ADOPTION OF CLOUD COMPUTING IN KENYA BY FIRMS LISTED IN THE NAIROBI STOCK EXCHANGE
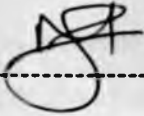
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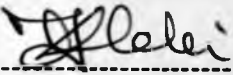
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DECLARATION

This project is my original work and has not been presented for award of a degree in any university

Signed --- Date--- 10|11|2012

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This proposal has been submitted for examination with my approval as the university supervisor.

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ABSTRACT

Cloud computing has become a topic of tremendous interest as organizations struggle to improve their IT performance. The promise of cloud computing is to deliver all the functionality of existing information technology services (and in fact enable new functionalities that are hitherto infeasible) even as it dramatically reduces the upfront costs of computing that deter many organizations from deploying many cutting-edge IT services. The study was concerned with the adoption of cloud computing in Kenya. The study was guided by the following research objectives: to determine the perception of Managers towards the adoption of Cloud Computing; establish which functions of business have been moved to the cloud and to determine the challenges/concerns associated with adoption of Cloud Computing by Managers of Firms listed on the NSE.

The study used a descriptive study targeting the chief information technology officer, information technology managers, information system managers and managers involved in policy making decisions on computing systems in the listed companies on the NSE. The study collected primary data from 56 of these respondents using questionnaires. Data was analysed using descriptive statistics and regression analysis. The results were presented using tables and other graphical presentations for ease of understanding and analysis.

The study found out that the majority of the respondents were male, had various ICT qualifications and worked in varied industries in the economy. The respondents were of the perception that cloud computing is easier to use, safer, solves problems and easier to learn. The companies had also moved messaging and collaboration, human resources and payroll to a moderate extent and CRM/sales management, accounting and finance, project management and application development to the cloud. The study also found out that the major concerns for cloud computing adoption were security, privacy and reliability.

The study found various factors affecting the adoption of cloud computing in Kenya and recommended that in order to promote cloud computing among commercial companies cloud service providers should provide successful case studies and statistics in order to help companies realise the applications of the cloud. Also further research on cloud computing should focus on investigating how businesses are using the cloud to create advantage. Further research also needs to identify the issues faced by organisations when adopting the cloud. Since cloud computing is

still new to both academia and commerce the outcome of these studies will help academics and practitioners alike assess the actual uses of the cloud in practice and the business benefits and challenges of adopting it.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

In the past few years there has been an explosive growth in computer usage for business, government and educational purposes. At the same time, the global nature of the Internet has opened up global markets and global competition. The combination of increased computer usage, global collaboration, and competition has brought with it the accompanying need to maximize the use of available resources while minimizing costs. One area of growing interest for meeting these needs is the use of cloud computing to centralize computing and information management functions for large, often geographically dispersed organizations and individual people.

Cloud computing is an approach where information technology services and capabilities are delivered to an organization or individual over the Internet by a centralized provider, often for a fee (Robinson, 2009). Cloud computing has a number of distinguishing characteristics (David, 2009). The computing resources are held by the provider. Computing resources are accessible over the Internet via personal computers, laptops, smart phones, and personal digital assistants. A cloud computer provides access to programs, storage, processing, applications, and software development. This access is granted after an agreement is negotiated between the cloud computing provider and the recipient of services (Daniel, 2008). With a commercial cloud computing provider, resources are normally available, for a set fee, based on usage. For the majority of cloud vendors that charge for cycles or time used, an accounting and billing procedure is needed, with contractual terms agreed upon before service is granted (David, 2009).

There has been an interest in cloud computing as seen with the publishing of cloud computing research by Chellappa in 1997 (as cited in Mei, Zhang, & Chan, 2008), though widespread awareness of cloud computing came later. In late 2006, Google CEO Eric Schmidt publicized the cloud computing concept (Aymerich, Fenu, & Surcis, 2008). Following this an extensive increase in cloud computing research has occurred, especially starting around 2008. Research efforts emphasize a variety of topics related to cloud computing. Some of these topics include applications and their capabilities, costs, the need for cloud computing, security, reasons for adoption, and growth trends (Neumann, 2008; Lin *et al.*, 2006; Hansen, 2004).

One common theme in the literature is the advantages to organizations and individuals of having large scale computational resources available upon demand that are connected to the Internet (Armbrust *et al.*, 2009; Buyya, Yeo, & Venugopal, 2008). Another theme that is addressed is the need to provide and maintain security for software, information and data, both against unauthorized outsiders and against other users of the cloud computing system that are not authorized access to specific files (Armbrust et al. 2009; Foster, Zhao, Raicu, & Lu, 2008; Weiss, 2007). With the large number of users on a system, maintaining separate access to different users is of paramount importance if the system is to be used for sensitive data (Hewitt, 2008).

Overall, while there is extensive current research interest in cloud computing, one area that needs more investigation is to evaluate the factors influencing a management decision to adopt cloud computing. To evaluate factors influencing management decisions to employ and adopt cloud computing, adoption theory is being considered. The field of adoption theory applies to the reasons and methods that information technology decision making managers use to guide them in the adoption of cloud computing as a method for meeting some or all of their organizational computing needs. In the literature, adoption theory addresses reasons for choosing to adopt a new approach or method for doing something (Da Costa Hernandez and Mazzon, 2008; Glynn, Fitzgerald, and Exton, 2005; Hansen, 2004; Lease, 2005). The field of adoption theory, though fairly new, is gaining in research interest.

There are a variety of computer fields where adoption theory is being evaluated. For example, Lin and Yu (2006) employed adoption theory to evaluate increased consumer usage of the Internet for shopping, while Wang, Archer and Zheng (2006) applied adoption theory to research on business-to-business electronic marketplaces. Da Costa Hernandez and Mazzon (2008) found factors that influence people to adopt Internet banking. In another area, adoption theory was applied by Lease (2005) to evaluate factors influencing the adoption of biometric identification measures for computer security.

1.2 Background Information

Before cloud computers became available, there were various precursor technologies, including thin clients, grid computing, and utility computing, used for remote access to computing resources (Leavitt, 2009). These technologies, as described by Leavitt, are as follows: A thin

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client is a keyboard and monitor connected to a centralized computer. Grid computing is an arrangement in which multiple similar systems, often geographically separated, can process computing jobs dispatched from a user to a centralized server. This centralized server dispatches the computing jobs to available computing resources. Utility computing is a method of providing computing to remote users, often on a fee basis, based on cycles used, much as providing an electrical utility. A thin client can be a low-priced portal to a centralized or cloud computer, with all of the computing and storage functions provided by the centralized cloud computer.

Some of the primary types of cloud services include infrastructure as a service, platform as a service, and software as a service (Aymerich, Fenu and Surcis, 2008; National Institute of Standards and Technology [NIST], 2009). Leavitt also includes a general group called services, though NIST spreads these services applications over the other three groups. Descriptions of these cloud services, as explained by Leavitt, follow: Services consist of storage, middleware, collaboration, and databases provided via the Internet. Infrastructure as a service (IaaS) is a full computer infrastructure provided via the Internet. A platform as a service (PaaS) is a full or partial application development environment accessible online, with collaboration possible. Finally, software as a service (SaaS) consists of complete turnkey computing applications, such as for enterprise resource management, available online. These applications together comprise the majority of the types of computing services available from cloud computers, ranging from hardware and software services, to entire computing environments. A survey conducted by private cloud service provider Eze Castle Integration in 2012 found out that firms began their use of the cloud with basic business or office functionality, including email, file services and mobility. With significant others indicated their first use of the cloud was for hosting of financial applications.

1.2.1 Cloud Computing In Kenya and the Nairobi Stock Exchange

There are several developments in Kenya that are helping to establish a case for Cloud computing in Kenya. In Kenya Vision 2030, the country's new development blue print covering the period 2008 to 2030 aims to transform Kenya into a new industrializing "middle-income country providing a high quality life to all citizens by the year 2030". Science Technology and Innovation (STI) is one of the pillars that Kenya's Vision 2030 is anchored on. As such there has been a push from Government toward implementation and adoption of Information and

communication Technology, and cloud computing is one of the new innovations that would be easy to adopt and implement, Republic of Kenya (2007).

The arrival and subsequent connection of fibre optic cables in Kenya is expected to impact heavily on local businesses. Currently Kenya has access to SEACOM and TEAMS undersea fibre optic cables. The use of fibre optic systems in Kenya is expected to expand at amazing rate. Kenya, just like most of African countries has been depending on the expensive and unreliable satellite for Internet connection. High costs of using Internet have been the reason barring many small businesses and households from accessing it.

The submarine fibre optic cable is expected to boost Internet connections and greatly reduce the cost of telecommunications; especially data transmission in the region. Being fast and affordable the Internet connectivity opens up the country to Hosted service and various cloud computing offerings on/over the Internet. Cloud computing services providers have already started setting up shop within the country (Kebs, 2012).

A survey done by Ovum survey in Kenya in 2012 found out that 51 per cent of organisations were currently using the cloud for data management while 4 per cent were considering adopting the cloud for data management in the next 6 months, 30 per cent in 24 months and 15 per cent weren't considering the cloud for data management at all. This study focused on Kenyan companies quoted in the Nairobi Stock exchange as they are usually the leading companies to adopt new technologies in Kenya.

The Nairobi Stock Exchange (NSE) is the principal stock exchange of Kenya. It began in 1954 to oversee stock exchange in Kenya. The NSE is Africa's fourth largest stock exchange in terms of trading volumes, and fifth in terms of market capitalization as a percentage of GDP. The Exchange works in cooperation with the Uganda Securities Exchange and the Dar es Salaam Stock Exchange, including the cross listing of various equities.

