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A project report submitted in partial fulfillment of the requirements for the award of Masters in Science in Information Systems, University of Nairobi, Kenya
August 2015
DECLARATION

This project is my original work and to the best of my knowledge this project work has not been submitted for any other award in any University.

Paul Nyamweya Ongige……………………………Date………………
P56/p/8184/2001

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This project work has been submitted in partial fulfillment of the requirement of the Master of Science Degree in Information Systems of the University of Nairobi with my approval as the University supervisor.

Dr E .O Abade ……………………………..Date………………

School of Computing and Informatics
University of Nairobi, Kenya.
I thank the Almighty God who has guided me throughout while I was undertaking this MSc in Information Systems course. He has provided me with wisdom, resources, good health, time, strength and countless blessings to this day.

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My deepest appreciation goes to my dear wife Ednah, my two lovely daughters Natasha and Anisa, my dear mum Cecilia and Dad Fredrick for their patience, support and understanding throughout the entire period of study.
DEDICATION

To my wife Ednah, Children Natasha and Anisa, for their love and support my father Fredrick and mother Cecilia for their love, encouragement, prayers and unending support to this day, My parents for making me who I am today and my entire family and friends for their support. God bless you all
ABSTRACT

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

The introduction of cloud computing services in Kenya by some telecommunication company like Safaricom Cloud from Safaricom Limited is an indicator that cloud computing technology is gaining ground and popularity locally. Technology adoption studies, which include Cloud computing adoption, have mainly been carried out in United State of America, Europe, Japan and Australia. No previous study has analyzed the adoption and use of cloud computing services in financial regulating bodies under national Treasury. This research aims at showing the factors and barriers/challenges to adopt Cloud Computing technology in these regulating bodies under the Ministry of National Treasury. The reason for studying these organizations is, they do control important sectors of the Kenyan economy. Using the descriptive analytical method to study the effects of the main seven dimensions (Relative advantage, Compatibility, Complexity, Firm Size, Government Support, Top management support and Organizational Readiness) on the adoption of Cloud Computing technology. This research focuses on these organizations because they are key in driving this country to vision 2030.

The researcher used a questionnaire as a data collection tool. The research population was (42) of Senior ICT Officers that are involved in ICT policy decision making. (42) Questionnaires were recollected out of (42) questionnaires that were distributed and were analyzed by SPSS program for statistical analysis.

The results showed that there is a significant relationship between the Intention to adopt Cloud Computing and the three independent variables; (Top management support, Relative Advantage and Compatibility) at level of significance $\alpha = 0.05$. The research recommended that these organizations can adopt Cloud Computing technology in their operations if it’s fully supported by top management.

Model/Framework: Hypothetical structure that is used in the investigation of interrelations between the elements.

Technology adoption: Cloud Computing adoption refers to the acceptance and agreement to use cloud-based services as a new way of deploying technology (Marston et al. 2011).
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<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>CBK</td>
<td>Central Bank of Kenya.</td>
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<tr>
<td>CC</td>
<td>Cloud computing.</td>
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<tr>
<td>Comp</td>
<td>Compatibility.</td>
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<td>Compx</td>
<td>Complexity.</td>
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<tr>
<td>CMA</td>
<td>Central Market Authority.</td>
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<tr>
<td>EDI</td>
<td>Electronic Data Interchange.</td>
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<td>ERP</td>
<td>Enterprise Resource Planning.</td>
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<td>GS</td>
<td>Government Support</td>
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<td>GHRIS</td>
<td>Government Human Resource Information System.</td>
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<tr>
<td>IaaS</td>
<td>Infrastructure as a service</td>
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<tr>
<td>IFMIS</td>
<td>Integrated Financial Management Information System.</td>
</tr>
<tr>
<td>IRA</td>
<td>Insurance Regulatory Authority.</td>
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<tr>
<td>KRA</td>
<td>Kenya Revenue Authority.</td>
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<tr>
<td>NIST</td>
<td>National Institute for Standard &amp; Technology.</td>
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<td>PaaS</td>
<td>Platform as a Service.</td>
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<tr>
<td>PC</td>
<td>Privatization Commission.</td>
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<tr>
<td>PPOA</td>
<td>Public Procurement Oversight Authority.</td>
</tr>
<tr>
<td>QoS</td>
<td>Quality of service.</td>
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<tr>
<td>RA</td>
<td>Relative Advantage.</td>
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<tr>
<td>RBA</td>
<td>Retirement Benefits Authority.</td>
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<tr>
<td>SaaS</td>
<td>Software as a Service.</td>
</tr>
<tr>
<td>SCI</td>
<td>School of Computing &amp; Informatics.</td>
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<tr>
<td>TM</td>
<td>Top Management Support.</td>
</tr>
<tr>
<td>TOE</td>
<td>Technology, Organization and Environment.</td>
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<tr>
<td>VM</td>
<td>Virtual Machine.</td>
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CHAPTER ONE: INTRODUCTION

