others. Presently, there is a lack of sufficient theoretical rational to hypothesize these temporal shifts compared to the effect of cognitive determinants such as ease of use, job relevance, results demonstrability, etc...on perceived usefulness. See below figure 7.
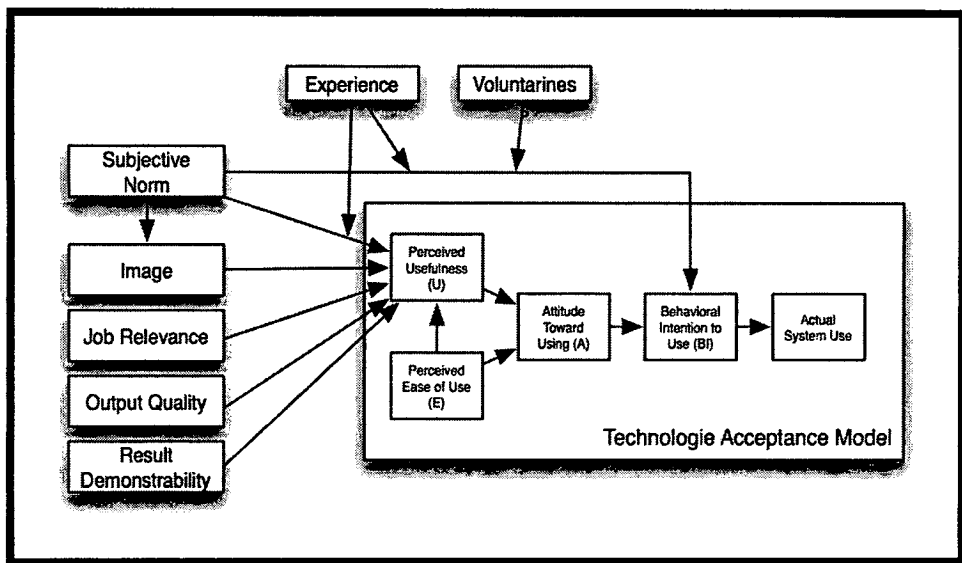
Figure 7: Technology Acceptance Model 2

(Venkatesh, Viswanath, Davis, & Fred, 2000)

TAM2 examines both subjective norms level of influence on the intention to accept the technology and its impact on the voluntariness intention and the effect on the perceived social influence of organizational image. Image and social influence is considered a factor to be analyzed in this study for further implications.

2.6. User Acceptance of Virtual Worlds

Today organizations face an increased need of Virtual worlds that enable them to communicate across different branches anytime and anywhere in the world. A virtual world allows a high level of communication, collaboration and cooperation

over the internet through multiple channels and applications such as e-mail, video conferencing, presentation or instant messaging. Fetscherin and Lattemann introduced in 2008 the theory of user acceptance of virtual worlds which is elaborated based on the TAM to study the following factors that are gravely influencing user intention to accept virtual worlds, below figure 8 shows the diagram of User acceptance of Virtual World:

- Perceived Usefulness
- Perceived easiness of use (skills, flexibility, understanding of behavioral intention)
- Social Norms
- Performance expectancy
- Anxiety
- Socio-demographical
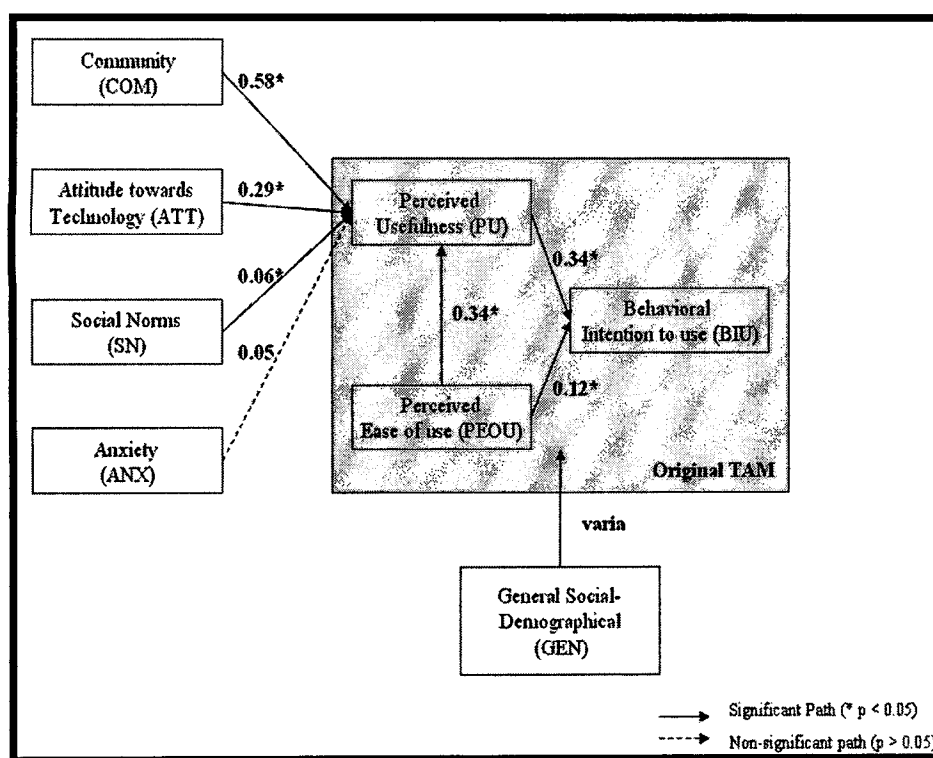
Figure 8: User Acceptance of Virtual Worlds

(Fetscherin & Lattemann, 2008)

The research result was the introduction of a new variable known as perceived community functions (COM) which enable new channels to communicate,

cooperate and collaborate in virtual words influence positively and play a pivotal role in influencing directly the users' behavioral intention of virtual worlds. The findings show that the COM is the most important factors for the user adoption and acceptance of virtual worlds. The other factors also proved that they have a relatively influence on users' behavioral intention in accepting the virtual worlds as stated in previous theoretical studies.

Businesses are influenced by high level of usefulness of virtualization and cloud technologies numerous advantages that are gained such as the reduced cost of physical infrastructure, the increased level of efficiency, agility and control; all of these are perceived in this study as relative advantage of the technology offering.

2.7. Innovation Diffusion Theory (IDT)

IDT has been included in extensive research for studying the diffusion and adoption of information technology and new innovations (Powelson, 2011; Ross, 2010; Venkatesh, Viswanath, Davis, & Fred, 2000).

Innovations come alive to fulfill specific needs or user demands; technological innovations are new ideas that may help individuals in enhancing their productivity level and in efficiently completing the required tasks.

Producers put effort to supply new technological innovations user friendly and to successfully convince potential adopters. Nevertheless, knowledge and experience of close friends or peers influence directly the speed of the adoption; high skilled users tend to adopt technology earlier then non skilled users. Therefore, the cycle life of innovation and the speed of diffusion are determined by the distribution of users' skill.

Diffusion shows the frequency of adoption or rejection of a new innovation spread over a period of time, it includes determinants such as time and social pressures.

In 1963, Rogers presented the Innovation diffusion theory that studies user adoption. The theory explores the innovation process and the related adoption rate by analyzing the factors influencing users' acceptance of new technology. Rogers

found that the following five factors identify the process of new technology adoption:

Relative advantage is the potential users' perception level of an innovation as being better or worse than the existing product. Typically, potential adopters who realize the added value of a new product or services and conceive the advantages and usefulness to be better than similar products they will promptly adopt it.

Compatibility is the potential users' perception level of an innovation as being consistent with the existing values and experience. Technologies that are congruent with similar system are likely to be adopted.

Complexity is the potential users' perception level of an innovation as being hard to understand and use. Complexity impacts negatively users' adoption or acceptance of a new technology.

Trial-ability is the accessibility offered to potential users' to innovation experimentation before adoption. This possibility to try out an innovation eases the adoption of an innovation.

Observability is the level of how an innovation is observable to others. The indirect influence of peers and communication channels through which information of an innovation is spread from an individual to another; if everyone else has an innovation, an individual will be more likely to adopt it which leads to a social threshold.

Social norms affect the diffusion process of an innovation adoption within a population. In 1963, Rogers also discussed how the factor of time also impacts the diffusion process; he dispatched adopters into groups based on the relative amount of time it took a percentage of individuals to adopt. He concluded that early adopters fall into high socio-economic status and have broad access to communication methods with a higher upward mobility within their social culture compare to late adopters who have a low capacity for uncertainty for change and falls into a lower socio-economic status with low access to mass communication.

Valier came to support the theoretical framework applied and examined the relationship between cloud computing innovation and its adoption by small

businesses; however, other researches by Rouibah and Hamdy in 2009 limited the innovation attributes to relative advantage, compatibility and complexity.

Furthermore, in a prominent diffusion research relative advantage was stressed as an essential innovation attribute in determining the adoption of IT innovations. Relative advantage was estimated in this study to be demonstrated by performing tasks quickly, increasing quality, working easier, raising effectiveness, improving performance and enhancing productivity (Venkatesh, Viswanath, Davis, & Fred, 2000) (Moore & Benbasat, 1991; Rogers, 2003; Venkatesh et al., 2003).

Therefore, relative advantage is significantly important to study the adoption of cloud computing and shapes the result of this study.

Social norms was also studied in TAM2 and IDT, however, it was not deeply researched to cover the psychosocial effects that results from the use of technology.

Psychosocial effects are the results of technological interventions on the psychological and social characteristics of the employees. These effects can be positive or negative to organizational performance. If there are no negative effects related to the use of the technology, therefore, the diffusion of this technology into the organization is successful (Byrd, 1992).

Further researches are needed to understand the correlation between user acceptance of a new technology and the related psychosocial changes. Moreover, the resistance for new technology might be as a result of employees' negative perception, such as fear of losing their job importance or an increase in skills needed to perform a certain job which consequently might result in replacing them by more skilled employees. The fear of losing job is proposed to have an implication on the intentional behavior towards accepting cloud computing in organizations.

2.8. Conclusion

In summary, this thesis tests the above elected variables from previous theoretical researches along with the combination of both negative and positive users' perception towards accepting cloud computing technology in this specified region through a survey filled out by SMEs decision makers in Lebanon.

As a result, the following is the conceptualization of this thesis research model that studies the relationship of each variable with the organizational behavioral intention to use cloud computing:

- Psychosocial effects/organizational image
- Security
- Relative advantage
- Perceived ease of use

Chapter 3. LITERATURE REVIEW

This chapter presents some previous researches that praise or pick apart from the above theoretical framework discussed in chapter 2 and dig into the related variables that explains the adoption behavior of DM of new technology.

3.1. Introduction

Several studies were done to research the different attributes related to cloud computing trends, adoption, benefits, offerings as well as the future of the cloud. Swanson said that the number of meta-analyses in general innovation are all motivated by the need for theory (e.g., Damanpour 1987, 1991; Kwon and Zmud 1987; Tornatzky and Klein 1982). IDT and TAM are the most utilized theories in researches of users' acceptance of new technology.

3.2. Previous Research

3.2.1. Understanding the determinants of cloud computing adoption

In 2011, Chinyao Low, Yahsueh Chen, Mingchang Wu studied the determinants of cloud computing adoption in firms belonging to the high tech industry. The study was based on factors taken from the IDT theory along with the effect of subjective norms. A questionnaire was completed by 111 firms in Taiwan. The findings of the study brought out that relative advantage, top management support, firm size, competitive pressure and trading partner pressure characteristics have significant influence on the adoption of cloud computing. Since the study was done on high-tech firms in the industry; complexity, compatibility and technology readiness didn't show an impact on the acceptance of this new technology. However, if the research was to be done on different industries the results would show a different variation (Low, Chen, & Wu, 2011).

3.2.2. An Examination of SB' Propensity to Adopt Cloud-Computing Innovation

Cloud computing is getting more and more famous in many areas and real world applications. Recently, cloud computing has been as visible as any topic in IT. A quantitative cross-sectional study done by Steven E. Powelson in U.S. based on IDT examined Small Businesses' leaders' perceptions of cloud computing innovation and their propensity to adopt this emerging technology. The fundamental research involved understanding the degree to which cloud computing determinants are linked to small business leaders' intention to use cloud computing. The analysis of the survey resulted in findings indicating a great correlation between the following cloud computing attributes: Relative advantage, compatibility, complexity and the intent to use this technology. The cloud-computing attributes trial-ability, results demonstrable, and observe-ability were found to have a less than moderate correlation to intent to use while voluntariness was found not significantly correlated to intent to use (Powelson, 2011). Compatibility and complexity were found to be essentials innovation attributes measures to the intent use of cloud computing technology.

3.2.3. Cloud computing and emerging IT platforms

Former studies had also depicted significance in the relative advantage of cloud computing for small business. In addition, clients can benefit from the ``potential" cost reduction of providers, which could lead to a more competitive market and thus lower prices (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009). In this study quality of service parameters such as time, cost, reliability and trust/security were considered crucial in a commercial cloud offering for the business operations of organizations. Buyya and et al. stated that quality of services may evolve over time with the continuing changes in business environments, a negotiation mechanism should be applied to distinguish between different offers that establish SLAs. The authors added that the commercial offerings of market-oriented Clouds must be able to:

- Support customer-driven service management based on customer profiles and requested service requirements

- Define computational risk management tactics to identify, assess, and manage risks involved in the execution of applications with regards to service requirements and customer needs

- Derive appropriate market-based resource management strategies that encompass both customer-driven service management and computational risk management to sustain SLA oriented resource allocation

- Incorporate autonomic resource management models that effectively self-manage changes in service requirements to satisfy both new service demands and existing service obligations, and leverage VM technology to dynamically assign resource shares according to service requirements (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009).

3.2.4. Factors influencing the adoption of cloud computing by decision Making managers

In her study Virginia Watson discussed the factors that influence organizations in their decision whether to adopt cloud computing as a part of their strategic information technology planning. Respondents were all DM in Upstate New York companies. Four variables relationship with the decision to adopt cloud computing were studied, cost-effectiveness, needs of cloud computing, its reliability, and the perceived security effectiveness of cloud computing. The result of the analysis, showed a strong relationship between the decision to adopt cloud computing and the four independent variable. This study fail to study the technical factors that also affect the decision of adopting cloud computing, in addition the sample used is very small, a larger sample size would be needed to build a valid hypothesis findings, in addition it is also limited the area of Upstate New York. Further studies are needed to evaluate reliable and solid results of the factors that influence DM in adopting cloud computing services to meet organizational requirements (Ross, 2010).

3.3. Conclusion

The findings of the above studies reflect the attributes related to cloud computing adoption in US and other developed countries which might share similar results.

However, further research is needed to study the adoption attributes in different geographic countries that might not share the same economic and technological growth.

Various researchers examined the global adoption of cloud computing technology along with the different determinants that influence DM intention to use this technology. However, this thesis goal is to identify what are the determinants related to the cloud ecosystem in Lebanon and discover if the variables relationships proved in global studies exert the same influence and impact on Lebanese DM. Different variables will be analyzed in the effort of revealing the perspective of DM and discover the market potentials that shape the successful adoption of cloud computing.

Chapter 4. RESEARCH METHOD

4.1. Introduction

This chapter discusses the research method used in the thesis. It includes the details of the development process of utilizing theories and formulating hypothesis, in addition to elaborating a quantitative instrument for data collection. The chapter guides you through the flow of identified methods used to analyze the information in hand, collect the data and choose the sample along with the research procedures.

Based on the theoretical framework stated above, several global studies were examined that researched the determinants that influence small, medium and large organizations decision making to adopt cloud computing specifically in US and Europe. However, none of the studies incorporated the SMEs intentional behavior in Lebanon towards the adoption of this technology.

Therefore, the objective of this research design is to examine the difference or common determinants that might be an influence on DM in Lebanese organizations when adopting cloud computing technology. The purpose is to understand DM rational when accepting or rejecting this technology in Lebanese organizations.

4.2. Research Problem

Today SMEs struggle to survive the economic and political crises that Lebanon is experiencing. In addition, SMEs failures may threaten their sustainability because of the limited resources. Therefore, SMEs need to invest in outsourced services and green technology to boost their operational potentials and meet their business requirement for greater economic and societal contribution.

Furthermore, some SMEs lack the knowledge in information technology that allows them to understand cloud computing relative added value which makes it hard to adopt this new technology. Consequently, the research purpose is to identify and evaluate the factors that lead SMEs DM to adopt cloud computing. In addition to the challenges and consequences related to the adoption of this technology; since the process requires large information and awareness of the technology. Although, the

shift process towards a centralized cloud computing is complicated, various benefits are provided such as economy of scale, efficient resource usage and availability of resources to a large pool (Armbrust, 2009) which attracts organizations with limited resources.

4.3. Selected Variables

As stated previously in chapter 1, the purpose of this study is to research the factors contributing to the adoption of cloud services in the Lebanese market; it contributes to the knowledge of both cloud providers and SMEs users of computing services. To be able to evaluate these reasons, the following independent variables: educational background, type of organization and number of employees were evaluated along with their relative influence on the dependent variable: strategies, benefits, concerns, impact, willingness, advantages, challenges and the future of cloud computing that might wield influence on the planned behavior of Lebanese respondents in the sample as they perceive the adoption of cloud computing.

4.4. Research Questions

The research questions of the study are:

Research Question 1:

What are the attitudes of senior managers towards the eight dimensions of cloud computing established in the study?

Research Question 2:

What variations are found among senior managers' attitudes towards the eight dimensions of cloud computing based on the independent variables of education, type of organization, and number of employees in the organization?

Research Question 3:

What recommendations can be taken for future research in this area in Lebanon?

The above research questions provide the vendors with insights on the cloud adoption pattern as well as the perceived barriers to customer adoption which may influence the technology adoption process. Vendors can modify their strategies to increase the level of potential customers and update their future offerings to meet the changing needs of organizations. The section set forth presents the alternative hypotheses of the study.

4.5. Research Hypotheses

Based on the above research questions, the following hypotheses were examined:

H_1: Respondents with data availability concerns are likely to differ on the eight dimensions with those with no data availability concerns registering less favorable attitudes towards the adoption of cloud computing.

H_2: Respondents with high education level (above secondary school) are more likely to register favorable attitudes in the eight dimensions established in the study than their less formally educated counterparts.

H_3: Respondents who agree with the benefits of cloud computing will have higher agreements with importance of increased security provided by cloud computing than those who did not agree on the eight dimensions established in this study.

4.6. Research Design

4.6.1. Methodology

The previous researches identified in chapter 3 literature review were used to discover cloud computing benefits. The review led to the identification of this thesis research questions. To embrace the above issues, a behavioral methodology in quantitative research is employed to measure the attitudes of SMEs DM adoption of cloud computing in Lebanon. In this research project, a quantitative online survey instrument is employed for data collection. The purpose of the survey is to tackle the

factors that influence SMEs DM in recommending the adoption of cloud computing in Lebanon.

Data gathering was obtained through an internet based methodology, using an online survey and a purposive sampling technique which constitutes of selecting a sample of knowledgeable experts. The study population of the survey consisted of a selected professionals such as IT managers/decision makers, CIOs, CEOs who influence deeply the adoption decision making of cloud computing services in their organizations that operates in Lebanon and falls within the SMEs segment.

The number of respondents is not predetermined for this research; the goal is to gather sufficient data that allow for valid statistics to base this study. A total of 136 respondents have completed the online questionnaire.