Companies listed in the various Stock Exchange(s) in the world tend to be the industry leaders in various aspects one of them being technology and technology adoption. This tends to influence other companies and institutions. As such the companies listed in the Nairobi Stock Exchange (NSE) would have an influence on the adaption of Cloud computing in Kenya. Most of the Small and Medium sized companies will be looking at the big corporations listed on the NSE to see

how they react to the new technology wave of cloud computing. The companies listed on the NSE are in the agricultural, automobiles and accessories, banking, commercial and services, construction and allied, energy and petroleum, insurance, investment, manufacturing and allied and the telecommunication and technology sector. Their expansive operations in Kenya and the East African region requires them to synchronise their information and data storage capabilities hence the adoption of cloud computing.

Since the decision on whether or not to adopt cloud computing can be a difficult decision for managers to make due to the challenges and concerns such as security and privacy, considerable thought goes into making such a decision. The goal of this research was to give organizational managers further insight into how such complicated decisions are made, to help them in making appropriate decisions for their own organizations. Since managers overseeing the information technology planning area of an organization provide guidance and input on these decisions, these are the people whose knowledge is being sought.

1.2.3 Advantages of Cloud Computing

According to Klein (2003), there are six main benefits to cloud computing, the first one is lower costs: cloud computing pools all of the computing resources that can be distributed to applications as needed, optimizing the use of the sum of the computing resources and delivering better efficiency and utilization of the entire shared infrastructure. The second benefit is reduced capital expenditure: whether you go with a public cloud or outsourced private cloud computing option, cloud computing delivers a better cash flow by eliminating the capital expense associated with building the server infrastructure. The third benefit is that cloud computing enables faster deployment of projects: this is because servers can be brought up and deployed in a matter of minutes ensuring that the time to deploy a new application drops dramatically with cloud computing. Rather than installing and networking a new hardware server, the new server can be dialled up and imaged in through a self-serve control console.

The fourth benefit of Cloud Computing is the ability to "Scale as Needed". As applications grow, you can add storage, RAM and CPU capacity as needed. This means you can buy "just enough" and scale as the application demands grow. The fifth benefit of cloud computing is lower maintenance costs. This is driven by two factors; less hardware and outsourced, shared information technology staff. Cloud computing uses less physical resources, therefore there is

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less hardware to power and maintain. With an outsourced cloud, you don't need to keep server, storage, network, and virtualization experts on staff full time The final benefit is that cloud computing offers resiliency and redundancy. This is because in cloud computing there is automatic failover between hardware platforms and disaster recovery services to bring up servers set up in a separate data centre should the primary data centre experience an outage.

An example of an organization that has moved business applications to cloud computing is the largest casino operator in the world, Harrah's Entertainment, which has moved applications such as reservations and their extensive customer loyalty database to a cloud provider (McDougall & Weier, 2008). This cloud computing transition has both advantages and disadvantages. A benefit that is mentioned for Harrah's cloud computing applications is localized innovation, while one disadvantage is that these applications are provider-specific and would be difficult to migrate to another provider's platform. Another cloud computing implementation, the Qatar Cloud Computing Initiative, was spearheaded by three universities, namely Carnegie Mellon University in Qatar, Qatar University, and Texas A & M University at Qatar (IBM, 2009). These universities are joining forces to address local business and industrial computing needs. Some areas of special interest include seismic modelling, gas exploration, and production operations support for the petroleum industry. This initiative also addresses compute intensive and parallel computing applications such as an Arabic language search engine, testing and migrating applications to enable parallel computing using Map Reduce programming, and support of secure computing research.

There also is a demand for cloud computing to support medical research. The Computational Intelligence Research Group located at the University of Pretoria, South Africa, is using cloud computing for medical research (IBM, 2009). Other groups can benefit from the economy of scale and centralized resources provided by cloud computing. A software as a service approach could bring needed computing capabilities to impoverished rural and Third-World areas (Parikh, 2009). Also, the Higher Education Alliance enables students at seven universities in East Africa to have access to advanced software, computing resources and educational materials, without the cost of acquiring and maintaining these resources at each site (IBM, 2009).

1.2.4 Challenges of Cloud Computing

Most organizations have concerns around the potential security risks posed by cloud computing According to McLaughlin (2008). the number one factor stopping Information Technology leaders from tapping into the cloud right away is security worries

Enterprise information are important in an information sharing world and the loss of customers' private information such as credit card details can be detrimental to a company. The security of such data especially when stored by a third party is a major concern to companies considering adopting cloud computing.

Privacy is another matter. When someone uses these cloud computing services, data is stored on someone else's server and not one's own hardware, and therefore, the user loses some control over the data. In addition to the above, Africa is faced by a unique set of challenges. Internet connectivity is still not available in large parts of the continent. Cloud computing relies on real-time server interactions with low latency, high bandwidth, and a stable connection that are largely lacking in most of Africa. This problem is compounded with the lack of cheap computing devices and low computing literacy levels where most people on the continent cannot even perform the most basic functions.

Enterprises need to consider the benefits, drawbacks and the effects of Cloud Computing on their organizations and usage practices, to make decision about the adoption and use. In the enterprise, the "adoption of Cloud Computing is as much dependent on the maturity of organizational and cultural (including legislative) processes as the technology, per se" (Fellowes, 2008)

Many companies have invested in Cloud Computing technology by building their public clouds, which include Amazon, Google and Microsoft. These companies are often releasing new features and updates of their services. For instance Amazon Web Services (AWS) released a Security[2] and Economics[3] centre on their website to have academic and community advice regarding these issues (Khajeh-Hosseini *et al.*, 2010b). This shows that there are still lots of doubts about the costs and security for enterprises to adopt Cloud Computing. Hence, the issues of economics and security in Cloud Computing for enterprises must be researched.

1.3 Statement of the Problem

The adoption of cloud computing technology offers tremendous opportunities for private industry, governments, and even individuals to access massive amounts of computational resources on-demand at very low cost. However cloud computing system requires a large information technology investment, both financial and manpower hence the need for management to evaluate the costs, benefits and risks associated with adopting cloud computing (Armbrust *et al.*, 2009; Buyya *et al.*, 2008; Liu & Orban, 2008). This is important since how an individual perceives the introduction of the technology is critical to whether the individual will eventually adopt the innovation

Prior technology adoption and diffusion literature by Rogers (1983); argues that user attitude is the key determinant of technology adoption. Attitude can be a very powerful enabler or a barrier towards the adoption of the new technology.

In Kenya the adoption of technologies has been studied with most focusing on the adoption of ICT in banks such as ICT banking in Kenyan commercial banks. Kahigu (2004), for instance, did a study on the enabling role of ICT in the business re-engineering, a case of KCB. Musyoka (2004) did a survey of the factors influencing choice of ICT systems for core banking activities in Kenya. Kitur (2001) did a survey of the strategic role of ICT systems among insurance companies in Kenya. A survey of application of ICT for competitive advantage of firms listed at the NSE was done by Vishal (2006) and Lelei (2003) did a study of ICT as a strategic tool in microfinance institutions in Kenya. However none of these studies looked at the adoption of cloud computing in NSE quoted firms in Kenya. This research, therefore intended to fill this gap regarding the adoption of Cloud Computing by addressing the following questions: What is the attitude of Managers towards the adoption of Cloud Computing? Which functions have businesses moved to the cloud? And what are the challenges/concerns associated with adoption of Cloud Computing by Managers of Firms listed on the NSE?

1.4 Objectives of the Study

The objectives of this study were:

(a) To determine the attitude of Managers of firms listed on the NSE towards the adoption of Cloud Computing

(b) To establish which functions of business the firms listed on the NSE have been moved to the cloud.

(c) To determine the challenges affecting the adoption of Cloud Computing by Firms listed on the NSE.

1.5 Value of the Study

The study helps us to establish the attitude of Information Technology Managers in firms listed on the Nairobi Stock Exchange have towards Cloud computing and its impact to their organizations if they are willing to adopt it. It also helps establish the key drivers for possible adoption of cloud computing and the concerns around it as well.

The value of this study is that it shows reasons influencing an organization to adopt cloud computing. These reasons for adopting cloud computing should aid in strategic planning, by both cloud providers and by organizations that could consider using cloud computing assets to meet current or future computing and data and information management needs.

The study will also be invaluable to the government as it might find it useful in getting an insight on how to foster the development and sustenance of ICT and cloud computing in Kenya. This is in line with its Vision 2030.

Scholars will find the study useful as it will act as a foundation for further research as they seek to improve and develop a better understanding of technology acceptance theories and attitudes towards cloud computing acceptance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Cloud computing is a current trend that reveals the next generation application architecture (Hutchinson, Ward, and Castilon, 2009). While cloud services such as webmail, Flickr and YouTube have been widely used by individuals for some time, it is not until relatively recently that organisations have begun to use cloud services as a tool for meeting their IT needs. It is estimated that by 2013 the cloud market will have reached $8.1 bn (BBC, 2010). Despite these trends cloud computing remains for many an unfamiliar concept. Therefore in order for cloud computing to grow it is important to understand the factors that can influence its rate of adoption by businesses. This study aims to investigate how cloud computing is perceived by IT professionals and the concerns that managers have in regard to the adoption of cloud services.

2.2 Cloud Computing Adoption

Cloud computing provides an on-demand computing model and changes the traditional allocation of IT resources to a more collaborative framework (Hayes, 2008) National Institute of Standards and Technology (NIST) has announced the definition of cloud computing, which has been widely used as a baseline for further discussion (Mell and Grance, 2011). In general, cloud computing uses virtualization technologies to provide on demand computing resources via networks and has the following characteristics: on-demand self-service, resource optimization, scalability, flexible pricing model, and measured service.

