UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

ADOPTION OF CLOUD COMPUTING IN MEDIUM AND HIGH TECH INDUSTRIES IN KENYA

By

PAULINE WAMBUI WANJIKU

(P54/66051/2013)

Supervisor

CHRISTOPHER A. MOTURI

A project report submitted in partial fulfillment of the requirements for the award of Master of Science Information Technology Management of the University of Nairobi

December, 2014

DECLARATION

I hereby declare that this project is my original work and has not been submitted for examination in this University or elsewhere for an award of any other degree.

Pauline Wanjiku
P54/66051/2013

Signed_____ Date_____

This research project has been presented for examination with my approval as the university supervisor:

Christopher A. Moturi
Deputy Director
School of Computing and Informatics

Signed_____ Date_____

ABSTRACT

Cloud Computing is a new computing paradigm that provides novel perspectives in internetworking technologies. In the recent years, there has been increased global focus and emphasis on Cloud Computing. The technology has the potential to dramatically change business models. This study sought to establish prevalence of Cloud Computing adoption among Medium and High Tech Industries in Kenya, ascertain the factors influencing decisions to adopt Cloud Computing determine the effects of Cloud Computing adoption and establish the challenges affecting the adoption of Cloud Computing in those industries. To add to these, the study sought to analyse existing technology adoption models and recommend an appropriate model for Medium and High Tech Industries to use when adopting Cloud Computing. The study used descriptive survey research design by adopting quantitative and qualitative research methods. Data was collected using questionnaires from 126 Medium and High Tech Industries within Nairobi that utilize Cloud Computing technologies and interviews with 25 Cloud Computing providers. Analysis of the collected data was done by the use of SPSS. Frequency tables, charts and mean scores were used to present and interpret the results. The study shows that 70% of Medium and High Tech Industries have adopted Cloud Computing as a technological operation to facilitate service delivery. The users and providers recognize Cloud Computing is a force that is reshaping ICT and powering innovation. The study found out that cost, performance and reliability of The Cloud applications are major factors influencing the adoption of Cloud Computing. Users believe it would be much better if they were aware of the most appropriate model for the adoption of Cloud Computing. The study recommends the UTAUT model for adoption of Cloud Computing in the Medium and High Tech Industries and that ICT managers should be enlightened of the same so that they can have reliable cloud in order to increase the prevalence of Cloud Computing.

Key Words: Cloud Computing Adoption, Medium and High-tech Industries, UTAUT

DEDICATION

To Almighty God
And
To the future of innovation adoption in Kenya.

ACKNOWLEDGEMENT

I am grateful to the Lord for the strength and capacity that enabled me to finish this work. I am forever grateful to my friends, fellow students, colleagues at The University of Nairobi; School of Computing and Informatics, supervising and examining panel who were all key to the success of the research process.

- My supervisor **Mr. Christopher Moturi** for using this project to lay in me, the foundation for academic writing and for helping me to appreciate the process that is research. The process transformed me. I will be forever grateful.
- My examiners (panellists); **Mr. Christopher Moturi, Dr. Elisha O. Abade, Dr. Ogutu, Dr. Elisha Opiyo.**
- **Prof. Timothy M. Waema**, for always willing to spare time to listen, give insight, guidance, valuable comments and inspiration.
- My Project Manager **Dr. Frank L. Bartels** and **Dr. Ritin Koria**. Thank you for your unending support and mentorship.
- **Eunice Wanjiru**, for assistance with data collection. Your dedicated hard work is highly appreciated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CRM – Customer Relationship Management

EDI- Electronic Data Interchange

ERP- Enterprise Resource Planning

GDP- Gross Domestic Product

HaaS- Hardware as a Service

IaaS- Infrastructure as a Service

ICT- Information and Communication Technology

MHTI – Medium and High Tech Industries

LAN- Local Area Network

PaaS- Platform as a service

SaaS- Software as a Service

SME- Small and Medium Enterprises

STEMIT-Science Technology Engineering Mathematics and Information Technology

UTAUT- Unified Technology Adoption Model

WAN- Wide Area Network

TAM- Technology Adoption Model

KEY TERMINOLOGIES

Computing

Describes any activities of using and/or developing computing devices; hardware and Software.

Cloud

Abstraction of the setup and configuration details of the “internet” and represented in computer network schematic diagrams using a “cloud” symbol (Sultan, 2010).

Cloud Computing

A paradigm that allows on demand access to a pool of metered computing resources that include applications, platform and hardware infrastructure, offered as a service by a provider/vendor via the internet infrastructure.

Model

A hypothetical structure that is used in the investigation of interrelations between the elements.

Theory

A supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained.

Technology adoption/Acceptance

The first use or acceptance of the new technology or new product.

Population

All items in any field of inquiry or the entire mass of observations, which is the parent group from which a sample is to be formed.

CHAPTER ONE: INTRODUCTION

1.1 Background

Information and Communications Technology (ICT) has become a strategic asset for companies around the world, increasing competitiveness and shaping business operations from finance and logistics to customer relations and human resources (Schäfferling & Wagner, 2013).Cloud Computing is a computer network which includes computing hardware machine or group of computing hardware machines commonly referred as a server or servers connected through a communication network such as the Internet, intranet, local area network (LAN) or wide area network (WAN) (Daniel, 2013)

Cloud Computing is rapidly transforming business processes both domestically and in international emerging markets. Information and Communications Technology is estimated to be based in more than 50 percent in The Cloud in the current decade, and it may be an ideal environment for many developing markets. This shift allows emerging international markets to move past costly technology barriers and drastically increase productivity and growth (Law, 2010). Cloud services are becoming more readily available in a variety of regions, which has fueled a strong desire for increased capacity. Although the use of cloud services is still in its formative years in many emerging markets, the adoption of The Cloud is becoming more prevalent (Callon & Latour, 2011). This steadily increasing switch to The Cloud by an assorted range of organizations has fueled the need for providers to invest in new data centers and cloud infrastructures as well as related offerings such as security and management services, more so in rapidly developing markets like Singapore (Brodkin, 2008; Schäfferling & Wagner, 2013).

Cloud utilization has steadily become the standard in more established markets like the U.S. and the U.K., and is also gaining a foothold in emerging markets with a focus on Singapore and South Africa (Zhang, Khan & Chen, 2011). The Cloud offers significant advantages in these markets and companies are experiencing these benefits regardless of business size. Other emerging markets like Kenya are finding that Cloud Computing has the potential to help them achieve many of their developmental goals while stimulating change and economic growth. This provides access to important opportunities for the development of new services and products in these countries (Callon & Latour, 2011). Select countries in the Asia Pacific

Region (mainly Singapore) are likely to lead the way in the growth of cloud services over the next few years (Schäfferling & Wagner, 2013).

Currently, worldwide spending on The Cloud is anticipated to increase rapidly as emerging areas may have a simpler task when it comes to switching to The Cloud since they do not have transition from older systems like many African businesses countries have to. For instance, Singapore's technological market has had the advantage of a swifter move to Cloud Computing to experience benefits such as scalability, flexibility and customized pricing (Callon & Latour, 2011). The awareness and acceptance of the necessity for changes in the technological world by the providers and users has scaled the country to higher heights in the recent years. Singapore is the third most ready country for Cloud Computing in the Asia Pacific region. The Singapore government has recently implemented a pro-innovative scheme that allows firms adopting Cloud Computing get a 400 percent tax deduction (Linderoth, 2010; Dasgupta, 2003).More and more firms are beginning to migrate to cloud platforms.

Consequently, the accessibility of The Cloud may become a chief factor in the ability of such a market like Singapore to expand its global trade capabilities and enhance trade with other emerging markets (Tambe & Hitt, 2013). In the African countries, Cloud Computing has been embraced to a certain extent, and if adoption continues, it will impact, small, Medium and High Tech Industries by driving job creation and increasing access to new products and business configurations. In the case of developing governments, The Cloud can support efforts to enhance their ability to provide services in an economical and effective manner to citizens in areas such as healthcare, education, telecommunications, etc. Cloud services offer practically unlimited potential for emerging markets in nations like Japan, Singapore, South Africa, India and China that have already embarked on the process of implementing the new technology. As the number of emerging markets adopting Cloud Computing increases, opportunities in the global market will begin to level out (Dargha, 2009; Linderoth, 2010). Despite the prevalence of Cloud Computing in the world, all organizations and nations need to adopt the technology in order to enhance their economical and political operations.

1.2 Statement of the Problem

Due to the pressure of industrial organizations working with slim budgets to support their numerous operations, unnecessary IT infrastructure expenses should be avoided. A viable way of dealing with this is by adopting technologies that enable flexibility and scalability of IT network. Medium and High Tech Industries are 'technologically shy' and that Cloud Computing adoption would be appropriate with the knowledge of the technology models that would help organizations to have the right framework (Nethope International, 2010). Though there are many models of technology that can lead to adoption of cloud computing, there is lack of knowledge regarding the most appropriate model of technology that can be used to adopt Cloud Computing in Medium and High Tech Industries, hence the low level of prevalence of the technology (Callon and Latour, 2011).

From various studies done on Cloud Computing adoption in African countries, it is evident that most organizations are seen as generally not technology oriented and non-aggressive towards adopting trending technologies and thus the drive to make more organizations aware about the need for Cloud Computing in businesses(Miller, 2008, Callon and Latour, 2011, Wangui (2011). While there has been a lot of discussions and surveys on the adoption of Cloud Computing in developed countries, not very much has been done in developing countries, especially in Kenya. In this regard, this study sought to close the existing gap by establishing the adoption of Cloud Computing in Medium and High Tech Industries in Kenya.

1.3Objectives of the Study

1. To establish the prevalence of Cloud Computing adoption in Medium and High Tech Industries in Kenya.
2. To determine the factors influencing the adoption of Cloud Computing in Medium and High Tech Industries in Kenya.
3. To analyze existing models for Technology Adoption.
4. To recommend an appropriate technology model for adoption of Cloud Computing in Medium and High Tech Industries.

5. To validate the proposed model for adoption of Cloud Computing in Medium and High Tech Industries in Kenya

1.4 Research Questions

1. What is the prevalence of Cloud Computing adoption among the Medium and High Tech Industries in Kenya?
2. What are the factors that the adoption of Cloud Computing in Medium and High Tech Industries in Kenya
3. What are the existing models for Technology Adoption?
4. Which is an appropriate technology model for adoption of Cloud Computing in Medium and High Tech industries in Kenya?
5. How can the recommended model for adoption of Cloud Computing in Medium and High Tech Industries in Kenya be validated?

1.5 Justification

This study will contribute positively towards understanding Cloud Computing adoption in the Medium and High Tech Industries in Kenya. The benefit will extend to cloud services vendors/provides. By understanding the factors that influence Cloud Computing adoption as well as the prevalence rate of Cloud Computing adoption, they can take advantage to tailor products and services around cloud technologies that are best suited for MHTI in Kenya. The study will also be useful to the Medium and High Tech Industries that may have plans of rolling out Cloud Computing infrastructure in designing cloud infrastructures and cloud services. Further, the government of Kenya will benefit as it formulates policies regarding technological innovations and adoptions by various industries.

CHAPTER TWO: LITERATURE REVIEW

2.1 The Concept of Cloud Computing

Cloud Computing is a technology that is used to access different services on the Internet "The Cloud." It is a technology model in which any and all resources application software, processing power, data storage, backup facilities, development tools literally, everything is delivered as a set of services via the Internet"(Tambe & Hitt, 2013). Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources e.g., networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction (National Institute of Standards and Technology, 2011). The term Cloud Computing comes from network diagrams in which cloud shapes are used to describe certain types of networks. All the computing of more than one computer via a network or the service gained from the host computer via a network is considered cloud computing. Through different types of devices such as PCs, smart phones users can access to services and computing resources in clouds (Dargha, 2009)

Cloud Computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction(Datta (2011). This model promotes availability and is composed of five essential characteristics (Daryl & and Mitchell, 2011). Essential Characteristics include;

On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and personal digital assistants.

Resource pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of

location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

Rapid elasticity: Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.

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

Also, Cloud Computing has different types of developments via four important models or developments:

Software as a Service (SaaS): This model allows users to pay for the software per one use. **Hardware as a Service (HaaS):** This means that computing processing capacity is purchased on the web. For example, Amazon allows their customers to purchase data storage online from a service called elastic compute cloud.

Infrastructure as a Service (IaaS): This allows Cloud Computing users to pay for the technology on a pay per use basis. The technology includes firewalls and antivirus software (Haag & Cumming, 2010), and is found to be efficient in terms of organizational service delivery.

Platform as a service (PaaS): Cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers.

With some PaaS offers like Microsoft Azure and Google App Engine, the underlying computer and storage resources scale automatically to match application demand so that The Cloud user does not have to allocate resources manually. The latter has also been proposed by an architecture aiming to facilitate real-time in cloud environments (Cloud tweaks, 2011).

Cloud Computing represents a convergence of two major trends (ICT efficiency and business agility) in Information and Communications Technology. The term ICT efficiency refers to using computing resources more efficiently through highly scalable hardware and software resources. Furthermore, the business agility is the ability of a business to use computational tools rapidly, to adapt quickly and cost efficiency in response to changes in the business environment (Callon and Latour, 2011).Cloud Computing can remove traditional boundaries between businesses, make the whole organization more business agile and responsive, help enterprises to scale their services, enhance industrial competitiveness, reduce the operational costs and the total cost of computing, and decreases energy consumption. It would seem that Cloud Computing can provide new opportunities for innovation by allowing companies to focus on business rather than be stifled by changes in technology (Srinivasan, Lilien & Rangaswamy, 2012).

2.2 Cloud Computing Adoption

In the current decade, many companies are changing their overall Information and Communications Technology strategies to embrace Cloud Computing in order to open up business opportunities. As projected by market-research firm IDC, ICT cloud-service spending will grow from about USD16 billion in 2008 to about USD42 billion by 2019 (Brodkin, 2008).The heaviest users of cloud applications are the companies that manufacture the technology hardware that enables Cloud Computing(computers/electronics/telecom equipment), while healthcare services providers are the lightest users (in terms of average number cloud apps per business function).Europe has an excellent background just like America in many of the key research, technological and development aspects related to cloud systems, such as GRIDs and Service Oriented Architectures, and non-technologically due to Europe’s position as a united body. Europe also has a strong market position with many of major contributors from different field originate from Europe. Recently, the Asian pacific region in Singapore has been capitalizing on economic growth whose foundation is on technological advancements (Datta, 2011).

According to the reality checks by Cisco (2013), on The Cloud in Africa, Cloud Computing uptake is about to explode in Africa's major economies, as businesses gain confidence in both the security and reliability of The Cloud (Cisco, 2013). The study was conducted among a small but representative sample of senior Information and Communications Technology decision-makers in medium-sized and large companies in Nigeria, Kenya and South Africa. South Africa, Kenya and Nigeria are leading countries in use of Cloud Computing in Sub-Saharan Africa as of the year 2013. The study also found out that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria. South Africa currently leads the continent in Cloud Computing uptake, but appears to not be growing fast enough to retain that position in the years to come. For Kenya, in addition to the 48%, another 24% of organizations in Kenya were considering adopting within a short while.