4.6.2. Instrumentation

A quantitative research method approach is used in this study. Primary data are collected through an online questionnaire formed using Google Docs and hosted over the internet by Google Drive; the survey link available through Google drive was shared online on two social networks Facebook and LinkedIn. The purpose of sharing the survey online is to target a wide range of decision makers working across different sectors in Lebanese SMEs to increase statistical accuracy.

4.6.3. Questionnaire

The entire list of the questionnaire design is presented in Appendix A. The structured questionnaire contributes to the analysis of the relationship between each variable that answers the researches questions addressed in this study. It is constituted by closed-end questions with single or numeric answers along with Likert type scale. Furthermore, the questionnaire includes a section divided into two parts; the first part cover information about the respondents' age, gender, educational background, seniority level and occupation; as for the second part, it inquires information related to the respondents' organization such as years of operation, number of employees, industry...etc. The precedent section rates the benefits, relative advantage and concerns in terms of importance to the respondent's when deciding to use cloud computing in their organizations. As for the last section, it

researches the respondent's perception of cloud computing, impact on the hiring process, willingness to adapt, relative advantage, barriers and motivation toward cloud adoption using Likert-scale.

4.6.4. Pilot Test

The survey was pilot tested by eligible respondents in order to assess the instrument for validity and remove potential errors. Pilot respondents opinions were taken into consideration to remove or update equivocal questions. As a result, several modifications were altered to allow a better understanding of the questionnaire and an improved clarity. Data collected during the pilot test were not included in the research.

4.6.5. Sample

The final number of respondents reached after data correction is 136 out of which 104 are males (76.5%) and 32 are females (23.5%). The mean age of respondents was 37.6 and standard deviation of 5.4.

In terms of educational level, 86 (63.2%) of my sample hold a university (BA) and 50 (36.8%) hold a university degree (above BA).

Educational Level

University BA	63.23%
University Above BA	36.76%
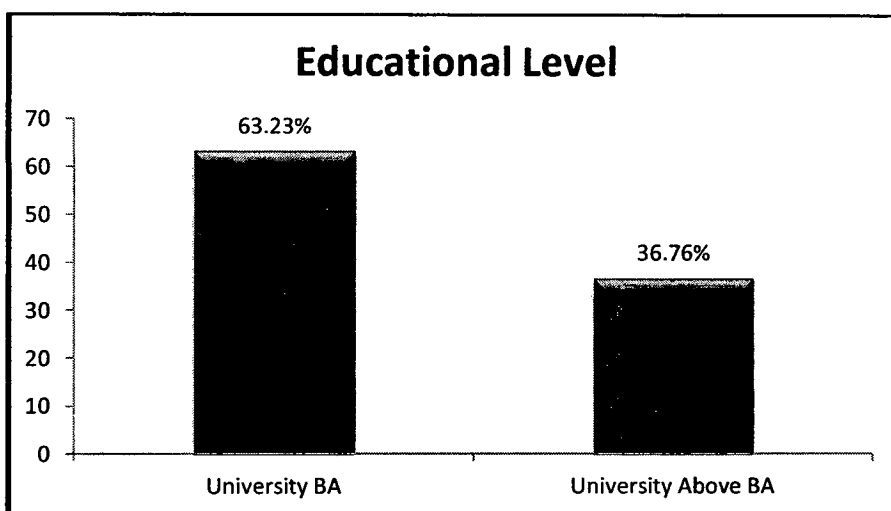
Figure 9: Education Level

Results show that my entire sample is educated with the majority of respondents' holding mid-level positions 80 (58.8%), 28 (20.6%) are vice

presidents/managers and 28 (20.6%) are in C-Level positions. The segmentation details are shown in Figure 13.
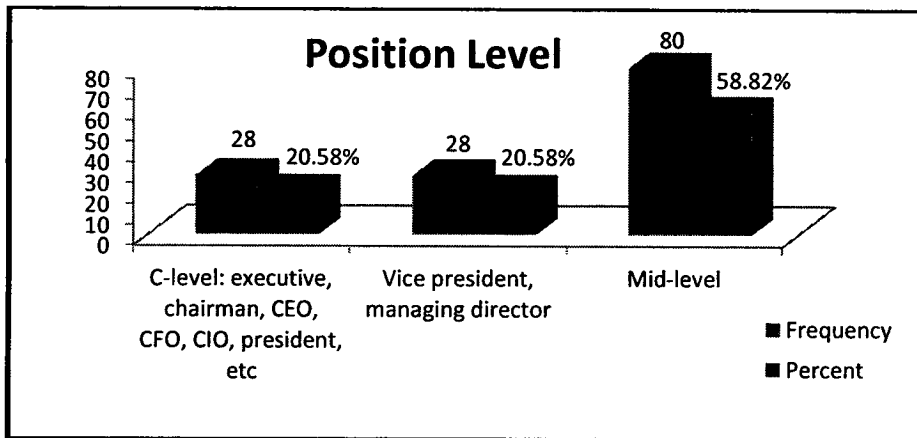
Figure 10: Position Level

The majority of respondents' are in the information technology field 45 covering (33.08%) of the sample; followed by business people with 43 (31.62%) working in business management or as coordinators and 30 (22.05%) operating in finance; and only 4 (2.94%) in marketing. As for the lowest is for planning or engineering with 13 (9.55%) and only 1 (0.73%) works in all the above; this might be related to a small company where the owner is holding different operational responsibilities. Details of the breakdown are shown in Figure 15.

This result might be due to the survey subject "Cloud computing" which is related to information technology and attracts high level business managers that follow IT trends. Information technology is nowadays booming and is a major component that is impacting all organizations and jobs.
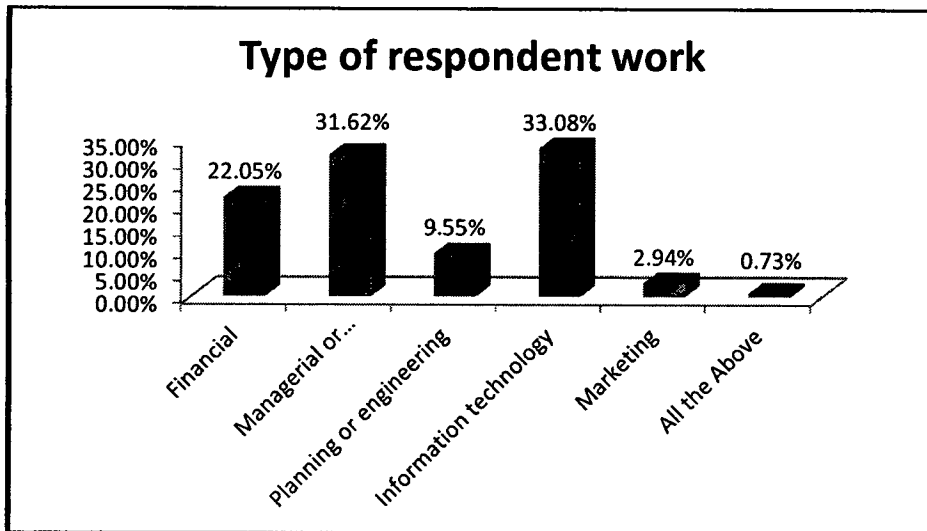
Figure 11: Type of work

The majority of respondents' organizations operate in Lebanon 105 (77 %) and 31 (22%) additionally to operating in Lebanon they have external presence in different countries.
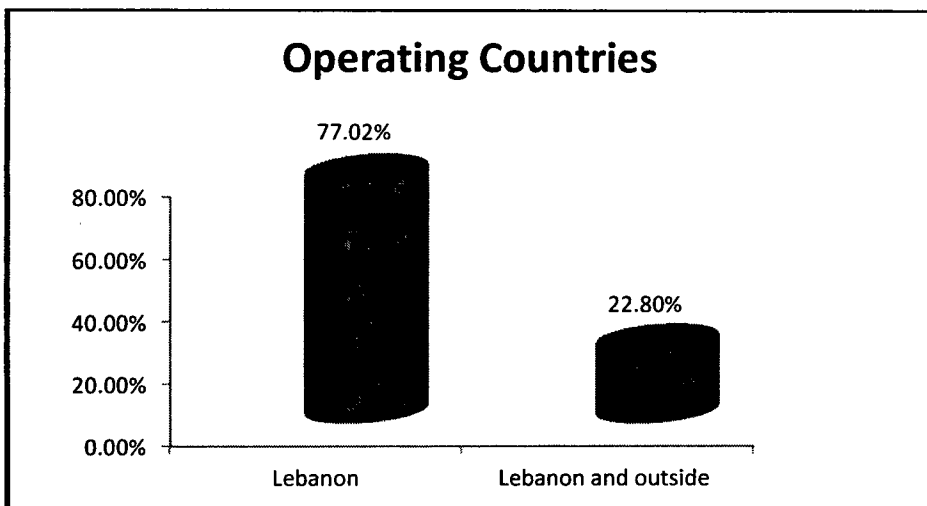
Figure 12: Operating Countries

In terms of organizational governorates dispersion, the majority of respondents said that there organizations are located in Beirut and Mount Lebanon with 95 (69.9%) and 31 (22.8%) successively and the rest of organizations are located in different area. We can assume this result is mostly related that most companies are located in the capital of Lebanon, Beirut.

Organization governorates dispersion

4.4% 2.2% ┌0.7%

■ Beirut
■ Mount Lebanon
▧ North
■ South
▧ Beqaa
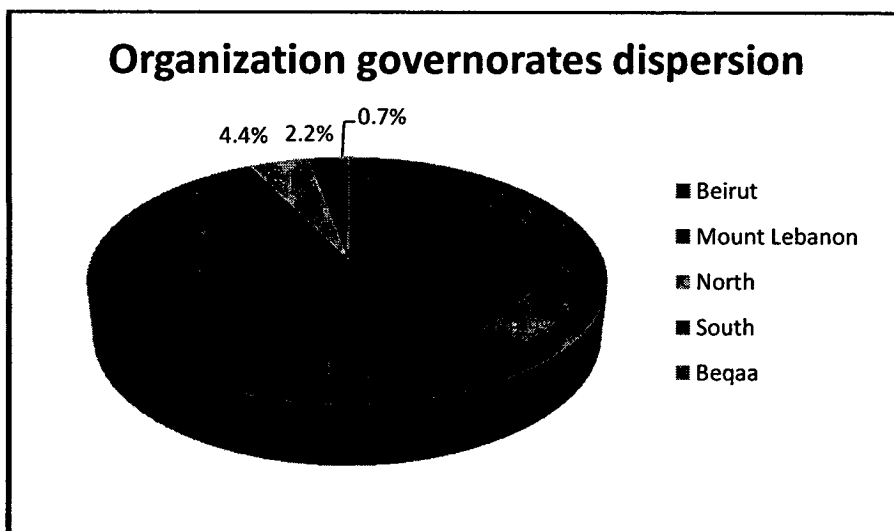
Figure 13: Organizational governorates dispersion of the sample

The majority of the respondents' organization falls in the information technology industry with 55 (40.44%); followed by Retail and wholesale with 19 (13.97%) and financial and insurance services with 17 (12.50%). As for the rest are divided between hotels and restaurants with 14 (10.29%), logistics and supply chain, manufacture, marketing and advertising and other industries.

In which industry does your organization fall?

40.44%

45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%   13.97%10.29%12.50%
10.00% 4.41%2.94%   2.94%5.88%5.14%
5.00%   0.73%0.73%
0.00%

Manufacture, Automotive, Retail and wholesale, Hotels and restaurants, Financial and insurance..., Information technology, Construction, Logistics and supply..., Marketing and..., Pharmaceuticals, Real estate

Figure 14: In which industry does your organization fall?

It can be noticed that most of the organizations in the sample are not cloud computing users at 117 (86%) compared to cloud users 19 (14%). Out of which 14 (73.70%) use non paid services compared to 5 (26.30%) use paid services. See

figures 18 and 19 below. It obviously shows that cloud computing technology is still not mature in Lebanon and that the product is at early stage of his life cycle.
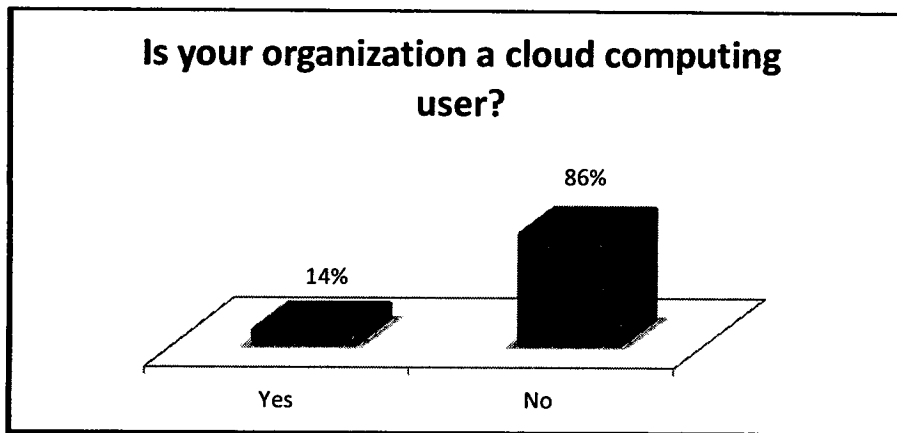
Figure 15: Is your organization a cloud computing user?
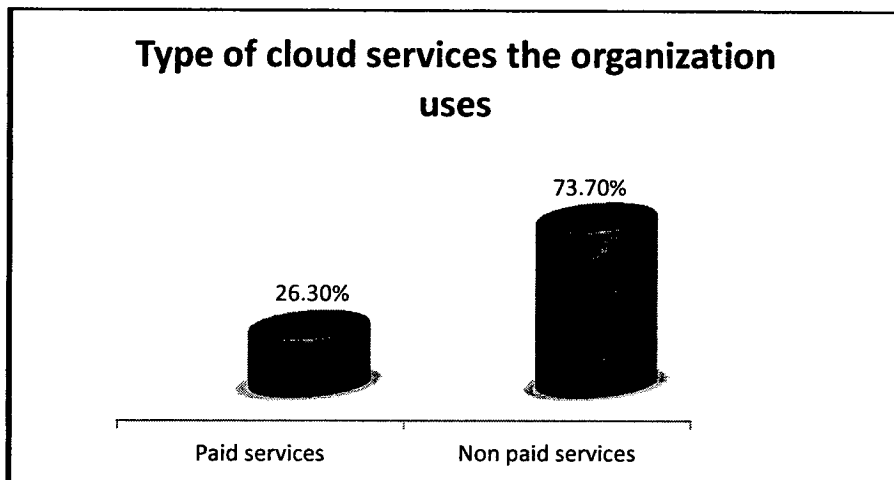
Figure 16: Type of cloud services the organization uses

4.6.6. Data Analysis

The data analysis was performed using SPSS. Two options were considered for examining the hypotheses of the study. Whether to use parametric or non-parametric test was focal point for consideration. Non-parametric test of Kruskal-Wallis test and Mann-Whitney (2) samples were considered for initial analysis. However, because parametric tests are more powerful than their non-parametric counterparts[1], and Independent t-test for dichotomous independent variable was

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[1] http://www.mayo.edu/mayo-edu-docs/center-for-translational-science-activities-documents/berd-5-6.pdf

considered and a One-way Analysis of Variance (ANOVA) was considered for independent variables larger than two categories. ANOVA was used because the data did not violate the use of parametric testing as yielded from Leven's test for homogeneity of variance[2]. The research was based on literature review that previously validated different concepts of determinants related to the acceptance of information technology innovation. This study constructs eight dependent variables: Strategies, benefits, concerns, impact, willingness, advantages, challenges and the future of cloud computing, which might influence the behavioral intention of SMEs to adopt cloud computing technology; and three independent variables: educational background, type of organization and number of employees.

4.6.7. Data Cleaning

Prior to the statistical analysis, all respondents were screened to check if they meet the following criteria:

- Top managers/senior decision makers at small to medium size enterprises (1-250 employees)
- Ages 21-65
- Companies operating in Lebanon

The data was also screened to eliminate any missing items or invalid data entered in SPSS. The purpose of data cleaning is to eliminate entries that are not eligible for this survey and prevent potential errors that could affect the results. For this reason, data frequency analysis is applied to detect wrong or missing data. Entries with wrong data were rubbed out from this study. In addition to entries that are not valid to the research purpose; such as respondents in junior level positions or companies that do not operate in Lebanon, were removed from the tested sample.

4.6.8. Reliability and Validity analysis techniques

A reliability analysis test is employed to test the reliability of the survey via Cronbach's coefficient alpha item analysis for each variable. Cronbach's alpha measures the correlations of each item scale, with a value that varies between 0 and 1 when all items measure a single construct; the higher level of reliability for Cronbach's alpha is reached. Generally, an alpha with a value of .70 is considered as

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[2] http://www.itl.nist.gov/div898/handbook/eda/section3/eda35a.htm

an acceptable level of reliability; however, the greater the value of alpha the better it is. A lower level of reliability might indicate some missing data or a low level of internal consistency in the instrument (Cronbach & Shavelson, 2004).

In this thesis, the Cronbach's alpha of the eight determinants which analyses the dependent variables effect on the perception of decision makers is equal to .80 which is considered good.

4.7. Conclusion

This study is based on data collected through a quantitative survey designed to test the variables that affect DM behavior in Lebanese SMEs toward adopting or rejecting cloud computing in their organizations. The survey targeted senior level decision makers. The next chapter discusses the findings of this research problem.

Chapter 5. Results and Findings

This chapter discusses the survey findings and reports the statistical results that allow a deep discourse of the proposed hypothesis.

5.1. Introduction

The purpose of this research is to study the factors that influence decision makers in adopting cloud computing to fulfill their organizational needs. The results will render both current or future adopters and service providers with information necessary to base their future organizational decisions and enlightening technological strategies.

5.2. Descriptive Statistics

This section shows the descriptive statistics for each concept addressed in the survey; all figures are listed below. For details refer to Appendix B.

In the first part respondents were asked to rate below strategies, benefits, concerns and impact of cloud computing in terms of their relative importance to the company in their own perspective. The rating is set on a scale from 1 to 7, with 1 being the least important and 7 being the most important.