The flexibility of a cloud-based framework allows cloud service providers to support multiple products with shared resources (Anandasivam and Premm, 2009). Cloud computing basically consists of three service models: (1) Infrastructure as a Service (IaaS): the provision of storage capabilities and computing power; (2) Platform as a Service (PaaS): the provision of a programmable environment with needed programming languages, libraries, services, and tools; (3) Software as a Service (SaaS): the provision of web-based applications. In addition, there are basically four ways to deploy cloud computing, including private cloud, public cloud, community cloud, and hybrid cloud (Mell and Grance, 2011). Each deployment model has its benefits and drawbacks (Zhang *et al.*, 2010). The decision of choosing a proper cloud computing deployment model should take technological as well as organizational factors into consideration.

Adopting cloud services, firms do not have to invest on up-front or other capital expenditure. For small and medium enterprises (SMEs), cloud computing provides affordable access to large data centers and unique services (Weinhardt *et al.*, 2009). Although there are many benefits with adopting cloud computing, Gill (2011) found that firms still hesitate to embrace cloud computing. Adopting cloud systems is not merely a technical improvement and can bring about many organizational changes. Companies concern about the issues of security, customization, reliability, and data ownership. Saya *et al.*, (2010) found that institutional influences can ease the perceived lack of security as well as spread potential benefits of adoption (i.e., accessibility, scalability, and cost effectiveness). Heart (2010) argued that data insecurity and system unavailability are associated with perceived risks of SaaS, which decrease organization's desire to adopt SaaS.

An empirical study on the adoption of SaaS-based applications on German companies revealed a difference between application types (Benlia *et al.*, 2009). Benlia *et al.*, (2009) found that companies are conservative to adopt SaaS services with higher strategic relevance, such as CRM and ERP. Accordingly, this study argues that the current internal, external status will affect firms' decision on cloud systems adoption. Although cloud-based framework reveals many potential benefits, firms should address technical and managerial issues to ensure a successful this digital transformation. We now turn our focus to further developing the theoretical foundations of system adoption.

2.3 Attitudes of Managers towards Technology Adoption

To begin to understand the forces influencing a manager's attitudes we must first consider the various lenses that individuals view an innovation through. Weick (1990) refers to innovations as equivoque or something that lends itself to be misunderstood or interpreted differently by others (Weick 1990). If perception and interpretation of an innovation varies on an individual basis, then we must consider them as contributing factors of an individual's attitude. How an individual perceives the introduction of the technology is critical to whether the individual will eventually adopt the innovation.

2.3.1 Beliefs and Values

People of varying backgrounds often have different belief and value systems which give rise to dissimilar attitudes (Rathus and Nevid 1987). Beliefs and values form a basis of attitudes

towards technology (Pancer, George and Gebotys 1992; Gardner, Dukes and Discenza 1993). Therefore varying backgrounds and belief systems contribute to an individual's attitude towards a technology.

Belief systems also contribute to attitudes towards innovation adoption rate. A study contrasting early innovation adopters and the early majority concluded that not only do early innovation adopters use new products more, but also seek new applications of the innovation more than later adopters (Ram et al., 1994). The authors point out that usage rate may linked to individual perception of the technology.

Findings in other studies confirm a relationship between the perception of usefulness of computers to perform job tasks and the level of usage (Koohang, 1989; Sacks, Bellisimo and Mergendoller, 1993) In addition, all studies identified a positive correlation between favorable attitudes toward computers and computer familiarity. Allowing individuals to become familiar with the technology and the perception of usefulness were noted as a critical contributor to successful adoption of the technology.

Often used as a foundation for one's perception and in turn attitude, is past experience. A study by Gardner (1993) identified a positive correlation between experiences with computers and beliefs towards them. Not surprisingly, negative experiences with computers correlated with negative beliefs and attitudes toward the technology. Individuals that had positive experiences also espoused positive beliefs and attitudes. Personal experience plays a strong role in forming an individual's attitude. It's no wonder that experience also influences attitudes towards technology.

2.3.2 Age, gender and cognitive/mechanical ability

Other considerations are that of gender, age and cognitive ability. Attitudes toward computers differ between the genders. Males tend to display more positives attitudes toward computers, regardless of the level of familiarity, while female attitudes become more positive as the level of familiarity increases (Sacks, Bellisimo and Mergendoller, 1993).

In contrast, a survey of older adults indicated that they are less likely than their younger counterparts to use a computers unless there is a perceived need. The same study attributed the low usage rates to low levels of familiarity (Baack, Brown and Brown, 1991). It is also suggested

that older individuals do not respond as well to rapid change as their younger counterparts unless the change is gradual over time (Linden and Adams 1992).

A third study by technology Arthur and Hart (1990) identified a positive relationship between cognitive ability and computer familiarity. The authors suggest that individuals with low cognitive ability levels may consciously opt not to become familiar with computers due to the challenging nature of the technology.

Mechanical reasoning skills can also contribute an individual's attitude. If the innovation is not user friendly and the individual is not mechanically adept, the user may choose not to adopt it. A study of mechanical-reasoning skill and attitude towards Automated Teller Machines concluded that are related to adoption of the innovation (Smither and Braun, 1994).

The factors of age, gender and cognitive/mechanical ability all influence perception of an innovation and consequently, attitude.

2.3.3 Organizational Control Factors

Often organizations portray new technology in a in a positive light. They tout the benefits that the innovation will bring to the employee and the organization without addressing the possible negative aspects. When the user encounters a negative experience with the innovation, an environment for rejection occurs. This scenario is called the paradox of positive value (Griffith and Northcraft, 1993).

Users have a need to reduce uncertainty in coping with the innovation (Lester, 1986). By only addressing the positive aspects of an innovation, users are not prepared to deal with any of the negative features when encountered, thus increasing the probability of adoption failure (Griffith and Northcraft, 1996). In contrast, users that are well apprised of the negative aspects may also reject the innovation if not allowed to learn from the experience. This is what Griffith and Northcraft (1996) refer to as the paradox of negative experience. They studied the effects of introducing a new technology on attitudes and perceptions of the innovation. It was concluded that attitudes towards the innovation were more positive when given enough time to become familiar with the technology in a risk free environment. Both satisfaction levels and feelings of expertise were positively related to the user's perception of having control of the environment pertaining to interfacing with the technology.

Murrell and Sprinkle (1993) concluded that if an organization addresses the user's phobia of the technology, and allows for a gradual introduction of the innovation, the likelihood of negative attitudes will decrease. The same authors also concluded that individual job attitudes have an impact on the employee's overall attitude towards the organization. Shani and Sena (1994) studied the effect of an organization's culture on an individual attitudes and the adoption of a technological change. The authors found that when employees were given control of the implementation and application of the innovation attitudes tended to be positive. Employees felt a sense of ownership and perceived a need for the innovation.

Also noted was the self-learning aspect of the culture. The authors identified this aspect, along with employee competence, as the critical elements of the adoption, utilization and internalization of the technology innovation.

2.3.4 Organizational Social Factors

Much research and theory suggests that individuals tend to adopt the attitudes and norms of the group with whom they associate (Homans, 1950; Newcomb, 1943; Sprague 1982). Burkhardt (1994) in a study of the formation of attitudes towards computers found that individuals developed their attitudes through interactions amongst peers and informal discussions.

2.4 Cloud Computing Challenges

Following are some limitations of cloud computing:

Data segregation: As data of many users are stored in same data centre and same server or same hard disks it will raise the question from the users about the problem of mismatch i.e. how cloud securely isolate users and differentiate the memory and storage of each users as this failure could lead to leakage of information from one customer to another (Victor, 2010).

Deletion of data: Many consumers' data will be stored in same data center, server and hard disk. After completion of their task with cloud if the consumer want to cancel the contract and withdraw the SLA from the provider and want to delete his data i.e. completely remove from the cloud but it is very hard to do since deletion of data can only be done by erasing entirely, repeatedly re-writing the disk sectors with random data, and possibly formatting the server's hard disk which is not possible to do so there always remain the threat of recovering the erased data or

if it is not perfectly overwritten or overlapped with random data then there will remain the chance of leaking information out (Victor, 2010).

The Offline cloud: As cloud computing is fully dependent upon internet connection. If the customer has a problem with internet connection then he/she is unable to access the application or data from internet (Victor, 2010).

Privacy: Privacy is one of the major issues in cloud as it needs high degree of trust among the users and it is fundamental human right not to privilege granted by authority (Weiss, 2007). Users are always concerned about their data so to overcome this issue provider should assure the users that there Employees are aware of their responsibilities related to the confidentiality, integrity, availability of data and information systems and the confidential and/or personal client data including system access credentials are protected (e.g. encrypted) from unauthorized interception(John, 2010).

Data Lock-In: Customers once stored their data in one data center and gone through SLA of one provider, then they cannot easily extract their data and programs from other providers. This concern about the difficulty of extracting data from the cloud prevents some organizations from adopting cloud computing. Data lock-in or customer lock-in is beneficial to cloud computing providers but users will suffer if price increases, reliability problems, or even when the providers are going out of business (Michael, 2009).

Data Confidentiality and Auditability: This aspect concerns customer's worries that data kept in a public cloud is exposed to more attacks and could be intercepted by a third party to compromise data integrity in the absence of adequate security (Mather et al. 2009). Similarly, Auditability could be added as an additional layer providing facilities arguably more secure than those built into the applications themselves (Michael, 2009).