According to Thong (2009), companies are conventional to adopt SaaS services such as CRM and ERP with higher strategic relevance. More so, the current internal, external status influences firm managers' decision on cloud technology adoption. For the adoption of cloud services, firms need not to invest on up-front or other capital expenditure (Brodkin, 2008).The rapid adoption of virtual infrastructure has popularized the practice of packaging, transporting and deploying pre-configured and ready-to-run systems, including all needed applications and the operating systems into virtual machines. The development of a standard, portable meta-data model for the distribution of virtual machines to and between virtualization and cloud platforms will enable the portability of such packaged workloads on any Cloud Computing platform. Some cloud workload formats contain a single VM only; modern enterprise applications are often constructed using a multiple tiered model, where each tier contains one or more machines. A single VM model is thus not sufficient to distribute a complete multi-tiered system. In addition, complex applications require install-time customization of networks and other customer-specific properties. Furthermore, a virtual machine image is packaged in a run-time format with hard disk images and configuration data suitable for a particular hypervisor. Run-time formats are optimized for execution and not for distribution. For efficient software distribution, a number of additional features become critical, including platform independence, compression, verification, signing, versioning, and software licensing management, temporal synchronization of state metadata snapshots and federated identification by organization and devices with organizations (Eagly& Chaiken, 2013).

Innovative process, many factors influence the process of industrial adoption and implementation of an innovation, like Cloud Computing (Rogers, 2003). In the initiation stage, members of industries prioritize the organizational needs and problems (agenda-setting phase), and thus look for suitable technology to strengthen organizational performance (matching phase) (Rogers, 2003). The proposed adoption by Medium and High Tech Industries is evaluated critically from technical, financial and strategic standpoints, after the organization gather and evaluate information about the technological innovation (Thong, 2009). In the implementation stage, the technology is first introduced to the members (clarifying phase). After using it, customized modification of the technology (redefining phase) or adjusting organizational structure (restructuring) will happen to improve the performance. Finally, using technological innovation may become part of the routine practices (Roger, 2003). Adopting innovation in Medium and High Tech Industries is understood in terms of perceived technological benefits, perceived organizational resources, and perceived environmental pressure. As Cloud Computing is essentially a type of Electronic Data Interchange (EDI), prior literature show three major factors affecting EDI's adoption in organizations are perceived benefits, organizational readiness, and external pressure. The three contexts – technological, organizational and environmental (TOE) may influence the process by which technological innovations are adopted and implemented, especially in Medium and High Tech Industries (Saya, Pee & Kankanhalli, 2010).

2.3 Medium and High Tech Industries in Kenya

In Kenya, Medium and High Tech Industries employs over 10.6 million people which is over 30% of all employment, accounting for approximately 67% of all organizations. The sector also contributes 30.60% of the GDP and accounts for 57% of the new job creation (Kiveu, 2013). In the real sense , Cloud Computing solves logistical implication of Medium and High Tech Industries ICT adoption through enabling them give-up the ICT hardware or software managing and maintaining burden and cost (Benioff, 2010). Therefore, at micro level, the diffusion of cloud is advantageous to Medium and High Tech Industries, and at macro level, it is beneficial for the economy and environment. For instance, the partnership of Safaricom Ltd, Seven Seas Technologies, EMC and Cisco, made an entry into The Cloud Computing service as the largest shareholder in East and Central Africa in 2011. The Companies targeted Medium and High Tech Industries and offered a range of Cloud Computing services that include hosting, storage and backup services. Kenya Data Network (KDN), Crimson

Technologies (Kenya) Ltd, Soften through its product Temenos T24, info Connect (a division of local firm Dimension Data Ltd) also provides cloud services which include SaaS, PaaS, and data recovery to Medium and High Tech Industries currently so that they can have an opportunity to grow in all dimensions (Shahonya, 2011).Fiber optic cable company Seacom Ltd became the latest entrant in The Cloud services market in 2013 through its subsidiary Pamoja Cloud Services owing to increased demand for Cloud Computing services by local SME's (Sunday, 2013).

According to Saya (2010), the increased adoption of cloud services by local SMEs has been fuelled by a regulatory requirement for companies, both large and small, to have a reliable backup which should be available for a long period of time. The traditional form of backup, tape backups where information is taken every day and stored offsite is time consuming and fraught with errors as a single incorrect tape backup will need to redone manually. Before the laying of TEAMS, EASSY, and SEACOM submarine fibre optic cables, Cloud Computing was offered through satellite telecommunication technology leading to bandwidth limitations. Medium and High Tech Industries were then reluctant to adopt Cloud Computing technologies. Therefore, Kenya is well equipped with Cloud Computing facilities, and the only thing required is the creation of awareness so that as many industrial corporations can adopt it to enhance their operational efficiency.

In Medium and High Tech Industries, Cloud Computing provides technologies that can be scaled and flexed according to Plummer & Smith (2010), hence; the need to create awareness about the technology to the users. Scalability is the ability to grow a structure over an extensive capacity assortment in order to meet the processing needs of an industry. Thus; choice of technology or platform for a function should consider the ability to grow the application with more users and more data as a result of increasing need. On the other hand, flexibility has its focus on the ability of a system to change easily in response to diverse user and system necessities. Medium and High Tech Industries' preferred state in relation to IT network is embarking on paying for whatever is useful without having extra idle competence, thus; the need to have a highly scalable and flexible resolution.

2.4 Application of Cloud Computing in Medium and High Tech Industries in Kenya

In the recent years, Cloud Computing has been taking preeminence in the business world in Kenya, owing to its proved efficiency in service delivery. With the ongoing advances in IT infrastructure and far more sophisticated applications, individuals and organizations now

have the ability to connect to data and computing resources anywhere and anytime. Cloud Computing and with enormous implications provides access to large-scale remote resources in a very efficient and quick manner. The emergence of Cloud Computing has tremendously changed the stakes for entrepreneurs, small and large businesses, researchers and the government (Tan & Lin, 2012).

Cloud Computing which is widely recognized as a technology game changer is growing at a rapid rate because it is beneficial for Medium and High Tech Industries in Kenya to reduce cost, achieve higher ROI, and increase efficiency (Industry Week, 2010). Its capabilities can provide delivery of applications, storage services, and spam filtering which bring a major change to utilize computing resources. Essentially, Cloud Computing consists of applications running remotely 'in The Cloud' that reside on personal computers and local servers and leverages on the Internet to provide resources to its users. Cloud Computing that is used in Kenya can be categorized into four deployment models as they are applied in Medium and High Tech Industries: private cloud, community cloud, public cloud, and hybrid cloud (Mell & Grance, 2011). A public cloud usually means a pay-as-you-go service for the general public, while private cloud refers to a closed internal data centers of a business or organization that is only available to employees and clients of the organization. Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) are the three Cloud Computing service models. Companies of different sizes, locations, and industries embrace cloud as a way to reduce complexity and costs associated with traditional IT approaches (Thong, 2009).

Kenyan industries of different sizes, locations, and foundational structures embrace cloud as a way to reduce complexity and costs associated with traditional IT approaches (Berman et al., (2011). Cloud, which has potential to drive industrial innovation that can empower six potentially game-changing business enablers: cost flexibility, business scalability, market adaptability, masked complexity, context-driven variability, and ecosystem connectivity (Mell & Grance, 2011). Medium and High Tech Industries ought to determine how to employ cloud-enabled business models to promote sustainable competitive advantages in order to transform operations, customer relationships and value chains. However, security concerns remain the main hurdle for the industries hesitating to total switch to Cloud Computingin industries (PWEB, 2012). There are industrial security risks as sensitive business data are outsourced to third parties for processing. There are numerous issues that make such

outsourcing services risky, such as protecting data privacy, problems with data segregation in The Cloud, and long-term viability of The Cloud Computing provider.

2.5 Theoretical Framework

2.5.1 Actor Network Theory

Actor Network Theory (ANT) is a sociological theory developed by Callon & Latour (1981) to recognize the processes of technological innovation in a heterogeneous network. The heterogeneous network is a coextensive network comprising a range of dissimilar elements called actors/actants. ANT claims that (1) actors, including human or non human (social or technical) entities are equally important to a network (2) the actors are treated as inseparable by ANT, and (3) the interactions and associations between the actors and networks are the key issue. As such, ANT deals with the socio technical situations in which there are no distinctions between human or nonhuman (social or technical) actors (Kennan et al. 2010). Neither social nor technical elements are favored in the network. For example, by employing ANT in a socio technical situation involving technological innovation, believe that human actors (e.g. customers, programmers, and development managers) and nonhuman actors (e.g. computers, modems, telephone lines, and web development tools) are equally important to implement a business to business e-commerce portal for regional industries in Melbourne, Australia.

The ANT approach is conceptually beneficial in helping to appreciate the complexity of an organization's network, the fluidity of this network, and the vigorous role of technology in different contexts (Cresswell et al., 2010). This can demonstrate an understanding of how social influences (Datta, 2011) are generated as a result of associations between different actors in a network (Linderoth, 2010). Literature on CC shows that theory which aims to explain the CC adoption decisions of organizations needs to consider a complex network and relationships among owner managers, employees, and external parties which may influence the decision of organization owner managers (Saya et al., 2010). The decisions made in the adoption of CC in organizations such as SMEs are very complex and involve many actors, both human and non-human. In other words, rather than characteristics of technology itself (non-human actors), human issues also determine how organizations may adopt and migrate to CC (Datta, 2011; Low et al. 2011). This means that complex networks in organizations benefit from being informed by ANT perspectives (Cresswell et al, 2010) and ANT offers a

suitable framework for analyzing CC adoption by organizations including Medium and High Tech Industries.

2.5.2 Theory of Reasoned Action

Theory of Reasoned Action suggests that a person's behavior is determined by his/her intention to perform the behavior and that this intention is, in turn, a function of his/her attitude toward the behavior and his/her subjective norm (Fishbein & Ajzen, 2002). The best predictor of behavior is intention. Intention is the cognitive representation of a person's readiness to perform a given behavior, and it is considered to be the immediate antecedent of behavior. This intention is determined by three things: their attitude toward the specific behavior, their subjective norms and their perceived behavioral control. Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior (Fishbein & Ajzen, 2002).

Reasoned behavior is determined through an assessment of one's beliefs regarding the consequences arising from a behavior and an evaluation of the desirability of these consequences. Formally, overall attitude can be assessed as the sum of the individual consequence and desirability assessments for all expected consequences of the behavior. Subjective norm is defined as an individual's perception of whether people important to the individual think the behavior should be performed. The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with the wishes of that referent. Hence, overall subjective norm can be expressed as the sum of the individual perception and motivation assessments for all relevant referents (Law, 2010).The model has some limitations including a significant risk of confounding between attitudes and norms since attitudes can often be reframed as norms and vice versa. A second limitation is the assumption that when someone forms an intention to act, they will be free to act without limitation. In practice, constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act. The theory of planned behavior (TPB) attempts to resolve this limitation (Jae-Nam & Young-Gul, 2005).

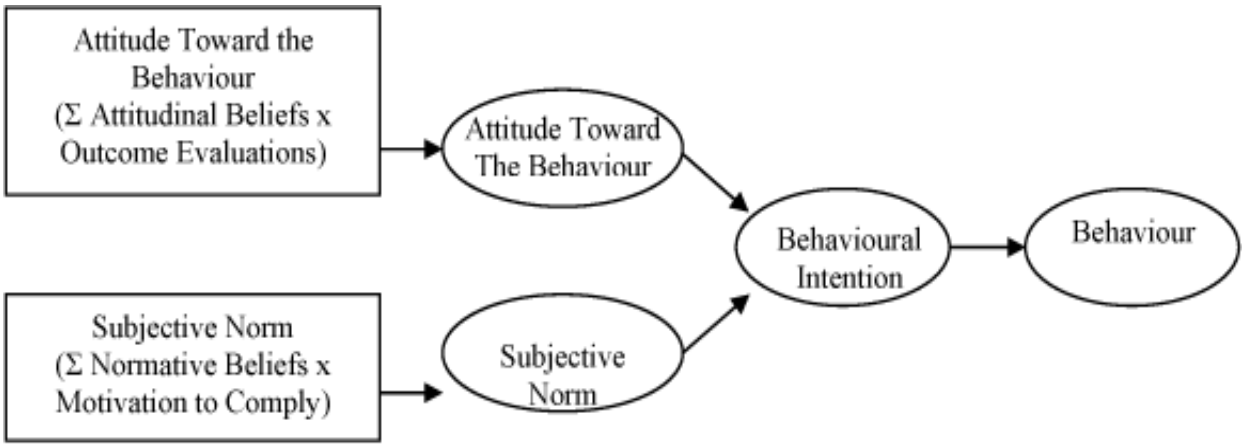

Figure 1. Theory of Reasoned Action

Figure 1: *Theory of reasoned action*

Source: Research

2.5.3 Theory of Planned Action

The theory of planned behavior is about the link between beliefs and behavior. The concept was proposed by Icek Ajzen in 2002to improve on the predictive power of the theory of reasoned action by including perceived behavioural control. It is one of the most predictive persuasion theories. It has been applied to studies of the relations among beliefs, attitudes, behavioral intentions and behaviors in various fields such as advertising, public relations, advertising campaigns and healthcare. The theory states that attitude toward behavior, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions and behaviors.

Theory of planned behavior (TPB) posits that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behaviour, the subjective norms surrounding the performance of the behavior, and the individual's perception of the ease with which the behavior can be performed (Eagly & Chaiken, 2013). Attitude toward the behavior is defined as the individual's positive or negative feelings about performing behaviour. It is determined through an assessment of one's beliefs regarding the consequences arising from a behavior and an evaluation of the desirability of these consequences. Formally, overall attitude can be assessed as the sum of the individual consequence and desirability assessments for all expected consequences of the behavior. Subjective norm is defined as an individual's perception of whether people

important to the individual think the behavior should be performed. The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with the wishes of that referent. Hence, overall subjective norm can be expressed as the sum of the individual perception and motivation assessments for all relevant referents (Brown &Venkatesh, 2005). TPB views the control that people have over their behavior as lying on a continuum from behaviors that are easily performed to those requiring considerable effort, resources, etc. Although Ajzen has suggested that the link between behavior and behavioral control outlined in the model should be between behavior and actual behavioural control rather than perceived behavioural control, the difficulty of assessing actual control has led to the use of perceived control as a proxy (Ajzen, 2002).

2.6 Technology Adoption

This section describes discusses the empirical issues as per the objectives relating to the adoption of technology via Cloud Computing which include the prevalence of cloud computing, factors influencing the adoption of cloud computing, the various models for adoption of technology as well as the recommendation and validation of an appropriate technology model for Cloud Computing adoption for Medium and High Tech Industries.

2.6.1 The Prevalence of Cloud Computing in Medium and High Tech Industries

In the past five years, it has been difficult to escape the hype around cloud computing. These technologies have been proclaimed by many as forces that will “reshape IT” and “power innovation,” while others describe them as a passing fad and “just another form of outsourcing.” As is often the case with potential disruptions in the high-tech industry, the real promise of Cloud Computing lies somewhere between these breathless pronouncements (Davison, Ou & Martinsons, 2013). Virtually all incumbent technology players (e.g., IBM, HP, Microsoft, Cisco, Oracle, EMC, and others) are making significant cloud investments while a number of “newer entrants” such as Amazon.com, Google, VMware, and Salesforce.com are making substantial plays in The Cloud space as well. In the list are also the large telecommunications companies and service providers (e.g., AT&T, Verizon, Comcast, Time Warner, and others) and a long and diverse group of other participants (e.g., hosting providers, cloud solution providers, resellers, and other players) and it quickly becomes clear that The Cloud landscape is highly competitive and quite fragmented as players jockey for position. As cloud technologies gain momentum with enterprise

applications and more prevalence in IT strategy, new models and trends continue to emerge that change the way we fundamentally think about business technology. But this rapidly evolving, multi-platform landscape also means significant challenges ahead for sourcing and managing Cloud Computing solutions. Effective customization in The Cloud requires access to highly specialized talent, while integration with on-premise solutions or SaaS can create unexpected complexities (Feuerlicht, 2010).