As shown in Figure 20 below, more than half of the respondents answered that the company sees investing in new technology is important with 72 (52.94%), 16 (11.76%) and 4 (2.94%) as relatively important. On the other hand, only 20 (14.70%) said that investing in new technology is somehow not important. This shows that companies are considering cloud computing or other new technologies in their top investment are for 2014.
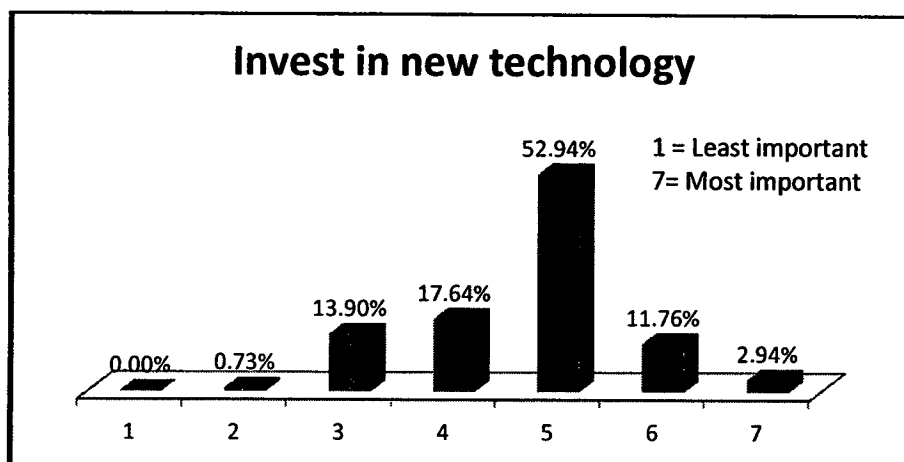
Figure 17: Rating strategies in terms of relative importance to the company: Invest in new technology

In terms of company strategies to expand physical presence, the majority of the respondents were neutral with 70 (51.47%) and 20 (14.70%) said that it is somehow not important with only 28 (20.58%) and 10 (7.35%) who sees expanding physical presence is important to the company. Therefore, we can conclude that the most of respondents see investing expanding physical presence in 2013 is not within the prioritized strategies of the company. This result might be related to the economic and political situation in the country and surroundings which hold back shareholders on investing in new projects or expansions.
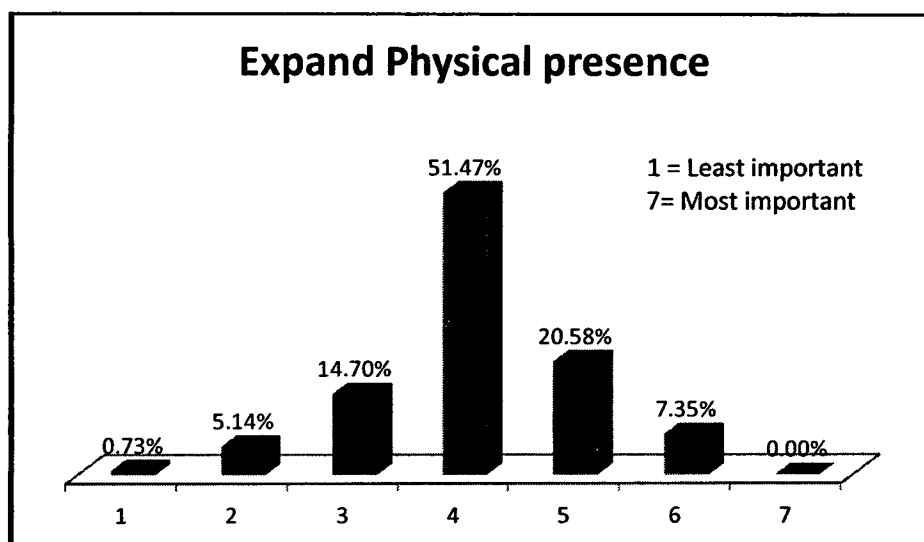
Figure 18: Rating strategies in terms of relative importance to the company: Expand physical presence

The study determines that most decision makers or managers still consider investing in human resource as an essential strategy for the company sustainability.

With the majority at 73 (53.67%) answered important and 32 (23.52%) answered most important to invest in human capital.

Invest in human capital

1 = Least important
7= Most important
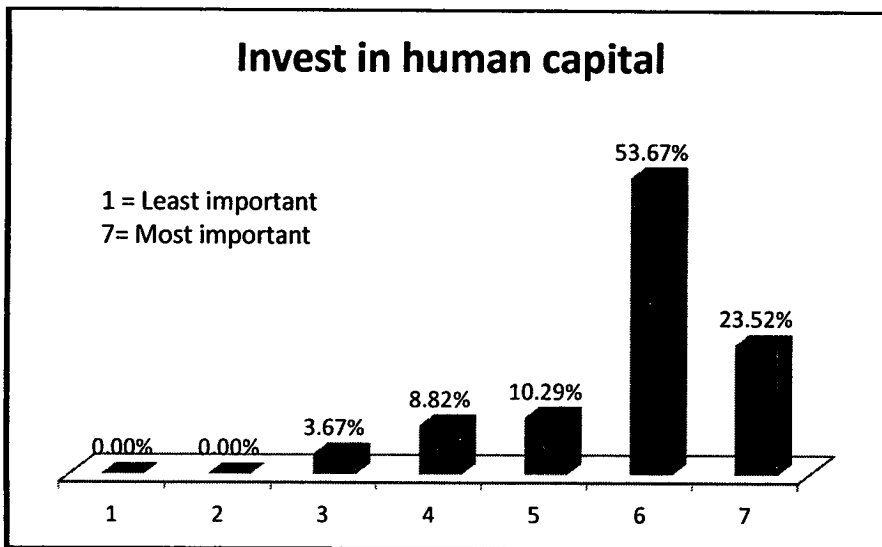
Figure 19: Rating strategies in terms of relative importance to the company: Invest in human capital

As for expanding business line, the probe shows a dispersed data across the scale, with most respondents answered somehow not important and not important with a sum of 51(14.70% and 22.80%); and the others answered somehow important and important with a sum of 43 (23.58% and 8.08%). In addition, a good share of neutral answers is seen at 35 (25.73%).

Expand Business Line

1 = Least important
7= Most important
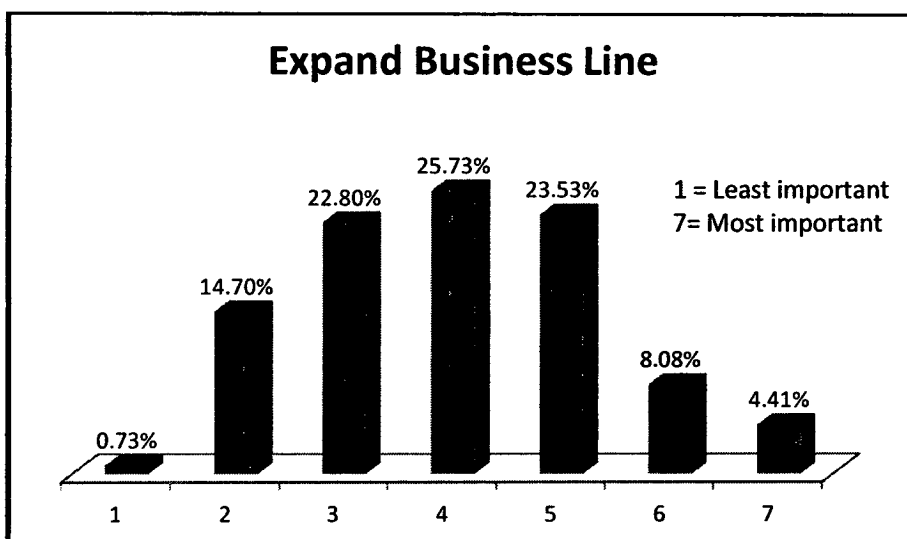
Figure 20: Rating strategies in terms of relative importance to the company: Expand physical presence

The following figure shows the high level of importance at 111 (81.6%) and 14 (10.29%) who answered important to focus on optimizing profitability. The results are very logic, as top management perspective is to maximize the company profitability through the increase of revenue towards the best interest of the stakeholders.

Focus on optimizing profitability

1 = Least important
7= Most important

	81.60%
	10.29%
5.88%	
2.20%	
0.00% 0.00% 0.00%	
1 2 3 4 5 6 7
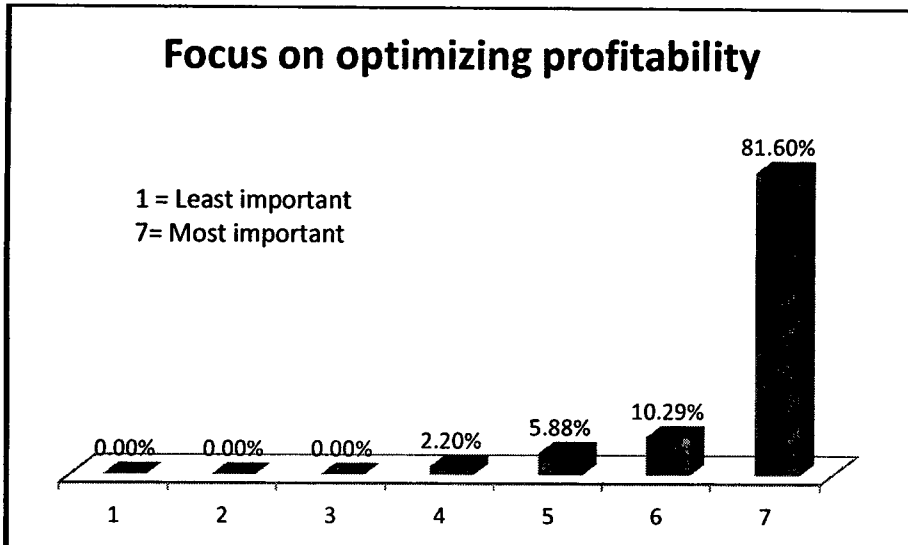
Figure 21: Rating strategies in terms of relative importance to the company: focus on optimizing profitability

More than 80% of the respondents acknowledge the importance to have access to company data anywhere though multiple devices and anytime, as business demands grow, the need for mobility and flexibility is increasing. Employees can benefit from accessing company data anytime, wherever they are; instead of having to bind to their offices. For numbers breakdown see figure below.

Allow me to access data anywhere through multiple devices

1 = Least important
7= Most important

	39.70%
	25.00%
17.64%	
13.23%	
4.41%	
0.00% 0.00%	
1 2 3 4 5 6 7
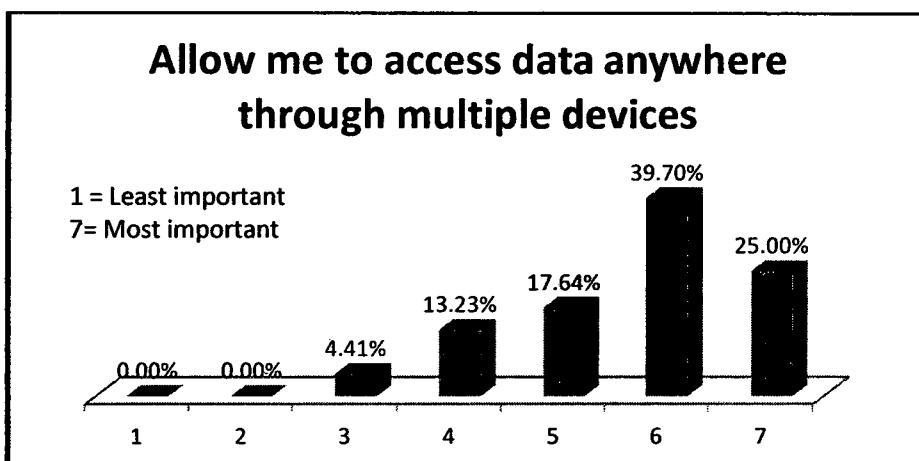
Figure 22: Rating benefits in terms of relative importance to the respondent: Allow access to data anywhere through multiple devices

From a management perspective, security is necessary at each level of the organization whether in IT infrastructure to the protection from external threats; this is why results show 118 respondents at more than 82% of the answered survey are aware of the security high importance even at an individual level. Top managers understand the importance of security measures and they leverage it to meet the business criteria.

Provide increased security

1 = Least important
7= Most important

37.50%
32.35%
16.91%
11.76%
0.00%   0.00%   1.47%

1   2   3   4   5   6   7
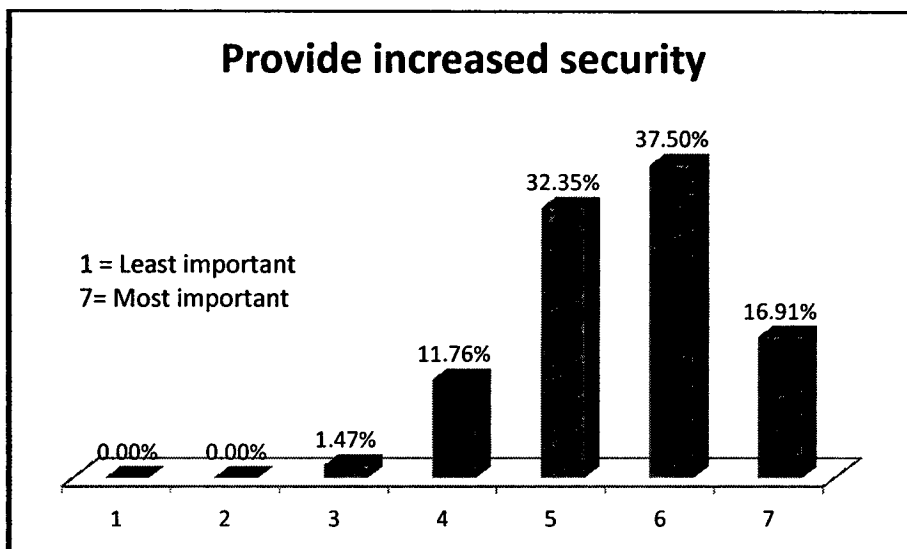
Figure 23: Rating benefits in terms of relative importance to the respondent: Provide increased security

Almost three quarter of the respondents are interested in acquiring latest versions of technology with 42 (30.88%), 28 (20.58%) and 26 (19.11%) relatively important to most important; with only 31 (22.79%) were neutral towards ensuring latest versions of technology. This might be due to the fact that most of my respondents' companies' fall under the information technology industry or finance who are the first emptor of new technology and who are in search for ways to keep the company software up to date.
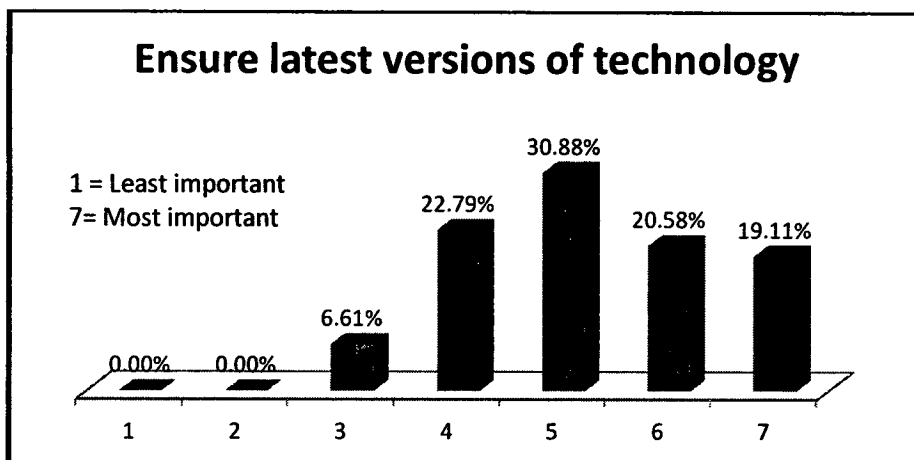
Figure 24: Rating benefits in terms of relative importance to the respondent: Ensure latest versions of technology

Almost all the respondents position cost savings as highly important, from a top management perspective with 128 (94%) inputs. Management are always concerned on finding ways to improve the bottom line costs while at the same time maintain a high level of productivity. See figure below 28.
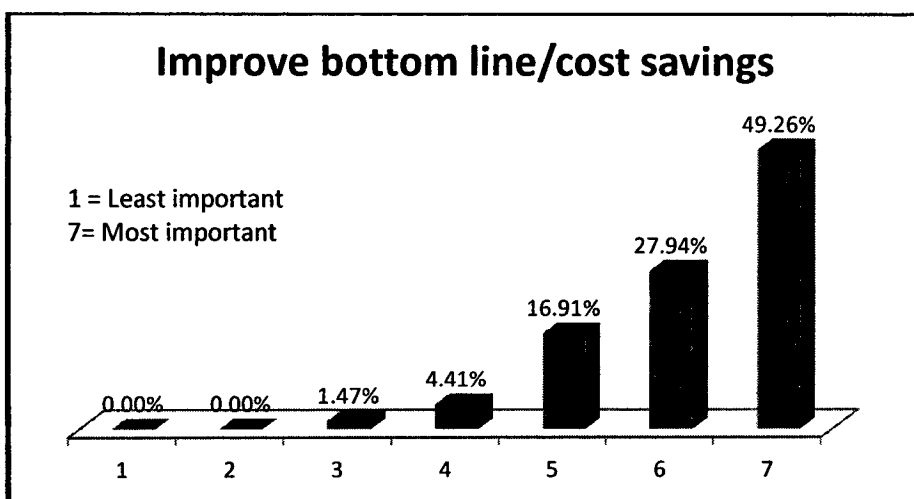
Figure 25: Rating benefits in terms of relative importance to the respondent: Improve bottom line / cost savings

It can be noticed in figure 39 below that most respondents 99 (71%) acknowledge the benefits and importance of reducing IT workloads. On the other hand, only 23 (16.91%) cannot actually feel the benefits of reducing IT workloads, and 16 (11.7%) are careless about IT workloads. It can be concluded that employees and top management today are looking for new ways to optimize productivity while at the same time minimizing cost and benefiting the utmost out of resources. Reducing IT workloads is a burden for most companies; as IT system management is

not easy; and the process of maintaining and keeping track of all machines is an encumbrance responsibility. Therefore, acquiring a new technology like cloud computing would attract lot of companies who are in a search to decrease their IT costs and remove the pain of IT system maintenance.
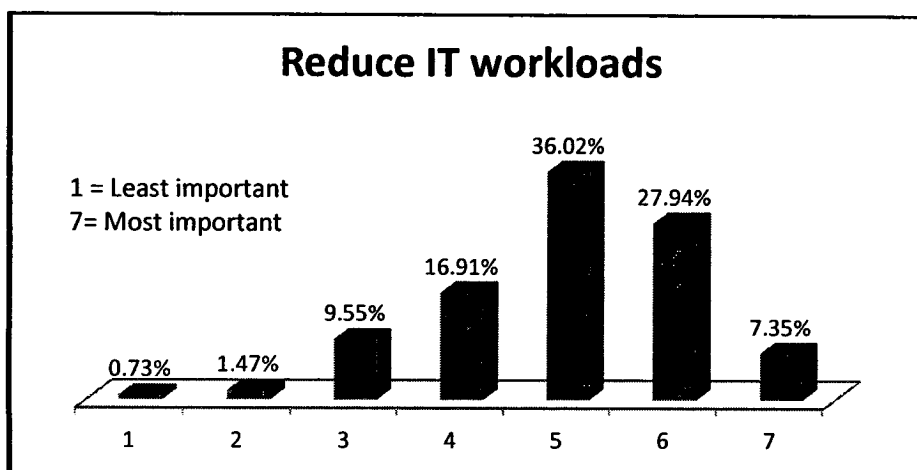
Figure 26: Rating benefits in terms of relative importance to the respondent: Reduce IT workloads

Cloud computing offers lots of benefit; however, it does not fulfill all organizational requirements; as some people might have concerns about security, down time or finding the right vendor to assist them in managing their mixed environment. The results show that most respondents are concerned about vendors' credibility. It can be assumed that these results are due to the fact that cloud computing is still quite new and users depend on vendors' expertise to assist them in deploying and integrating their hybrid cloud. More than 127 (90%) of the respondents see vendors' credibility as important to most important for cloud computing projects. Therefore, we can assume that the need to cloud deployment certified vendors will increase.