Network: For the proper utilization of cloud computing application/services there is a need of high speed internet connection. Lack of speed and high bandwidth are the causes for not accessing the cloud services, so still there are a lot of questions regarding the cloud computing. Similarly, network failures can result in loss to the company by causing extensive time delays (Weiss, 2007). It is possible in the countries like Sweden where there is high internet connection

speed but in other countries where there is the problem of continuous supply of high speed of internet connection. this is a big issue in such places.

Software Licensing: Many cloud providers relied heavily on open source software because the licensing model for commercial software is not a good match to Utility Computing (Michael, 2009). Users first pay for the software and then pay for annual maintenance.

Security: If you are adopting cloud then the data which you store in data center is not under your direct control and it will be stored somewhere. where you cannot get physical access to it. Moreover. with the potential to leave your information will be exposed in some cases. Cloud computing providers support encryption and rudimentary identity management but still people do not want to place secrets in to the cloud (David, 2009).

Control: Control means that when you leverage a cloud computing provider, you are giving up control of all your data and file to them. so now you are at control of provider who could cause you a bunch of trouble like shutting down the account if you accidently violate some policy or in case your provider go out of business if the services are no longer profitable. You need to address these considerations into the case for cloud computing (David, 2009).

2.5 Theoretical Framework

2.5.1 TAM and its modified versions

Davis (1986) proposed the original version of TAM based on the Theory of Reasoned Action (Fishbein and Ajzen. 1975) for testing how users come to accept and use information systems. TAM has become one of the most widely used models in the information system field, partly because of its understandability and simplicity (King and He, 2006). Referring to Lee, Li, Yen, and Huang (2010), TAM enables an organization to grasp the effects of external variables concerning the causal relationship between Perceived Usefulness (PU), Perceived Ease of Use (PEOU). and Behavioral Intention (BI); it thereby helps the organization with implementation and application of technology systems.

With regard to the original version of TAM, Davis (1986) argues that (1) user's motivation can be explained by three factors: PU, PEOU, and Attitude Toward Using (ATU); (2) the ATU is a major determinant of whether the user will actually use the system; (3) the ATU is affected by

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two major beliefs: PU and PEOU; (4) PEOU has a direct influence on PU; and (5) these two beliefs are both directly influenced by "System Design Characteristics". Subsequently, the original TAM has been modified into more advanced forms: the first modified version (Davis, Bagozzi, and Warshaw, 1989), the final modified version (Venkatesh and Davis, 1996), TAM2 (Venkatesh and Davis, 2000), the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh, Morris, Davis, and Davis, 2003), and TAM3 (Venkatesh and Bala, 2008).Referring to King and He (2006), four kinds of modifications contributed to the evolution of TAM: (1) altering external antecedents; (2) amending predictive variables; (3) manipulating moderator variables; and (4) varying consequence measures.

Apart from the main stream of TAM modifications, there have been further attempts at modifying TAM. Rogers (1995) endeavored to develop integrated models that combine TAM with Innovation Diffusion Theory. Lopez-Nicolas et al. (2008) propose the TAM-diffusion theory model (TAM-DTM). Eight constructs are contained within the TAM-DTM, including: Media Influence, Social Influence, Perceived Flexibility Benefits, Perceived Status Benefits, Attitude toward Mobile Innovations, PU, PEOU, and BI.

2.6 Conceptual Framework

The conceptual frame work as shown in Figure 2.1 is mainly based on the TAM-DTM (Lopez-Nicolas et al., 2008). For the eight constructs in the research model, note that (1) SI, Perceived Benefits (PB), Attitude toward Technology Innovations (ATI), PU, PEOU, and BI are adopted from TAM-DTM (Lopez-Nicolas et al., 2008); (2) S and T is adopted from Shin (2009); and (3) ME is obtained referring to Lin et al. (2010). From the marketing perspective, a user's attitude and decision can be affected by a marketing mix involving various types of stimulation and promotion activities. Referring to Lin et al. (2010), the marketing mix can influence user motive, PU, attitude, and, PEOU.

Figure 2.1 Conceptual Framework

Independent Variables   **Dependent Variables**

```
┌─────────────────────────────────┐
│   Behavioral Intention (BI)     │ ──────┐
└─────────────────────────────────┘       │
                                           │
┌─────────────────────────────────┐       │
│   Perceived Ease of Use (PEOU)  │ ──────┤
└─────────────────────────────────┘       │
                                           │
┌─────────────────────────────────┐       │
│   Perceived Usefulness (PU)     │ ──────┤
└─────────────────────────────────┘       │        ┌──────────────────────┐
                                           ├──────▶ │      Adoption        │
┌─────────────────────────────────┐       │        └──────────────────────┘
│   Security and Trust (S&T)      │ ──────┤
└─────────────────────────────────┘       │
                                           │
┌─────────────────────────────────┐       │
│   Attitude toward Technology    │ ──────┤
│   Innovations (ATI)             │       │
└─────────────────────────────────┘       │
                                           │
┌─────────────────────────────────┐       │
│   Perceived Benefits (PB)       │ ──────┤
└─────────────────────────────────┘       │
                                           │
┌─────────────────────────────────┐       │
│   Social Influence (SI)         │ ──────┘
└─────────────────────────────────┘
```
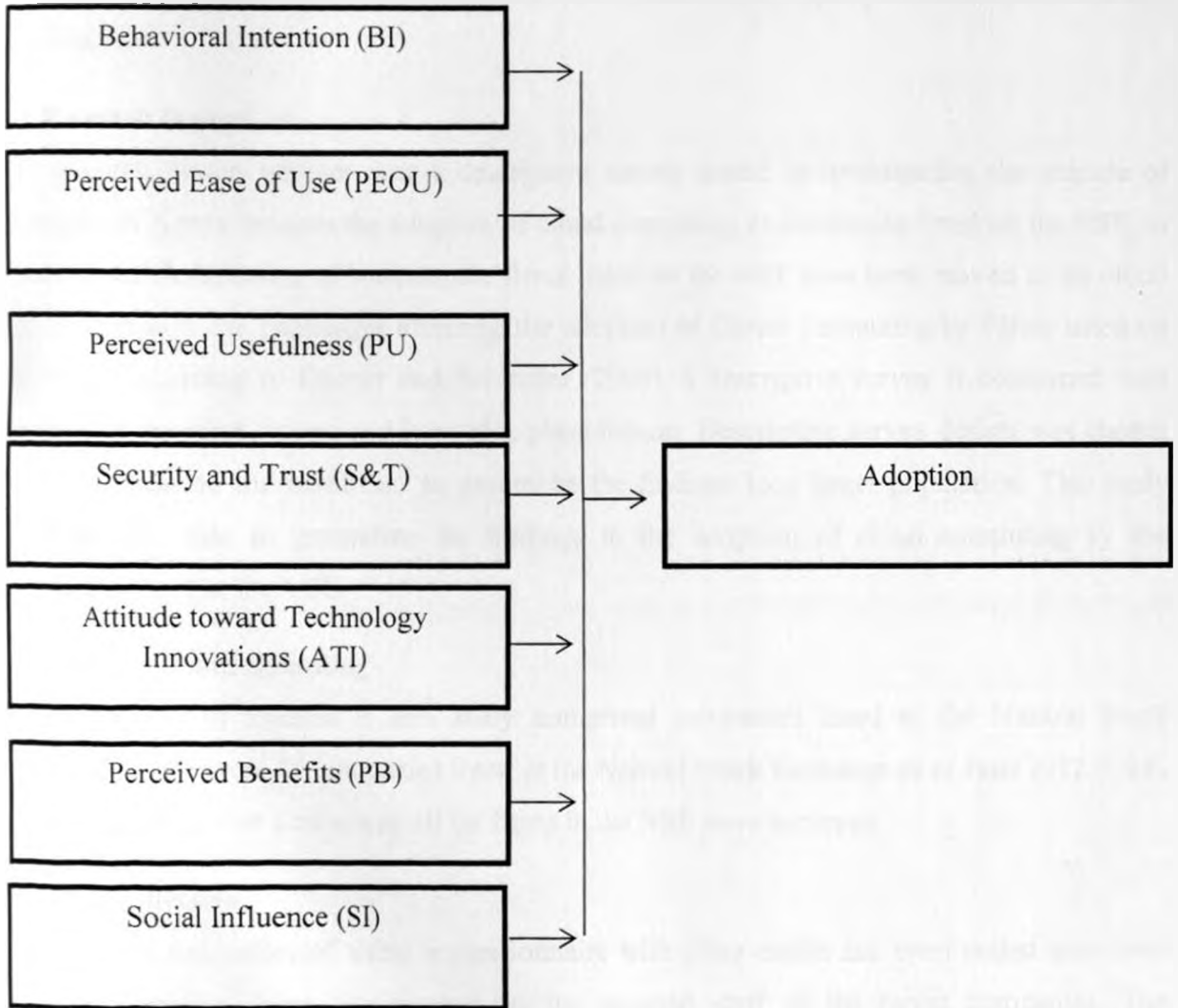
This conceptual Framework was used to analyse the factors that can affect adoption of Cloud Computing.

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CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter sets out the research methodology that was adopted so as to meet the objectives of this study. The chapter covers the research design, population, sampling and data collection and data analysis

3.2 Research Design

The research design adopted was a descriptive survey aimed at investigating the attitude of Managers in Kenya towards the adoption of cloud computing at companies listed on the NSE, to establish which functions of business the firms listed on the NSE have been moved to the cloud and to determine the challenges affecting the adoption of Cloud Computing by Firms listed on the NSE. According to Cooper and Schindler (2000), a descriptive survey is concerned with finding out the what, where and how of a phenomenon. Descriptive survey design was chosen because it enabled the researcher to generalize the findings to a larger population. This study therefore was able to generalize the findings to the adoption of cloud computing by the companies listed in the NSE.