All tech giants are aiming at Cloud Computing as The Cloud landscape is all set to dominate the technological world. The biggest tech giants including IBM, Amazon, Microsoft, and Google are expected to invest $1 billion annually in Cloud Computing in the upcoming years (Tehrani, 2013). "All the companies are developing knowledge through their cloud services of how to run truly huge Internet-based computing systems that may soon be nearly impossible for other companies to match." It is evident that 2014 will see some of the biggest players in the IT industry trying to develop high-end Cloud Computing applications. The consumers can expect an increase in platform independent services in the near future (Kituku, 2012). Some of the most noticeable features of Cloud Computing involves the scalability and efficiency it offers. In 2014, development of new web-powered apps with platform independence as their key feature is expected (Verhoeven, et al, 2010). According to the chief executive of Soft Layer, cloud-computing company, IBM will put more than 40 infrastructure services including mobile applications development and big data analysis as their Cloud Computing offerings.

Cloud Computing solves logistical implication of SMEs ICT adoption through enabling them give-up the ICT hardware or software managing and maintaining burden and cost (Saya, Pee & Kankanhalli, 2010). Therefore, at micro level the diffusion of cloud is advantageous for Medium and High Tech Industries. At macro level, it is beneficial for the economy and environment. However, improved internet infrastructure has shifted computing challenge to pricing (Kagwe, 2012). The Cloud Computing Technologies have helped Medium and High Tech Industries improve, protect and grow business as users carry out their duties with minimum capital. Deloitte East Africa's (2011) survey cited cost and tax advantages as some of the key reasons for increase in Cloud Computing Technologies uptake among Medium and High Tech Industries in Kenya, in addition to other advantages derived from The Cloud services. It, however, reports that the inertia to migration is linked to security, legislation issues, and lack of IT knowledge, data privacy, and internal factors within the organizations.

Similarly, Kituku (2012) established that major concerns for Cloud Computing adoption in Kenya are security, privacy and reliability. Mbuvi (2012) state that 51 per cent of Medium and High Tech Industries use cloud for data management while 4 per cent planned to adopt The Cloud for data management in 6 months, 30 per cent in 24 months and 15 percent weren't considering The Cloud for data management at all, hence, the prevalence of Cloud Computing continues to be notable in the current decade as more need arises for improved technology.

2.6.2 Factors Influencing Cloud Computing Adoption

Cloud Computing helps organizations to achieve business efficiencies, however, evidence indicates that not all companies intend to adopt cloud-based solutions. Feuerlicht (2010) conducted a study on the factors influencing Cloud Computing adoption and found that the security and privacy, identity management standards, and the need for sharing and collaboration in today's highly competitive world have a positive effect on using and adopting cloud computing. In fact, a data breach is a security incident in which a company or a government agency loses sensitive, protected or confidential data. Cloud Computing involves storing data and computing in a shared multi-user environment, which increases security concerns. Privacy-enhancing techniques, monitoring mechanisms, authentication, encryption, and the security of data in The Cloud environment are good ways to enhance cloud security and minimize risk (PRWEB, 2012).

Some of the major factors include:

Reliability- An outage is the absence of The Cloud service. An outage is unavoidable and users should take it into account before adopting Cloud Solutions. It might happen for a short or a long time, a few or many times. Even large companies such as Google and Amazon experienced many similar cases in the past and they will have many more in the future. In short, 100 % availability of the service is impossible. Most of the applications hosted in The Cloud are currently non-critical such as back up and software testing. Moreover, users who are using Cloud Computing solutions should make sure to have backup of their data in other places. Nowadays, Cloud providers are trying to avoid outage and promise a high level of availability in the Service-Level Agreement (SLA) and try to compensate their users in the case of an outage of the service. This factor represents a risk and it is one of the effective factors in Cloud Computing adoption. It will determine the kind of applications that can be used in The Cloud along with its adoption strategy.

Security-Users of Cloud Computing give The Cloud provider full control over their data and they should trust that this third party will take care of their business, secure the data, and do backups for them. This issue can be partly solved by Service-Level Agreements (SLA) where the conditions of security issues in the contract will be clarified. The security issue is one of the biggest doubts when users think about adopting Cloud Computing as the users do not have their own data in their companies anymore. Almost 75 percent of IT executives and CIOs report that security is their primary concern (Eagly, & Chaiken, 2013).

Performance: The main source of performance problems come from the connection quality between the user and The Cloud Computing server, mainly when more users are connecting at the same time and large amounts of data are transferred between the end user and The Cloud server. This results in a slowdown in The Cloud service. The performance issue is an important factor which companies have to think about when adopting Cloud Computing. Companies should measure their possible current and future bandwidth and processing requirements before they decide to adopt Cloud Solutions. Performance is seen as one of the main risks, and an important opportunity at the same time.

Scalability: Scalability is an important factor that should be taken into account in terms of performance. As the requirements of The Cloud Computing adopters increase, The Cloud provider should be able to scale up their resources and infrastructure to satisfy the adopter's new requirements of storage, processing, and connection bandwidth. On the other hand, scalability in Cloud Computing is one of the main strength points and constitutes an important opportunity for companies. As these companies' requirements change, their infrastructure will be scaled up or down dynamically providing a high level of strategic flexibility (PRWEB, 2012).

Compliance and Physical Location: Since Cloud Computing is a fairly young technology, no rules and governmental regulations really exist to set the boundaries and laws regarding the storage of data by enterprises on third-party computing facilities that are shared with others. Moreover, some old regulations already exist concerning the enterprise data privacy, access, and location without taking Cloud Computing into account, and these regulations might be violated by Cloud Solutions. For instance, while many countries have regulations concerning the physical location of enterprise data, The Cloud providers cannot guarantee the exact physical location of the data, and even some of them have policies to hide such kind of information from the end user. However, some companies are now trying to solve this issue

and comply with the local regulations. For example, Amazon Web Services (AWS) has started a new service called the Amazon Virtual Private Cloud which allows users to connect their own infrastructure to AWS computing resources.

Integration with other Services: Companies need to adopt different types of applications from different cloud providers and these applications might need to interact with each other. At the same time, some companies might adopt a hybrid strategy of Cloud Solutions as public clouds have different characteristics from that of private clouds. Consequently, the integration between the data from these different applications needs to be achieved and this issue poses many technical and business challenges for cloud providers and adopters. On the other hand, Mashups can be a real opportunity in cloud solutions. Mashups are a web service providing data or functionality relying on different external sources (Feuerlicht, 2010).

Environmental Issues: Environmental issues constitute a real concern for companies in this era as more regulations are issued to minimize the carbon footprint organizations leave behind. Efficient use of energy and recycling IT resources are important issues that should be handled properly and these factors constitute the main element of green IT. By changing the IT functionality into The Cloud, companies not only reduce their IT infrastructure but also use the energy in an intelligent way. However, other researchers suggest that cloud servers are consuming a huge amount of energy and not all cloud providers are following the best standards in energy efficient consumption, consequently, moving to The Cloud does not reduce the global CO2 emissions necessarily. Moving to The Cloud can reduce the IT infrastructure by sharing with others and cloud providers can follow best standards in energy efficient consumption which might not be possible for the small companies as a result of the economy scale, but adopters of Cloud Computing should make sure that these providers are applying these environmental standards before adopting their solutions (Feuerlicht, 2010).

Cost: Cost is a very import ant factor and opportunity in Cloud Computing. "Cost advantages are the strongest driver affecting IT executives' perceptions of SaaS opportunities. Feuerlicht (2010) stated that companies need to spend a big part of their balance on the IT infrastructure, while less than 10 % of their servers can be really utilized, resulting in a big waste of money. In addition, these servers need to be replaced almost every three years and need to be maintained and administrated, increasing the total cost of IT operations radically. Cloud Computing can reduce these costs remarkably."Economies of scale for datacenters cost savings can lead to a five to seven-time reduction in the total cost of computing".

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

2.7 Information and Communications Technology Adoption Models

2.7.1 Technology-Organization-Environment Framework (TOE) Theory

Technology-Organization Environment theory (TOE) was proposed by DePietro in 1990 to analyze adoption of technological innovations by firms and organizations (Melville & Ramirez, 2008). The TOE framework posits that adoption of IT technology by firms and organizations is influenced by three different context groups: technological, organizational, and environmental contexts (Melville & Ramirez, 2008). The technological context refers to the characteristics of innovation such as availability, complexity, and compatibility which significantly affect adoption of innovation (Low, et al, 2011). In addition, the technological context is related to both internal/external and to existing/new technologies which are relevant to the firms or organizations. The organizational context refers to the characteristics of an organization such as size, the degree of complexity in managerial structure, degree of formalization, human resources, amount of slack resources, and linkages among employee. For example, this theory notes that large organizations as compared to SMEs may have more financial resources to invest in IT innovation and adoption. The environmental context includes structure of the industry, competitors, and government's regulations and policies. In fact, within this context, the relationship between organizations and trading partners, competitors, government, pressure from trading partners, and industry community may affect adoption decisions (Melville & Ramirez 2012). For example, to obtain competitive advantages in the marketplace, the more intense the competition in a business, the more pressure is on an organization to adopt a new innovation and technology.

There are several reasonable motivations which make TOE framework feasible for Cloud Computing adoption. Cloud Computing adoption is a different scenario to conventional innovation adoption and diffusion (Feuerlicht, 2010). Cloud Computing services are usually offered to firms and organizations by a third party (cloud service provider). Thus, Cloud Computing technology compared to other conventional innovations consists of three foremost

players: cloud-based services, cloud users (clients), and cloud service providers (Dargha, 2013). As a result, adoption of Cloud Computing is influenced by three major factors which include the characteristics of Cloud Computing technology as a technological context, the characteristics of firms and organizations as an organizational context, and the characteristics of a third party as an environmental context (Low, et al.; 2011). However, because of the nature of socio-technical factors in cloud- based services, organizational and environmental factors are equally as important as technological factors (Low et al. 2011. TOE framework explains the adoption of technology through three elements: technological, organizational, and environmental contexts. Therefore, TOE framework compared to other adoption and diffusion theories is a much more relevant analytical tool to classify all determinants of Cloud Computing adoption in technological, organizational, and environmental contexts. In addition, The TOE framework is a useful analytical tool for explaining the adoption of innovation by firms and organizations (DePietro et al., 1990).

2.7.2 TAM (Technology Acceptance Model -2)

The TAM model was first proposed by Davis (2003) and modified in the subsequent years in order to fit appropriately into the developing technology. The Technology Acceptance Model (TAM) is an adaptation of Fishbein Ajzen's (2002) theory of Reasoned Action (TRA). TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use. Perceived usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance; people are more likely to use an information system that they believe will help them perform their job better. Perceived ease of use is the degree to which a person believes that using a particular system would be free of effort. Therefore, even if a system is believed to be useful by an individual, if the system is too difficult to use, the potentially enhanced performance benefits to be derived from the system are outweighed by the effort required of having to use it.

TAM-2 has become one of the most widely used models in the information systems field, partly because of its understandability and simplicity. Referring to Lee, Li, Yen & Huang (2010), TAM-2 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, 2003) 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 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 (Bagozzi, 2007) the final modified version (Venkatesh and Davis, 1996), TAM2 (Venkatesh and Davis, 2003), the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Davis, 2003) and TAM3 (Venkatesh, 2003). Referring to King & 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 (2003) endeavored to develop integrated models that combine TAM with Innovation Diffusion Theory. Davis & Venkatesh (2003) 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. TAM assigns considerable weight to two key determinants perceived usefulness and perceived ease of use (Davis, 2003). The TAM-2 model can be presented as follows;

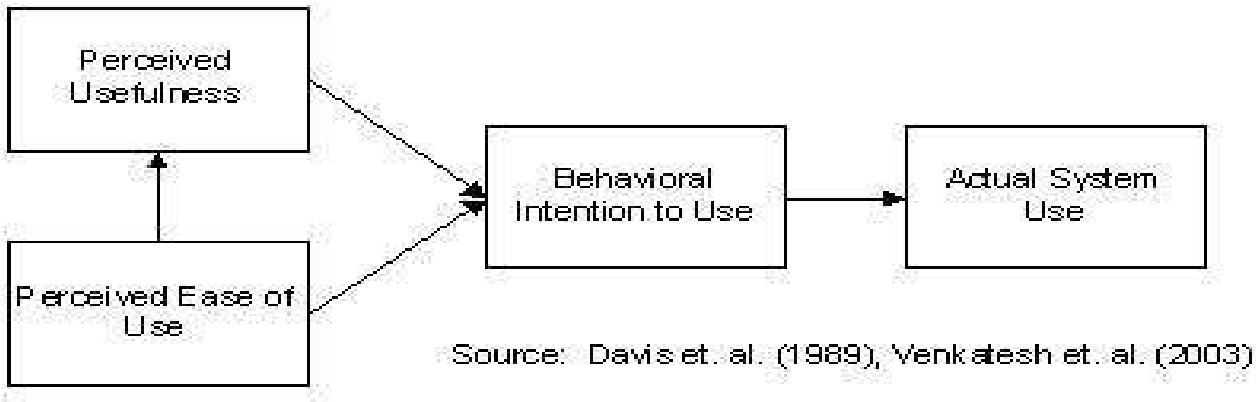

Figure 2: *Technology Adoption Model*

Source: *Research*

2.7.3 The Diffusion Model of Innovation

Roger's (2003), Diffusion of Innovation model argues that media and interpersonal contacts provide information that influences a person's opinion and judgment. The theory comprises four elements: invention, diffusion through the social networks, time and consequences. Information filters through the networks and depending on the nature of the networks and the roles of its opinion leaders, new innovations are either adopted or rejected. The most striking feature of diffusion theory is that, for most members of a social system, the innovation-decision depends heavily on the innovation-decisions of the other members of the system. In fact, empirically we see the successful spread of an innovation follows an S-shaped curve. There is, after about 10-25% of system members adopt an innovation, relatively rapid adoption by the remaining members and then a period in which the holdouts finally adopt.

The innovation-decision is made through a cost-benefit analysis where the major obstacle is uncertainty. People will adopt an innovation if they believe that it will, all things considered, enhance their utility. So they must believe that the innovation may yield some relative advantage to the idea it supersedes. How can they know for sure that there are benefits? Also, in consideration of costs, people determine to what degree the innovation would disrupt other functioning facets of their daily life. Finally, social systems determine diffusion, norms on diffusion, roles of opinion leaders and change agents, types of innovation decisions, and innovation consequences. To use Rogers' model in health requires us to assume that the innovation in classical diffusion theory is equivalent to scientific research findings in the context of practice, an assumption that has not been rigorously tested. How can we spread and sustain innovations in health service delivery and organization? Greenhalgh et al., evaluate an evidence-based model for considering the diffusion of innovations in health service organizations (Berman, 2013). The model proposes five stages of innovation process as in the figure below;

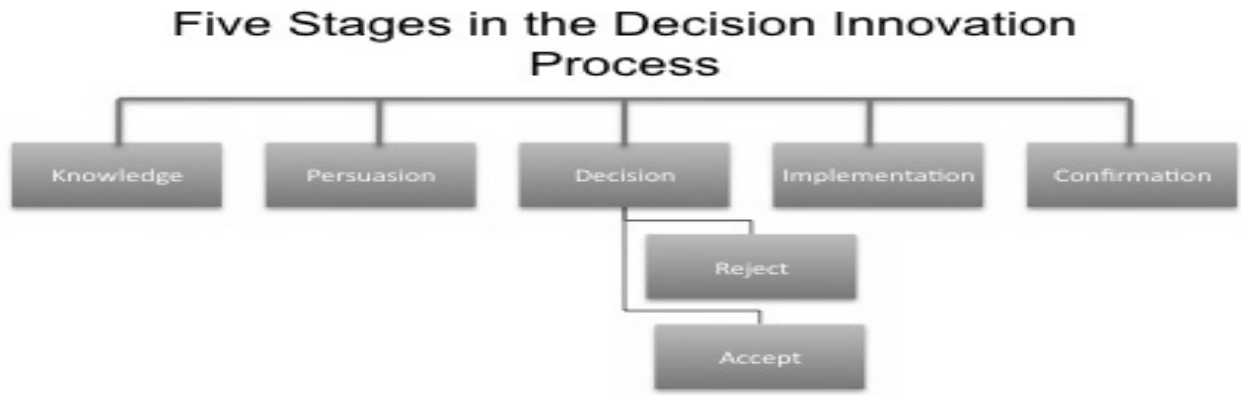

Figure 3: *Five stages of decision adoption innovation process*

Source: Research

2.7.4 Unified Model of Acceptance and Use of Technology (UTAUT)

Unified theory of acceptance and use of technology (UTAUT) is a technology acceptance model formulated by Venkatesh et al (2003) in "User acceptance of Information and Communications Technology: Toward a unified view," the UTAUT aims to explain user intentions to use an information system and subsequent usage behavior. The theory holds that four key constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions; the first three being direct determinants of usage intention and behavior, and the fourth a direct determinant of use behavior. Gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behavior. The theory was developed through a review and consolidation of the constructs of eight models that earlier research had employed to explain information systems usage behaviour (theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of personal computer use, diffusion of innovations theory, and social cognitive theory). Subsequent validation by Venkatesh et al (2003) of UTAUT in a longitudinal study found it to account for 70% of the variance in behavioral intention and about 50% in actual use.