Vendors credibility

1 = Least important
7= Most important

0.00% 0.00% 0.73% 5.89% 15.44% 41.18% 36.76%

1   2   3   4   5   6   7
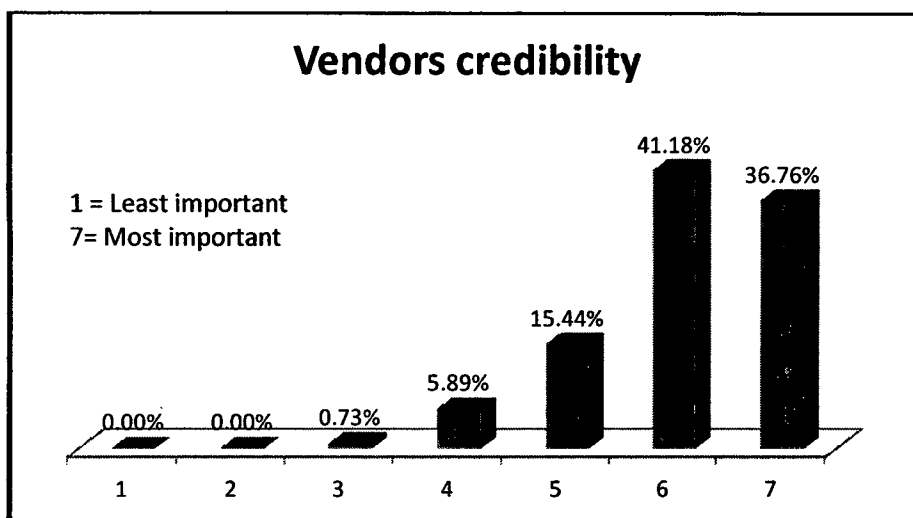
Figure 27: Vendors Credibility

Most importantly in cloud computing is data availability/reliability with 133 (97%) of respondents who expressed a high level of concern out of which 105 (77.20%) see it as extremely important. Nowadays, the most critical resource for organizations is Data. As a matter of fact, big data is the main particle that drives the cloud forward towards expansion and new structure development; such as economies of scale through low cost services as SaaS, PaaS or IaaS... that allow the development of huge data and undertake all arising challenges. This need accompanied by the increase of Data storage and speed of generating this data and all time availability and reliability is pushing the IT infrastructure forward and creating new cloud utilities to assist the users in problem solving through the system capabilities.
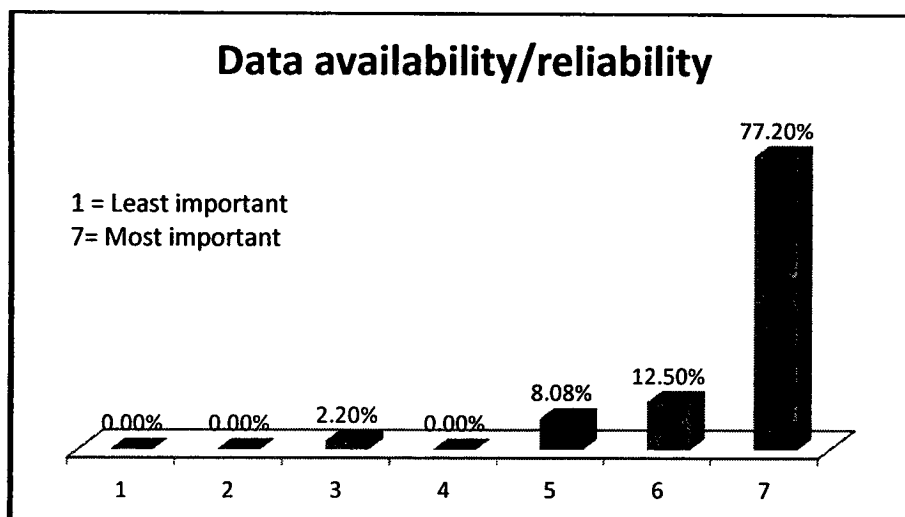
Figure 28: Data availability/reliability

The survey shows that Data privacy/Data loss is highly important to users at 126 (11.02% and 81.62%) respondents; this is an expected logical result, as organizations needs to know that there data is stored in a safe place. Furthermore, conventionally managers used to have great control over the company information system and loosing this control over their resources and data intimidates them. Therefore, vendors should make the cloud benefits clear to organizational decision makers and help them understand the different security levels; making sure that the cloud services are compliant and answering their organizational needs without harming their privacy or putting the company data at risk. CIOs need to realize that moving to the cloud is strategic to the company and the requested security measures meet their standards; they have the right to know what are the laws that govern their data and in which data center it is stored. On top of this, cloud solution providers are able to offer high level of security measures that SMBs are not able to afford because of their financial restraints; such as hardware and software redundancy that can be promptly positioned in case of emergency and availability of IT specialists monitoring the system. Nowadays, companies are looking for business sustainability, SMBs are subject to different system threats like fire, theft, earthquakes or power outages due to the Lebanese weak infrastructure; cloud solution providers are able to secure organizational data through data replication across data centers existing in different geographic locations to eliminate the risk of these threats and allow for disaster recovery and secure business continuity.
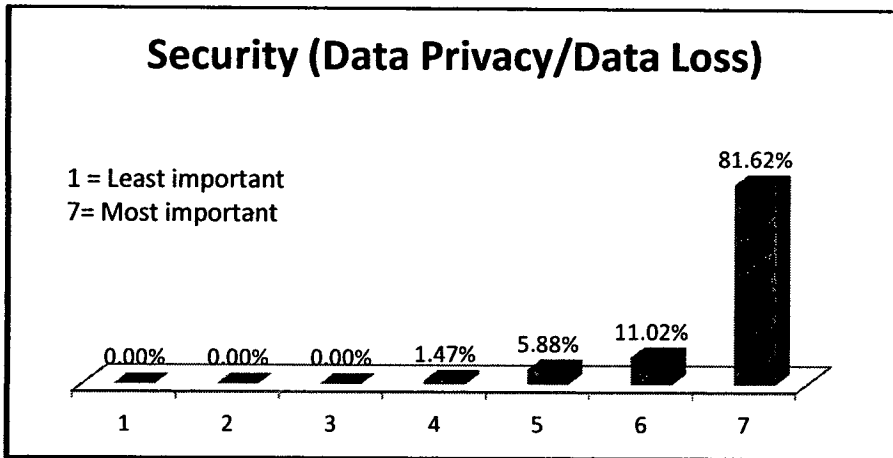
Figure 29: Security (Data Privacy/Data Loss)

Today Managers want to have cost-savings by having best-practice processes in the cloud while being able to take care of local compliance and reporting requirements. Consequently, vendors are offering cloud solutions that are specifically tailored for the SMB market demand through on demand services and economy of scale; in order to help companies reduce their CAPEX and therefore increase their return on investment (ROI), customers only pay for their amount of resources they consume. Customers pay only for the resources they consume as the figure below shows, 131 (96%) respondents are highly looking to the importance of cost savings.
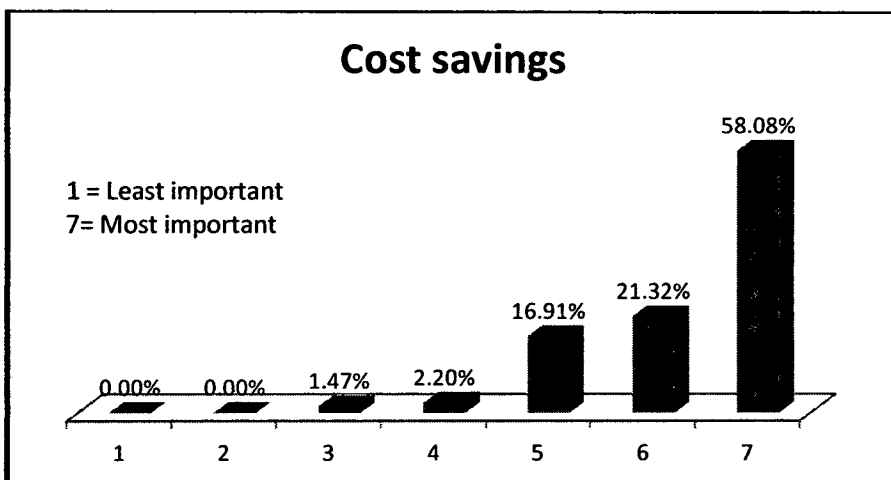
Figure 30: Cost savings

It can be noticed that more 116 (85%) of my respondents consider data migration and deployment as important to the organization and only 20 (15%) sees data migration and deployment as easy or relatively not that important. Data

migration and deployment require an experienced cloud specialist; as various issues. should to be considered before moving to the cloud, such as data backup requirements, business continuity and disaster requirements, system uptime, client device requirement, training, data export...etc.

Data migration and deployment

1 = Least important
7= Most important

Value
0.00%
2.94%
4.41%
7.35%
31.62%
35.30%
18.39%
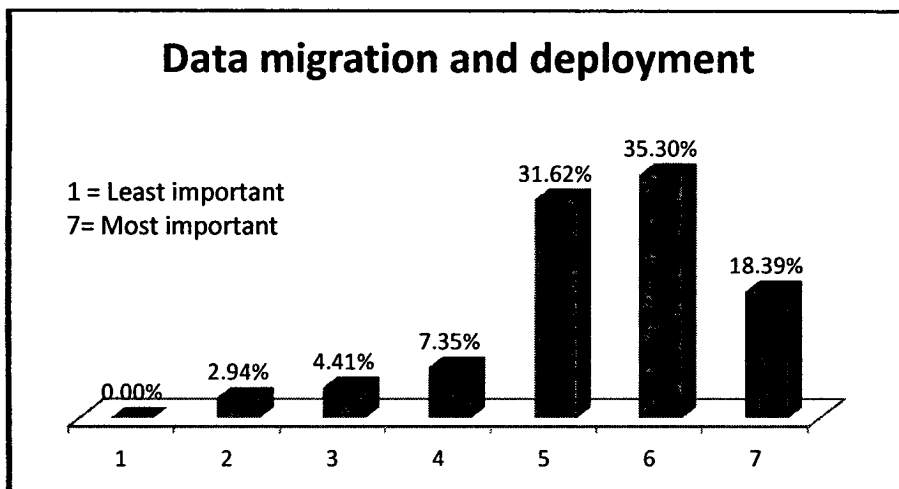
Figure 31: Data migration and deployment

According to the study, 83 (61%) respondents claim that it is somehow not important to hire more internal staff with cloud computing experience and only 22 (16%) find that it is relatively important to hire more internal staff with cloud computing experience. This result could be due to the type of cloud subscription model that does not require internal management; on the other hand the IT management of the infrastructure in addition to the deployment and integration are controlled by the vendor.

Hire more internal staff with cloud computing experience

1 = Least important
7= Most important

Value
2.20%
6.62%
61.00%
13.97%
11.02%
4.41%
0.73%
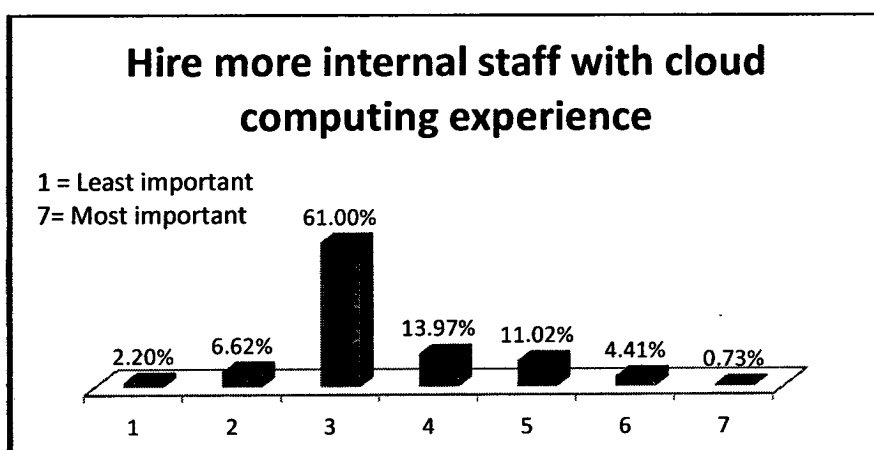
Figure 32: Hire more internal staff with cloud computing experience

As the below figure shows, most respondents claim that they need to hire vendors to assist them in deploying cloud project with 129 (95%) respondents. Organizations are in need of cloud experienced vendors to assist them in deploying their cloud projects and this is due to the lack of cloud expertise among the available resources at the company and that the product is rather new. We can further infer that the need to experienced cloud employees or consultants will extremely increase. Therefore, the demand for cloud skilled IT people will enormously increase, due to the knowledge gap.

Hire vendors to assist deploy cloud project

1 = Least important
7= Most important

				37.50%	53.68%	
0.00%	0.00%	2.20%	2.94%			3.67%
1	2	3	4	5	6	7
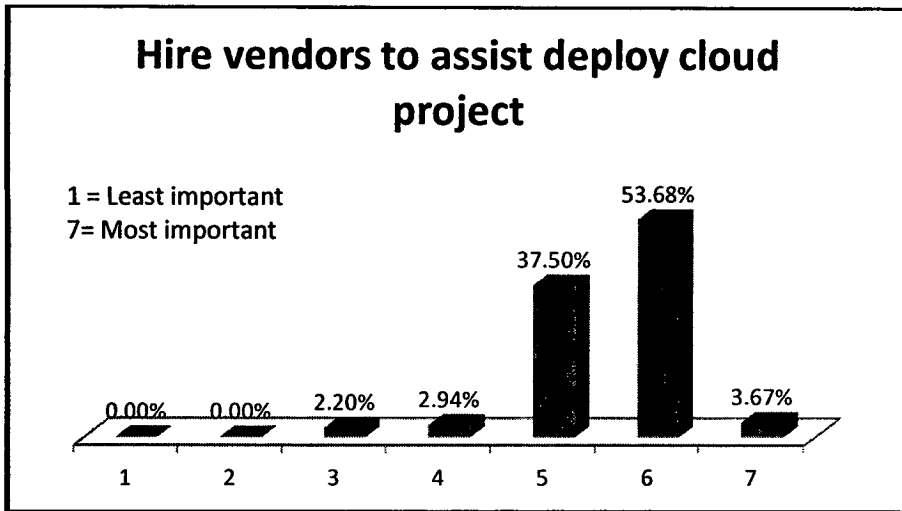
Figure 33: Hire vendors to assist deploy cloud project

The survey also finds that most of respondents would not reduce the IT staff; this might be due to the fact that most companies have a small IT team limited to one or two employees or they use outsourced IT services. You can find below numbers breakdown.
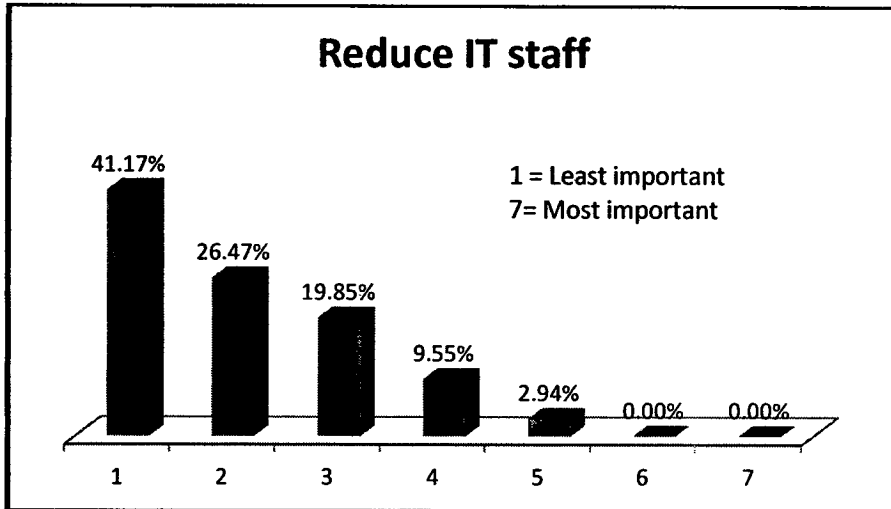
Figure 34: Reduce IT staff

Although cloud products are still new, however, the survey finds that more than 105 (77%) respondents agree that adapting to cloud computing is easy; compared to 31 (23%) who disagree that adapting to cloud computing is easy.

In the second part, respondents were asked to rate their level of agreement on the following: willingness to adapt, relative advantages, challenges and the future of cloud computing. The rating is set on a scale from 1 to 7, with 1 for strongly disagree and 7 for strongly agree.
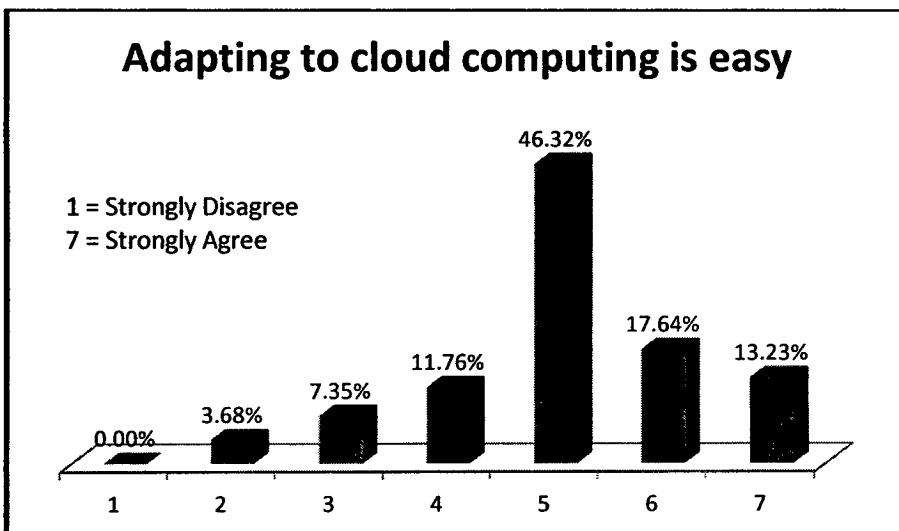
Figure 35: Adapting to cloud computing is easy

Although respondents seems to find adapting to cloud computing is relatively easy; however, the survey shows that the management sees that the IT staff is still

not enough qualified to adapt to the implementation of cloud computing services. See below figure 39.
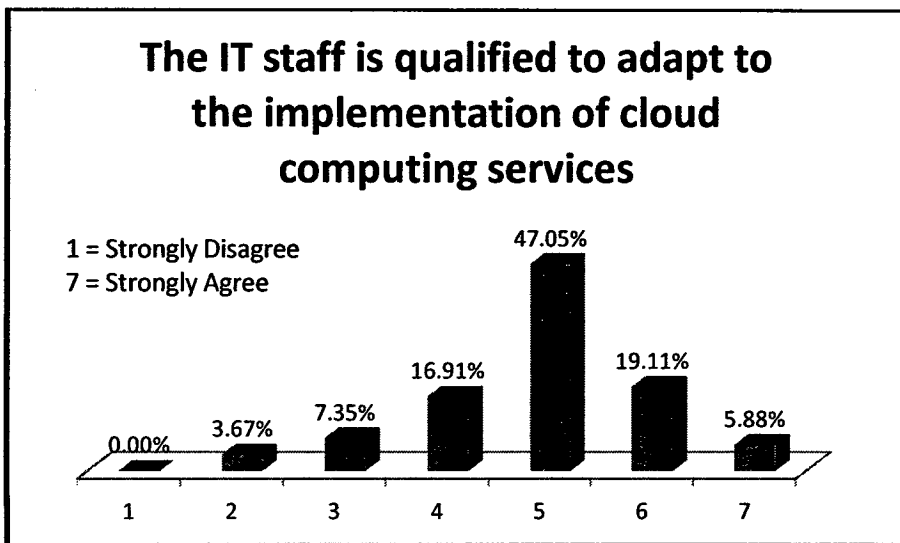
Figure 36: The IT staff is qualified to adapt to the implementation of cloud computing services

The respondents' claim that they are positive towards increasing the training budget for the IT staff with 98 (72%) agrees responses. This result might be due to the interest in cloud computing products and the decrease the gap of knowledge through awareness and staff readiness programs towards the use of expertise in the field.
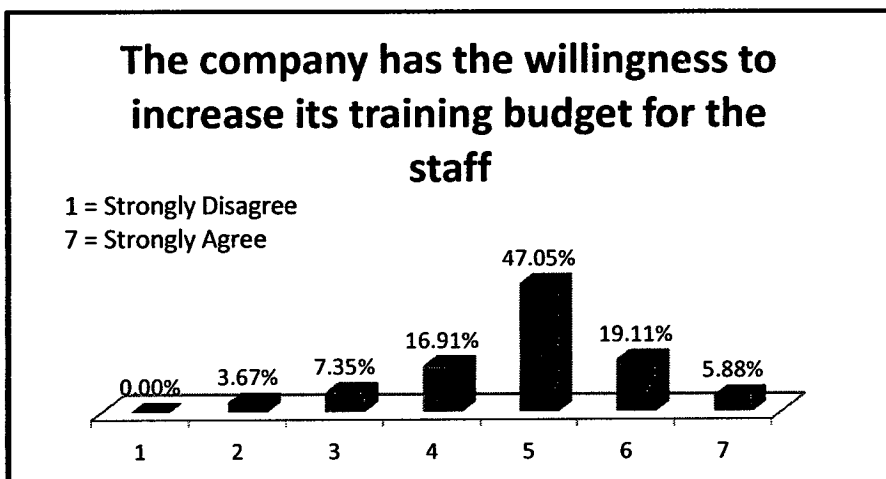
Figure 37: The Company has the willingness to increase its training budget for the staff

The survey finds that 96 (70%) respondents claim that they have good understanding of cloud computing operating procedures. This shows that the

Lebanese market is enough mature towards the acceptance of this technology and the level of interest is high.