1.1 Background
Cloud computing represents a fundamental change in how information technology is provisioned in that it enables computing facilities such as storage, computing power, network infrastructure and applications to be delivered as a method service over the internet (Creeger, 2009). Cloud computing is now being evaluated to be considered for e-government provision. There is evidence to suggest that cloud computing has become strategic direction for many government agencies and has the capacity to be employed in critical areas of government’s IT infrastructure.

Cloud computing for e-government is a viable alternative mechanism to traditional ERP. Implementing cloud computing improves the traditional ERP in public sector context. As the cloud computing paradigm continues to evolve, the benefits and risks associated with selecting a cloud solution become more understood and accepted by potential adopting organizations. Cloud computing adoption requires that organizations have readiness on multiple dimensions including: governance, process analysis and improvement, applications rationalization and modernization and hardware and software standardization. Readiness in turn determines how far organizations can go in their cloud programs with key milestones being proof of concept, infrastructure service, virtual desktop, and platform service and enterprise software as service. Readiness and milestones inform us about multiple stages in cloud adoption. The analysis also indicates that certain governance structures are most suitable for cloud adoption.

The advent of cloud computing revolutionized post industrial society and cloud computing shows signs of revolutionizing the information technology society. “The ability to connect users to computing and data resources via standardized network emerged as a key enabler of cloud computing” (the Defense Science Board). Cloud computing has been enabled by the availability of broadband networks and inexpensive end-use devices as well as commodity nodes that can be simply interconnected and controlled and virtualized to provide the appearance of isolating processes that share computers. Cloud computing is a model for enabling convenience on demand network access to a shared pool of configurable computing resources (e.g. Network, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effect or cloud provider information (Information Technology Laboratory). Government and the public sector lag behind private sector across all aspects of
adopter cloud computing including developing strategy, proof of concept and staged implementation (KPMG). Government and public sectors see security as a key concern to be addressed. Governments of Australia, Japan, Singapore, UK and USA are pursuing or initiating cloud programs and these programs have been closely followed by industry analysts. These governments see cloud computing as an opportunity to improve business outcomes, eliminate redundancy, increasing agility and providing information and communication technology service at a potentially cheaper cost. National governments, County governments, Local authorities and Public sector intend to become faster, better and cheaper when they go in for cloud computing. According to (Kaul and Odedra, 1991) governments around the world have been engaged in the process of implementing a wide range of ICT applications. Countries have been classified by the United Nations according to their computer industry development potential (CIPD) as advanced or less advanced (Mgaya, 1999). (Heeks, 2002) observes that there is a big difference between ICT implementation and ICT use between developed and developing countries. Cloud computing adoption has great growth potential with the current and predicted total budget to be spent on its services. For example, Gartner reported significant amount of money spent on cloud computing IaaS, cloud management, security devices and PaaS totaling to $7.6 billion in 2011 worldwide and projected to be $35.5 billion in 2016 (Gartner, 2012). Relevant literature reveals that most drivers of cloud computing adoption are benefit-driven. However, not all benefits of cloud computing could drive investment as such decisions often require careful cost-benefits analysis. In other words, organizations invest in cloud computing while expecting its business values in return but only when they feel cloud computing is needed.

This research emphasizes on the government because literature on cloud computing adoption in government is lacking. Government institutions are complex, have the largest number of employees and are the biggest spenders in new technology but have not been at the forefront in cloud computing. The Kenyan government lacks the plethora of IT paradigms that are available to the developed countries e.g. grid computing, peer-to-peer computing etc. An easy way to adopt cloud computing is to use cloud computing models which make it likely to succeed in government. As much as the government is convinced of the utility capacity and other benefits of cloud computing, are they willing to embrace this new model of acquiring IT infrastructure? The Government Cloud market is segmented on the basis of types of agencies, delivery modes, deployment models and various applications.
Cloud computing initiative in the government sector is mainly to bring about modernization of the IT infrastructure and to support agencies to reduce their overall costs. The government agencies maintain their own data centers and servers, resulting in an increasing number of government data centers over a period of time. Cloud computing serves multiple purposes, such as reducing redundant infrastructure and services and improving the sharing of data among national government, state and county agencies, amongst others. While the above benefits are increasingly recognized and embraced by organizations around the globe, a recent study by Tata Consultancy Services (TCS) found surprising regional differences in cloud adoption rates. An average large enterprise in Latin America has some 40% of its total applications in the cloud as SaaS. Asia Pacific follows closely behind with roughly a quarter (28%). In comparison, large firms in the United States have only shifted 19% of their applications to the cloud; in Europe the figure is closer to 12%. Can this lag be attributed to a different perception of implementation risks, a lack of top management support, or to bottlenecks in the legislation environment? Theories of adoption in IS discipline are aimed at understanding, explaining, or predicting how, why and to what extent individuals, firms or organizations will adopt and agree to deploy a new technology (Choudrie & Dwivedi, 2005). Finance Regulatory bodies under the Ministry of National Treasury need to adopt cloud computing because they drive the economy of Kenya, The regulating bodies are KRA, PPOA, PC, RBA, CBK, CMA and IRA