Venkatesh, et al (2003) thinks that the purpose of UTAUT model is to offer the manager with using tools, the manager can use UTAUT to weigh the introduction of new technology and predict and explain the user's behavior of accepting Information and Communications

Technology. From previous empirical test results, Koivumäki et al (2008)found that the explanatory power of this UTAUT model is up to 70% with regard to technology using behavior, it is more effective than any of the models that are known before; and the use of UTAUT model has become more extensive in recent years, it is no longer confined to the discussion of the use of information system, such as mobile commerce, online learning and wireless network; and the problem of this study takes user's prevalence and influence factors for Cloud Computing as the core, so this study uses UTAUT model as the theoretical foundation of this study.

2.8 Recommendation of an appropriate Model for Cloud Computing Adoption

There are various models that have been proposed by researchers for the adoption of Information Communication Technology such as Roger's (2003) Diffusion Model (discussed earlier) and Technological Acceptance Model (TAM) as well as the Technology-Organization-Environment Model (TOE). The kinds of Cloud Computing Technologies that Medium and High Tech Industries in Kenya can adopt are categorized depending on the type of service being offered and the complexity of the process needed for adoption. For instance, industries would prefer to adopt a technology that has ease in adoption and also yields great results as compared to those technologies whose adoption models are complex and involving. The best model for Medium and High Tech Industries to use for Cloud Computing adoption is Unified Model of Acceptance and Use of Technology (UTAUT).

For many years, a lot of studies on the MIS implementation have been performed to identify and assess organizational characteristics that lead to an information system success or failure (Bagozzi, 2007). At present, many user acceptance models with different determinants are created to measure the user agreement of information systems which is an important factor to indicate a system success or failure. Each theory or model has been widely tested to predict user acceptance (Davis, 2003). However, no comprehensive instrument to measure the variety of perceptions of Information and Communications Technology innovations had existed Venkatesh et al. (2003) attempted to review and compare the existing user acceptance models with an ultimate goal to develop a unified theory of technology acceptance by integrating every major parallel aspect of user acceptance determinants from those models. For the proposed model by the researcher, seven elements appear to be significant because they directly determined the intention of Information and Communications Technology usage.

2.8.1 Criteria for Model Selection

The criteria used for recommending a model in this study is based on various elements for models of technology as discussed in this document. The distinct criterion includes;

Performance expectancy: the degree to which an individual believes that using a particular system would improve his or her job performance;

Effort expectancy: the degree of simplicity associated with the use of a particular system;

Attitude toward using technology: the degree to which an individual believes he or she should use a particular system;

Social influence: the degree to which an individual perceives that others believe he or she should use a particular system;

Facilitating conditions: the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular system;

Self-efficacy: the degree to which an individual judges his or her ability to use a particular system to accomplish a particular job or task; and

Anxiety: the degree of anxious or emotional reactions associated with the use of a particular system.

2.9 Empirical Validation of Unified Model of Acceptance and Use of Technology (UTAUT)

Empirical evidence shows that the model is useful in industrial platforms for adoption of technology and could be used for adoption of cloud computing, thus; the reason why it is deemed as the best model for use in The Cloud Computing processes in Medium and High Tech Industries. Continued use of this model will see the prevalence of Cloud Computing rise rapidly in the coming decades. Prior empirical tests that ascertain the viability of the model have been presented by various researchers in order to justify the usefulness of the proposed model. First, Koivumäki et al (2008) applied UTAUT to study the perceptions of 243 individuals in northern Finland toward mobile services and technology and found that time spent using the devices did not affect consumer perceptions, but familiarity with the devices and user skills did have an impact.

Additionally, Curtis et al, 2010) applied UTAUT to the adoption of social media by 409 United States nonprofit organizations. UTAUT had not been previously applied to the use of social media in public relations. They found that organizations with defined public relations departments are more likely to adopt social media technologies and use them to achieve their organizational goals. Women considered social media to be beneficial, and men exhibited more confidence in actively utilizing social media. Thirdly, Verhoeven et al (2010) applied UTAUT to study computer use frequency in 714 university freshmen in Belgium and found that UTAUT was also useful in explaining varying frequencies of computer use and differences in information and communication technology skills in secondary school and in the university. These tests verify how the model could be useful if all high and medium tech industries utilized it in their bid to adopt the best technologies for cloud computing.

2.10 Conceptual Model

Most academic research uses a conceptual framework at the outset because it helps the researcher to clarify his research question and aims. It is a comprehensive presentation of the study objectives in terms of useful variables that can be ascertained from the study. From the literary discussion, the factors leading to the adoption of Cloud Computing determine the level of prevalence of the technology among organizations. In turn, the prevalence rate determines the outcome of the technology, whilst the models chosen intervene in the process of Cloud Computing adoption. The conceptual framework of this study included the independent variables and the dependent variables as in the figure below;

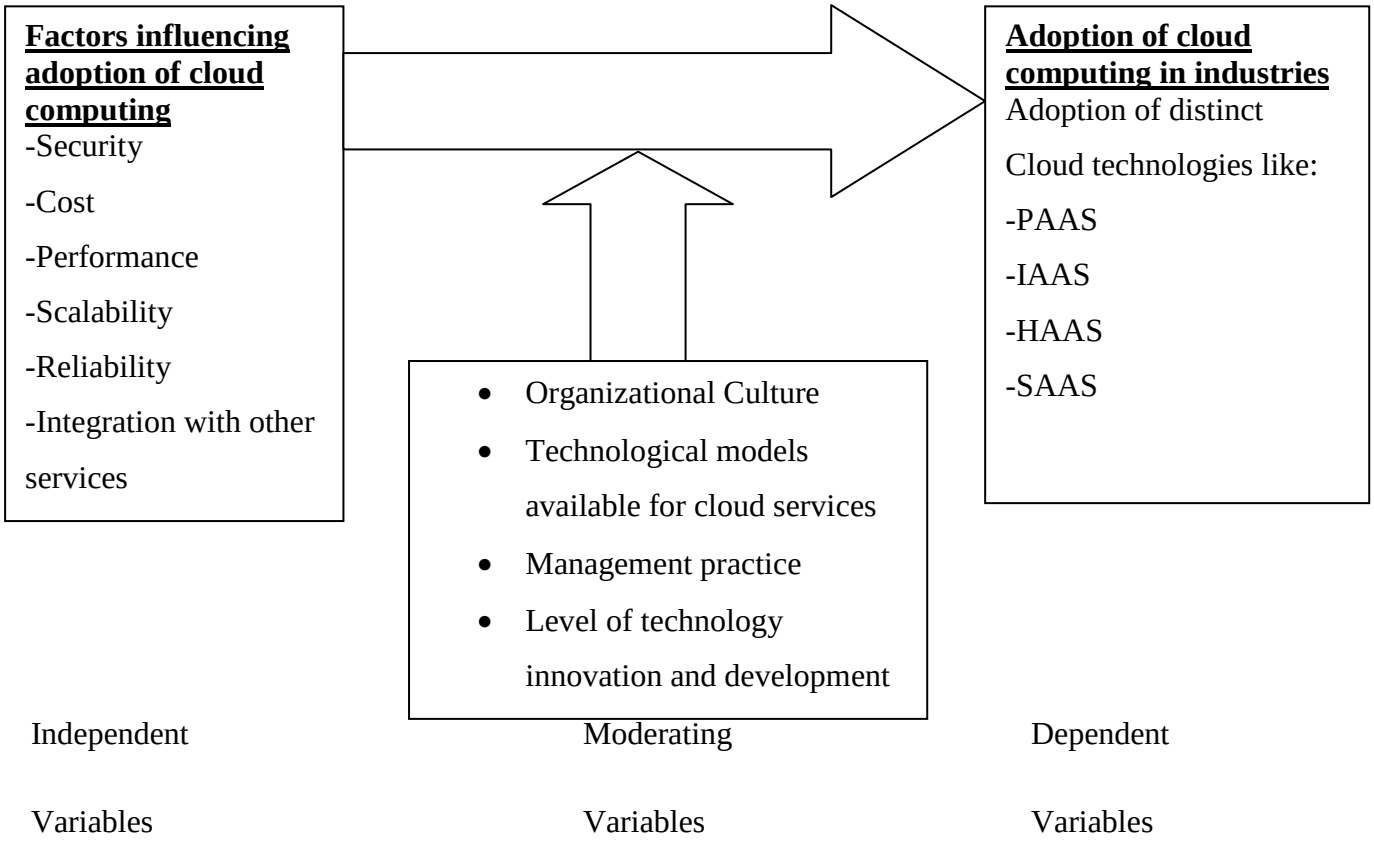

Figure 4: *Conceptual Model*

Source: *Research*

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This study sought to establish the extent at which Cloud Computing technologies have been adopted in Medium and High Tech Industries in Kenya. This has been structured around a conceptual model developed by the researcher derived from the UTAU technology adoption model analysed.

3.1 Research Design

Research design is the arrangement of conditions needed for collection of data and analysis in a manner that aims to combine relevance to the research purpose with the economy in the procedure (Babbie, 2002). This study used both quantitative and qualitative approaches. The quantitative dimension utilized descriptive survey research design, and the qualitative aspect used interviews for The Cloud Computing providers. The quantitative approach uses numerical methods and statistical tools for data collection and analysis. The utilized cross sectional survey involved the collection of a onetime data from the samples participants, which in this case constituted of 126 Medium and High Tech Industries within Nairobi. The qualitative dimension entailed the collection of data by the use of an interview guide from 25 Cloud Computing providers so that qualitative aspects could be acquired that would be useful in explaining certain phenomena.

3.2 Study Population

According to Ngechu (2004), a population is a well defined set of people, services, elements, and events, group of things or households that are being investigated. The data source for this study was the information provided by the targeted participants from the selected Medium and High Tech Industries in Kenya and Cloud Computing providers as indicated in the research design. The study's target population comprised of 126 Medium and High Tech Industries based in Nairobi Kenya that were deemed to have either adopted The Cloud or were in the process of Cloud Computing adoption and 25 Cloud Computing providers in Nairobi, making a total of 151 target companies for the study.

3.3 Sample Size

A sample size is the number or size of items, objects or individual selected for research to represent the population as a whole. Kothari (2004) points out that an optimum sample is one that has the ability to fulfill the requirements of efficiency, representativeness, reliability and flexibility. The level of desired precision and the population size are the key factors for consideration of the sample size. In this study, a census survey will be used to select the study sample. Census is a study of every unit, everyone or everything, in a population. It is known as a complete enumeration, which means a complete count. The advantages of a census survey are: it provides a true measure of the population (no sampling error) and the benchmark data may be obtained for future studies. Also, it provides true information regarding the elements of study because it targets those people with the coherent knowledge regarding the area of study. Therefore, the sample size of this study was all the 126 selected Medium and High Tech Industries, which would be provided with questionnaires in order to provide the information required, where the ICT management staff was targeted as the participants because they are deemed to have the relevant information regarding adoption of Cloud Computing in Medium and High Tech Industries. Also, all the 25 selected providers were interviewed by the researcher, mainly interviewing the ICT managers and thus, the total sample size of this study constituted of 151Medium and High Tech Industries.

3.4 Data Collection: Instruments and Techniques

The researcher considered several options of data collection techniques by examining the ability of the tool to assist in efficiently and effectively collecting the required data, in addition to minimizing bias, cost and duration of data collection. This study used a questionnaire as the main data collection instrument, and an interview guide was utilized in sourcing additional information for the study. The questionnaire method presented a number of advantages: It is free from the bias of the interviewer (Kothari, 2004; Singh, 2006). Respondents and in this case IT Managers in MHTI, who may not be easily approachable, could be reached conveniently. Since it can be used to cover a large geographical area, large samples can be made use of, making the results much more dependable and reliable. Respondents have adequate time to give well thought out answers. There are several disadvantages as well and these include; Low rate of return of the duly filled in questionnaires and a high possibility of ambiguous replies or omission of replies altogether to certain questions, which presents the difficulty of interpretation of the omissions.

The semi-structured questionnaire was used to collect data from Cloud computing users, and consisted of open-ended, close-ended and Likert scale questions. Close ended questions only allow specific types of responses such as Yes or No, while in the open ended type, respondents give responses according to personal reasoning. Likert scales usually give the respondents a wide range of statements emerging from the literary discussion, where they are expected to agree to or disagree, and are crucial in ensuring that the study objectives are comprehensively evaluated. Questionnaires were preferred in this study because they are very economical in terms of time, energy and finances as well as to facilitate an easier analysis as they are in immediate usable form. The questionnaires also encourage the respondent to give an in-depth and felt response without feeling held back in revealing of any information

The questionnaires were self administered to the respondents by the researcher by hand delivery and offer enough time to fill them, then collected the complete questionnaires after a few days. The advantage of this method is that the researcher had the opportunity to personally introduce the study to the respondents and explain to them the intentions of the study, as he also clarified anything regarding doubts that may arise during the study.

Additionally, data was collected by the use of an interview guide from cloud providers via one on one interaction of the researcher with ICT managers of the selected organizations. An interview guide was considered appropriate for it allows one on one interaction between the researcher and the respondent, and more reliable information can be obtained, especially because the providers have the relevant information regarding the scope of Cloud Computing adoption by various industries in their customer databases.

3.5 Validity and reliability of the research instrument

This research adopted content and construct validity. Validity indicates the degree to which the instrument measures the constructs under investigation (Mugenda and Mugenda, 2003). Content validity was used since it measures the degree to which the sample of the items represents the content that the test is designed to measure. The researcher developed a questionnaire based on an intensive literature review and various technology adoption models studied to guarantee validity of the results. Validity was affirmed by performing a pretest. From the discussion, the researcher was able to detect questions that needed editing and those with ambiguities. The final questionnaire was then printed and dispatched to the field for data collection with the help of research assistants.