I have good understanding of cloud computing operating procedures

1 = Strongly Disagree
7 = Strongly Agree

47.79%

0.00% 4.41% 13.90% 11.02% 16.17% 6.61%

1   2   3   4   5   6   7
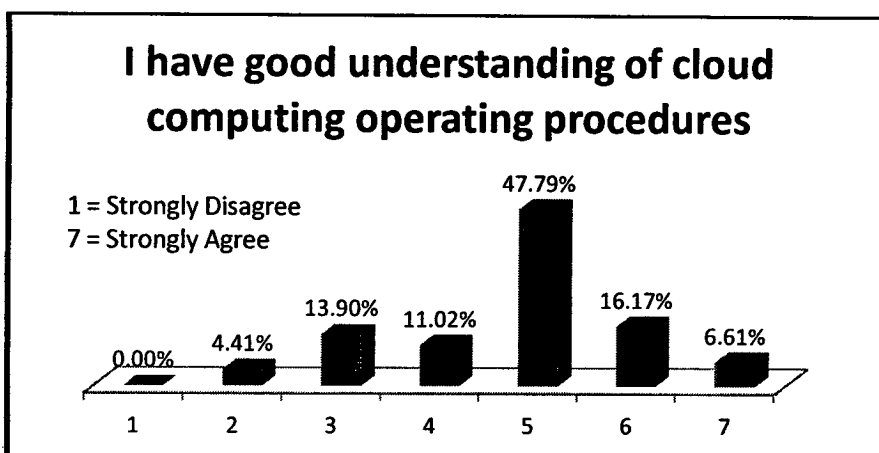
Figure 38: I have good understanding of cloud computing operating procedures

Although, Cloud computing is still in its early life cycle, however, organizations are seeing its advantages through their business improvements. As per figure 42, 56% (77) of the respondents said that cloud computing is completely compatible with their current organization activities, 27.20% (37) are still not sure about the product compatibility and only 16% (22) do not agree that cloud computing is compatible.

Cloud computing is completely compatible with current organization activities

1 = Strongly Disagree
7 = Strongly Agree

41.17%

27.20%

0.00% 3.67% 12.50% 8.82% 6.61%

1   2   3   4   5   6   7
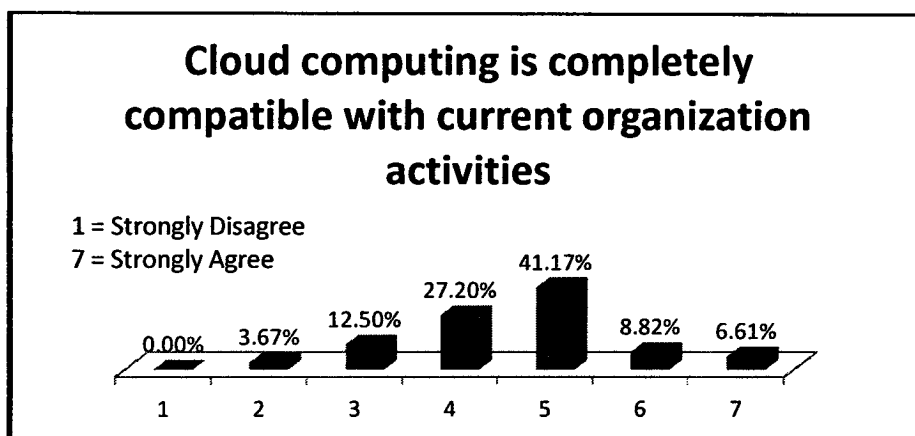
Figure 39: Cloud computing is completely compatible with current organization activities

The survey shows that 36% of respondents are eager to take advantage of cloud computing as they see that cloud computing provide competitive edge over competitors. A good proportion of respondents with 35% are neutral and 28% do not agree that cloud computing provides any advantage over competitors.
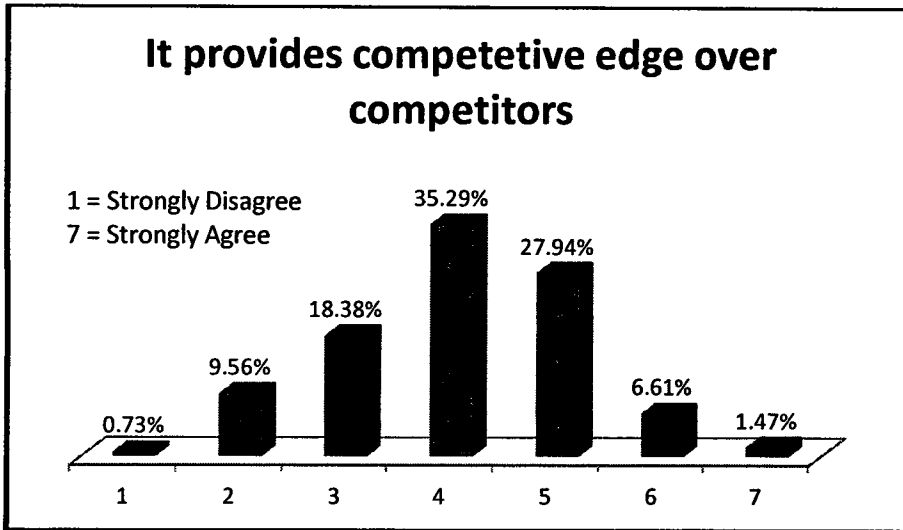
Figure 40: It provides competitive edge over competitors

According to the survey results, organizations are starting to realize the opportunity to cut down on cost while using advanced technology; 72 (52.94%) respondents agree that cloud computing is an added value to the organization in terms of the usage of latest technology and the decrease in CAPEX.
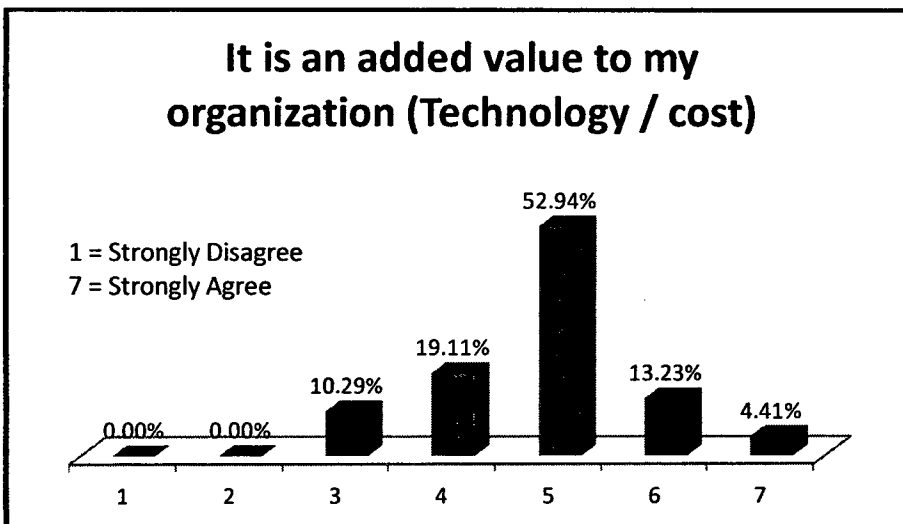
Figure 41: It is an added value to my organization (Technology/cost)

As seen in the figure 45 below, more than half of respondents agree that cloud computing impact positively the organizations' productivity.
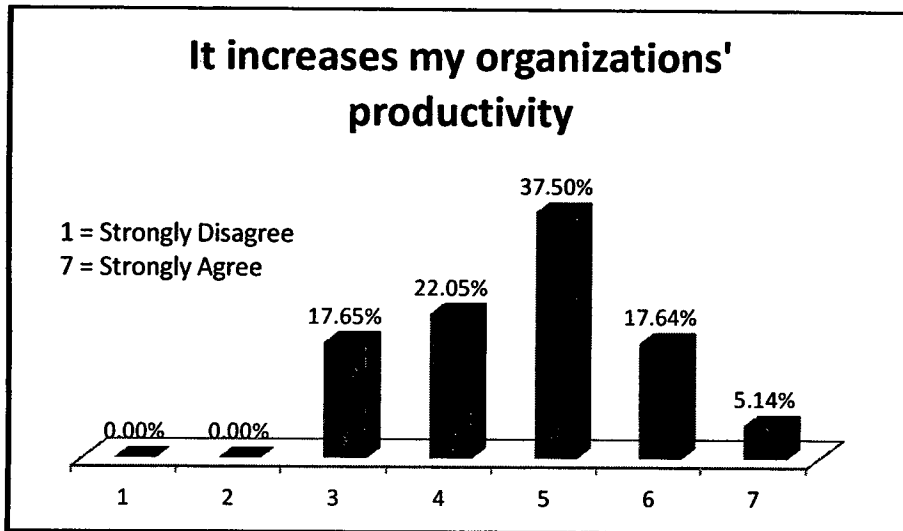
Figure 42: It increases my organizations' productivity

It can be noticed that more than half of respondents admit that cloud computing can help organizations in keeping IT cost down. However, 55 (40.44%) respondents are still not sure whether cloud computing can help organizations in keeping IT costs down which quite a high number.
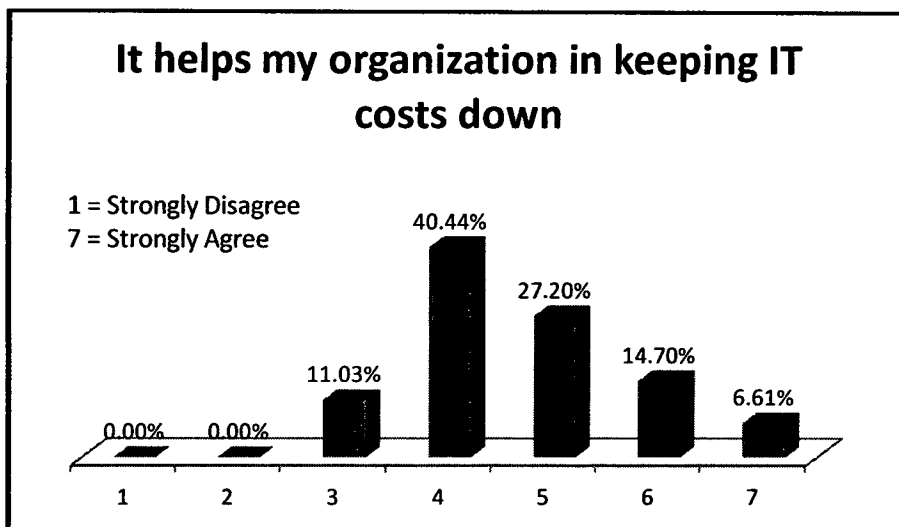
Figure 43: It helps my organization in keeping IT costs down

More than half of respondents acknowledge that cloud computing increases organization profitability; this implicate that top managers level of awareness is somehow on average of the added value that cloud computing usage will bring to the company and that impact the company profit margin. The other half of respondents is divided between people that are not sure about the impact of cloud computing on company profitability and others that say that it does not have any significance.

Managers are gradually starting to realize that with the cloud, today SMBs do not need to wait until they grow in size to be able to expand their IT infrastructure and use advanced technology solutions that enable them to be efficient, productive and increase profitability.
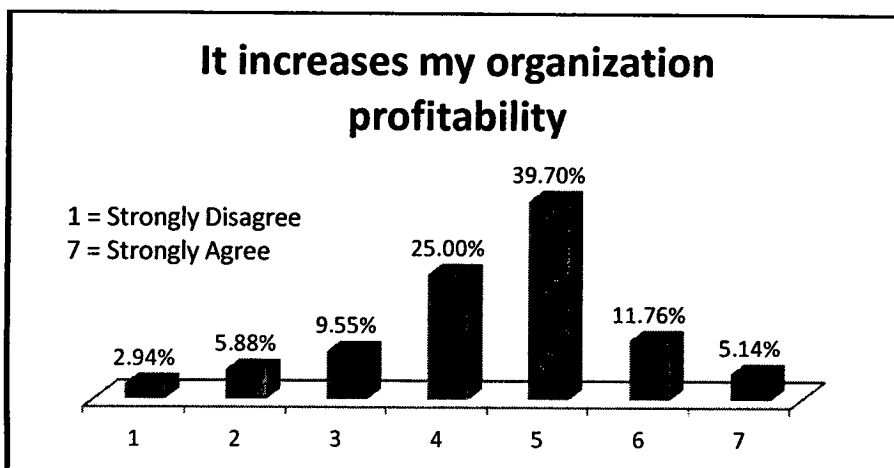
Figure 44: It increases my organization profitability

Impressing that 120 respondents (88%) answered that cloud computing provides high availability/uptime; this might be due to the reason that SMBs financial constraints do not empower companies to have the right resources and well established infrastructure. Subscribing to the cloud increases SMBs assurance to have a stable and secure access provide by multinational vendors that are capable to offer high availability/uptime.
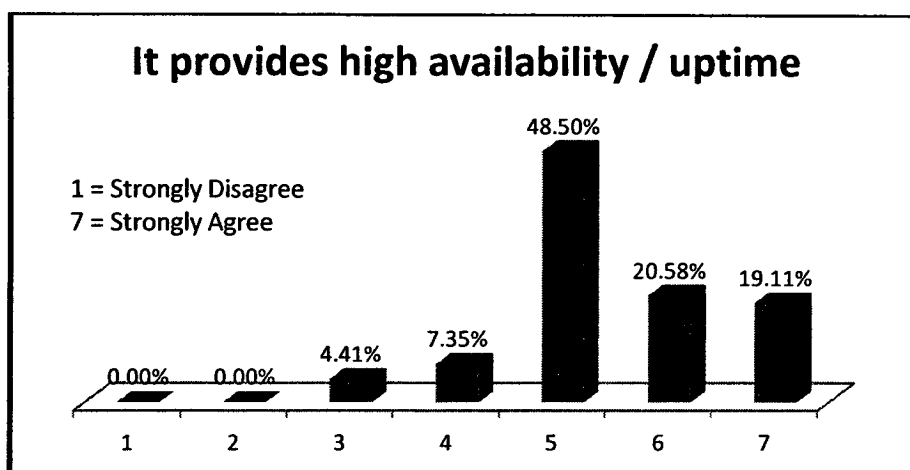
Figure 45: It provides high availability/uptime

66
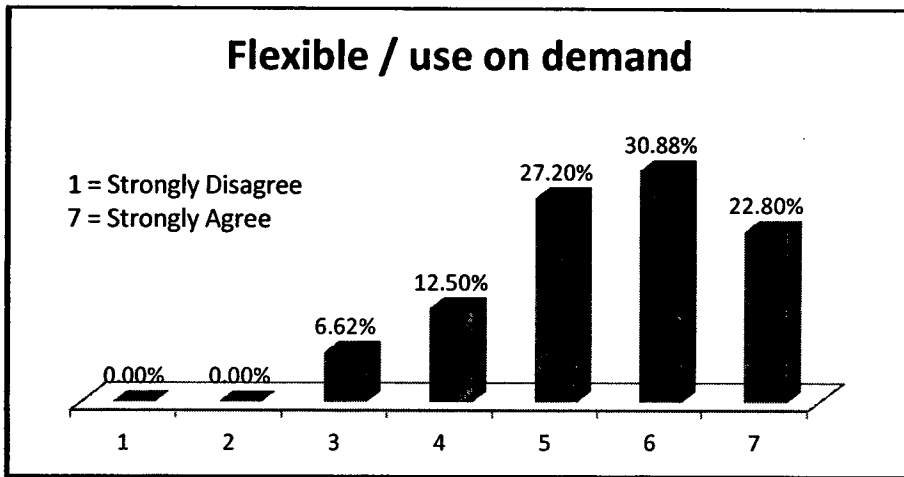
Figure 46: Flexible/use on demand
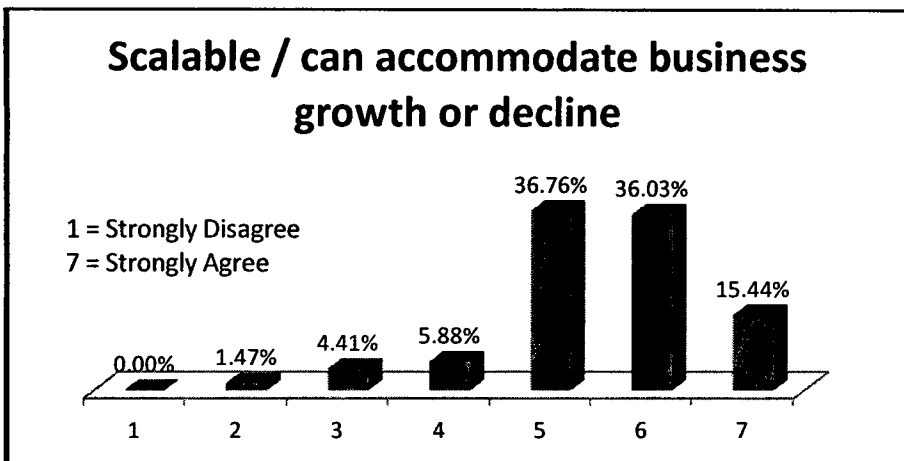
Figure 47: Scalable/can accommodate business growth or decline

Most of respondents' are cognized of cloud relative advantage of using company data anytime/anywhere with 111 agreeing (95%). SMBs are now more capable to support various branches and utilize resources across; this allows more mobility to employees while having access to company data anytime/anywhere and increase productivity. In addition, it facilitates companies' expansion whether inside the country or outside due to the available IT infrastructure.
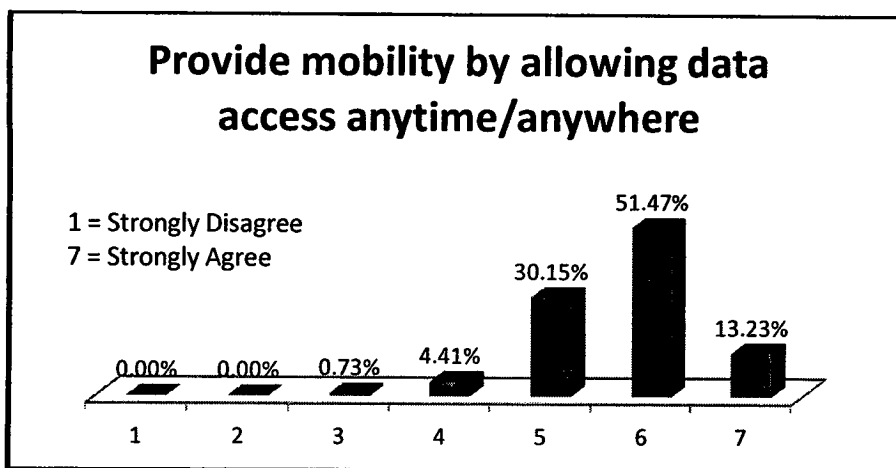
Figure 48: Provide mobility by allowing data access anytime/anywhere

58% of the CIOs/ top management surveyed stated that cloud services help startup companies in reducing upfront cost. The implication is that CIOs and senior IT managers anticipate that cloud computing will help in reducing CAPEX while offering latest IT solutions that meet organizational needs.
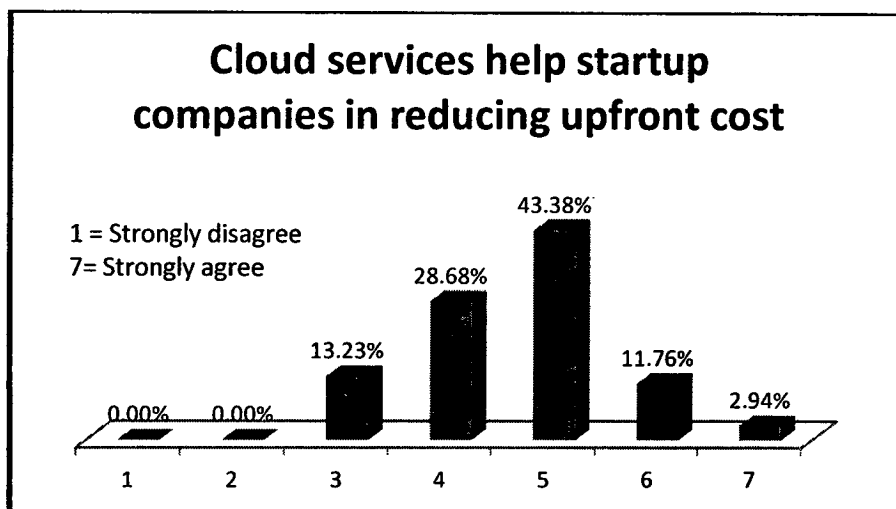
Figure 49: Cloud services help startup companies in reducing upfront cost

78% of companies are concerned about the pace of IT change and its impact on the business. Organizations need a stable IT environment where they don't have to always upgrade and purchase new technology.