3.3 Population and Sampling

The population of interest in this study comprised companies listed at the Nairobi Stock Exchange. There were 60 companies listed at the Nairobi Stock Exchange as of June 2012 (NSE, 2012). This study was a census as all the firms in the NSE were surveyed.

3.4 Data Collection

Primary data was collected using a questionnaire with close ended and open ended questions. The questionnaires were administered to the selected staff of the target companies. The respondents were the chief information technology officer, information technology managers, information system managers and managers involved in policy making decisions on computing systems. The study selected 24 chief information officers, 24 information technology managers, 12 information system managers and 12 managers involved in policy making decisions on IT in the companies. These are shown in Table 3.1.

Table 3.1 Respondent Selection

Category	Total	Sample Ratio	Selected
Chief information technology officer	120	0.2	24
Information technology managers	120	0.2	24
Information system managers	60	0.2	12
Managers involved in policy making decisions on computing systems	60	0.2	12
Total	360		72

The questionnaire had four sections. Section A of the questionnaire collected data on the demographic data of the respondents and company data, Section B collected data on the attitude of the respondents towards adoption of cloud computing, Section C collected data on the functions in the companies that have been moved to the cloud and Section D collected data on cloud computing concerns/challenges in the companies. The questionnaires were self-administered to the respondents through "drop and pick later" method.

3.5 Data Analysis

Before processing the responses, the completed questionnaires were edited for completeness and consistency. The data was then coded to enable the responses to be grouped into various categories. Data relating to Section A, B and D of the questionnaire was analyzed using descriptive statistics. SPSS and Microsoft excel was used to obtain percentages, tabulations, means and other central tendencies. Tables and other graphical presentations as appropriate were used to present the data collected for ease of understanding and analysis. Section B was analysed using regression analysis. The analyzed data was presented in form of tables, graphs and pies charts.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the analysis and findings of the study as set out in the research methodology. The research data was gathered exclusively through questionnaires as the primary research instrument. The questionnaire was designed in line with the research objectives of the study.

4.2 Respondents' demographic characteristics

4.2.1 Response Rate

The study targeted 72 respondents in collecting data. 56 out of 72 target respondents, filled in and returned the questionnaire resulting in a 78% response rate, this are shown in Table 4.1.

Table 4.1 Response Rate

Response Rate	Frequency	Percentage
Responded	56	78
Not responded	16	22
Total	72	100

4.2.2 Gender of the Respondents

The researcher sought to find out the gender of the respondents. The respondents were therefore asked to indicate their gender. The findings are shown in Figure 4.1.

Figure 4.1 Gender of the Respondents
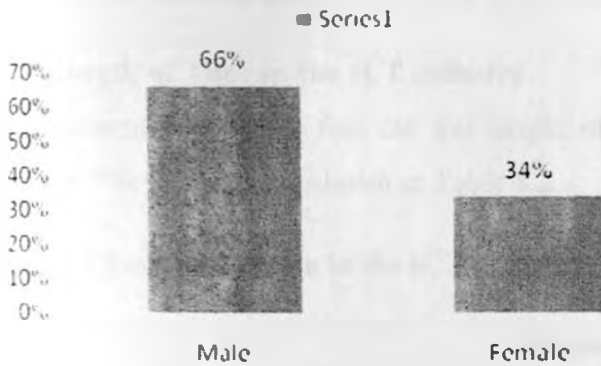
Source: Survey (2012)

From the results, the study found out that the majority of the respondents were male (66%) while the minority was female (34%).

4.2.3 Ages of the Respondents

The researcher sought to find out the ages of the respondents. The respondents were therefore asked to indicate their ages. The findings are shown in Figure 4.2.

Figure 4.2 Ages of the Respondents
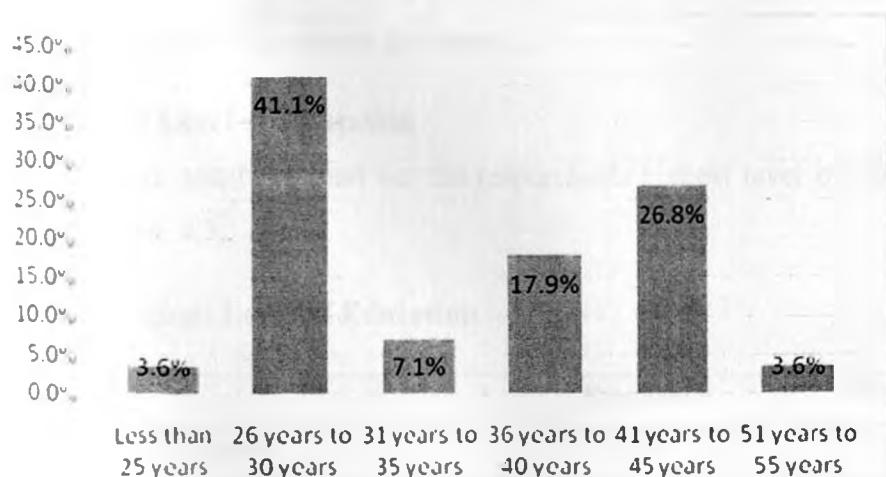
Source: Survey (2012)

From the results, the study found out that 41.1% of the respondents were aged 36 years to 30 years. 26.8% were aged 41-45 years. 17.9% were aged 36-40 years. 7.1% were aged 31-35 years, 3.6% were aged 51-55 years while 3.6% were aged less than 25 years. This indicates that the majority of the respondents (41%) were in the age bracket of 26-30 years.

4.2.4 Length of Time in the ICT industry

The researcher sought to find out the length of time the respondents had worked in the ICT industry. The findings are shown in Table 4.2.

Table 4.2 Length of Time in the ICT industry

	Frequency	Percent
Less than 1 year	1	1.8
1 – 2 Years	2	3.6
3 – 5 Years	22	39.3
6 – 10 Years	20	35.7
11 - 15 Years	6	10.7
21 - 25 Years	5	8.9
Total	56	100.0

The findings in Table 4.1 indicate that 39.3% of the respondents had worked in the ICT industry for 3-5 years, 35.7% for 6-10 years, 10.7% for 11-15 years, 8.9% for 21-25 years, 3.6% for 1-2 years and 1.8% for less than one year. This indicates that majority of the respondents have been in the ICT industry for between 3-5 years.

4.2.5 Highest Level of Education

The researcher sought to find out the respondents highest level of education. The findings are shown in Table 4.3.

Table 4.3 Highest Level of Education

	Frequency	Percent
Undergraduate Degree	20	35.7
Postgraduate Degree	26	46.4
Doctorate Degree	10	17.9
Total	56	100.0

The findings in Table 4.2 indicate that most of the respondents (46.4%) indicated that they had post graduate degrees. 35.7% had undergraduate degrees while 17.9% had doctorate degrees. This indicates that majority of the study respondents had attained a postgraduate degree as their highest level of education.

4.2.6 Respondents Professional Certifications

The researcher sought to find out the respondents professional certifications. The findings are shown in Table 4.4.

Table 4.4 Respondents Professional Certifications

	Yes	NO
Cisco Certified Network Administrator	66.1	33.9
Microsoft Certified Systems Engineer	76.8	23.2
Microsoft Certified Database Administrator	72.2	26.8
CompTIA A+	66.1	33.9
Certified Information Systems Auditor	58.9	41.1
Certified Web Professional (CWP)	78.6	21.4
CompTIA Security+	73.2	26.8
International Computer Driving License	57.1	42.9
Oracle Certified Associate	50.0	50.0
Oracle Certified Professional	53.6	46.4
SAP Associate	58.9	41.2

The findings in Table 4.3 indicate that66.1% had Cisco Certified Network Administrator certification, 76.8% had Microsoft Certified Systems Engineer Certification, 72.2% had Microsoft Certified Database Administrator Certification, 66.1% had CompTIA A+ certification, 58.9% had Certified Information Systems Auditor certification, 78.6% had Certified Web Professional (CWP) certification, 73.2% had CompTIA Security+ certification, 57.1% had International Computer Driving License certification, 50.0% had Oracle Certified Associate certification, 53.6% had Oracle Certified Professional certification, and 58.9% had SAP Associate certification.

4.2.7 Job Designation

The researcher sought to find out the respondents job designation. The findings are shown in Table 4.5

Table 4.5 Job Designation

	Frequency	Percent
Chief information technology officer	15	26.8
Information technology manager	23	41.1
Information system manager	10	17.9
Policy making Manager	8	14.3
Total	56	100.0

The findings in Table 4.4 indicate that most of the respondents (41.1%) were Information technology managers, 26.8% were Chief information technology officers, 17.9% were Information system manager while 14.3% were Policy making Managers. This indicates that most of the respondents were in major decision making positions in the companies.

4.2.8 Number of Employees

The researcher sought to find out the number of employees in the companies. The findings are shown in Table 4.6.

Table 4.6 Number of Employees

	Frequency	Percent
1-50 Employees	7	12.5
51 -100 Employees	4	7.1
101 – 250 Employees	20	35.7
251 – 500 Employees	20	35.7
501 – 1000 Employees	1	1.8
1001 – 2500 Employees	2	3.6
2501 – 5000 Employees	2	3.6
Total	56	100.0

The findings in Table 4.5 indicate that most 35.7% had 101 – 250 Employees, 35.7% had 251 – 500 Employees, 12.5% had 1-50 Employees, 7.1% had 51 -100 Employees, 3.6% had 1001 – 2500 Employees, 3.6% had 2501 – 5000 Employees and 1.8% had 501 – 1000 Employees. The respondent with employee base of between 101 -250 employees and 251 – 500 employees had the highest representation with 35.7% each.