Why Cloud Computing in these Bodies under Study

i. Sharing of information will be much easier

ii. Improve service provision leading to efficiency, effectiveness and/or lowering the cost (time and money) associated with provision of services.

iii. Pricing mechanism (pay as you go).

iv. Its deployment models(private or private)

v. Target Customers(small/medium)

1.2 Problem Statement

According to a survey (KPMG, 2010), government organizations and financial institutions are relatively reluctant to use cloud computing services compared to the private sector, the public sector still trails in adoption of clouding computing. Moreover global public-sector cloud computing adoption remains more in the investigative stages than in actual deployments, whereas the private sectors seems more willing to invest in and deploy the technology
While existing research on cloud computing has been undertaken from the service providers “perspective” there is need for further research that focuses on the organizational “perspective” (Clarke, 2010). The Regulatory Bodies under the Ministry of National Treasury offer very essential services to Kenyans, which requires them to be very efficient and effective in service delivery to Kenyans. To achieve these, new technologies must be adopted mostly the cloud computing for efficient and effective delivery of services. Restudy shows that these organizations have not adopted cloud computing, just using the old way of offering services which are very slow and require a lot of investment in infrastructure. To assess the adoption intention of these bodies on cloud computing specific research questions and objectives need to be set. Cloud adoption is dependent on the type of Clouds and the intended use for the deployment. Using TOE, what factors influence the adoption of cloud computing in these organizations?

### 1.3 Research Objectives

The main objective of this study was to analyze the factors that determine the intent to adopt cloud computing and get empirical evidence for its intention to be adopted by regulating bodies in the ministry of National Treasury in Kenyan government. The research objectives are to

1. Review Cloud Computing technology adoption frameworks.
2. Identify Cloud Computing adoption framework to use.
3. Use the Cloud Computing adoption framework to determine the factors that influence the Intention to adopt Cloud Computing Technology.

### 1.4 Research Questions

From the research objectives the following research questions were derived to guide my research.

1. What are the different cloud computing adoption frameworks?
2. What factors influence the intention to adopt Cloud Computing by KRA, PC, IRA, RBA, PPOA, CBK and CMA

### 1.5 Research outcomes and their significance

The research aims at providing some analysis on what factors determine the intention to adopt cloud computing of these regulating bodies. The analysis will also guide and help the government in adopting this technology in those bodies under study. It will also provide information as to what extend cloud computing has been adopted in these bodies. The findings of
this research will greatly influence the uptake of cloud services which could effectively and efficiently deliver services which would otherwise have been only accessible by large blue chips corporations and multinationals. Over the last five years, the Kenyan government has initiated some capital investment towards set up and installation of ICT infrastructure. Funding for these investments is achieved through partnerships between the government and development partners. So far, the Information Communication & Technology Authority (ICTA) is mandated in approving these ICT projects in all ministries. The government is also connecting the ministries to run integrated information systems for example IFMIS and IPPD.

1.6 Limitations of the Research

The research is only limited to study of cloud computing adoption in the five key regulatory bodies under the ministry of National Treasury, CBK, IRB, KRA, PPOA, PC, RBA and CMA. Cloud computing is still in the early adoption phase which implies that it is not ready to meet enterprise requirements (Staten et al, 2008). But still we can assess how far the adoption has gone in these organizations.