The pace of IT change sometimes threatens my business

1 = Strongly Disagree
7 = Strongly Agree

47.80%

25.73%

0.00% 5.15% 6.61% 10.29%

4.41%

1   2   3   4   5   6   7
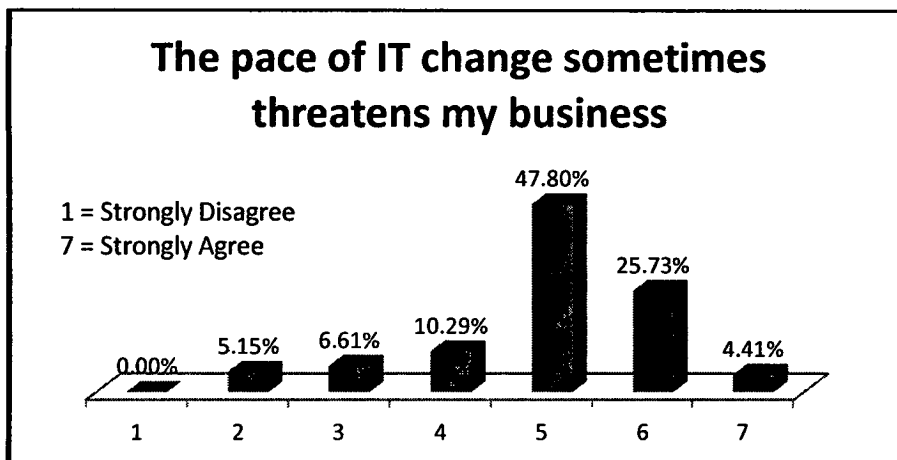
Figure 50: The pace of IT change sometimes threatens my business

Companies search for the most inexpensive solutions that meet their business requirements while complying with regulations. 83% of respondents answered that the country is not ahead of the game when it comes to embracing the latest technology to support business; this result might be due to the Lebanese underdeveloped infrastructure while cloud computing gravely relies on internet and follows government security laws.

My country is not ahead of the game when it comes to embracing the latest computer tehnology to support business

1 = Strongly
Disagree

41.91%

23.52% 18.38%

1.47% 2.94% 4.41% 7.35%

1   2   3   4   5   6   7
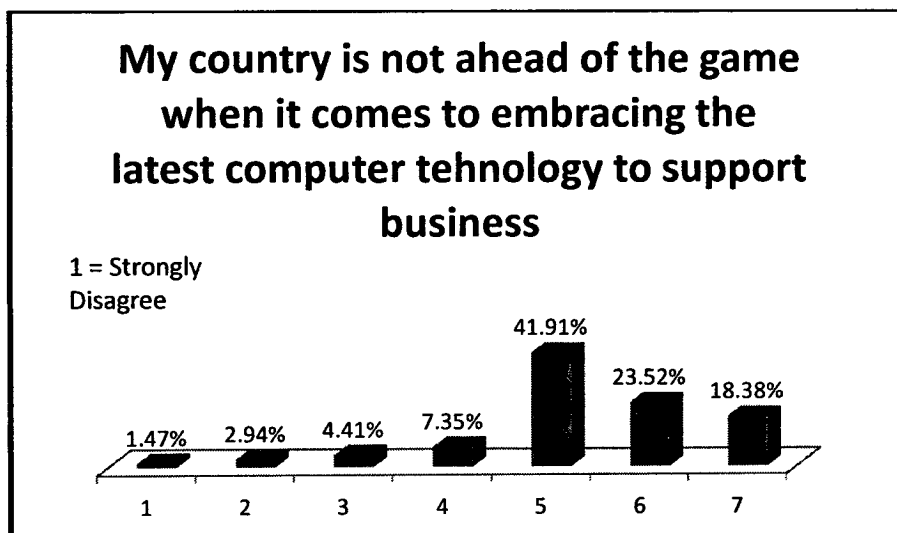
Figure 51: My country is not ahead of the game when it comes to embracing the latest computer technology to support business

73.5% of respondents answered that they are concerned that cloud computing implementation is time consuming. Even though, most respondents are keen of cloud computing benefits and admit the need to use cloud products in their company; however, it can be noticed that respondents are still conservative towards moving to

cloud as the level of awareness concerning cloud deployment and the process of migration to cloud is still ambiguous for most of them.
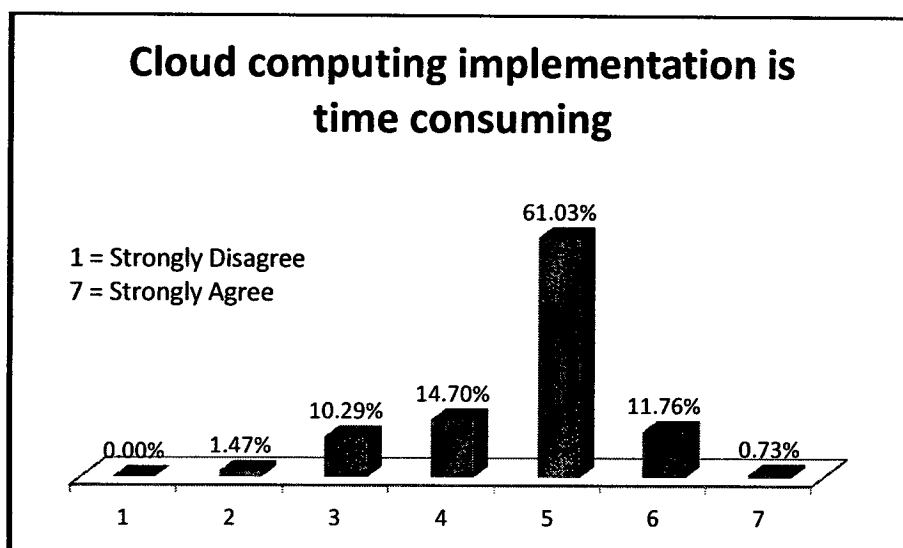
Figure 52: Cloud computing implementation is time consuming

As discussed above, respondents finds that data privacy laws and security are still not mature in Lebanon; 92% of respondents are concerned specially that cloud computing relies heavily on government laws and applied security.
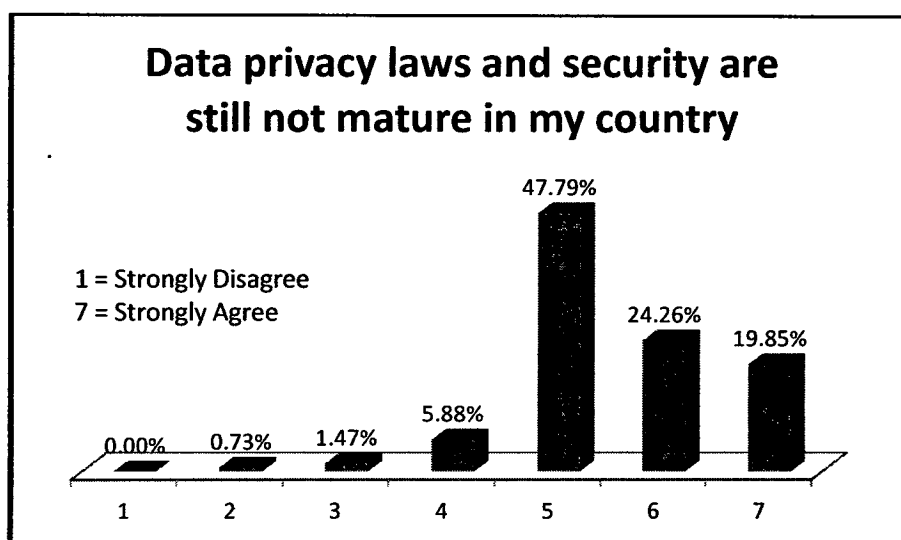
Figure 53: Data privacy laws and security are still not mature in my country

85% of respondents agree that cloud computing aid in expanding the scope of business operations.
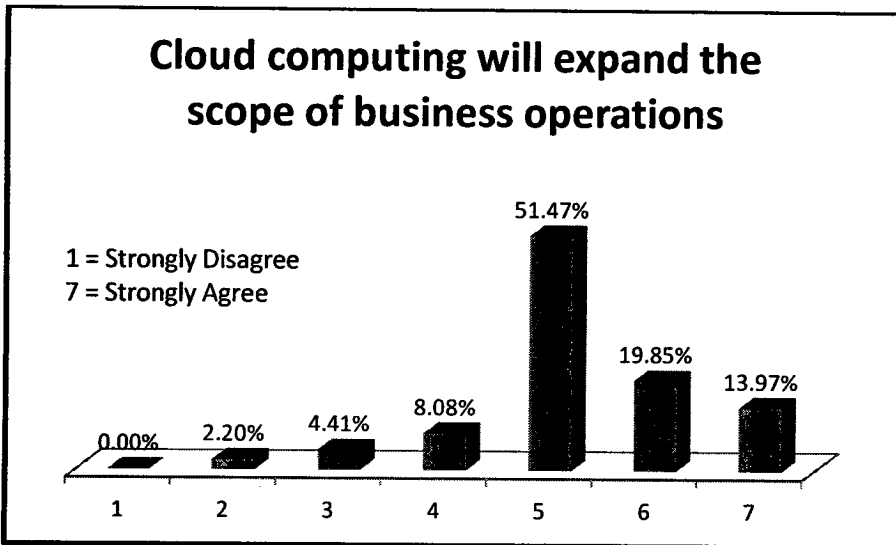
Figure 54: Cloud computing will expand the scope of business operations

IT decision makers are searching for various cloud solutions that address the challenges of their complex and unique environment. 78% of respondents say that the company will be likely to expand their use of cloud services in the coming six months which will influence positively the level of cloud adoption.
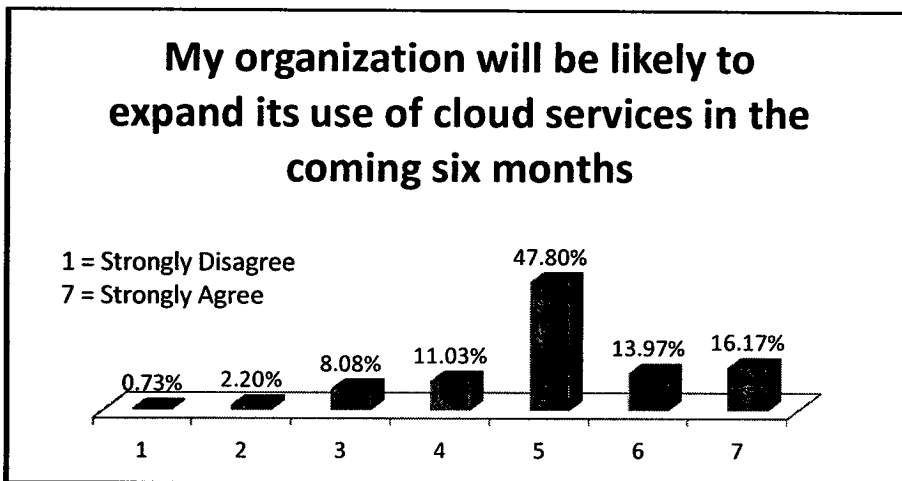
Figure 55: my organization will be likely to expand its use of cloud services in the coming six months

More than 80% of respondents agree that cloud computing will allow Lebanese SMEs to be more competitive in global markets; as they will anytime be up to date on the latest technology and industry top level productivity software at a low cost.
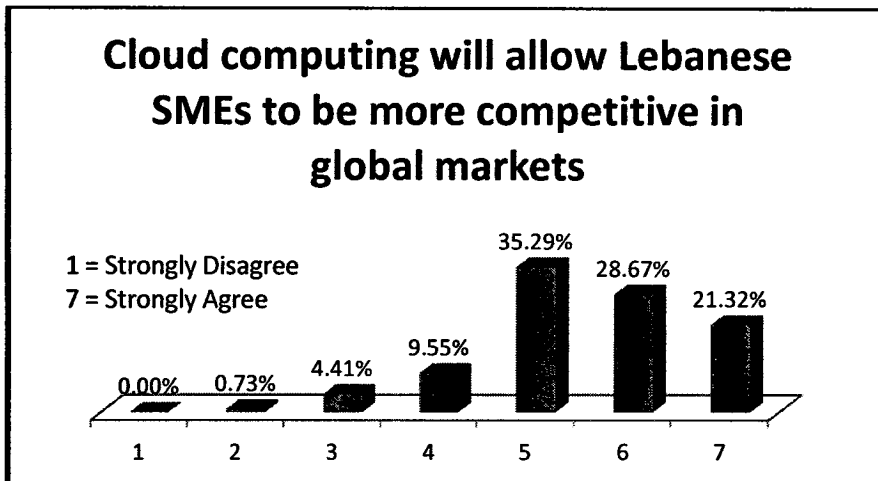
Figure 56: Cloud computing will allow Lebanese SMEs to be more competitive in global markets

Today's organizations are very concerned about sustainability, profits and corporate social responsibilities; therefore, they search for more sustainable datacenters and cloud solutions to be more competitive in the market and sustain their businesses.

5.3. Discussion of Hypotheses

In this section the three hypotheses are discussed and the analysis process of each hypothesis is detailed towards the findings that will lead to the acceptance or rejection of the hypothesis.

There are eight dependent variables: Strategies, benefits, concerns, impact willingness, advantages, challenges, future; that affect the decision of cloud computing adoption. In order to answer the different questions related to each of the independent and dependent variables, we computed the items of the each of the eight dimensions by adding each of these items together and dividing them by the number of items on that particular dimension to obtain the mean score of each dimension separately.

The recoding of each dimension introduced eight new variables: Strategy, benefit, concern, importance, willingness, advantage, challenge and future that will allow the running of One-Way ANOVA and t-test analysis to test the above hypotheses.

5.3.1. Hypothesis 1

As already stated in chapter 4; the alternative hypothesis 1 to study in this research is the following:

H_1: Respondents with data availability concerns are likely to differ on the eight dimensions with those with no data availability concerns registering less favorable attitudes towards the adoption of Cloud computing.

To measure mean differences of respondents' responses on the each of the eight yielded dimensions by the concern of data availability as an independent variable. This variable was transformed from a dependent to an independent variable categorized into agreements and disagreements using independent t-test.

Following the recoding of eight new dimensions and generating the means; we transformed respondents from Likert scale level from 1 being the least important or strongly disagree and 7 being the least important or strongly agree to the following: 1 to 3 being the disagreements and 5 to 7 being the agreements.

Using Independent t-test, differences were found between those who agreed and those who disagreed with data availability and reliability on concerns dimension (t =-3.09; df = 134; p<.05). Those who have agreed had a higher mean rating of data availability and reliability on the concern dimension with 99.95% level of certainty (see table below....)

Table 1: Data availability t-test

Dimensions		n	$\overline{X}$	SD
Strategy	Disagreements	3	5.07	0.12
	Agreements	133	5.06	0.49
Benefit	Disagreements	3	5.67	0.31
	Agreements	133	5.53	0.59
Concern	Disagreements	3	5.40	0.00
	Agreements	133	6.26	0.48
Importance	Disagreements	3	3.56	0.51
	Agreements	133	3.67	0.63
Willingness	Disagreements	3	3.75	1.30
	Agreements	133	4.72	0.96
Advantage	Disagreements	3	4.61	0.69
	Agreements	133	4.92	0.61
Challenge	Disagreements	3	5.00	0.66
	Agreements	133	5.13	0.72
Future	Disagreements	3	4.89	0.19
	Agreements	133	5.29	0.91

As the above table shows, hypothesis 1 is rejected on seven dimensions and was accepted only on one dimension i.e.: concern dimension.

5.3.2. Hypothesis 2

As already stated in chapter 4; the hypothesis 2 to study in this research is the following:

H_2: Respondents with high education level (above secondary school) are more likely to register favorable attitudes on the eight dimensions established in the study than their less formally educated counterparts.

To analyze the effect of the independent variable: educational level; on CIOs views towards the eight dimensions of the adoption of cloud computing we used independent t-test.

Using Independent t-test, we generated the mean scores of education variable on the recoded eight new dimensions. Responses were distributed between

university BA and university above BA only. This might be related that all respondents hold senior level positions which require at least a university degree.

Table 2: Mean scores of education variable on the eight dimensions devised

Dimensions	Education level	n	$\bar{X}$	SD
Strategy	University BA	86	5.00	0.47
	University Above BA	50	5.10	0.50
Benefit	University BA	86	5.40	0.57
	University Above BA	50	5.60	0.61
Concern	University BA	86	6.20	0.52
	University Above BA	50	6.32	0.44
Importance	University BA	86	3.68	0.60
	University Above BA	50	3.65	0.68
Willingness	University BA	86	4.66	0.96
	University Above BA	50	4.78	1.01
Advantage	University BA	86	4.90	0.63
	University Above BA	50	4.95	0.60
Challenge	University BA	86	5.15	0.69
	University Above BA	50	5.09	0.78
Future	University BA	86	5.31	0.85
	University Above BA	50	5.23	0.99

As shown in the above table, no significant result was found in mean scores by education level on the eight new dimensions ($p > .05$). Therefore, hypothesis 2 is rejected on the eight dimensions as no significance is found on the attitude of respondents who have different educational level. This result might be due to the fact that all respondents hold senior positions and that years of experience and level might shield the difference between employees who hold a university degree above BA than those who hold only a university BA.