4.2.9 Average Annual Revenue of the Firm

The researcher sought to find out the average annual revenues of the firms. The findings are shown in Table 4.7.

Table 4.7 Average Annual Revenue of the Firm

	Frequency	Percent
Less than 500 million	8	14.3
Between 501 Million and 1Billion	14	25.0
Between 1.1 and 2.5 Billion	4	7.1
Between 2.6 and 5 Billion	6	10.7
Between 5.1 and 10 Billion	11	19.6
Between 10.1 and 20 Billion	9	16.1
Between 20.1 and 30 Billion	2	3.6
Between 40.1 and 50 Billion	2	3.6
Total	56	100.0

The findings in Table 4.6 indicate that 25% of the respondents had Between 501 Million and 1Billion in revenue, 19.6% had Between 5.1 and 10 Billion in annual revenue, 16.1% had Between 10.1 and 20 Billion in annual revenue, 14.3% had Less than 500 million in annual revenue, 7.1% had between 1.1 and 2.5 Billion in annual revenue, 3.6% had Between 20.1 and 30 Billion in annual revenue and 3.6% had Between 40.1 and 50 Billion annual revenue.

4.2.10 Industrial Section of the Firm

The researcher sought to find out the industrial section of the firms. The findings are shown in Table 4.8.

Table 4.8 Industrial Section of the Firm

	Frequency	Percent
Agricultural	11	19.6
Commercial and services	9	16.1
Telecommunications and technology	6	10.7
Automobiles and accessories	8	14.3
Banking	6	10.7
Insurance	5	8.9
Investment	5	8.9
Manufacturing and allied	1	1.8
Energy and petroleum	5	8.9
Total	**56**	**100.0**

The findings in Table 4.6 indicate that19.6% were in Agriculture, 16.1% were in Commercial and services, 10.7% Telecommunications and technology, 14.3% were in Automobiles and accessories, 10.7% were in banking, 8.9% were in insurance, 8.9% were in investment, 8.9% were in Energy and petroleum while 1.8% were in Manufacturing and allied.

4.3 Attitude towards Adoption of Cloud Computing

The study sought to find out how the respondentsperceived the adoption of cloud computing in their firms. The results are shown in Table 4.9.

Table 4.9 Attitude towards Adoption of Cloud Computing

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Weighted Mean	Standard Deviation
Using the Cloud computing solutions is attractive	46	4	3	1	2	1.3750	.94508
Using the Cloud computing solutions is cost-effective.	10	38	6	1	1	2.0179	.72591
Cloud computing solutions are easy to get and purchase.	7	23	23	3		2.3929	.77878
Mass media affects the acceptance of cloud computing solutions	7	25	23		1	2.3393	.76934
Expert opinions affect the adoption of Cloud computing solutions.	11	27	17	1		2.1429	.74903
The word-of-mouth affects the adoption Cloud computing solutions.	18	26	7	5		1.9821	.90435
Using the Cloud computing solutions is a representation of industrial trends.	56					1.8750	.71510
Using the Cloud computing solutions raises status symbols.	8	30	16	2		2.2143	.73148
Using the Cloud computing solutions is a way to increase employee confidence.	12	24	17	1	2	2.7321	4.20602
Using the Cloud computing solutions makes work easier.	19	19	18			1.9821	.82000
Using cloud computing is a symbol of being technologically receptive	10	37	6	2	1	2.0536	.77271
Being a pioneer in cloud computing puts one on leading edge technologically	12	24	16	3	1	2.2321	.91435
Using the Cloud computing solutions enhances the security of backups.	18	27	7	3	2	2.0179	.99984

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	1	2	3	4	5	Mean	Std. Dev
Cloud computing solutions eliminates the problem of incompatibility	15	22	13	6		2.1786	.95550
Using the Cloud computing solutions is secure.	19	18	15	3	1	2.0893	.99593
Using the Cloud computing solutions is trustworthy	13	25	12	4	2	2.2321	1.00889
Using the Cloud computing solutions enables work to be done faster	7	32	16	1		2.1964	.67203
Using the Cloud computing solutions enables me to do things better.	7	25	20	3	1	2.3929	.84592
Using the Cloud computing solutions improves user performance.	14	28	13		1	2.0357	.80824
Using the Cloud computing solutions advances user competitiveness.	25	19	5	7		1.8929	1.02120
The functionality of the Cloud computing solutions is satisfying.	11	24	17	3	1	2.2679	.90435
The user interface of the Cloud computing solutions is friendly.	21	19	12	3	1	2.1071	.92792
The procedure of using the Cloud computing solutions is understandable.	13	28	11	4		2.5000	4.24692
It is easy to learn using the Cloud computing solutions.	21	19	11	5		2.1071	.84592
It is easy to make use of the Cloud computing solutions.	15	22	15	5		2.0000	.97234

The findings of the study are indicated in Table 4.8. The scale used in the study was 1 - Strongly Agree; 2 – Agree; 3 - Neither Agree nor Disagree; 4 - Disagree; 5 - Strongly Disagree. The findings indicate that the respondents strongly agreed that using the cloud computing solutions is attractive as shown by a mean of 1.3750, while they agreed that using the cloud computing solutions is cost-effective, cloud computing solutions are easy to get and purchase, mass media affects the acceptance of cloud computing solutions, expert opinions affect the adoption of cloud computing solutions, the word-of-mouth affects the adoption cloud computing solutions., using the cloud computing solutions is a representation of industrial trends., using the cloud computing solutions raises status symbols., using the cloud computing solutions is a way to increase

employee confidence, using the cloud computing solutions makes work easier, using cloud computing is a symbol of being technologically receptive, being a pioneer in cloud computing puts one on leading edge technologically, using the cloud computing solutions enhances the security of backups, cloud computing solutions eliminates the problem of incompatibility, using the cloud computing solutions is secure, using the cloud computing solutions is trustworthy, using the cloud computing solutions enables work to be done faster, using the cloud computing solutions enables me to do things better, using the cloud computing solutions improves user performance, using the cloud computing solutions advances user competitiveness, the functionality of the cloud computing solutions is satisfying, the user interface of the cloud computing solutions is friendly, the procedure of using the cloud computing solutions is understandable, it is easy to learn using the cloud computing solutions and it is easy to make use of the cloud computing solutions as shown by means of 2.0179, 2.3929, 2.3393, 2.1429, 1.9821, 1.8750, 2.2143, 2.7321, 1.9821, 2.0536, 2.2321, 2.0179, 2.1786, 2.0893, 2.2321, 2.1964, 2.3929, 2.0357, 1.8929, 2.2679, 2.1071, 2.5000, 2.1071 and 2.0000 respectively.

This indicates that using the cloud computing solutions is attractive, using the cloud computing solutions is cost-effective, cloud computing solutions are easy to get and purchase, mass media affects the acceptance of cloud computing solutions, expert opinions affect the adoption of cloud computing solutions, the word-of-mouth affects the adoption cloud computing solutions., using the cloud computing solutions is a representation of industrial trends., using the cloud computing solutions raises status symbols., using the cloud computing solutions is a way to increase employee confidence, using the cloud computing solutions makes work easier, using cloud computing is a symbol of being technologically receptive, being a pioneer in cloud computing puts one on leading edge technologically, using the cloud computing solutions enhances the security of backups, cloud computing solutions eliminates the problem of incompatibility, using the cloud computing solutions is secure, using the cloud computing solutions is trustworthy, using the cloud computing solutions enables work to be done faster, using the cloud computing solutions enables me to do things better, using the cloud computing solutions improves user performance, using the cloud computing solutions advances user competitiveness, the functionality of the cloud computing solutions is satisfying, the user interface of the cloud computing solutions is friendly, the procedure of using the cloud computing solutions is

understandable, it is easy to learn using the cloud computing solutions and it is easy to make use of the cloud computing solutions

4.4 Functions Moved To the Cloud

The study sought to find out the companies functions moved to the cloud in their firms. The results are shown in Table 4.10.

Table 4.10 Functions Moved To the Cloud

	No Extent	Little Extent	Moderate Extent	Great Extent	Very Great Extent	Weighted Mean	Standard Deviation
Messaging and Collaboration		20	21	11	4	2.9821	.92424
Human Resources		12	16	24	4	3.3571	.90310
Procurements	13		21	14	8	3.0714	1.33290
CRM/Sales Management	3	13	11	20	9	4.0357	1.55621
Accounting and Finance	3	8	15	23	7	4.3929	1.97444
Project management	2	12	8	24	10	4.4464	1.62436
Application development	1	8	13	17	17	3.6071	1.24577
Payroll	3	7	23	13	10	3.3571	1.08592

The findings in Table 4.9 show the functions that the firms have moved to cloud computing. The scale used was 1- No Extent; 2 – Little Extent; 3 – Moderate Extent; 4 – Great Extent; 5 – Very Great Extent. The findings moved messaging and collaboration, human resources, human resources and payroll to a moderate extent to the cloud as shown my means of 2.9821, 3.3571, 3.0714 and 3.3571 respectively while they indicated that their firms moved CRM/sales management, accounting and finance, project management and application development to a great extent as shown by means of 4.0357, 4.3929 and 4.4464 respectively.