In order to achieve a good report on the findings, the reliability of this study was ascertained through pre-testing of the research tool using a sample group similar to the actual sample. The pre-test results were used by the researcher to evaluate the compatibility and the consistency of the instrument with the study requirements, and editing was done in the areas reaquiring improvement in order to come up with a reliable instrument. The participants selected for the pre-test were from different, though organizations with similar characteristics with the ones used in this study. The different participants of the pilot study were selected in order to ensure that the actual participants were not engaged in the pilot study because that would otherwise compromise the outcome of the study findings. The reliability coefficient of the research instrument was assessed using Cronbach's alpha.

3.6 Ethical Considerations

Neumann (2003) explains that the term 'ethical' is used to mean principle of conduct that is usually considered accurate, particularly by people of a specified group or profession. Conduct principles are among the most significant components because they provide a comprehensive view regarding ethical behavior content. Research activities normally provoke ethical issues concerning the rights of participants, for instance the right of privacy. In order to address the issues, the researcher obtained an informed consent of the respondents before he could issue them with questionnaires. Additionally, the researcher made the participants aware on the information type needed from them, the reason for seeking the information, the purpose, as well as their expected mode of participation, in addition to the direct and indirect effects of research on them. Additionally, confidentiality was of great concern as the information relevant to the study was of strategic importance. In this regard, the names of the respondents were not disclosed. In addition, where a response was attributed to specific individuals or departments, the said information was maintained in strict confidence.

3.7 Data Cleaning Process

The returned questionnaires were perused for validity by identifying those with errors and discarding them. The errors included incomplete forms especially for the fields that were not optional and those with double or triple responses for a single statements. After identifying valid questionnaires, the data was then code and keyed into Statistical Package for Social Scientists (SPSS) for detailed analysis.

3.8 Reliability

Reliability is defined as an assessment of the degree of consistency between multiple measures of a variable. It is designed to demonstrate the extent to which the operations in a study; data collection procedures can be repeated with similar results. A measure is deemed reliable if an individual's score on the test is the same when given more than once in similar test and under similar circumstances. Several reliability tests were considered. The First method to be considered was the test-retest method. Here, the same questionnaire is re-administered after sometime. The method is resource intensive and time consuming and therefore was considered less suitable for this study, given the time constraints. The second method was the split-half reliability method. This method randomly splits the data set into two. A score of each participant is the calculated based on each half of the scale. If the scale is very reliable, a participant's score on one half of the scale should be the same to their score on the other half, therefore across several participants score from the two halves of the questionnaire should correlate perfectly. A high correlation signifies reliability. This method slightly better than the test-retest, presented one major challenge; there are several ways of splitting a set of data and the therefore correlation results could be a product of how the data is split. To overcome the problems presented by the first two methods, Cronbach's (1951) came up with a measure that is loosely equivalent to splitting data into two in every possible way and computing the correlation coefficient for each. The average value is equivalent to the Cronbach's Alpha coefficient, which is the most common measure of the scale of reliability. This was the reliability measure used in this study. In addition to the fact that it is superior over the split half method, it was selected and used in this study on the strength that it has been successfully applied in many other similar and related studies, and the lower limit for Cronbach's Alpha is 0.7.

3.9 Data Analysis

The affirmed data was coded and entered into the Statistical Package for Social Sciences (SPSS). SPSS was used because it aids in organizing and summarizing the data to provide meaningful parameters, which are useful for data analysis, which include measures of, frequency distribution, percentages, correlation and regression tests frequencies, means, standard deviation and percentages, especially from quantitative data. Descriptive statistics was utilized in the analysis of the data parameters generated, where through the parameters;the presentation of findings was done by the use of pie charts, bar charts and graphs, and percentages and frequency tables accompanied by appropriate descriptions. For

qualitative data, qualitative data analysis was done that utilized the quick impersonator summary, which according to Kotler & Armstrong (2006) involves the summary of the key findings, an explanation and interpretation of these findings to ensure that the gathered information is clearly understood. Then a summary of key findings and conclusions was provided so that the results of the study would be clearly understood.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents an analysis of the findings on Cloud Computing adoption by Medium and High Tech Industries in Kenya. Semi-structured questionnaires were used in data gathering and SPSS software was used for analysis of data.

4.1 Response Rate

The study targeted 151 industries within Nairobi County, where the 126 Medium and High Tech Industries were provided with questionnaires and the 25 providers were interviewed by the researcher. Out of the 126 questionnaires distributed to the targeted industries, 108 questionnaires were collected back fully completed, making a response rate of 86% while 18 questionnaires were not completed, making a non-response rate of 14%. Out of the 25 targeted cloud providers for interview, only 16 providers were available for the interviews, making a response rate of 64% while those who never responded for the interview were 9 represented by a rate of 36%.

4.2 Demographic Characteristics

Table 1 illustrates the gender, age, responsibilities and experience characteristics. The respondents were ICT managers and had the responsibility of overseeing that any decisions and operations requiring the use of technology in their organizations. Looking at the gender of the respondents, 69% were male while 31% are female. This is a clear indication that not many women hold senior positions in ICT related fields as well as partaking ICT related courses. (Buskens, I, & Webb, A, 2009, Hilbert, M. 2011, December). The age of the majority of the respondetsis between 30-35 years (28%)while their The experience of majority of the respondents (40%) is between 1-5 %. while (40%) have experience of between 1-5 %. This is an indication that focus on ICT based positions only inindustries in Kenya started recently hence the majority of a younger generation . At the same time this is a positive aspect since the younger generation is more innovative and accommodating to change unlike the older generation. This can drive adption of innovations such as Cloud Computing.

Table 1: *Demographic characteristics*

Variable	Category	Frequency	Percentage %
Gender	Female	33	31
	Male	75	69
Age bracket	Below 25 yrs	7	6
	26-30 yrs	17	16
	31-35yrs	30	28
	36-40yrs	24	22
	41-45yrs	19	18
	Above 45 yrs	11	10
Experience	Less than a year	11	10
	1-5 years	42	39
	6-10 years	30	28
	11-15 years	16	15
	Above 15 yrs	9	8

Source: *Research*

4.3 Cloud Computing Adoption

Most organizations have adopted Cloud Computing as a technology as shown by 72% which corresponds to 76 users(Figure 5). The results were analyzed in order to establish the level to which The Cloud users agreed with various statements relating to Cloud Computing adoption:

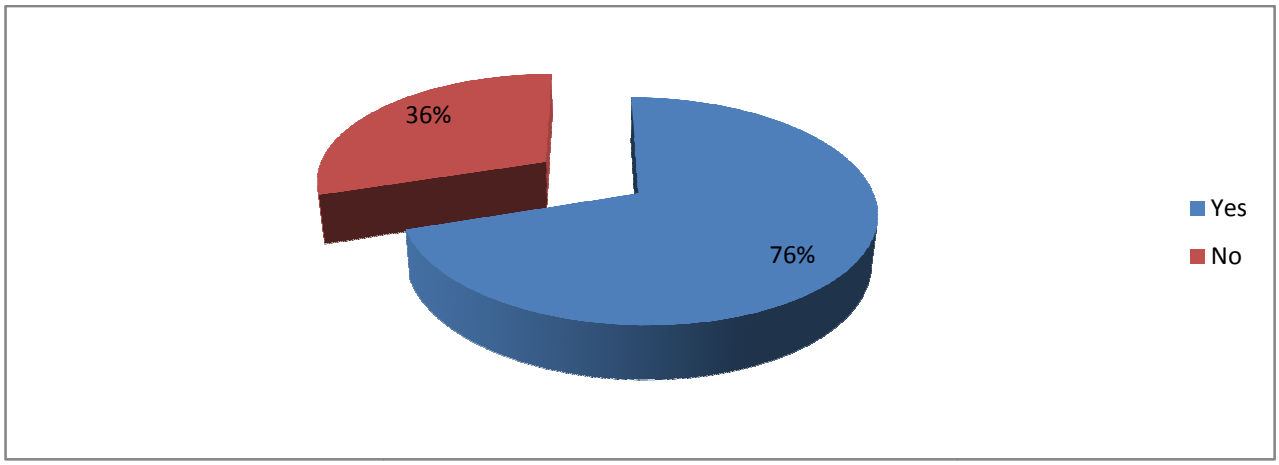

Figure 5: *Cloud Computing adoption*

Source: *Research*

Cloud Computing adoption statistics illustrated in Table 3 indicate that 56% representing 61 respondents agreed that Cloud Computing is a force that is reshaping IT and powering innovation.51 % accounting for 55 participants agreed that at macro level, Cloud Computing has been beneficial for the economy and environment, while 49% representing 53 users

agreed that at micro level, the diffusion of cloud has been advantageous for Medium and High Tech Industries, and 46% accounting for 50 participants agreed that The Cloud Computing services have helped Medium and High Tech Industries improve, protect and grow business as users carry out their duties with minimum capital.

Table 2: *Cloud Computing adoption*

Statement	**Strongly agree**	**Agree**	**Moderately agree**	**Disagree**	**Strongly disagree**
Cloud Computing is a force that is reshaping IT and powering innovation	32	56	7	4	1
At macro level, Cloud Computing has been beneficial for the economy and environment	33	51	9	5	2
At micro level, the diffusion of cloud has been advantageous for Medium and High Tech Industries	36	49	10	3	2
The Cloud Computing services have helped Medium and High Tech Industries improve, protect and grow business as users carry out their duties with minimum capital.	40	46	5	6	3

Source: *Research*

4.4. Prevalence of Cloud Computing

Data on prevalence of Cloud Computing was analyzed in order to establish the level at which computerization on the activities had been achieved in the organization. Table 3 illustrates that the computerization level of most organizations was at 51%-75% as accounted for by 50% (54 respondents). This confirms studies that organization/ industries in particular in Kenya are still not technology oriented and non-aggressive towards adopting trending technologies and thus the need to create awareness on importance of technology adoption in industries. (Callon and Latour, 2011)

Table 3: *Computerization level*

Level of computerization	**Frequency**	**Percentage %**
0-25%	2	2
26 – 50%	21	19
51-75%	54	50
76-100%	31	29
Total	**108**	**100**

Source: *Research*

Table 5 illustrates the percentage at which the technologies in industries are cloud based. Data collected indicate that only 35 industries (32.40%) have computerized their services to a level 41-60%. This is a very small number as it is less than 50%. The level of cloud based technologies / services in MHTI industries very low as well. This calls for the need to create more awareness on cloud computing as well as government intervention to encourage adoption of cloud computing.

Table 4*: Percentage of cloud services*

% of services	Frequency	Percentage %
21– 40%	24	22.22
41-60%	35	32.40
61-80%	27	25.00
76-100%	9	8.33
Total	108	100

Source: *Research*

Statistics on allocation of IT budget to adoption of Cloud Computing are illustrated in Table 5.The results show that IT managers in MHTI have an IT budget that and they can make decisions o how best to allocate the funds. It is clear that there is consideration in MHTI to adopt Cloud Computing technologies considering the focus on just the IT budget in the industries. Only 4.63% (5 industries) indicated that none of their annual budget has been budgeted for cloud. Presumably, these organizations that had no IT budget or were still in their early stages of Cloud Computing adoption and they had not set aside the budget.

Table 5: *Cloud budget*

% of services	Frequency	Percentage %
21– 30%	32	29.63
11-20%	27	25.00
More than 30%	24	22.22
Less than 10%	20	18.52
None	5	4.63
Total	108	100

Source: *Research*

Further, the research data was analyzed to establish the respondents agreement with the various loud Computing Service models that they had adopted in their firms. The statistics in Table 6 illustrate that the targeted organizations had adopted the various models, and if not all, the each organization had adopted at least one of the models. All the targeted 108 users had adopted the Software-as-a Service (SaaS) while 72.22% have adopted PaaS. This could be due to the ease of implementing these services and the cost implications. HaaS and IaaS service have been fairly adopted at 51.855 and 31.48% respectively. This can be presumed

due to the cost of implementing as well as the level of skills required to implement this service models. (Omwansa T. K, Waema T. M, & Omwenga M. B, 2014).

Table 6: *Cloud Computing service models*

Model	**Frequency**	**Percentage**
Software-as-a Service (SaaS);applications are hosted by the provider	108	100
Platform-as-a-Service (PaaS) -Rent hardware, OS, storage and network capacity	78	72.22
Hardware as a service (HaaS), Computing processing capacity is purchased on the web	56	51.85
Infrastructure-as-a-Service (IaaS) –outsource equipment	34	31.48

Source: *Research*

4.5 Factors affecting Cloud Computing adoption

The results of the study in Table 7 show that cost is the major factor that influences the adoption of cloud computing. Additionally, reliability and performance of The Cloud as offered by the providers was an important factor for consideration when adopting cloud services because some applications are non-reliable and may delay the efficiency of services that an organization is to deliver.

Table 7*:* *Factors influencing Cloud Computing Adoption*

Factor	**Very great extent %**	**Great extent %**	**Moderate extent %**	**Little extent %**	**Very little extent %**
Cost	13	67	15	5	2
Performance	15	61	14	7	3
Reliability	21	54	16	6	3
Scalability	16	44	25	10	5
Security	26	38	25	9	2
Compliance	35	36	24	3	2
Integration with other services	37	31	22	5	5

Source: *Research*

4.6 Model for Adoption of Cloud Computing

Statistics on the importance of use of technology adoption models while considering Cloud Computing are illustrated in figure 6. These show that 84% (91 industries) agreed that it is important use a relevant model while moving to The Cloud in organizations.

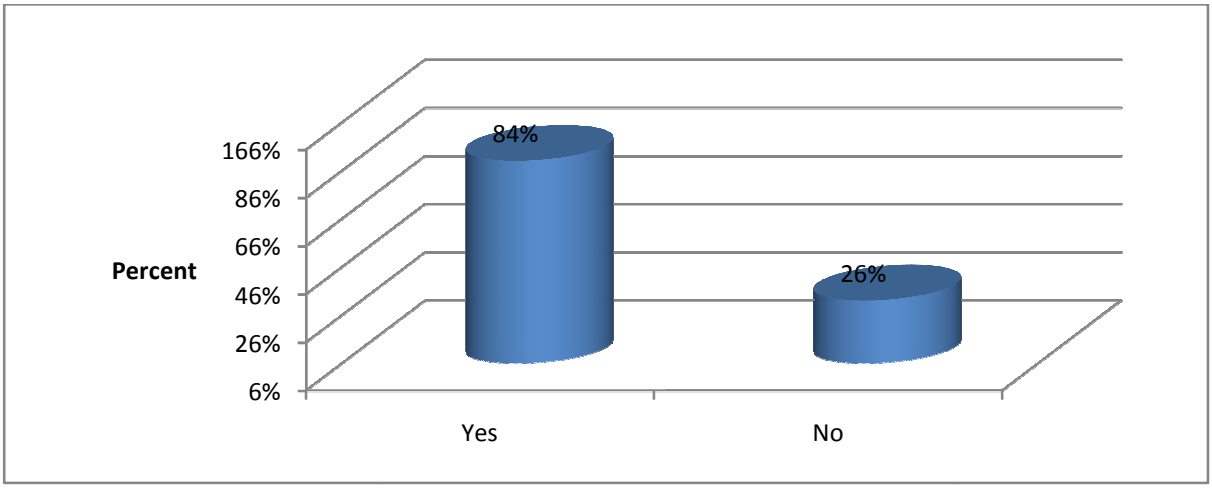

Figure 6: *Models for cloud computing*

Source: *Research*

Figure 7 illustrates the relevance of the UTAUT Model as an appropriate technology model for the adoption of cloud computing. 51% representing 55 respondents agreed that the model is very relevant and suitable for Cloud Computing adoption in a Medium and High Tech Industries setting while 45% disagreed. This was mainly due to lack of knowledge on technology adoption models. This is an implication that almost half f ICT mangers in MHTI have no clue about any technology adoption models.