1.7 Justification

For Kenyan government to achieve Vision 2030, new technology adoption should be very effective, this adoption must be done on key government departments and ministries, the ones under study in this research are key for driving the economy to vision 2030 and cloud computing is the technology. If they have access to scalable technologies they could potentially deliver products and services that in the past only large private enterprises could deliver hence flatten the competition arena. (Yazn et al, 2013). Also it will add to body of knowledge and understand cloud computing adoption. The ideal framework would ensure that benefits of cloud adoption are maximized whilst minimizing the risk of cloud adoption. Gap: Many studies have been done on individual level while fewer studies have been done at organizational level in adoption of new technology. TOE encapsulate the adoption factors into one big picture
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction to cloud computing
Computing services are now being treated similar to traditional utilities such as electricity, gas, and water. Various paradigms have been introduced which are aiming to provide computing services as a utility. The computing technologies that are commonly used are four namely, cluster computing, grid computing, parallel computing and cloud computing

Cluster computing
Cluster computing was first proposed by IBM in 1960s. Cluster computing is a form of computing where two or more computer nodes are interconnected in order to have processing power as a single entity. Use of cluster computing is to create redundancy to ensure continuity and reliable availability and provide low-cost high performance computing. The employment of Cluster computing has been relatively slow mainly due to the poor software support.

Grid Computing
Grid computing refers to a particular computer network where each computer node is sharing its resources (e.g. storage, memory, etc.) with every other node. Grid computing can be considered as a special variation of distributed computing. In distributed computing, computer nodes on the same network share the same resources, whereas in grid computing, all the resources on each node are shared which creates a computing power equivalent to the ones in supercomputers. The main set back of grid computing is the lack of a set of standard and policies.

Parallel computing
The use of multiple processors or computers working together on a common task. Each processor works on its section of the problem and Processors can also exchange information. Parallel computing allows one to solve problems that don’t fit on a single CPU and solve problems that can’t be solved in a reasonable time.

2.2 Definition of Cloud Computing
Literature offers many cloud computing definitions; these definitions cover a spectrum of perspectives and come in various degrees of details. Cloud computing has been termed as being confusing (Rimal et al, 2009) as an overloaded phrase with tens of connotations (Pritzer, 2008) and as a technology at the peak of the Gartner hype cycle (Schonfed, 2008). The term cloud computing was first mentioned by Professor Ramnath Chellapa in 1997. He said that cloud computing is going to be a new computing paradigm where the boundaries of computing will be
determined by economic rationale rather than technical limits alone. The first practical implementation of cloud was by Salesforce.com where it became the first enterprise-level application provider by offering its services through Internet. There are uncountable numbers of journal and peer-reviewed conference papers on the definitions, aspects, advantages and disadvantages of cloud computing. (Armbrust et al, 2009) remarks that cloud computing has the potential to revolutionize the IT industry. Among the many definitions of cloud computing, (Zhang et al, 2010) defines cloud computing as an extension to three main computing technologies, which are grid computing, cluster computing and parallel computing.

Cloud Computing Characteristics

Cloud computing models should have the following characteristics according to NIST

- **On-Demand Self-Service:** The cloud user should be able to solely control (e.g. obtain and release) services as required without any human supervision. This greatly improves the cost efficiency of the services hence reducing the number of staff needed.

- **Measured Service:** Similar to other utility services, cloud computing comprises a metering mechanism in order to measure the services provided to each cloud user. In addition, the detailed information about the resource usage could be useful to cloud providers to enhance their services.

- **Broad Network Access:** This characteristic refers to the availability of the resources to a wide range of computing devices (e.g. laptops, hand phones, tablets, etc.) regardless of their operating system, hardware, etc. through standardized network

- **Rapid Elasticity:** This characteristic enables the services to be expanded and contracted to serve the “actual need”. This automated process ensures that service is instantly provided if the demand rises and released if the demand drops and therefore, increasing the efficiency while providing transparency to end-users.

- **Resource Pooling:** Using a method called virtualization, the service provider can use a multi-tenant model in order to pool physical and virtual resources to meet the need of multiple cloud users simultaneously. The geographical locations of the resources should be hidden from the user.
Benefits of cloud computing.

Studies to highlight the benefits of cloud computing have been done; the benefits are many which mostly motivate governments and organizations to migrate to cloud computing. According to (IJAES, volume 8) these are some of the benefits of adopting cloud computing, the key benefits of adopting cloud computing are cost reduction, easy scalability and increased productivity.

i. **Cost Reduction**

The usage of SaaS enables business organizations to minimize payment costs for IT resources and maximize business performance as well as profit. Clients are required to pay according to the use of resources. If clients need an application for a short period of time, it is useless to buy the application by paying the complete licensing cost. The solution based on cloud computing cuts down the cost of paying for the applications and resources that are not in use any more. As the service provider owns and hosts the software, the users can benefit from ongoing upgrades and maintenance without the associated costs and time constraints. With the use of cloud technology clients are not required to create data backups. Cloud providers that use multiple redundant sites can provide reliable and secure locations for data storage and are ideal for disaster recovery and business continuity, So business organizations are not worried about the loss of data and creating recovery backups (Clark .2014)