This indicates that the firms had moved messaging and collaboration, human resources, human resources and payroll to a moderate extent and CRM/sales management, accounting and finance, project management and application development to a great extent.

4.5 Cloud Computing Concerns/Challenges

The study sought to find out to what extent the following challenges/factors affect the adoption of cloud computing in the respondents company. The results are shown in Table 4.11.

Table 4.11 Cloud Computing Concerns/Challenges

	No Extent	Little Extent	Moderate Extent	Great Extent	Very Great Extent	Weighted Mean	Standard Deviation
Privacy	2	10	15	24	5	3.3571	.99870
Security	5	5	19	19	8	3.3571	1.11890
Availability of Services	1	11	13	23	8	3.4643	1.02628
Availability of Data	1	9	9	22	15	3.7321	1.08697
Confidentiality of corporate data		6	12	24	14	3.9286	1.33290
Loss of control of services	3	6	13	28	6	3.5000	1.00905
Inconsistency between transnational laws and regulations	1	9	21	13	12	3.4643	1.06112
Cost of migration to the cloud		6	25	24	1	3.3571	.69879
Difficulty in migration to the cloud		7	21	23	5	3.4643	.83043
Intra-clouds (vendor lock-in) migration		7	15	28	6	3.5893	.84803
Lack of liability of providers in case of security incidents		6	17	27	6	3.5893	.82631

Rejection by the employees	2	16	19	17	12	3.5536	1.06035
Unclear scheme in the pay per use approach		14	7	27	8	3.5179	1.02675
Uncontrolled variable cost	1	11	6	27	11	3.6429	1.06904
Ability to Back up and Restore of data after a disaster	4	8	7	23	14	3.6250	1.21450
Cloud Service Reliability	3	2	14	23	14	3.7679	1.04431
Reliability of supporting infrastructure	4	11	25	16		3.9464	.88255

The findings in Table 4.10 indicate the concerns and challenges of adopting cloud computing. The scale used was 1- No Extent: 2 – Little Extent; 3 – Moderate Extent; 4 – Great Extent; 5 – Very Great Extent. The respondents indicated that privacy and security affected the adoption of cloud computing to a moderate extent as shown by means of 3.3571 and 3.3571 respectively while they agreed to a great extent that availability of services, availability of data, confidentiality of corporate data, loss of control of services, inconsistency between transnational laws and regulations, cost of migration to the cloud, difficulty in migration to the cloud, intra-clouds (vendor lock-in) migration, lack of liability of providers in case of security incidents, rejection by the employees, unclear scheme in the pay per use approach, uncontrolled variable cost, ability to back up and restore of data after a disaster, cloud service reliability and reliability of supporting infrastructure affect the adoption of cloud computing as shown by means of 3.4643, 3.7321, 3.9286, 3.5000, 3.4643, 3.3571, 3.4643, 3.5893, 3.5893, 3.5536, 3.5179, 3.6429, 3.6250, 3.7679 and 3.9464 respectively.

This indicates that respondents indicated that privacy and security affected the adoption of cloud computing to a moderate extent while they agreed to a great extent that availability of services, availability of data, confidentiality of corporate data, loss of control of services, inconsistency between transnational laws and regulations, cost of migration to the cloud, difficulty in migration to the cloud, intra-clouds (vendor lock-in) migration, lack of liability of providers in case of security incidents, rejection by the employees, unclear scheme in the pay per use approach, uncontrolled variable cost, ability to back up and restore of data after a disaster, cloud service reliability and reliability of supporting infrastructure affect the adoption of cloud computing.

4.6 Regression analysis

A multivariate regression model was applied to determine the attitude of Managers in Kenya towards the adoption of cloud Computing. The logistic regression used in this model was:

$Y = \alpha - \beta_1 X_1 + \beta_1 X_2 + \beta_1 X_3 + \beta_1 X_4 - \beta_1 X_5 - \beta_1 X_6 + X_{7+} \varrho$

Where

Y= Attitude Towards Adoption

α = Constant Term

β_1= Beta coefficients

X_1= Behavioral Intention (BI)

X_2=Perceived Ease of Use (PEOU)

X_3=Security and Trust (S&T)

X_4= Perceived Usefulness (PU)

X_5=Attitude toward Technology Innovations (ATI)

X_6= Perceived Benefits (PB)

X_7= Social Influence (SI)

ϱ = Error

Table 4.12 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.866ª	.749	.701	.28733

Adjusted R^2 is called the coefficient of determination and tells us how the factors determine the attitude of Managers in Kenya towards the adoption of cloud Computing. From table above, the value of adjusted R^2 is 0.749. This implies that, there was a variation of 74.9% of attitude towards cloud computing adoption varied with variation with changes in Behavioural Intention (BI), Perceived Ease of Use (PEOU), Security and Trust (S&T), Perceived Usefulness (PU), Attitude toward Technology Innovations (ATI), Perceived Benefits (PB) and Social Influence (SI) at a confidence level of 95%.

Table 4.13 Regression Coefficients results

Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.309	.664		.466	.645
	Behavioral Intention (BI)	.106	.084	-.125	-1.259	.218
	Perceived Ease of Use (PEOU)	.119	.076	.219	1.564	.128
	Security and Trust (S&T)	.170	.096	.191	1.763	.088
	Perceived Usefulness (PU)	.243	.108	.295	2.244	.032
	Attitude toward Technology Innovations (ATI)	.117	.078	-.165	-1.512	.141
	Perceived Benefits (PB)	.151	.085	.167	1.776	.086
	Social Influence (SI)	.513	.086	.564	5.934	.000
a. Dependent Variable: Mortgage financing leads to improve profitability of the bank						

Source, Researcher (2012)

From the data in Table 4.13, there is positive relationship between attitude towards cloud computing adoption and Behavioral Intention (BI), Perceived Ease of Use (PEOU), Security and Trust (S&T), Perceived Usefulness (PU), Attitude toward Technology Innovations (ATI), Perceived Benefits (PB) and Social Influence (SI). The established regression equation was;

$$Y = 0.309 + 0.106X_1 + 0.119X_2 + 0.170X_3 + 0.243X_4 + 0.117X_5 + 0.151X_6 + 0.513X_7$$

From this regression model, it was found attitude towards cloud computing adoption would be at 0.309 holding factors influencing attitude towards cloud computing adoption to a constant zero. A unit increase in Behavioral Intention would lead to a change in attitude towards cloud computing adoption by factor of 0.106; a unit increase in Perceived Ease of Use would lead to increase a change in attitude towards cloud computing adoption by factor of 0.119, a unit increase in Security and Trust would result to an increase in a change in attitude towards cloud computing adoption by a factor of 0.170, also unit increase in Perceived Usefulness would result to increase in a change in attitude towards cloud computing adoption by factor of 0.117. This implies that Behavioral Intention (BI), Perceived Ease of Use (PEOU), Security and Trust (S&T), Perceived Usefulness (PU), Attitude toward Technology Innovations (ATI), Perceived Benefits (PB) and Social Influence (SI) have an influence on a managers attitude towards cloud computing.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the summary of the findings from chapter four, and also it gives the conclusions and recommendations of the study based on the objectives of the study.

5.2 Summary of the Findings

The study found out that the majority of the respondents are male and were mature enough to answer the questions. The respondents also had enough experience in the ICT industry to answer the study's questions. On the level of the respondents education, the study found out that the study's respondents had the prerequisite education level to occupy their positions in the companies. The respondents also had Cisco Certified Network Administrator, Microsoft Certified Systems Engineer, Microsoft Certified Database Administrator, CompTIA A+, Certified Information Systems Auditor, Certified Web Professional (CWP), CompTIA Security+, International Computer Driving License, Oracle Certified Associate Oracle Certified Professional and SAP Associate certifications.

The study also found out that the respondents were in major decision making positions in the companies and most of the companies had large numbers of employees. The companies were also in major industrial sectors in the economy such as Agricultural, Commercial and services, Telecommunications and technology, Automobiles and accessories, Banking, Insurance, Investment, Manufacturing and allied and Energy and petroleum.

The study found out that cloud computing solutions is attractive, using the cloud computing solutions is cost-effective, cloud computing solutions are easy to get and purchase, mass media affects the acceptance of cloud computing solutions, expert opinions affect the adoption of cloud computing solutions, the word-of-mouth affects the adoption cloud computing solutions., using the cloud computing solutions is a representation of industrial trends., using the cloud computing solutions raises status symbols., using the cloud computing solutions is a way to increase employee confidence, using the cloud computing solutions makes work easier, using cloud computing is a symbol of being technologically receptive, being a pioneer in cloud computing

puts one on leading edge technologically, using the cloud computing solutions enhances the security of backups, cloud computing solutions eliminates the problem of incompatibility, using the cloud computing solutions is secure, using the cloud computing solutions is trustworthy, using the cloud computing solutions enables work to be done faster, using the cloud computing solutions enables me to do things better, using the cloud computing solutions improves user performance, using the cloud computing solutions advances user competitiveness, the functionality of the cloud computing solutions is satisfying, the user interface of the cloud computing solutions is friendly, the procedure of using the cloud computing solutions is understandable, it is easy to learn using the cloud computing solutions and it is easy to make use of the cloud computing solutions

On the services and functions that had been moved to the cloud, the study found out that the firms had moved messaging and collaboration, human resources, human resources and payroll to a moderate extent and CRM/sales management, accounting and finance, project management and application development to a great extent.