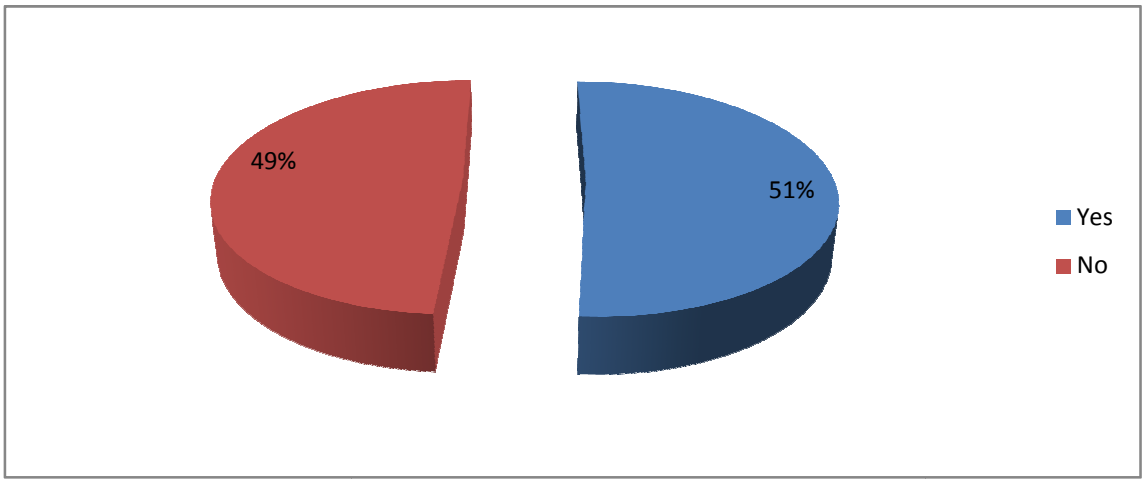

Figure 7: *Cloud Computing Models*

Source: *Research*

Statistics on the expected rate of improvement in Information and Communications Technology efficiency if the UTAUT models for Cloud Computing adoption is applied are illustrated in figure 8.Respondents agreed that there would be improved Information and Communications Technology efficiency if the right model for Cloud Computing adoption is

applied as shown by 81%, which accounts for 87 medium and high tech organizations. Hence, emphasis need to be made on the importance of using a technology adoption model while deploying cloud services and technologies in MHTI as well as when developing cloud services.

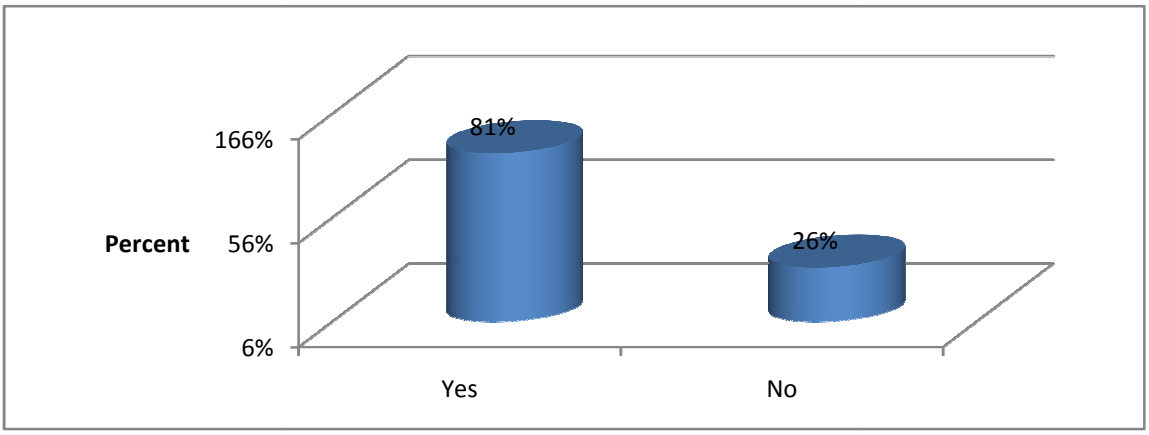

Figure 8: *Relevance of UTAUT Model*

Source: *Research*

The data was further analyzed to show the rate of prevalence of Cloud Computing if the UTAUT model was applied. Table 8 shows that 81.37% of the respondents agreed that the rate of prevalence of Cloud Computing adoption would be to a great extent as shown by 41.67% accounting for 45 respondents.

Table 8: *Prevalence of cloud services via UTAUT*

% of services	Frequency (n=108)	Percentage %
Very great extent	45	41.67
Great extent	31	29.70
Little extent	20	18.52
Very little extent	12	11
Total	108	100

Source: *Research*

With regards to models the respondents would approve as the best for technology adoption in terms of cloud computing, many organizations were found to have known several models that are important and would give results. Table 9 indicates that the UTAUT model was very important at a rate 47.22% representing 51 respondents. 9.26% accounting for 10 organizations showed that the model is very important, and that the UTAUT model is not important at 4.63% accounting for 5 organizations**.**

Table 9: *Importance of UTAUT*

% of services	Frequency (n=108)	Percentage %
Very important	51	47.22
Important	42	38.89
Less important	10	9.26
Not important at all	5	4.63
Total	108	100

Source: *Research*

4.8 Validation of the UTAUT Model

Analysis of responses for three selected constructs measuring statements for the validation of UTAUT; Effort expectancy, performance expectancy and facilitating conditions.

A summary of the responses for the measure statements for each construct was computed on statement by statement basis. The Likert scale in the questionnaire had five levels; strongly disagree, moderately agree, agree and strongly agree. The responses for Disagree and strongly agreed were summed up and presented as Disagree. The responses for Agree strongly agree and agree were also summed up and presented as Agree, while the responses of moderately agree were left as Neutral. The final output shows three measures; Disagree, Neutral and Agree.

(i) Performance Expectancy

The respondents were asked to indicate their level of agreement with four statements of Performance expectancy. Table 11 illustrates the results and response levels associated with each measure. A high percentage of respondents (97.70%) agreed that Cloud Computing technologies were useful in their day to day tasks, 93.10% agreed that Cloud Computing services enabled the users to accomplish their tasks more quickly while 94.1% agreed Cloud Computing services increased their productivity. This puts emphasis on the importance of Cloud Computing technologies in industries. The adoption of The Cloud will improve operations in these industries and eventually contribute to the growth of the GDP of Kenya

Table 11: *Analysis for Performance Expectancy constructs*

Item	Disagree	Neutral	Agree	Total
Cloud Computing service(s) useful in my tasks**.**	0.50%	1.80%	97.70%	100%
Using Cloud Computing service(s) enables organizations to accomplish tasks more quickly	2.30%	4.60%	93.10%	100%
Using Cloud Computing service(s) increases productivity	1.80%	4.10%	94.10%	100%
Cloud Computing service(s) is convenient	2.30%	2.30%	95.40%	100%

Source: *Research*

(ii) Effort expectancy

Effort Expectancy measure was designed to capture information related to effort that the user has to put in order to use Cloud Computing services and how the level of effort exerted influences adoption and use of Cloud Computing services.

Table 12 illustrates that 74.1% and 74.2% agree that their interaction with Cloud Computing Technologies/ services is clear and easy respectively while 72.80% and75.90% agreed that acquiring skills in Cloud and learning how to use Cloud Computing Technologies is easy. This response statistics suggest that a high number of the respondents have good knowledge of the usage of Cloud Computing services and they do not find the process of improving skills on how to use Cloud Computing services a hindrance. This could be due to the fact that the respondents are ICT Managers and hence have prior training and interest in the area. More work should be done focusing respondents that have little or no training in ICT in MHTI.

Table 12: *Analysis for Effort Expectancy constructs*

Item	Disagree	Neutral	Agree	Total
My interaction with Cloud Computing service(s) is clear and understandable	19.4%	6.5%	74.1%	100%
It is easy for me to become skillful at using Cloud Computing service(s).	18.4%	8.8%	72.8%	100%
I find Cloud Computing service(s) easy to use.	17.5%	8.3%	74.2%	100%
Learning to operate Cloud Computing service(s) is easy for me	18.1%	6.0%	75.9%	100%

Source: *Research*

(iii) Facilitating Conditions

The facilitating conditions construct was designed to generate information about the environment in the industries and how it influences the adoption and use of Cloud Computing services. In order to collect data related to this, the users were presented with four statements that required them to indicate their level of agreement with each.

Table 13 illustrates that 90.30% of the respondents have the knowledge necessary to use and deploy Cloud Computing technologies and services. Further, 77.40% respondents agreed that their organization has the finances and the equipment necessary for cloud computing. On the other hand, 64.5% confirmed that their current core system is not compatible with Cloud Computing technologies/ services. This is an indication that most o the operations in MHTI are still manual and that the systems run on old technologies hence the incompatibility. To move fully to The Cloud, the industries would need to computerize their operations as well as upgrade their systems to the latest technologies hence an implication on the cost. With

38.80% confirming that manpower to provide assistance to users is readily available, this is an indication that the ICT department in MHTI is not well staffed hence affecting negatively adoption of new technologies like Cloud Computing.

Table 13*:* *Analysis for Facilitation Condition Measure*

Item	**Disagree**	**Neutral**	**Agree**	**Total**
Our organization has the resources (financial and/or equipment) necessary to use Cloud Computing service(s**)**	8.30%	14.30%	77.40%	100%
I have the knowledge necessary to use Cloud Computing service(s).	2.80%	6.90%	90.30%	100%
Cloud Computing service(s) is not compatible with the university systems I use.	16.10%	19.40%	64.50%	100%
There are people available for assistance with Cloud Computing service(s) difficulties.	35.90%	25.30%	38.89%	100%

Source: *Research*

4.8 Reliability Tests

The study tested the reliability of the research instrument via the determination of Cronbach's alpha coefficient. In data analysis, the Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. A reliability coefficient of .70 or higher is considered "acceptable" in most social science research situations. The research found the alpha coefficient for the five items is .839, suggesting that the items have relatively high internal consistency as shown in table 12**.**

Table 10: *Coefficient of determination*

Cronbach's Alpha	N of items
.839	108

Source: *Research*

4.9 Discussion

Companies are developing knowledge through their cloud services of how to run truly huge internet-based computing systems that may soon be nearly impossible for other companies to match (Tehrani, 2013).(Kituku (2012)predicted that 2014 will see some of the biggest players in the IT industry trying to develop high-end Cloud Computing applications, and that the consumers can expect an increase in platform independent services in the near future. Some of the most noticeable features of Cloud Computing involves the scalability and efficiency it offers. Verhoeven, et al, (2010) predicts that in 2014, development of new web-powered apps

with platform independence as their key feature is expected. The study concluded that the average organization's level of computerization was between 51% and 75%, which created the impression that the majority of MHTI have become aware of the benefits that are accrued on the adoption of The Cloud Computing. With regard to implementation of cloud services models, most MHTI have adopted SaaS and PaaS while very few have adopted HaaS and IaaS. This could be due to high cost implicated (Low C, Chen Y, & Wu, M 2011) and level of skills required to implement and maintain the services (Omwansa T. K, Waema, T. M, & Omwenga M.B, 2014).Hence, Cloud Computing technologies have prevailed in most Medium and High Tech Industries since the inception of the technology and that more industries are willing to take up the technology. Hence, the findings are in line with previous studies on Cloud Computing: Tehrani (2013), Kituku (2012), Verhoeven, et al, (2010), Low C, Chen Y, & Wu, M (2011) and Omwansa T. K, Waema, T. M, & Omwenga M.B (2014).

Feuerlicht (2010) conducted a study on the factors influencing Cloud Computing adoption and found that the security and privacy, identity management standards, and the need for sharing and collaboration in today's highly competitive world have a positive effect on using and adopting cloud computing. To add to these, this study found out that cost is a major factor that influences the adoption of Cloud Computing in most organizations because the adoption adds to the organizational budget. In a study conducted by Saya, Pee and Kankanhalli (2010), the findings indicated that the three contexts – technological, organizational and environmental (TOE) may influence the process by which technological innovations are adopted and implemented. This study found out that reliability, scalability, security, compliance and integration with other services are other factors that influence the adoption of Cloud Computing in Medium and High Tech Industries. This finding was positively related to the findings of Saya, Pee and Kankanhalli (2010) in that the aforementioned factors have a positive influence on adoption of Cloud Computing in Medium and High Tech Industries.

This study proposes the UTAUT model as the most appropriate to use. The empirical evidence further shows that the model is useful in industrial platforms for adoption of technology and can be used for adoption of cloud computing, thus; the reason why it is deemed as the best model for use in The Cloud computing processes in medium and high tech industries. Continued use of this model will see the prevalence of cloud computing rise rapidly in the coming decades. Prior empirical tests that ascertain the viability of the model

have been presented by various researchers in order to justify the usefulness of the proposed model. This confirms various studies by Koivumäki et al (2008, Curtis et al (2010), Verhoeven et al (2010).

Through empirical validation of the recommended model, the study found out that though there is no comprehensive instrument to measure the variety of perceptions of Information and Communications Technology innovations had existed, empirical evidence showed that the model is useful in industrial platforms for adoption of technology and could be used for adoption of cloud computing. Prior empirical tests that ascertain the viability of the model have been presented by various researchers in order to justify the usefulness of the proposed model. On the best method of validation, the study looked into the distinct elements of the recommended model and concluded that facilitating conditions is an element that is used in the validation of the UTAUT model in regard to its applicability in the adoption of Cloud Computing as well as other elements that include performance, attitude toward using technology, social influence, anxiety and self-efficacy. The study therefore found out that the possession of the crucial validation elements has a direct relationship with the efficiency of the model, and thus it was a viable model Cloud Computing adoption.

Venkatesh et al., (2003) established that among the three primary constructs that influence adoption and use of technology namely Performance Expectancy, Effort Expectancy and facilitating conditions influence, performance expectancy was the most important in influencing technology adoption and use. Their findings showed that Performance Expectancy had a direct and significant effect on Cloud Computing adoption. The findings of this study on the Performance Expectancy construct concur with the findings of Venkatesh et al., (2003). This is a further confirmation that performance expectancy is an important factor in adoption and use of technology and this can be extended to Cloud Computing services adoption in institutions of higher learning in Kenya. The study results show that Performance Expectancy associates positively and had significant effect on Cloud Computing adoption. Contrary to Venkatesh et al., (2003) study which state that facilitating conditions do not have significant influence on adoption of cloud computing, this study found that facilitating condition significantly influence adoption of Cloud Computing by Medium and High Tech Industries.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.0 Achievements of the Study

The achievements of the study are as follows based on the objectives that shaped the study:

Objective 1: *Establish the prevalence of Cloud Computing adoption among the Medium and High Tech Industries in Kenya.*

From the results collected in this study, there is a high prevalence of cloud computing in Medium and High Tech Industries. These industries are making effort to move to The Cloud and reap the benefits that come with the move. This has been made possible by measures taken by the management. These measures include: allocation of a reasonable budget to ICT operations, employing competent employees in the ICT field etc.

Objective two; *Determine the factors influencing the adoption of Cloud Computing in Medium and High Tech Industries in Kenya.*

This study has established that cost is a major factor that influences the adoption of Cloud Computing in most organizations because the adoption adds to the organizational budget. This mainly affects The Cloud Service models that the industries adopt. Most industries have implemented PaaS and SaaS since they have low cost implications compared to HaaS and IaaS.

Third objective: *Analyze existing models for technology adoption.*

Various models have been developed for technology adoption. The researcher analysed the following models.

Technology-Organization Environment theory (TOE) framework posits that adoption of IT technology by firms and organizations is influenced by three different context groups: technological, organizational, and environmental contexts (Melville & Ramirez, 2008).

Technology Adoption Model (TAM) TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use.