ii. **Easy Scalability**

Cloud computing is a flexible model and provides on-demand business scalability by using on-demand cloud services such as SaaS, PaaS or IaaS. Scalability is another aspect of cloud computing that can provide an advantage to business. Depending on service needs at any given time period, a company can scale back the amount of virtual server space they need, or raise it according to their pattern of growth. This is especially helpful for new businesses that are trying to save money at every possible turn. A smaller business does not have to pay a fixed rate for a certain amount of data center hosting that they might not even use. In this way, a company can scale up the level of space they need on a dedicated server through cloud computing. A low-cost dedicated server can easily save a business thirty to forty percent of their average annual cost for IT (Clark .2014). If an organization is a SaaS user, it can request to adopt PaaS or IaaS whenever required. With an on-demand integration solution, companies can quickly and easily increase or
decrease connections, transactions, or the number of companies in their integration community, and then scale up when business requires it.

iii. Increased Productivity

In this rapid era of technology and innovations, business is growing rapidly. The demands of customers are increasing with high speed and they need the products more quickly with less time. In order to achieve these demands, business organizations around the globe need to communicate and collaborate by using IT resources such as collaborative applications and remote access web services. Cloud computing provides these business demanded application on the cloud or internet. Users are able to access these applications at anytime and anywhere. Business people can arrange their meetings and share messages or emails by using cloud applications provided by various vendors. Cloud computing has moved mobility ahead in business, as well. Business people can access the services of cloud just by using a web browser on a Smartphone, tablet, or notebook. There is no need to use laptops or desktop computers. With the help of cloud applications, salespersons can view updated orders from customers at any time. The quick processing of customer orders enables organizations to achieve customer satisfaction levels that automatically lead to increased productivity and profit.

2.3 Barriers to Cloud Computing Adoption

For a service to be ready for organization to consume cloud it must pass from the early adopter phase to early majority, Early majority is depicted by a sufficient volume of customers using the service for business and critical purposes. Currently the majority customers of cloud computing are small companies and startups that do not have a legacy of IT investments to manage and developers in business units within IT who are experimenting on the platform (Stafen et al, 2008). A global cloud computing company survey that was done in 2012 by Cloud Techsoup found out that the following barriers are common, amongst developing countries and mostly African countries to adoption of cloud computing. These barriers are-

- Lack of Knowledge: - In-house staff is not knowledgeable to implement, inadequate training available, no consultants available to assist with setup/configuration, senior management doesn’t understand /support cloud use and organization founders don’t understand the cloud.
- Lack of trust: - Concerns about integrating cloud apps with existing IT and cloud computing is not quite ready to depend upon.
- Cost based: Monthly cost are too high, setup and configuration costs are too high, migration of existing apps too difficult or expensive and internet connectivity too expensive.
- Data security: Data security or privacy concerns and data loss concerns
- Non-controllable externalities: Internet connectivity not available/not enough, electric grid not stable enough, government regulations about not sharing data offshore, foreign currency issues and cross border taxation.

### 2.4 Cloud Computing Architecture

Cloud computing architecture consists 4 layers (Zhang et al, 2010). Figure 2.1 below show the cloud computing architecture.

![Cloud Computing Architecture Diagram](image)

- **The Hardware Layer**: This is the first layer in cloud architecture which is dedicated to administering and directing the physical resources (e.g. physical servers, networking hardware). Generally, hardware layer is located in data centers which are used to provide accommodation for computer systems.
- **The Infrastructure Layer**: This is a detachable component of cloud computing which enables resource pooling. This layer which is also known as virtualization layer provides pool of resources by employing the virtualization techniques.
- **The Platform Layer**: This layer consists of platforms and operating systems and is built on top of the infrastructure layer.
• **The Application Layer**: All the applications that are provided through cloud computing reside in the application layer. This is the most accessible layer to the cloud user.

**2.5 Cloud Computing Delivery & Deployment Models**

Cloud Computing Delivery Models

Cloud computing services can be delivered in one of the three main models below:

- **Software as a Service (SaaS)**: This service is the most common and cost efficient service that is provided by cloud computing (Armbrust et al, 2009). It consists of the software and applications that are provided by cloud in order to meet the specific needs of a user. The main difference of cloud software and ordinary software is that cloud software is much more scalable and does not need to be installed on the user’s machine and are usually accessible to cloud users via web browsers. Cloud user has no control over the underlying infrastructure that the software is being run. The cloud provider is usually in charge of managing the operating systems and the underlying infrastructure.