The study also found out the concerns of the respondents with respect to adopting cloud computing, the study found out that privacy and security affected the adoption of cloud computing to a moderate extent while they agreed to a great extent that availability of services, availability of data, confidentiality of corporate data, loss of control of services, inconsistency between transnational laws and regulations, cost of migration to the cloud, difficulty in migration to the cloud, intra-clouds (vendor lock-in) migration, lack of liability of providers in case of security incidents, rejection by the employees, unclear scheme in the pay per use approach, uncontrolled variable cost, ability to back up and restore of data after a disaster, cloud service reliability and reliability of supporting infrastructure affect the adoption of cloud computing.

5.3 Conclusions

The study concludes that cloud computing solutions are attractive, cost-effective, easy to get and purchase, mass media affects the acceptance of cloud computing solutions, expert opinions affect the adoption of cloud computing solutions, the word-of-mouth affects the adoption cloud computing solutions, are a representation of industrial trends, raise status symbols, increases employee confidence, make work easier, are symbol of being technologically receptive, being a

pioneer in cloud computing puts one on leading edge technologically, enhances the security of backups, eliminates the problem of incompatibility.

The study also concludes that cloud computing solutions are secure, trustworthy, enables work to be done faster, enables things to be done better, improves user performance, advances user competitiveness, cloud computing solutions is satisfying, the user interface of the cloud computing solutions is friendly, the procedure of using the cloud computing solutions is understandable, it is easy to learn using the cloud computing solutions and it is easy to make use of the cloud computing solutions.

The study also concludes that messaging and collaboration, human resources, human resources and payroll to a moderate extent and CRM/sales management, accounting and finance, project management and application development can be moved to cloud computing easily.

The study also concludes that privacy and security affect the adoption of cloud, availability of services, availability of data, confidentiality of corporate data, loss of control of services, inconsistency between transnational laws and regulations, cost of migration to the cloud, difficulty in migration to the cloud, intra-clouds (vendor lock-in) migration, lack of liability of providers in case of security incidents, rejection by the employees, unclear scheme in the pay per use approach, uncontrolled variable cost, ability to back up and restore of data after a disaster, cloud service reliability and reliability of supporting infrastructure affect the adoption of cloud computing.

5.4 Recommendations

The implications of the findings of this study for practice are these. First, in order to promote cloud computing among commercial companies cloud service providers should provide successful case studies and statistics in order to help companies realise the applications of the cloud. That is, to make the benefits of adoption more observable to companies will help companies understand the concept and realise the potential benefits. Second, to achieve agreement on an industry standard perhaps is the priority in the sector. The standardization will reduce uncertainties and hence encourage adoptions. Third, like other information technology adoptions in businesses there are issues other than the technology that need to be taken into account for example compatibility of the technology with organizational policy, structure, value,

and most importantly products and services. Companies will have to assess the necessity of cloud computing to their business first and then its compatibility.

5.5 Limitations of the Study

Although the study was completed and reached its aim, it was not done without some limitations. First of all the not all the respondents managed to respond to the questionnaire. Secondly, with more resources in form of money and time I could have managed to better inform of data collection and analysis. Finally, Cloud computing is very new to Kenya and there isn't much information about the same in the Kenyan context.

5.5 Recommendations for Further Research

Further research on cloud computing should focus on investigating how businesses are using the cloud to create advantage. Further research also needs to identify the issues faced by organizations when adopting the cloud. Since cloud computing is still new to both academia and commerce the outcome of these studies will help academics and practitioners alike assess the actual uses of the cloud in practice and the business benefits and challenges of adopting it.

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APPENDICES

Appendix I: Questionnaire
SECTION A: DEMOGRAPHIC

1. What is your Gender?: Male[ ]   Female [ ]

2. In which age bracket does your age fall?

    Less than 25 years [ ]

    36 years to 30 years [ ]

    31 years to 35 years [ ]

    36 years to 40 years [ ]

    41 years to 45 years [ ]

    46 years to 50 years [ ]

    51 years to 55 years [ ]

    More than 55 years [ ]

3. How long have you worked in the ICT industry?

    Less than 1 year   [ ]

    1 – 2 Years   [ ]

    3 – 5 Years   [ ]

    6 – 10 Years   [ ]

    11 - 15 Years   [ ]

    16 - 20 Years   [ ]

    21 - 25 Years   [ ]

    Over 25 years   [ ]

4. What is your highest level of education?

    [ ]   O level

    [ ]   Undergraduate Degree

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[ ]   Postgraduate Degree

[ ]   Doctorate Degree

[ ]   Other (Specify) _____

5. Which of the following professional certifications do you hold?

Cisco Certified Network Administrator   [ ]

Microsoft Certified Systems Engineer   [ ]

Microsoft Certified Database Administrator [ ]

CompTIAA+   [ ]

Certified Information Systems Auditor   [ ]

Certified Web Professional (CWP)   [ ]

CompTIA Security+   [ ]

International Computer Driving License   [ ]

Oracle Certified Associate   [ ]

Oracle Certified Professional   [ ]

SAP Associate   [ ]

Other (Specify) _____

6. What is your job title?

Chief information technology officer [ ]

Information technology manager   [ ]

Information system manager   [ ]

Policy making Manager   [ ]

Other (specify) _____

7. In terms of the number of employees, what is the size of the firm?

1-50 Employees   [ ]

51 -100 Employees   [ ]

101 – 250 Employees   [ ]

251 – 500 Employees   [ ]

501 – 1000 Employees   [ ]

1001 – 2500 Employees   [ ]

2501 – 5000 Employees   [ ]

More than 5000 Employees   [ ]

8. What is the average annual revenue of the firm?

[ ]   Less than 500 million

[ ]   Between 501 Million and 1Billion

[ ]   Between 1.1 and 2.5 Billion

[ ]   Between 2.6 and 5 Billion

[ ]   Between 5.1 and 10 Billion

[ ]   Between 10.1 and 20 Billion

[ ]   Between 20.1 and 30 Billion

[ ]   Between 30.1 and 40 Billion

[ ]   Between 40.1 and 50 Billion

[ ]   Between 50.1 and 60 Billion

[ ]   Between 50.1 and 60 Billion

[ ]   Between 60.1 and 70 Billion

[ ]   Between 70.1 and 80 Billion

[ ]   Between 80.1 and 90 Billion

[ ]   Between 90.1 and 100 Billion

[ ]   More than 100 Billion

9. Which industry does the firm belong to?

[ ]   Agricultural

[ ]   Commercial and services

[ ]   Telecommunications and technology

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[ ] Automobiles and accessories

[ ] Banking

[ ] Insurance

[ ] Investment

[ ] Manufacturing and allied

[ ] Energy and petroleum

Other Specify _____

Section B: ATTITUDE TOWARDS ADOPTION OF CLOUD COMPUTING

Tick to indicate the degree to which you agree with each of the following statements concerning what you perceive of adoption of cloud computing in your firm

	Strongly agree	agree	neutral	disagree	Strongly disagree
Using the Cloud computing solutions is attractive					
Using the Cloud computing solutions is cost-effective.					
Cloud computing solutions are easy to get and purchase.					
Mass media affects the acceptance of cloud computing solutions					
Expert opinions affect the adoption of Cloud computing solutions.					
The word-of-mouth affects the adoption Cloud computing solutions.					

Using the Cloud computing solutions is a representation of industrial trends.					
Using the Cloud computing solutions raises status symbols.					
Using the Cloud computing solutions is a way to increase employee confidence.					
Using the Cloud computing solutions makes work easier.					
Using cloud computing is a symbol of being technologically receptive					
Being a pioneer in cloud computing puts one on leading edge technologically					
Using the Cloud computing solutions enhances the security of backups.					
Using cloud computing solutions promotes service stability					
Cloud computing solutions eliminates the problem of incompatibility					
Using the Cloud computing solutions is secure.					
Using the Cloud computing solutions is trustworthy					
Using the Cloud computing solutions enables work to be done faster					
Using the Cloud computing solutions enables me to do things better.					
Using the Cloud computing solutions improves user performance.					
Using the Cloud computing solutions advances user competitiveness.					

The functionality of the Cloud computing solutions is satisfying.					
The user interface of the Cloud computing solutions is friendly.					
The procedure of using the Cloud computing solutions is understandable.					
It is easy to learn using the Cloud computing solutions.					
It is easy to make use of the Cloud computing solutions.					

SECTION C: FUNCTIONS MOVED TO THE CLOUD

10. Tick to indicate the degree to which you agree with each of the following statements concerning the extent to which you firm has moved the following functions to the cloud

	Business Function	No Extent	Little Extent	Moderate Extent	Great Extent	Very Great Extent
1	Messaging and Collaboration					
2	Human Resources					
3	Procurements					
4	CRM/Sales Management					
5	Accounting and Finance					
6	Project management					
7	Application development					
8	Payroll					

| 9 | Other(please specify and rate accordingly)_____ | | | | | |

SECTION D CLOUD COMPUTING CONCERNS/CHALLENGES

11. Tick in the appropriate box to indicate the extent to which the following challenges/factors affect the adoption of cloud computing in your

Concern	No Extent	Little Extent	Moderate Extent	Great Extent	Very Great Extent
Privacy					
Security					
Availability of Services					
Availability of Data					
Confidentiality of corporate data					
Loss of control of services					
Inconsistency between transnational laws and regulations					
Cost of migration to the cloud					
Difficulty in migration to the cloud					

Intra-clouds (vendor lock-in) migration					
Lack of liability of providers in case of security incidents					
Rejection by the employees					
Unclear scheme in the pay per use approach					
Uncontrolled variable cost					
Ability to Back up and Restore of data after a disaster					
Cloud Service Reliability					
Reliability of supporting infrastructure					
1. Other(specify and rate accordingly)_____ _____					