The Diffusion model of innovation argues that media and interpersonal contacts provide information that influences a person’s opinion and judgment (Roger’s ,2003).. The theory

comprises four elements: invention, diffusion through the social networks, time and consequences

Unified theory of acceptance and use of technology (UTAUT) is a technology acceptance model formulated by Venkatesh et al (2003) in "User acceptance of information technology: Toward a unified view," the UTAUT aims to explain user intentions to use an information system and subsequent usage behavior.

Fourth Objective: *Recommend an appropriate technology model for adoption of Cloud*

Based on the criteria set by the researcher to determine the best model to use while adopting technology, this study proposes the UTAUT model as the most appropriate to use.

Fifth objective; *Validate the proposed technology model for adoption of Cloud Computing in Medium and High Tech Industries in Kenya.*

To validate the proposed model, the study looked into the distinct elements of the recommended model and concluded that facilitating conditions is an element that is used in the validation of the UTAUT model in regard to its applicability in the adoption of Cloud Computing as well as other elements that include performance, attitude toward using technology, social influence, anxiety and self-efficacy. The study therefore found out that the possession of the crucial validation elements has a direct relationship with the efficiency of the model, and thus it was a viable model Cloud Computing adoption.

5.2 Conclusion

Most Medium and High Tech Industries have adopted Cloud Computing technologies to faciliatate service delivery. This has been made possible by a few measures taken by the managemnent: allocation of a sizeable budget to ICT and employment of competent individuals to run the ICT department. Availability of reasonable cloud services is also a big factor hence, the adoption of cloud service models like SaaS and PaaS by majority of MHTI. Cloud Computing is a force that is reshaping ICT and powering innovation as many factors influence the process of industrial adoption and implementation of an innovation, like Cloud Computing at macro level. Adoption Cloud Computing in MHTI is beneficial to the economy and environment. Cloud Computing services have helped Medium and High Tech Industries improve, protect and grow businesses. This has lead to an increase of the GDP of the Kenyan economy.

An appropriate model to be used when adopting Cloud Computing Technologies needs to be emphasized on and if possible develop a model that is in line with conditions that prevail in MHTI in Kenya. With an appropriate model, Providers of cloud technologies and services in Kenya will be well guided to develop services that are well suited for MHTI in Kenya. This will also ensure efficiencies in these industries to the best of the levels. Medium and High Tech Industries need to Adopt Cloud Computing and use it to the level best to serve their clientele. These industries need to get to a level where they use big data analytics to develop products. Big data Analytics ensures that products are well suited to the consumer and improvements are made from time to time.

The development of industries necessary for backward and forward linkages is equally important. The evolution of The Cloud computing-led telecommuting in South Africa, for instance, can be attributed to the country's high speed, low cost bandwidth. As to the current status of The Cloud, the above analysis indicates that the usage has been vanishingly small in most developing economies but is expanding rapidly. Unsurprisingly The Cloud industry has become more visible and evident in developing countries that have exhibited leadership in other IT areas. Vietnam has entered as a newcomer in the global IT arena due to dynamism of its economy and the government's meaningful intervention, which have attracted global cloud players.

Security is among possible impediments to realizing The Cloud's potential. The Cloud's diffusion and that of social media have superimposed onto organizations' rapid digitization in a complex manner that allows cyber-criminals and cyber-espionage networks to exploit The Cloud's weaknesses. Employees' general lack of security consciousness and unsound regulations negatively affect The Cloud's value proposition in developing countries. A related point is that these factors can lead to a negative country of origin effect in developing world-based cloud providers' internationalization activities. Developing world-based clouds may also pose risks to industrialized countries. Therefore, security of The Cloud should be enhanced to ensure great heights of adoption by medium and high tech industries.

5.2 Limitations and recommendations for further work.

This study's main limitation was that the information used for the results especially on the recommended model was derived from the data obtained from the users and providers who

were already familiar with Cloud Computing. Further study should be done to include non ICT staff in MHTI like finance managers and operations managers.

This study was based on recommendation and validation of an existing technology adoption model -the UTAUT model. Hence, the findings are limited to the constructs of this model. Further work can be done to develop a Cloud Computing adoption model that suits MHTI considering the prevailing factors in these industries in Kenya.

5.3 Recommendations

The developing world Kenya in particular must take advantage of the opportunities offered by The Cloud and, at the same time, minimize the associated risks and threats so that advanced IT infrastructure, data centers and applications can be accessed and sensitive information can be protected. Some barriers to realizing The Cloud's full potential could be avoided through better planning and efforts to address human resources. The existing skills may be insufficient for the development of The Cloud industry.

The Government of Kenya specifically the Ministry of Education Science and Technology (MEST), Ministry of Information, Communication and Technology and The ICT Authority needs to take measures to develop and improve cloud related skills. Regulatory measures should be taken to encourage adoption of Cloud Computing. Various bodies that regulate how MHTI operate should also be involved ensuring adoption of Cloud computing is achieved. Some of these organizations are: Ministry of Industrialization and Enterprise Development, Kenya Association of Manufacturers (KAM) and Kenya Private Sector Alliance (KEPSA).Some recommendations from this study are:

i) Provision of tax breaks to ICT equipment especially those related to Cloud Computing. This will reduce the cost of moving to The Cloud for MHTI.
ii) MHTI need to increase the staff in their organizations to ensure ease of adoption of new innovations like Cloud Computing.
iii) Gender mainstreaming of STEMIT in Knowledge Based Institutions as early as Primary school. This will increase the number of women in senior management in ICT departments.
iv) Develop mechanisms that will curb cyber crime in Kenya. This will increase adoption of Cloud Computing since MHTI will have confidence in The Cloud.

REFERENCES

Babbie, E. (2002). *Survey research methods* (2nd ed.). Belmont: Wodsworth.

Bagozzi, R.P. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems*, **8** (4), pp.244–254

Benioff, M. (2010). Cloud Computing. *Keynote Speech* at the Oracle Open World 2010 Conference.

Berman, S. (2013)., Kesterson-Townes, K., Marshall, A., & Srivatbsa, R. (2011). The power of cloud: driving business model innovation.Brace Jovanovich College Publishers

Buskens, I., & Webb, A. (2009). *African women and ICTs: Investigating technology, gender and empowerment*. Zed books.

Brodkin, J. (2008). Loss of customer data spurs closure of online storage service 'The Linkup'. *Network World (August 2008)*

Callon, M., and Latour, B. (2011). Unscrewing the big leviathan: How actors macro-structure reality and how sociologists help them to do so. InK. Knorr Cetina, A. V. Cicourel, R. Paul & K. Paul (Eds.), Advances in social theory and methodology. Towards an integration of micro and macro-sociologies. London. pp. 277-303).

Cisco (2013). The Cloud in Africa: reality check 2013. Available at:

Cloud tweaks. (2011). Inside Cloud. *From Areas best suited for cloud Computing*. Retrieved July 04, 2012, Website: http://www.cloudtweaks.com

Cresswell, K. M., Worth, A., and Sheikh, A. (2010). Actor-network theory and its role in understanding the implementation of Information and Communications Technology developments in healthcare. BMC Medical Informatics and Decision Making, 10 (67), 2-11.

Curtis, L., Edwards, C., Fraser, K. L., Gudelsky, S., Holmquist, J., Thornton, K., & Sweetser, K. D. (2010). Adoption of social media for public relations by nonprofit organizations. *Public Relations Review*, *36*(1), 90-92.

Dargha, R. (2009). Cloud computing: Key considerations for adoption. Apr 2009. Retrieved from www.Infosys.com.

Daryl C.P. and Mitchell, G. (2011).Cool Vendors in Cloud Management. Infrastructure Resource Management.

Datta, P. (2011). A preliminary study of ecommerce adoption in developing countries. *Information Systems Journal*, *21*(1), 3-32.

David, B. (2009). Top Five Cloud Computing Security Issues, Computer Weekly (2009).

Davis, F.D. (2003). Perceived usefulness, perceived ease of use, and user acceptance of Information and Communications Technology . *MIS Quarterly*, 13(3), 319-339.

Davison, R. M., Ou, C. X., & Martinsons, M. G. (2013). Information and Communications Technology to support informal knowledge sharing. Information Systems Journal, 23(1), 89-109.

decision making trial and evaluation laboratory on a technology acceptance model.

Deloitte East Africa's (2011). Risks in cloud computing. Journal of international studies, Vol. 2 (4), pp 34-56.

DePietro, R., Wiarda, E., and Fleischer, M. (1990). The context for change: Organization, technology, and environment. In L. G. Tornatzky & M. Fleischer (Eds.), Processes of technological innovation (Vol. 273, pp.151-175). Lexington, MA: Lexington Books.

Eagly, A.H. & Chaiken, S. (2013). *The psychology of attitudes*. Fort Worth: Harcourt

Ebbrell, L. (2012). The Journal of Cloud Confusion amongst IT Professionals. Technical and business information about cloud computing

Ernst & Young (2010). Cloud adoption in India-Infrastructure as a Service (IaaS). Trends and perceptions in the Indian market by Ernst & Young.

Expert Systems with Applications, 37(2), 1745–1754.

Feuerlicht, G. (2010). Next generation soa: Can Soa survive cloud computing? Advances in intelligent web mastering -2. In V. Snášel, P. Szczepaniak, A. Abraham & J. Kacprzyk (Eds.), (Vol. 67, pp. 19-29): Springer Berlin / Heidelberg

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, Mass; Don Mills, Ontario: Addison-Wesley Pub. Co

Gartner (2011). Gartner Says Cloud Computing Will Be as Influential As E-business. Gartner Press.

Hilbert, M. (2011, December). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics. In *Women's Studies International Forum* (Vol. 34, No. 6, pp. 479-489). Pergamon.

http://www.cisco.com/web/ZA/press/2013/112813.html.

Industry Week. (2010). The case for cloud computing. *IT Professional, March/April 2010.*

Jae-Nam, L., & Young-Gul, K. (2005). Understanding outsourcing partnership: A comparison of three theoretical perspectives. IEEE Transactions on Engineering Management, 52(1), 43-58.

Kagwe, W. (2012). Cloud Computing to pick up pace in Kenya. The Star, November 2, 2012.

Karanja, M. (2008). Cloud Computing: Web-based applications that change the way you work and collaborate online. IN, Indianapolis: Que Publisher.

Kennan, M. A., Cecez-Kecmanovic, D., and Underwood, J. (2010). Having a say voices for all the actors in ant research? International Journal of Actor-Network Theory and Technological Innovation (IJANTTI), 2 (2), 1-16.

Khan, S., Zhang, B., Khan, F., & Chen, S. (2011). Business intelligence in The Cloud: A case of Pakistan. 2011 IEEE International Conference on Cloud Computing and Intelligence Systems (CCIS), (pp. 536-540).

Kim, et al (2009). Having a say voices for all the actors in ant research? International Journal of Actor-Network Theory and Technological Innovation (IJANTTI), 2 (2), 1-16.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model.

Kituku, K.M. (2012). Adoption of Cloud Computing in Kenya by firms listed in the Nairobi Stock Exchange. Unpublished MBA Project, University of Nairobi.

Kiveu, M. (2013). Enhancing Market Access in SMEs in Kenya Using ICT. Paper For Presentation At the 2nd National Science, Technology and Innovation Week (13-17th May, 2013) *leads to opportunity*, 14-16.*Management*.

Koivumäki, et al. (2008).The perceptions towards mobile services: An empirical analysis of the role of use facilitators," Personal & Ubiquitous Computing, vol. 12, no. 1, pp. 67–75.

Kotler, P., & Armstrong, G. (2006). *Principles of marketing* (9th Ed). London: Prentice Hall.

Kotler, P., & Armstrong, G. (2006). *Principles of marketing* (9th Ed). London: Prentice Hall.

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

Law, et al. (2010). A theory of reasoned action model of accounting students' career choice in public accounting practices in the post-Enron. *Journal of Applied Accounting Research 11(1),* 58-73.

Lee, Y. C., Li, M. L., Yen, T. M., & Huang, T. H. (2010). Analysis of adopting an integrated

Linderoth, H. C. J. (2010). Understanding adoption and use of bim as the creation of actor networks. Automation in Construction, 19 (1), 66-72.

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of Cloud Computing adoption. *Industrial Management & Data Systems, 111*(7), 363-97.

Mbuvi, D. (2012). Enterprise considerations for cloud computing. CIO East Africa, May 30, 2012.

Mell, P., & Grance, T. (2009). The NIST Definition of Cloud Computing. National Institute of Standards and Technology, Information and Communications Technology Laboratory, July, 1 -25.

Melville, N., and Ramirez, R. (2008). Information and Communications Technology innovation diffusion: An information requirements paradigm. Information Systems Journal, 18 (3), 247-273.

Miller, M. (2008). Complexity Is the Enemy, IEEE Security and Privacy, Vol. 6, No. 6.

Mitchell and Smith, D. (2012). *Cloud Computing confusion leads to opportunity*. A Gartner Research Special Report. November/December 2010.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative and qualitative approaches*. Nairobi: Acts Press.

Nethope International (2010). Rate of new technology adoption by organizations. Journal of Marketing, 66(3), 150-160.

Neuman, W. 2000).*Social Research and Methods: Qualitative Quantitative Approaches.* 4th Edition. Boston: Allyn and Bacon.

Ngechu. M. (2004). *Understanding the research process and methods. An introduction to research methods.* Acts Press, Nairobi.

NIST (2011).The NIST Definition of Cloud Computing. Recommendations of the National Institute of Standards and Technology. http://csrc.nist.gov/publications/nistpubs/800-

Oliveira, T. & Martins, M. F. (2011) Literature Review of Information and Communications Technology Adoption Models at Firm Level. *The Electronic Journal Information Systems Evaluation,* 14(1), 110-121.

Omwansa, T. K., Waema, T. M., & Omwenga, M. B. (2014). Cloud Computing in Kenya.

Plummer. (2008). A Gartner's Research Special Report. *Cloud Computing confusion.*

PRWEB (2012, July 19). Garner predicts Cloud Computing spending to increase by 100 percent In 2016,says Apps Care.

Republic of Kenya. (2006). Economic Survey. Ministry of Planning and National Development, CBS. Nairobi: Government Printer.

Rogers, E.M. (2003). Diffusion of Innovations, 5th edition. New York, NY: Free Press.

Saya, S., Pee, L. G., and Kankanhalli, A. (2010). The impact of institutional influences on perceived technological characteristics and real options in Cloud Computing adoption. Paper presented at the ICIS 2010 Proceedings, St. Louis.

Schäfferling, A., & Wagner, H.T. (2013). Do Investors Recognize Information and Communications Technology As A Strategic Asset? A Longitudinal Analysis Of Changes In Ownership Structure And IT Capability, ECIS 2013 Completed Research, Paper 31. Available at http://aisel.aisnet.org/ecis2013_cr/31

Schmerken, I. (2012). The Rise of Cloud Computing on Wall Street. Wall Street & Technology, January 20, 2012.security-issues.htm>

Shahonya, E. (2011). Cloud Computing Offers Big Gains and Challenges to Firms. Daily Nation, December 12, 2011.

SIIA's (2012). Information and Communications Technology innovation diffusion: An information requirements paradigm. Information Systems Journal, 18 (3), 247-273.

Srinivasan, R., Lilien, G.L. & Rangaswamy, A. (2012). The Role of. Technological Opportunism in Radical Technology Adoption: An Application to e-Business. Journal of Marketing, 66(3), 47-60.

Sunday, F. (2013). SME's shores up revenue for Cloud Computing providers. Standard Newspaper, July 9, 2013.