- **Platform as a Service (PaaS)**: This service provides cloud users with development platforms which are usually equipped with software design, development, deployment and testing services. While the cloud user has control over the platform that is being delivered as a service, he has no control over the underlying cloud infrastructure including operating systems, network hardware, storage units, etc. PaaS can help organization to avoid the extreme costs of the purchase and maintenance of the computing resources.

- **Infrastructure as a Service (IaaS)**: This model offers computing resources such as storage and networks in order to enable the user to run his own operating system and user specific applications. Comparing IaaS to SaaS and PaaS, this model provides more flexibility for the user. The cloud user is not able to directly access the cloud infrastructure but has control over the operating system, storage units, software development applications and API’s.

Figure 2.2 shows the difference in the number of parts of the whole server stack that a customer of an IaaS or PaaS provider is able to control compared to a private on-premises server.
Cloud Computing Deployment Models

The cloud providers offer different types of clouds (cloud deployment models) to an organization according to their business requirements. Normally there are four different types of cloud deployment models, i.e. public, private, hybrid and community cloud.

Public clouds

It conveys the basic perception of cloud computing, where cloud users can access the resources on the fly. Services provided by public clouds are usually accessible by public. In public cloud models, the cloud infrastructure are owned and managed by the cloud provider. A public cloud normally delivers services to many unrelated cloud users.

Private Clouds

Private clouds are cloud services provided within the enterprise as shown in figure 2.4 these clouds exist within the company firewall and are managed by the enterprise. Private clouds offer several similar benefits to those of public clouds but with one major difference that the enterprise is in charge of setting up and maintaining the cloud. The difficulty and cost of establishing an
internal cloud can be very expensive, and the cost of continual operation of the cloud might exceed the cost of using a public cloud. Private clouds offer some advantages compared to public clouds such as control over managing the cloud. Organizations feel in control over their cloud services and security (Dustin, 2009)

**Hybrid Clouds**

Hybrid clouds are a combination of public and private clouds. These clouds would typically be created by the enterprise, and management responsibilities would be split between the enterprise and the cloud provider. The hybrid cloud provides services that are in both the public and private clouds as shown in figure 2.5 (IBM, 2010). Hybrid clouds are required when a company needs to employ the services of both a public and private cloud. In this case, a company can outline the goals and needs of services, and obtain them from the public or private cloud as appropriate. A well-constructed hybrid cloud can be useful for providing secure services such as receiving customer payments, as well as employee payroll processing.

**Community Clouds**

The community cloud is a new and rarely offered cloud model. These clouds are based on a group of several organizations that jointly construct and share the same cloud infrastructure as well as policies, requirements, values, and concerns. These community clouds are normally
based on an agreement between related business organizations such as banking or educational organizations. The cloud infrastructure can be hosted by a third-party vendor or one of the organizations within the community (Dillon et al., 2010)

2.6 Cloud Computing Security.
There are a few organizations that are devoted in identifying the possible threats. Cloud Security Alliance has done many researches on identifying security threats of cloud computing in different organizations. According to Cloud Security Alliance, 2010, these threats include:

i. Abuse and Nefarious Use of Cloud Computing: Cloud services are provided to users with relatively high level of anonymity. Therefore, anyone holding a valid credit card can sign up for powerful cloud processing capabilities. The high degree of anonymity enables malicious users (e.g. hackers, crackers, etc.) to simply exploit this computing power in mounting organized attacks such as Denial of Service attacks, password cracking, CAPTCHA solving firms, etc. Primarily, PaaS providers are more prone to this kind of attacks than IaaS. Evidently, SaaS providers are also threatened by such attacks.

ii. Insecure Interfaces and APIs: Generally, cloud providers enable cloud users to access the services with use of software interfaces and APIs. The task of managing and monitoring cloud services is therefore controlled using these interfaces and APIs. Hence, the security of the cloud is greatly dependant on the security of the underlying interfaces and APIs.

iii. Malicious Insiders: This threat has been around for a long time and it is not only related to cloud environments. However, it is quite amplified in cloud computing settings. This is due to the fact that a large number of users are related in via the same cloud computing provider.

iv. Shared Technology Issues: This threat is specific to IaaS providers where they offer highly elastic infrastructure as service to a large number of cloud users. However, these infrastructures are not originally designed to provide strict isolation for a shared environment. While the virtualization software is in place to isolate each user’s services and data and address this issue to a certain point, it still cannot address this problem completely.

v. Data Loss or Leakage: When organizations move to cloud, the cloud provider is in charge of disaster recovery and needs to back-up the users’ data on regular basis. Therefore, any shortcoming on the cloud provider’s side may result in users data loss. In addition, since the entire users’ data is stored in encrypted format (for data protection purposes), the loss of the decryption key by the cloud user may cause vanishing of all his/her data. Lastly, the chance
of data compromisation increases in cloud setting due to its architecture and its nature to be a worthy target for computer hackers and crackers.

vi. Account or Service Hijacking: These types of threats have been around for a long time. Impersonation, identity theft, and phishing attacks are some examples that can lead to account hijacking. Nevertheless, these threats are amplified in case of cloud computing due to the possibility that if the user’s credentials are disclosed to the attacker it would enable him to access or alter the user’s personal data. The hijacked accounts will then be used as new platforms for subsequent attacks.