5.3.3. Hypothesis 3

As already stated in chapter 4; the hypothesis 2 to study in this research is the following:

H_3: Respondents who agree with the benefits of cloud computing will have higher agreements with importance of increased security provided by cloud computing than those who did not agree on the eight dimensions established in this study.

To analyze the effect of the benefit of increased security on CIOs views towards the eight dimensions of the adoption of cloud computing we used One-Way ANOVA.

Following the recoding of eight new dimensions; we transformed respondents from Likert scale level from 1 being the least important or strongly disagree and 7 being the least important or strongly agree to the following: 1 to 3 being the disagreements, 4 being the neutrals and 5 to 7 being the agreements; to be able to generate the ANOVA mean scores of security variable on the eight new dimensions.

Table 3: ANOVA mean scores of security variable on the eight dimensions devised

Dimensions		n	$\overline{X}$	SD
Strategy	Disagreements	2	4.70	0.71
	Neutrals	16	4.95	0.48
	Agreements	118	5.09	0.48
Benefit	Disagreements	2	4.60	0.57
	Neutrals	16	5.28	0.53
	Agreements	118	5.58	0.58
Concern	Disagreements	2	5.40	1.13
	Neutrals	16	6.26	0.39
	Agreements	118	6.26	0.49
Importance	Disagreements	2	3.17	1.18
	Neutrals	16	3.90	0.69
	Agreements	118	3.65	0.61
Willingness	Disagreements	2	4.38	0.18
	Neutrals	16	4.64	0.87
	Agreements	118	4.72	1.00
Advantage	Disagreements	2	4.32	0.19
	Neutrals	16	4.82	0.36
	Agreements	118	4.94	0.64
Challenge	Disagreements	2	4.38	0.88
	Neutrals	16	4.97	0.69
	Agreements	118	5.16	0.72
Future	Disagreements	2	3.50	0.24
	Neutrals	16	5.48	0.88
	Agreements	118	5.29	0.88

Significant differences were found on three dimensions benefits, concerns and future. For benefits significance was ($F = 4.72$; $p < .05$), for concerns ($F = 3$; $p = .50$) and for future ($F = 4.5$; $p < .05$). We conclude that the hypothesis is partially

accepted on three dimensions: benefits, concerns and future and is rejected on the other five dimensions.

Respondents who agree that cloud computing can provide increased security; are more likely to agree with the advantages of cloud computing such as: data access anywhere through multiple devices, ensuring latest versions of technology and improving bottom line cost savings while reducing IT workload. In addition, as the results shows, these respondents have also a high attention to the concerns associated with cloud computing such as vendors' credibility, data migration and deployment and data privacy.

5.4. Answering the research questions

This section set forth will answer the research questions of the study.

Research question 1:

What are the attitudes of senior managers towards the eight dimensions of cloud computing established in the study?

In summary to Chapter 5, section 5.4 descriptive statistics; the mean score and standard deviation of each dimension is calculated; the following is the result.

Most of senior managers agree with the importance of strategies with a mean of 5.06 and standard deviation or .48.

Also, most respondents acknowledge the value of increased benefits associated with the adoption of cloud computing with a mean of 5.53 and a standard deviation of .58.

Although respondents claim that cloud computing has great benefits, however, they are still concerned about cloud computing, data migration and deployment, security in terms of data privacy/data loss/data availability, cost saving and the credibility of vendors with a mean of 6.24 and standard deviation of .49.

Some respondents claims that cloud computing will impact the hiring process specifically will have impact on IT resources; as more IT cloud experienced would

be needed and the need for vendors will increase to assist companies in cloud deployment with a mean of 3.67 and a standard deviation of .62.

Respondents kind of have the willingness to adapt to cloud computing and claim that they have good understanding of cloud computing operating procedures with a mean of 4.7 and high standard deviation of .97.

As it is shown in table below5, respondents agree on cloud computing relative advantage with a mean of 4.91 and a standard deviation of .61.

At the same time, respondents recognize the associated challenges of cloud computing in terms of laws, security and country infrastructure and ability to embrace the latest technology with a mean of 5.12 and standard deviation of .71.

Finally, most respondents realize that cloud computing will be the future in the Lebanese SMEs business operations and will allow more competitiveness in global markets with a mean of 5.28 and standard deviation of .90.

The table below summarizes the mean score and standard deviations of senior managers' attitudes on the eight dimensions of cloud computing adoption.

Table 4: Mean of eight dimensions representing senior managers responses

Dimensions	N	$\bar{X}$	SD
Strategy	136	5.06	0.48
Benefit	136	5.53	0.59
Concern	136	6.24	0.49
Importance	136	3.67	0.63
Willingness	136	4.70	0.98
Advantage	136	4.92	0.61
challenge	136	5.13	0.72
Future	136	5.28	0.90

Research question 2:

What variations are found among senior managers' attitudes towards the eight dimensions of cloud computing based on the independent variables of education, type of organization, and number of employees in the organization?

As shown in the table below, no significant result was found in mean scores by education level on the eight dimensions (p > .05). This result could be that all respondents included in this research hold senior level positions; at this career stage the educational level has no longer any significance, as work experience becomes more impactful on decision making and on a person attitude.

Table 5: Mean scores of education variable on the eight dimensions devised

Dimensions	Education level	n	$\bar{X}$	SD
Strategy	University BA	86	5.00	0.47
	University Above BA	50	5.10	0.50
Benefit	University BA	86	5.40	0.57
	University Above BA	50	5.60	0.61
Concern	University BA	86	6.20	0.52
	University Above BA	50	6.32	0.44
Importance	University BA	86	3.68	0.60
	University Above BA	50	3.65	0.68
Willingness	University BA	86	4.66	0.96
	University Above BA	50	4.78	1.01
Advantage	University BA	86	4.90	0.63
	University Above BA	50	4.95	0.60
Challenge	University BA	86	5.15	0.69
	University Above BA	50	5.09	0.78
Future	University BA	86	5.31	0.85
	University Above BA	50	5.23	0.99

As discussed in hypothesis 2, no significance is found on the attitude of respondents who have different educational level. This result might be due to the fact that all respondents hold senior level positions and who hold at least a university degree.

Table 6: Mean score of number of employees' in the organization on the eight dimensions devised

Dimensions	Number of employees	n	$\bar{X}$	SD
Strategy	1-14	28	5.06	0.57
	15-25	33	4.96	0.44
	30-60	40	5.07	0.45
	60.1 and above	35	5.17	0.49
Benefit	1-14	28	5.64	0.63
	15-25	33	5.36	0.52
	30-60	40	5.53	0.58
	60.1 and above	35	5.61	0.60

Concern	1-14	28	6.39	0.47
	15-25	33	6.08	0.49
	30-60	40	6.26	0.50
	60.1 and above	35	6.26	0.47
Importance	1-14	28	3.63	0.65
	15-25	33	3.58	0.44
	30-60	40	3.63	0.57
	60.1 and above	35	3.84	0.80
Willingness	1-14	28	4.88	1.17
	15-25	33	4.72	0.90
	30-60	40	4.69	0.89
	60.1 and above	35	4.55	1.00
Advantage	1-14	28	4.95	0.71
	15-25	33	4.80	0.53
	30-60	40	4.98	0.64
	60.1 and above	35	4.92	0.59
Challenge	1-14	28	5.04	0.69
	15-25	33	5.08	0.66
	30-60	40	5.34	0.63
	60.1 and above	35	5.01	0.86
Future	1-14	28	5.07	1.07
	15-25	33	5.53	0.69
	. 30-60	40	5.28	0.84
	60.1 and above	35	5.22	0.98

No significance difference was found between numbers of employees categorized on the eight dimensions. This implicate that Cloud services impose the same benefits, advantages and concerns on SMEs regardless of company size and its relative number of employees.

Table 7: Mean scores of type of organization on the eight dimensions devised

Dimensions	Type of organization	n	$\overline{X}$	SD
Strategy	Manufacture	6	5.2	0.63
	Automotive	4	5.1	0.42
	Retail and wholesale	19	5.15	0.49
	Hotels and restaurants	14	5.03	0.46
	Financial and insurance services	17	4.89	0.44
	Information technology	55	5.09	0.51
	Construction	4	5.2	0.43
	Logistics and supply chain	8	4.83	0.43
	Marketing and Advertising	7	5.26	0.47
	Pharmaceuticals	1	5.2	.
	Real estate	1	4.6	.
Benefit	Manufacture	6	5.6	0.59
	Automotive	4	5.3	0.6

	Retail and wholesale	19	5.47	0.52
	Hotels and restaurants	14	5.29	0.49
	Financial and insurance services	17	5.46	0.64
	Information technology	55	5.68	0.59
	Construction	4	5.65	0.62
	Logistics and supply chain	8	5.55	0.67
	Marketing and Advertising	7	5.46	0.51
	Pharmaceuticals	1	4.2	.
	Real estate	1	5	.
Concern	Manufacture	6	6.43	0.08
	Automotive	4	6.3	0.38
	Retail and wholesale	19	6.11	0.61
	Hotels and restaurants	14	6.07	0.47
	Financial and insurance services	17	6.31	0.41
	Information technology	55	6.32	0.5
	Construction	4	6.45	0.44
	Logistics and supply chain	8	6.25	0.45
	Marketing and Advertising	7	5.91	0.58
	Pharmaceuticals	1	6.2	.
	Real estate	1	6	.
Importance	Manufacture	6	3.89	0.81
	Automotive	4	3.75	0.32
	Retail and wholesale	19	3.68	0.61
	Hotels and restaurants	14	3.62	0.64
	Financial and insurance services	17	3.63	0.73
	Information technology	55	3.6	0.58
	Construction	4	3.75	0.63
	Logistics and supply chain	8	4.13	0.73
	Marketing and Advertising	7	3.76	0.5
	Pharmaceuticals	1	2.33	.
	Real estate	1	4	.
Willingness	Manufacture	6	5.17	0.83
	Automotive	4	4.56	0.24
	Retail and wholesale	19	4.57	0.85
	Hotels and restaurants	14	4.45	0.92
	Financial and insurance services	17	4.46	0.92
	Information technology	55	4.87	1.08
	Construction	4	5.44	0.92
	Logistics and supply chain	8	4.06	0.95
	Marketing and Advertising	7	4.89	0.92
	Pharmaceuticals	1	4.5	.
	Real estate	1	4.75	.
Advantage	Manufacture	6	4.91	0.43
	Automotive	4	4.86	0.62
	Retail and wholesale	19	4.91	0.44
	Hotels and restaurants	14	4.63	0.44
	Financial and insurance services	17	4.79	0.55
	Information technology	55	5.05	0.7
	Construction	4	5.23	0.83
	Logistics and supply chain	8	4.83	0.57

	Marketing and Advertising	7	4.97	0.7
	Pharmaceuticals	1	4.18	.
	Real estate	1	3.91	.
Challenge	Manufacture	6	4.75	0.61
	Automotive	4	5.31	0.66
	Retail and wholesale	19	5.14	0.69
	Hotels and restaurants	14	5.14	0.76
	Financial and insurance services	17	5.46	0.69
	Information technology	55	5.07	0.76
	Construction	4	5	0.89
	Logistics and supply chain	8	5.13	0.58
	Marketing and Advertising	7	5	0.79
	Pharmaceuticals	1	5	.
	Real estate	1	5.25	.
Future	Manufacture	6	5.56	0.75
	Automotive	4	5.58	0.74
	Retail and wholesale	19	5.12	0.9
	Hotels and restaurants	14	5.05	0.77
	Financial and insurance services	17	5.22	1.12
	Information technology	55	5.39	0.96
	Construction	4	5.08	0.69
	Logistics and supply chain	8	5.46	0.59
	Marketing and Advertising	7	5.43	0.57
	Pharmaceuticals	1	3.33	.
	Real estate	1	4.33	.

No significance was found on the eight dimensions. We also tried to eliminate the outliers' real estate and pharmaceuticals but the significance was not found on the eight dimensions.

Research question 3:

What recommendations can be taken for future research in this area in Lebanon?

The findings of this study indicate various recommendations for future research. This study can be exercised on a larger sample size to conduct in-depth results that could be only obtained through a large sample to alter the interrelation across the dependent and independent variables that measure the adoption decision.

Moreover, in this research Lebanese legal issues were not addressed; however, legal issues can be considered in future research to understand its impact on Lebanese decision to adopt this technology.

Further study should examine thoroughly the effect of company size on the decision of cloud computing adoption. Companies with larger scale who have more than 250 employees could be included in the study to understand if organizational size might reveal any significant influence on the decision of adoption.

Following this thesis result, an advanced research can be initiated to examine deeply the effect of educational level on the attitude of decision makers towards technology adoption as they advance in their career.

5.5. Conclusion

In summary, we can conclude that in general most of the senior managers admit that in the future cloud computing will take a remarkable place in organizations. In addition, they recognize the importance, benefits, relative advantage and need of cloud computing; however, they also confront cloud concerns such as security, data privacy and cost saving and an impact on organizational hiring process.

Furthermore, as the statistical results above show, SMEs adoption of cloud computing in Lebanon is somehow not affected by the independent variables: educational background, type of organization and number of employees in the organization.

Chapter 6. Conclusions and Recommendations

6.1. Introduction

This chapter lays out the findings, limitations, managerial implications and conclusions of this study. The study examines the significance of education, type of organization, number of employees, Security benefits and data availability concerns on the adoption behavior of cloud computing. The respondents in this study represent seniors or IT decision makers in Lebanese SMEs.

6.2. Main findings, analysis of main results and comparison with chapter 2 and 3

The result of this thesis proved many correlations between the theories stated above and its related variables that were included in this thesis research.

The following theories discussed the perceived ease of use of new technology, the perceived behavioral control and attitude toward behavior such in TPB, TAM, TRA, IDT and user acceptance of virtual world. Most respondents in this research perceive adapting to cloud computing is easy; therefore the level of adoption is positively affected by the positive feeling of perceived willingness to adapt and ease of use which impacts positively the intentional behavior to use cloud computing.

Davis explained the relationship of perceived usefulness and technology acceptance in his theory TAM & TAM2, in addition to other theories such as user acceptance of virtual world and IDT who also dig into this relationship. Virginia Watson also researched the factors influencing the adoption of cloud computing by decision making managers and found a strong correlation between cost-effectiveness, its need and reliability, and the perceived security effectiveness of cloud computing. This thesis proves that most of respondents acknowledge the need to invest in new technology and the gained benefits out of cloud services such as the provided increased security, latest versions of technology and improved bottom line/ cost savings while reducing IT workload.

Many studies of cloud computing adoption proved that relative advantage is a main determinant in the adoption of IT innovations, such as the studies completed by Steven Powelson and Chinyao Low, that are mentioned above in chapter 3. Relative advantage was explored in this study to prove cloud computing compatibility, increase of productivity and profitability, high availability, flexibility and mobility which are recognized by respondents in this thesis.

6.3. Limitation of the research

In this study, we assume that IT decision makers/ CEOs own solely the decision of cloud adoption and they have sufficient understanding of cloud computing technology to provide their point of view concerning organizational transition to cloud.

In addition, the unavailability of high speed internet in Lebanon and the cut of electrical power in some areas could pose a limitation on the adoption behavior; however, in this study we assume that the adoption decision is not impacted by the internet availability or the country legal consideration.

Moreover, the study digs into organizational adoption behavior and do not include individual behavior; even though, individuals are also cloud computing users.

Besides, because of lack of important population elements, I was not able to create a cluster or stratified sampling such as gender, age, demographics...etc, therefore, the purposive sampling technique was adequate in this research.

These limitations can be tackled in depth in future researches.

6.4. Managerial implications

This research provides implications for both vendors and organizations interested in the adoption of cloud computing to satisfy their current and future technology needs. The findings of this study contributed in understanding the rationale behind SMEs adoption of cloud computing in Lebanon.

The research also provides insights of Lebanese cloud market in the aim of understanding the contribution of technology to businesses sustainability. It helps to increase the understanding of the cloud adoption patterns and the relationship of education, organization industry and number of employees that showed no significant impact on the adoption decision; contrary to previous research. Understanding these relationships help seniors and decision makers in identifying their adoption strategies and the benefits and concerns associated with their decision to meet their business needs. Moreover, vendors can shape their offerings towards grabbing the interest of slow adopters and fulfilling organizational needs.

Further researches can dig into banks and financial services adoption behavior of cloud computing with a focal on cloud security and cloud computing regulations; this study can be implemented in Lebanon to understand the requirements of the Lebanese financial industry.

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APPENDIX A

6.5. QUESTIONNAIRE

Ref:_____

Cloud computing survey

This survey is set to gather information for a Master thesis of Business Administration and International Business at Notre Dame University-Louaize (NDU).

It seeks to examine challenges, and factors that may influence small and medium-sized enterprises (SMEs) adoption of cloud computing in Lebanon.

Cloud computing is about rendering hosted services over the internet to individuals and businesses of all size through their computing resources (network, servers, storage, applications and services) on a pay per use service. It is on demand delivery of applications or infrastructure as standardized IT services that are transforming the way IT serves businesses.

All information gathered for this survey will be treated with strict confidentiality. The survey should take no more than 7 minutes of your time to complete. Please complete the survey one time only to the best of your knowledge.