Tambe, P., & Hitt, L. M. (2013). Measuring Information and Communications Technology spill overs. Information Systems Research, 25(1), 53-71

Tan, M., & Lin, T.T. (2012). Exploring Organizational Adoption of Cloud Computing in Singapore. The 19th ITS Biennial Conference, 18 -21 November 2012, Thailand.

Tehrani, S.R. (2013). Factors Influencing the Adoption of Cloud Computing by Small and Medium-Sized Enterprises (SMEs). Master Thesis Paper 1179, Ryerson University, Ontario.

Thong, J.Y.L. (2009). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems, 15*(4), 187-209.

Venkatesh, V.; Morris; Davis; Davis (2003), "User Acceptance of Information and Communications Technology : Toward a Unified View", *MIS Quarterly*27 (3), pp.425–478

Verhoeven et al. (2010).Information and communication technologies in the life of university freshmen: An analysis of change," Computers & Education, vol. 55, no. 1, pp. 53–66.

Wangui, J. (2009). Software as a service inflection point: Using Cloud Computing to achieve business agility. New York: Global Authors Publishers.

APPENDIX 1: CLASSIFICATION OF MEDIUM AND HIGH TECH INDUSTRIES

International Standard Industrial Classification of All Economic Activities, Rev.3 (ISIC Rev.3)

Medium-high and high technology (MHT)

Division 24	Manufacture of chemicals and chemical products
Division 29	Manufacture of machinery and equipment n.e.c.
Division 36	Manufacture of office, accounting and computing machinery
Division 31	Manufacture of electrical machinery and apparatus n.e.c.
Division 32	Manufacture of radio, television and communication equipment and apparatus
Division 33	Manufacture of medical, precision and optical instruments
Division 34	Manufacture of motor vehicles, trailers and semi-trailers
Division 35	Manufacture of other transport equipment (excluding 351, Building and repairing of ships and boats)

APPENDIX 2: LIST OF MEDIUM AND HIGH TECH INDUSTRIESI KENYA

DIVISION 24:MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS	
1	BETA HEALTH CARE ITERNATIONAL LIMITED
2	BOTANICAL EXTRACTS EPZ LIMITED
3	HOMA LIME COMPANY LIMITED
4	HENKEL POLYMER COMPANY LIMITED
5	WELDING ALLOYS LTD
6	SPHINX PHARMACETICAL LTD
7	AUTOSTERILE(EA) LTD
8	XPERT ADHESIVES LTD
9	NORBROOK KENYA LIMITED
16	CHEMID KENYA LTD
11	ANDROCLOVI CHEMICALS AGENCIES
12	BIODEAL LABORATORIES LTD
13	GLAXOSMITHKLINE EASTERN AFRICA
14	BALM INDUSTRIES LIMITED
15	LABORATORY & ALLIED LTD
16	TWIGA CHEMICALS
17	CANON CHEMICALS LTD
18	ORBIT CHEMICALS INDUSTRIES LTD
19	OSHO CHEMICALS
26	MAGIC CHEMICALS
21	TATA CHEMICALS MAGADI
22	CONTINENTAL PRODUCTS LIMITED
23	ALPHA MEDICAL MANUFACTURERS LTD
24	ELYS CHEMICAL INDUSTRY LTD
25	CONCEPT(AFRICA) LIMITED
26	UNIVERSAL CORPORATION LTD
27	NOVA INDUSTRIES LTD
28	OPTIMUM LUBRICANTS LIMITED
29	COOPER K BRANDS LTD
36	VETCARE KENYA LIMITED
31	COMET HEALTHCARE LTD
32	METOXIDE AFRICA LIMITED
33	KEL CHEMICALS LTD
34	DAWA LTD
35	MURPHY CHEMICALS
36	HACO TIGER BRANDS
37	REGAL PHARMACEUTICALS LTD
38	SARA LEE KENYA LTD
39	KAM INDUSTRIES LTD
49	JOHNSON DIVERSEY EA LTD
41	PAN AFRICA CHEMICALS LTD

42	HENKEL CHEMICALS EAST AFRICA LTD
43	TIMCO CHEMICAL INDUSTRIES
DIVISION 29:MANUFACTURE OF MACHINERY AND EQUIPMENT	
44	CHAINS AND PRODUCTS (K) LTD
45	SERVISCOPE (EA) LTD
46	STEEL STRUCTURES LTD
47	TIM WOOD PRODUCTS LTD
48	ABE CONSTRUCTION CHEMICALS (EA) LTD
49	ELDORET STEER MILLS LTD
56	BISELEX KENYA LTD
51	BLACKWOOD HODGE KENYA LTD
52	HOBRA MANUFACTURING LTD
53	EAST AFRICA FUNDRY WORKS (K)LTD
54	NDUME LTD
55	JF MCCLOY LIMITED
56	CHLORIDE EXCIDE
57	DAVIS & SHIRTLIFF
58	DAVIS & SHIRTLIFF
59	KENYA ORDANCE FACTORIES CORPORATION
66	ALICO MAHINERY AND EQUIPMEMT LTD
61	HEAVY EQUIPMENT & MACHINERY DEALERS
62	NAICOF COFFEE MACINERY
63	NAIROBI MACHINERY INDUSTRIAL CO. LTD
64	RIFT VALLEY MACHINERY SERVICES LTD
65	KAY LIFT SERVICES LTD
66	ATLAS COPCO
67	LEGEND PETROLEUM EQUIPMENTS
68	SCHINDLER LTD
69	AGRO IRRIGATION AND PUMP SERVICES LTD
DIVISION 30:MANUFACTURE OF OFFICE COMPUTING AND OFFICE MACHINERY	
76	THE COPY LTD
71	SHARP ELECTRONICS TECHNOLOGY LTD
72	REDINGTON KENYA LTD
73	MITSUMI COMPUTER GARAGE LTD
74	DESPEC EAST AFRICA
75	IMAGETEK
76	MACHINE TECHNOLOGIES
77	ELITE DIGITAL SOLUTIONS
78	PC WORLD
79	TECHNOLOGY TODAY LTD
86	INSPIRON LTD
81	KODAK (K) LTD
82	OFFICE TECHNOLOGIES LTD
83	HEIDELBERG EAST AFRICA LTD
84	OSWALD OVERSEAS CORPORATION

85	TOTAL OFFICE SOLUTIONS
86	XEROX KENYA
87	MFI OFFICE SOLUTIONS
DIVISION 31: MANUFACTURER OF ELECTRICAL MACHINERY AND APPARATUS N.E.C	
88	A BAUMANN (K) LTD
89	MERRIMACK POWER SYSTEM LTD
96	FRAMETECH EQUPMENT LIMITED
91	SIEMENS LIMITED
92	MASTER POWER SYSTEM LTD
93	CRAFTSKILLS EA LIMITED
94	CRAFTSKILLS EA LIMITED
95	KENWEST CABLES LTD
96	POWER INNOVATIONS LTD
97	POWER INNOVATIONS LTD
98	SPECIALISED POWERE SYSTEMS LTD
99	RAEREX EA LTD
166	THAMES ELECTRICALS LTD
161	DOSHI GROUP OF COMPANIES
162	POWER PROTECTION LTD
163	CREATIVE INNOVATIONS LTD
164	POWER TECHNICS
DIVISION 33: MANUFACTURE OF MEDICAL, PRECISION AND OPTICAL INSTRUMENTS	
165	ACHELIS KENYA LTD
166	ALPHA MEDICAL MANUFACTURERS LIMITED
167	AVERY EAST AFRICA LTD
168	BONFARM KENYA LTD
169	BORA BIOTEH LTD
116	CHEM LABS
111	CHEMO QUIP LTD
112	COSMOS LTD
113	ESTEC LTD
114	HARLEYS LTD
115	BOC KENYA LTD
DIVISION 34: MANUFACTURE OF MOTOR VEHICLE TRAILERS AND SEMI TRAILLERS	
MR	KENYA VEHICLE MANUFACTURERS LTD
116	ASSOCIATED VEHICLE ASSEMBLERS
117	CAR AND GENERAL
118	CAR AND GENERAL
119	CMC MOTORS
126	CMC MOTORS
121	CMC MOTORS
122	DT DOBIE & CO (KENYA) LTD
123	DT DOBIE & CO (KENYA) LTD
124	FUNTON EAST AFRICA LTD
125	GENERAL MOTORS EAST AFRICA

126	GENERAL MOTORS EAST AFRICA
127	HYUNDAI EA HOLDINGS
128	HYUNDAI EA HOLDINGS
129	KENYA GRANGE VEHICLES INDUSTRIES LTD
136	MARSHALLS EA LTD
131	SUBARU KENYA
132	TATA AFRICA HOLDINGS
133	TOTAL KENYA LTD
134	PAN AFRICA EQUIPLMENT LTD
135	SPA ENGINEERING AND EQUIPMENT LTD
136	MANTRACK KENYA
DIVISION 35: MANUFACTURE OF TRANSPORT EQUIPMENT (excluding 351 manufacture of building and repairing of ships and boats)	
137	PADAM ENG WORKS LTD
138	CITY REDIATORS (ELDORET) LTD
139	BHACHU ENGINEERING WORKS LTD
146	RT. EAST AFRICA LIMITED
141	SAIKAM FABRICATORS (K) LTD
142	PRIMETECH INDUSTRIES E.A. LTD
143	DYNACORP MOTORS LTD
144	FASFIT AUTO LIMITED
145	SAHOTA BODY WORKS LTD
146	SAI RAJ LTD
147	PATMOSE TECHNICAL SERVICES
148	MANN MANUFACTURER CO LTD
149	AMITY EQUIPMENT LIMITED
156	ORIEL LTD
151	SAMEER AFRICA

APPENDIX 3: LIST OF CLOUD COMPUTING PROVIDERS

	COMPANY NAME
1	IBM
2	SAFARICOM/SEVEN SEAS TECHNOLOGY
3	DIMENSION DATA
4	CISCO
5	EMERGING MARKETS COMMUNICATION
6	ACCESS KENYA
7	CRIMSON TECHNOLOGIES
8	XTRANET COMMUNICATIONS LTD
9	MTN BUSINESS
16	JAMII TELKOM
11	LIQUID TELCOM
12	ANGANI LTD
13	DIMENSION DATA
14	KDN
15	NAISOFT
16	SEACOM
17	SIMBANET
18	COMTECH
19	EAST AFRICAN DATA HANDLERS
26	SASA HOST
21	DATAPOSIT

APPENDIX 4: LETTER OF INTRODUCTION

Pauline Wanjiku
P.O BOX, 930-00217
Nairobi
Cell: 0722303511

Dear Respondent,

RE: SUPPORT ON MSC PROJECT

I am an Msc student at the University of Nairobi undertaking a course in Masters of Science in Information and Communications Technology Management. As part of the requirement for graduation, I'm undertaking a research to establish the adoption of Cloud Computing in Medium and High Tech Industries in Kenya.

In this regard, I'm kindly requesting for your support in terms of time, and by responding to the attached questionnaire. Your accuracy and candid response will be critical in ensuring objective research, and all information received will be treated in strict confidence.

In addition, the findings of the study will solely be used for academic research purposes. If need be the research report may be presented to your institution for information and record.

Thank you for your valuable time on this.

Yours faithfully;

Pauline Wanjiku

APPENDIX 5: QUESTIONNAIRE

Adoption of Cloud Computing in Medium and High Tech Industries

SECTION A: INTRODUCTION

Please provide the following information:

Date of Interview	
Company Name	
Position within the company	
Company's co Business	
Company utilizing a private or public cloud implementation	

SECTION B: DEMOGRAPHIC QUESTIONS

1	Gender Male [ ] Female [ ]
2	Age Below 25 years […] 26 – 30 years [ ] 31-35 years [ ] 36-40 years […] 41-45 years [ ] Above 45 years [ ]
3	How long have you worked with the organization? Less than a year […] 1-5 years […] 5 years and above […] 5-10 years [ ] 10-15years [ ] Above 15 years [ ]
4	What is your responsibility in the company/Department?

SECTION B: CLOUD COMPUTINGADOPTION

5. Has your organization adopted Cloud Computing as a technology?
   Yes [ ] No [ ]
6. State the level of agreement with the following statements relating to Cloud Computing adoption

Statement	Strongly agree	Agree	Moderately agree	Disagree	Strongly disagree
Cloud Computing is a force that is reshaping IT and powering innovation					
At micro level, the diffusion of cloud has been advantageous for Medium and High Tech Industries					
At macro level, Cloud Computing has been beneficial for the economy and environment					
The Cloud Computing services have helped Medium and High Tech Industries improve, protect and grow business as users carry out their duties with minimum capital.					

SECTION C: PREVALENCE OF CLOUD COMPUTING

7	What is the level of computerization on the activities in your organization? (*Single response*) 0-20% [ ] 21 – 40% [ ] 41 – 60% 61-80% [ ] 81-100
8	What is the percentage of technologies in your organization that are at The Cloud based? (*Single response*) None [ ] Less than 10% [ ] 11-20% [ ] 21– 30% [ ] More than 30 [ ]
9	c) What percentage of your IT budget was set aside for Cloud Computing usage? (*Single response*) None [ ] Less than 10% [ ] 11-20% [ ] 21– 30% [ ] More than 30 [ ]

10. The following Cloud Computing service models have been adopted by your organization so far**.** Select all the models that your organization has adopted for its Cloud Computing operations (Use (*) for the applicable ones and leave blank if not applicable)

Model	
Software-as-a Service (SaaS); applications are hosted by the provider	
Platform-as-a-Service (PaaS) - Rent hardware, OS, storage and network capacity	
Infrastructure-as-a-Service (IaaS) – outsource equipment	
Hardware as a service (HaaS), Computing processing capacity is purchased on the web	

SECTION D: FACTORS INFLUENCING CLOUD COMPUTINGADOPTION

11. Explain three factors of your choice that influence the adoption of Cloud Computing in your organization.

…….

……

……..……

……

SECTION E: MODEL FOR CLOUD COMPUTINGADOPTION

12	a) State any two models of technology adoption that can be employed for the adoption of cloud computing?
14	In your own opinion, do you think there would be improved Information and Communications Technology efficiency if the right model for Cloud Computing adoption could be applied? Yes [ ] No [ ]

SECTION D: MODEL RECOMMENDATIONAND VALIDATION

15	How can you rate the importance of the UTAUT model in industrial platforms for adoption of technology and could be used for adoption of cloud computing? Very important [ ]Important [ ] Less important […]Not at all […]

THANK YOU FOR YOUR COOPERATION

APPENDIX 6: INTERVIEW GUIDE

SECTION A: INTRODUCTION

Please provide the following information:

Date of Interview	
Company Name	
Position within the company	
Company's co Business	
Company utilizing a private or public cloud implementation	

SECTION B: QUESTIONS

1	Are you familiar with the term Cloud Computing and its usefulness in organizations?
	If yes, is it a technology that your organization has adopted? And if adopted, for how long have it been used in the organization?
2	How can you rate the level of prevalence of Cloud Computing in industries in the consideration of the various models to be adopted including Platform as a service, Hardware as a service, software as a service and infrastructure as a service?
3	In your opinion, what are the various factors influencing the adoption of Cloud Computing in industries, especially your organization?
4	There are various technology models that can be used in the adoption of cloud computing. Kindly state three that you are familiar with.
5 a)	Which is the best technology model according to you for adoption of cloud computing?
b)	Have you heard of Unified Model of Acceptance and Use of Technology? If u have, do you think it could be the best technology model for the adoption of cloud computing?
c)	In regard to the appropriateness of the model, which do you think are the elements for consideration when recommending and validating a model for adoption of technology?
D	Why do you think Cloud Computing technology is necessary in industries, especially in your organization?

THANK YOU FOR YOUR COOPERATION