2.7 Cloud Computing Adoption in Finance Regulating Bodies.

Countries like USA, India and Singapore have adopted cloud computing in most of their financial regulating bodies for example their Federal Central Banks. South Africa, Kenya and Nigeria are leading countries in the use of cloud computing in sub-Saharan Africa as by the year 2013. According to the survey carried out by Cisco and the World Wide Worx, Cisco, (2013). The study found that 50% of South Africa organizations 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 not to be growing fast enough to retain that position in years to come. For Kenya, in addition to 48%, another 24% of organizations in Kenya were considering adopting within a short while. How are the government bodies preparing to be among the 24% considering taking up cloud computing and what will enhance that consideration (Intention to adopt cloud computing).

2.8 Cloud Computing Adoption models.

Cloud computing will be adopted by firms /organizations that are likely to use a more hybrid process of on-premise, “public” cloud and “private” cloud services when appropriate (Goscinski &Brock, 2010). The concept of private cloud computing involves firms deploying key enabling technologies, such as virtualization and multi-tenant applications to create their own private cloud database. Individual business units then pay the IT department for using industrialized or standardized services in line with agreed charge back mechanisms. Considering the way in which adoption of cloud computing can revolutionize the business scenario in different technological innovations, its facilities and resources could be accessed on demand (Tuncay, 2010). Many previous studies in the field of cloud computing have addressed the areas of new technologies, security requirement and the future expectations in these emerging environments. From the
financial point of view, (Misra and Mondal, 2010) built two types of business models that can be drawn for companies (cloud users) willing to adopt cloud computing services. There are business models for companies/organizations with an existing IT infrastructure and business models for startup companies. A contemporary survey found that the current changing pattern and other factors of the cloud make it highly suitable for small-and medium-sized firms (Misra & Mondal, 2010). However, firm size was found to have an effect on perceived strategic importance of cloud computing in innovative technological development. (Pyke, 2009) has stated that firm applications typically would be in charge of their localized sets of processes, with the connection of applications to these processes. Cloud adoption is not only an IT issue, numerous commercial and regulatory considerations must also be evaluated before cloud solution can be implemented, including the location of corporate data and the repercussions it will have on legal jurisdiction and compliance. The impact on business processes and the ability of the business to react to changing market conditions after a cloud service has been implemented must also be assessed.

There are many models in technology adoption. The most used models are the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT), DOI (Rogers 1995), and the TOE framework (Tornatzky and Fleischer 1990). This research will look at only DOI and TOE models because they are the only ones that are at the firm level. The TAM, TPB and UTAUT are at the individual level.

2.8.1 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), shown in Figure 2.6 (Davis et al, 1989) is one of the implementing theories that is most used and cited. This model posits that two independent factors namely perceived ease of use and perceived usefulness have an influence on a dependent construct called intention to use and ultimately the usage behavior. Venkatesh et al. (2003, p. 428) explain that “TAM was designed to predict information technology acceptance and usage on the job.” In the Technology Acceptance Model, the fundamental factors that influence ICT officers’ attitudes towards using cloud computing and intended use are Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness is how a user feels that the innovation contributes to make the work more effective and improves the results. Perceived Ease of Use measures the effort the user has to exert to use the system. They are both influenced by external variables. (Venkatesh and Davis 2000) extended the model with explanations on what contributes to
Perceived Usefulness and Perceived Ease of Use. The new model is called TAM 2 (Venkatesh and Davis 2000, Chuttur 2009).

**Dependent Constructs** – Intention to use, Usage Behavior

**Independent Constructs** – Perceived Usefulness, Perceived Ease of Use

TAM 2 is the extended version of the technology acceptance model, proposed by Venkatesh and Davis (2000). The model is extended with factors that affect both Perceived Usefulness and Perceived Ease of Use. The factors that influence the perceived usefulness are Result Demonstrability, Output quality, Job relevance, Image and Subjective Norm. Subjective Norm is moderated by two factors namely Experience and voluntariness.