1- **What is your age? :** _____

2- **What is your gender?** Mark only one oval

     o Male
     o Female

3- **What is your highest educational level?** Mark only one oval

     o Pre-Secondary
     o Secondary
     o University (BA)
     o University (Above BA)
     o Vocational
     o No formal education

4- **What is your position level in the organization?** Mark only one oval

     o C-level: executive, chairman, CEO (chief executive officer), CFO (chief financial officer), CIO (chief information officer), president, etc
     o Vice president, managing director
     o Mid-level
     o Entry-level

5- **Which of the following best describes the type of your work?*** *Mark only one oval.*

     o Financial
     o Managerial or coordinator
     o Planning or engineering
     o Information technology
     o Other, please specify: _____

6- **In which countries does your organization operate?**

_____

7- **Where is your company located?** * *Mark only one oval.*

     o Beirut
     o Mount Lebanon
     o North
     o South
     o Nabatiye
     o Beqaa
     o Other, please specify: _____

8- **In which industry does your organization fall?** *Mark only one oval*

- o Manufacture
- o Automotive
- o Retail sale
- o Hotels and restaurants
- o Financial and insurance services
- o Information Technology
- o Other, please specify: _____

9- **What is the number of employees in your organization?** _____

10- **What is the number of IT staff in your organization?** _____

11- **How many years has your organization been in business?** _____

12- **Is your organization a cloud computing user?** * Mark only one oval

- o Yes
- o No

13- **If yes, what type of cloud services does your organization use?**

- o Paid services
- o Non paid services

14- **Please rate the following strategies in terms of their relative importance to your company** * *Circle only one answer per row*

1 being the least important and 7 being the most important

1. Invest in new technology	1 2 3 4 5 6 7
2. Expand physical presence	1 2 3 4 5 6 7
3. Invest in human capital	1 2 3 4 5 6 7
4. Expand business line	1 2 3 4 5 6 7
5. Focus on optimizing profitability margins	1 2 3 4 5 6 7

15- **Please rate the following benefits in terms of their relative importance to you*** *Circle only one answer per row.*

1 being the least important and 7 being the most important

1. Allow me to access data anywhere through multiple devices   1 2 3 4 5 6 7
2. Provide increased security   1 2 3 4 5 6 7
3. Ensure latest versions of technology   1 2 3 4 5 6 7
4. Improve bottom line/cost savings   1 2 3 4 5 6 7
5. Reduce IT workload   1 2 3 4 5 6 7

16- **Please rate the following cloud computing concerns in terms of their relative importance to you** * *Circle only one answer per row.*

1 being the least important and 7 being the most important

1. Vendors credibility   1 2 3 4 5 6 7
2. Data availability / reliability   1 2 3 4 5 6 7
3. Security (data privacy/ data loss)   1 2 3 4 5 6 7
4. Cost saving   1 2 3 4 5 6 7
5. Data migration and deployment   1 2 3 4 5 6 7

17- **To what extent do you agree with the following impact of cloud computing usage on your organizational hiring process*** *Circle only one answer per row.*

1 for strongly disagree and 7 for strongly agree

1. Hire more internal staff with cloud computing experience   1 2 3 4 5 6 7
2. Hire vendors to assist deploy cloud project   1 2 3 4 5 6 7
3. Reduce IT staff   1 2 3 4 5 6 7

18- To what extent do you agree with the following statements about the willingness to adapt to cloud computing * *Circle only one answer per row.*
1 for strongly disagree and 7 for strongly agree

1. Adapting to cloud computing is easy	1 2 3 4 5 6 7
2. The IT staff is qualified to adapt to the implementation of cloud computing services	1 2 3 4 5 6 7
3. The company has the willingness to increase its training budget for the staff	1 2 3 4 5 6 7
4. I have good understanding of cloud computing operating procedures	1 2 3 4 5 6 7

19- To what extent do you agree with the following statements about cloud computing relative advantages * *Circle only one answer per row.*
1 for strongly disagree and 7 for strongly agree

1. Cloud computing is completely compatible with current organization activities	1 2 3 4 5 6 7
2. It provides competitive edge over competitors	1 2 3 4 5 6 7
3. It is an added value to my organization (technology/cost)	1 2 3 4 5 6 7
4. It increases my organizations' productivity	1 2 3 4 5 6 7
5. It helps my organization in keeping IT costs down	1 2 3 4 5 6 7
6. It increases my organization profitability	1 2 3 4 5 6 7
7. It provides high availability/ uptime	1 2 3 4 5 6 7
8. Flexible/ use on demand	1 2 3 4 5 6 7
9. Scalable /can accommodate business growth or decline	1 2 3 4 5 6 7
10. Provide mobility by allowing data access anytime/anywhere	1 2 3 4 5 6 7
11. Cloud services help Startup companies in reducing upfront cost	1 2 3 4 5 6 7

20- **To what extent do you agree with the following statements about cloud computing challenges** * *Mark only one oval per row.*

1 for strongly disagree and 7 for strongly agree

1. The pace of IT change sometimes threatens my business

1 2 3 4 5 6 7

2. My country is not ahead of the game when it comes to embracing the latest computer technology to support business

1 2 3 4 5 6 7

3. Cloud computing implementation is time consuming

1 2 3 4 5 6 7

4. Data privacy laws and security is still not mature in my country

1 2 3 4 5 6 7

21- To what extent do you agree with the following statements about the future of cloud computing in Lebanon * *Mark only one oval per row.*

1. Cloud computing will expand the scope of Business operations

1 2 3 4 5 6 7

2. My organization will be likely to expand its use of cloud services in the coming six months

1 2 3 4 5 6 7

3. Cloud computing will allow Lebanese SMEs to be more competitive in global markets

1 2 3 4 5 6 7

I would like to thank you for participating in this survey. Your input is extremely valuable in helping us reach reliable findings for this research project.

APPENDIX B

6.6. FREQUENCY ANALYSIS

Table 8: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	27-33	30	22.1	22.1	22.1
	34-36	32	23.5	23.5	45.6
	37-39	39	28.7	28.7	74.3
	39.1-56	35	25.7	25.7	100.0
	Total	136	100.0	100.0	

Table 9: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	104	76.5	76.5	76.5
	Female	32	23.5	23.5	100.0
	Total	136	100.0	100.0	

Table 10: What is your highest educational level?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	University BA	86	63.2	63.2	63.2
	University Above BA	50	36.8	36.8	100.0
	Total	136	100.0	100.0	

Table 11: What is your position level in the organization?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid C-level: executive, chairman, CEO, CFO, CIO, president, etc	28	20.6	20.6	20.6
Vice president, managing director	28	20.6	20.6	41.2
Mid-level	80	58.8	58.8	100.0
Total	136	100.0	100.0	

Table 12: Which of the following best describes the type of your work?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Financial	30	22.1	22.1	22.1
Managerial or coordinator	43	31.6	31.6	53.7
Planning or engineering	13	9.6	9.6	63.2
Information technology	45	33.1	33.1	96.3
Marketing	4	2.9	2.9	99.3
All the Above	1	.7	.7	100.0
Total	136	100.0	100.0	

Table 13: In which countries does your organization operate?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Lebanon	105	77.2	77.2	77.2
Lebanon and MENA	25	18.4	18.4	95.6
Lebanon and Egypt	1	.7	.7	96.3
Lebanon and Africa	1	.7	.7	97.1
Lebanon and Dubai	3	2.2	2.2	99.3
Lebanon, Dubai, Qatar	1	.7	.7	100.0

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lebanon	105	77.2	77.2	77.2
	Lebanon and MENA	25	18.4	18.4	95.6
	Lebanon and Egypt	1	.7	.7	96.3
	Lebanon and Africa	1	.7	.7	97.1
	Lebanon and Dubai	3	2.2	2.2	99.3
	Lebanon, Dubai, Qatar	1	.7	.7	100.0
	Total	136	100.0	100.0	

Table 14: Where is your company located?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Beirut	95	69.9	69.9	69.9
	Mount Lebanon	31	22.8	22.8	92.6
	North	6	4.4	4.4	97.1
	South	3	2.2	2.2	99.3
	Beqaa	1	.7	.7	100.0
	Total	136	100.0	100.0	

Table 15: In which industry does your organization fall?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manufacture	9	6.6	6.6	6.6
	Retail sale	16	11.8	11.8	18.4
	Hotels and restaurants	5	3.7	3.7	22.1
	Financial and insurance services	8	5.9	5.9	27.9
	Information technology	84	61.8	61.8	89.7
	Education	2	1.5	1.5	91.2
	Construction	11	8.1	8.1	99.3

Logistics and supply chain	1	.7		.7	100.0
Total		136	100.0	100.0	

Table 16: Is your organization a cloud computing user?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	14.0	14.0	14.0
	No	117	86.0	86.0	100.0
	Total	136	100.0	100.0	

Table 17: If yes, what type of cloud services does your organization use?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paid services	5	3.7	26.3	26.3
	Non paid services	14	10.3	73.7	100.0
	Total	19	14.0	100.0	
Missing	System	117	86.0		
Total		136	100.0		

Table 18: Invest in new technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.7	.7	.7
	3	20	14.7	14.7	15.4
	4	71	52.2	52.2	67.6
	5	28	20.6	20.6	88.2
	6	12	8.8	8.8	97.1
	7	4	2.9	2.9	100.0
	Total	136	100.0	100.0	

Table 19: Expand physical presence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.7	.7	.7
	2	7	5.1	5.1	5.9
	3	20	14.7	14.7	20.6
	4	70	51.5	51.5	72.1
	5	28	20.6	20.6	92.6
	6	10	7.4	7.4	100.0
	Total	136	100.0	100.0	

Table 20: Invest in human capital

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	5	3.7	3.7	3.7
	4	12	8.8	8.8	12.5
	5	14	10.3	10.3	22.8
	6	73	53.7	53.7	76.5
	7	32	23.5	23.5	100.0
	Total	136	100.0	100.0	

Table 21: Expand Business line

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.7	.7	.7
	2	20	14.7	14.7	15.4
	3	31	22.8	22.8	38.2
	4	35	25.7	25.7	64.0
	5	32	23.5	23.5	87.5
	6	11	8.1	8.1	95.6
	7	6	4.4	4.4	100.0
	Total	136	100.0	100.0	

Table 22: Focus on optimizing profitability margins

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3	2.2	2.2	2.2
	5	8	5.9	5.9	8.1
	6	14	10.3	10.3	18.4
	7	111	81.6	81.6	100.0
	Total	136	100.0	100.0	

Table 23: Allow me to access data anywhere through multiple devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	6	4.4	4.4	4.4
	4	18	13.2	13.2	17.6
	5	24	17.6	17.6	35.3
	6	54	39.7	39.7	75.0
	7	34	25.0	25.0	100.0
	Total	136	100.0	100.0	

Table 24: Provide increased security

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	1.5	1.5	1.5
	4	16	11.8	11.8	13.2
	5	44	32.4	32.4	45.6
	6	51	37.5	37.5	83.1
	7	23	16.9	16.9	100.0
	Total	136	100.0	100.0	

Table 25: Ensure latest versions of technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	9	6.6	6.6	6.6
	4	31	22.8	22.8	29.4
	5	42	30.9	30.9	60.3
	6	28	20.6	20.6	80.9
	7	26	19.1	19.1	100.0
	Total	136	100.0	100.0	

Table 26: Improve bottom line / cost savings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	1.5	1.5	1.5
	4	6	4.4	4.4	5.9
	5	23	16.9	16.9	22.8
	6	38	27.9	27.9	50.7
	7	67	49.3	49.3	100.0
	Total	136	100.0	100.0	

Table 27: Reduce IT workload

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.7	.7	.7
	2	2	1.5	1.5	2.2
	3	13	9.6	9.6	11.8
	4	23	16.9	16.9	28.7
	5	49	36.0	36.0	64.7
	6	38	27.9	27.9	92.6
	7	10	7.4	7.4	100.0
	Total	136	100.0	100.0	

Table 28: Vendors credibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	.7	.7	.7
	4	8	5.9	5.9	6.6
	5	21	15.4	15.4	22.1
	6	56	41.2	41.2	63.2
	7	50	36.8	36.8	100.0
	Total	136	100.0	100.0	

Table 29: Data availability/reliability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	2.2	2.2	2.2
	5	11	8.1	8.1	10.3
	6	17	12.5	12.5	22.8
	7	105	77.2	77.2	100.0
	Total	136	100.0	100.0	

Table 30: Security (Data privacy/data loss)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	2	1.5	1.5	1.5
	5	8	5.9	5.9	7.4
	6	15	11.0	11.0	18.4
	7	111	81.6	81.6	100.0
	Total	136	100.0	100.0	

Table 31: Cost savings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	1.5	1.5	1.5
	4	3	2.2	2.2	3.7
	5	23	16.9	16.9	20.6

	6	29	21.3	21.3	41.9
	7	79	58.1	58.1	100.0
	Total	136	100.0	100.0	

Table 32: Data migration and deployment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	2.9	2.9	2.9
	3	6	4.4	4.4	7.4
	4	10	7.4	7.4	14.7
	5	43	31.6	31.6	46.3
	6	48	35.3	35.3	81.6
	7	25	18.4	18.4	100.0
	Total	136	100.0	100.0	

Table 33: Hire more internal staff with cloud computing experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.2	2.2	2.2
	2	9	6.6	6.6	8.8
	3	83	61.0	61.0	69.9
	4	19	14.0	14.0	83.8
	5	15	11.0	11.0	94.9
	6	6	4.4	4.4	99.3
	7	1	.7	.7	100.0
	Total	136	100.0	100.0	

Table 34: Hire vendors to assist deploy cloud project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	3	2.2	2.2	2.2
	4	4	2.9	2.9	5.1
	5	51	37.5	37.5	42.6

		Frequency	Percent	Valid Percent	Cumulative Percent
	6	73	53.7	53.7	96.3
	7	5	3.7	3.7	100.0
	Total	136	100.0	100.0	

Table 35: Reduce IT staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	56	41.2	41.2	41.2
	2	36	26.5	26.5	67.6
	3	27	19.9	19.9	87.5
	4	13	9.6	9.6	97.1
	5	4	2.9	2.9	100.0
	Total	136	100.0	100.0	

Table 36: Adapting to cloud computing is easy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	5	3.7	3.7	3.7
	3	10	7.4	7.4	11.0
	4	16	11.8	11.8	22.8
	5	63	46.3	46.3	69.1
	6	24	17.6	17.6	86.8
	7	18	13.2	13.2	100.0
	Total	136	100.0	100.0	

Table 37: The IT staff is qualified to adapt to the implementation of cloud computing services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.7	.7	.7
	3	60	44.1	44.1	44.9
	4	34	25.0	25.0	69.9
	5	17	12.5	12.5	82.4

		Frequency	Percent	Valid Percent	Cumulative Percent
	6	15	11.0	11.0	93.4
	7	9	6.6	6.6	100.0
	Total	136	100.0	100.0	

Table 38: The Company has the willingness to increase its training budget for the staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	5	3.7	3.7	3.7
	3	10	7.4	7.4	11.0
	4	23	16.9	16.9	27.9
	5	64	47.1	47.1	75.0
	6	26	19.1	19.1	94.1
	7	8	5.9	5.9	100.0
	Total	136	100.0	100.0	

Table 39: I have good understanding of cloud computing operating procedures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	6	4.4	4.4	4.4
	3	19	14.0	14.0	18.4
	4	15	11.0	11.0	29.4
	5	65	47.8	47.8	77.2
	6	22	16.2	16.2	93.4
	7	9	6.6	6.6	100.0
	Total	136	100.0	100.0	

Table 40: Cloud computing is completely compatible with current organization activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	5	3.7	3.7	3.7
	3	17	12.5	12.5	16.2
	4	37	27.2	27.2	43.4
	5	56	41.2	41.2	84.6

		Frequency	Percent	Valid Percent	Cumulative Percent
	6	12	8.8	8.8	93.4
	7	9	6.6	6.6	100.0
	Total	136	100.0	100.0	

Table 41: It provides competitive edge over competitors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.7	.7	.7
	2	13	9.6	9.6	10.3
	3	25	18.4	18.4	28.7
	4	48	35.3	35.3	64.0
	5	38	27.9	27.9	91.9
	6	9	6.6	6.6	98.5
	7	2	1.5	1.5	100.0
	Total	136	100.0	100.0	

Table 42: It is an added value to my organization (Technology / cost)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	14	10.3	10.3	10.3
	4	26	19.1	19.1	29.4
	5	72	52.9	52.9	82.4
	6	18	13.2	13.2	95.6
	7	6	4.4	4.4	100.0
	Total	136	100.0	100.0	

Table 43: It increases my organizations' productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	24	17.6	17.6	17.6
	4	30	22.1	22.1	39.7
	5	51	37.5	37.5	77.2

6	24	17.6	17.6	94.9
7	7	5.1	5.1	100.0
Total	136	100.0	100.0	

Table 44: It helps my organization in keeping IT costs down

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	15	11.0	11.0	11.0
	4	55	40.4	40.4	51.5
	5	37	27.2	27.2	78.7
	6	20	14.7	14.7	93.4
	7	9	6.6	6.6	100.0
	Total	136	100.0	100.0	

Table 45: It increases my organization profitability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	2.9	2.9	2.9
	2	8	5.9	5.9	8.8
	3	13	9.6	9.6	18.4
	4	34	25.0	25.0	43.4
	5	54	39.7	39.7	83.1
	6	16	11.8	11.8	94.9
	7	7	5.1	5.1	100.0
	Total	136	100.0	100.0	

Table 46: It provides high availability / uptime

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	6	4.4	4.4	4.4
	4	10	7.4	7.4	11.8
	5	66	48.5	48.5	60.3

	Frequency	Percent	Valid Percent	Cumulative Percent
6	28	20.6	20.6	80.9
7	26	19.1	19.1	100.0
Total	136	100.0	100.0	

Table 47: Flexible / use on demand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	9	6.6	6.6	6.6
	4	17	12.5	12.5	19.1
	5	37	27.2	27.2	46.3
	6	42	30.9	30.9	77.2
	7	31	22.8	22.8	100.0
	Total	136	100.0	100.0	

Table 48: Scalable / can accommodate business growth or decline

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.5	1.5	1.5
	3	6	4.4	4.4	5.9
	4	8	5.9	5.9	11.8
	5	50	36.8	36.8	48.5
	6	49	36.0	36.0	84.6
	7	21	15.4	15.4	100.0
	Total	136	100.0	100.0	

Table 49: Provide mobility by allowing data access anytime/anywhere

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	.7	.7	.7
	4	6	4.4	4.4	5.1
	5	41	30.1	30.1	35.3
	6	70	51.5	51.5	86.8

		18	13.2	13.2	100.0
7		18	13.2	13.2	100.0
	Total	136	100.0	100.0	

Table 50: Cloud services help startup companies in reducing upfront cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	18	13.2	13.2	13.2
	4	39	28.7	28.7	41.9
	5	59	43.4	43.4	85.3
	6	16	11.8	11.8	97.1
	7	4	2.9	2.9	100.0
	Total	136	100.0	100.0	

Table 51: The pace of IT change sometimes threatens my business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	7	5.1	5.1	5.1
	3	9	6.6	6.6	11.8
	4	14	10.3	10.3	22.1
	5	65	47.8	47.8	69.9
	6	35	25.7	25.7	95.6
	7	6	4.4	4.4	100.0
	Total	136	100.0	100.0	

Table 52: My country is not ahead of the game when it comes to embracing the latest computer technology to support business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.5	1.5	1.5
	2	4	2.9	2.9	4.4
	3	6	4.4	4.4	8.8
	4	10	7.4	7.4	16.2
	5	57	41.9	41.9	58.1

	Frequency	Percent	Valid Percent	Cumulative Percent
6	32	23.5	23.5	81.6
7	25	18.4	18.4	100.0
Total	136	100.0	100.0	

Table 53: Cloud computing implementation is time consuming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.5	1.5	1.5
	3	14	10.3	10.3	11.8
	4	20	14.7	14.7	26.5
	5	83	61.0	61.0	87.5
	6	16	11.8	11.8	99.3
	7	1	.7	.7	100.0
	Total	136	100.0	100.0	

Table 54: Data privacy laws and security is still not mature in my country

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.7	.7	.7
	3	2	1.5	1.5	2.2
	4	8	5.9	5.9	8.1
	5	65	47.8	47.8	55.9
	6	33	24.3	24.3	80.1
	7	27	19.9	19.9	100.0
	Total	136	100.0	100.0	

Table 55: Cloud computing will expand the scope of business operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.2	2.2	2.2
	3	6	4.4	4.4	6.6
	4	11	8.1	8.1	14.7

5	70	51.5	51.5	66.2
6	27	19.9	19.9	86.0
7	19	14.0	14.0	100.0
Total	136	100.0	100.0	

Table 56: My organization will be likely to expand its use of cloud services in the coming six months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.7	.7	.7
	2	3	2.2	2.2	2.9
	3	11	8.1	8.1	11.0
	4	15	11.0	11.0	22.1
	5	65	47.8	47.8	69.9
	6	19	14.0	14.0	83.8
	7	22	16.2	16.2	100.0
	Total	136	100.0	100.0	

Table 57: cloud computing will allow Lebanese SMEs to be more competitive in global markets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.7	.7	.7
	3	6	4.4	4.4	5.1
	4	13	9.6	9.6	14.7
	5	48	35.3	35.3	50.0
	6	39	28.7	28.7	78.7
	7	29	21.3	21.3	100.0
	Total	136	100.0	100.0	