Subjective Norm is defined as a person’s perception that most people who are important to him think he should or should not perform the behavior in question (Fishbein, 1975). This may include ones superiors, co-workers, professional colleagues, friends and even family. Image is the “degree to which use of an innovation is perceived to enhance one’s status in one’s social system” (Moore, 1991). Therefore, Image can be seen as what an individual feels that he is portraying to others by using a particular technology.

Voluntariness is the perception by the user on whether the use of technology is mandatory or otherwise. Job relevance explains the user’s perception on the fit between the technology and the task in terms of supportiveness in the achievement of goals. The indicator of the technologies in performing regular work tasks well is reflected by Output Quality, while the last factor Result
Demonstrability is an indicator of the results of the system to signify how useful a technology is. Without any existing demonstrable positive results from the technology, the user might have doubts about the usefulness of the technology and how the technology can be used. Venkatesh and Davis (2000) state that implementing an effective system can lead to failure if the Perceived Usefulness cannot be demonstrated.

### 2.8.2 UTAUT Model

(Venkatesh et al., 2003) proposed The Unified Theory of Acceptance and Use of Technology (UTAUT) (depicted in figure 2.7) which compared and combined eight previous adoption theories through empirical studies; the Theory of Reasoned Action, Technology Acceptance Model (TAM1 and TAM2), Motivational Model, Theory of Planned Behavior, Combined TAM and TPB, Model of PC Utilization, Innovation Diffusion Theory, and Social Cognitive Theory. UTAUT is used in this study in the analysis of the gathered data. In the UTAUT model the independent constructs are Performance Expectance, Effort Expectancy, Social Influence which have a direct influence on behavioral intention while the other independent construct Facilitating Conditions has direct influence on the actual use behavior of the system.

![Figure 2.7 UTAUT Model](image)

**Dependent Constructs** – Behavioral Intention, Use Behavior

**Independent Constructs** – Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions
Moderating Variables – Gender, Age, Experience, Voluntariness of use

(Venkatesh et al, 2003) defined Performance Expectancy as perception the individual has that the system will improve job performance which he argued was the most influential factor on behavioral intention. Effort Expectancy reflects the amount of time and degree of effort individuals think will be spent using the system. Social Influence is what the user considers others to think of a system while Facilitating Conditions includes the equipment and other infrastructure that are necessary to use the system.

2.8.3 Diffusion of Innovation (DOI) Model for Technology adoption

DOI is a model of how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and firm level. DOI model sees innovations as being communicated through certain channels over time and within a particular social system (Rogers 1995). Individuals are seen as possessing different degrees of willingness to adopt innovations, and thus it is generally observed that the portion of the population adopting an innovation is approximately normally distributed over time (Rogers 1995). Breaking this normal distribution into segments leads to the segregation of individuals into the following five categories of individual innovativeness (from earliest to latest adopters): innovators, early adopters, early majority, late majority, laggards (Rogers 1995). The innovation process in organizations is much more complex. It generally involves a number of individuals, perhaps including both supporters and opponents of the new idea, each of whom plays a role in the innovation-decision. Based on DOI model at firm level (Rogers 1995), innovativeness is related to such independent variables as individual (leader) characteristics, internal organizational structural characteristics, and external characteristics of the organization. (a) Individual characteristics describe the leader attitude toward change. (b) Internal characteristics of organizational structure includes observations according to Rogers (1995) whereby: “centralization is the degree to which power and control in a system are concentrated in the hands of a relatively few individuals”; “complexity is the degree to which an organization’s members possess a relatively high level of knowledge and expertise”; “formalization is the degree to which an organization emphasizes its members’ following rules and procedures”; “interconnectedness is the degree to which the units in a social system are linked by interpersonal networks”; “organizational slack is the degree to which uncommitted resources are available to an organization”; “size is the number of
employees of the organization”. (c) *External characteristics of organizational* refer to system openness.

![Diffusion of Innovation Model](image)

**Figure 2.8 Diffusion of Innovation Model**

Since the early applications of DOI to IS research and technology adoption, the model has been applied and adapted in various ways.

Table 2.1 Some Studies Based On DOI Model (Rogers 1995)

<table>
<thead>
<tr>
<th>IT Adoption</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material requirements planning (MRP)</td>
<td>(Cooper and Zmud 1990)</td>
</tr>
<tr>
<td>IS adoption (uses at least one major software application: accounting; inventory control; sales; purchasing; personnel and payroll; CAD/CAM; EDI; MRP), and extent of IS (number of personal computers and the number of software applications)</td>
<td>(Thong 1999)</td>
</tr>
<tr>
<td>Intranet</td>
<td>(Eder and Igbaria 2001)</td>
</tr>
<tr>
<td>Web site</td>
<td>(Beaty et al. 2001)</td>
</tr>
<tr>
<td>Enterprise resource planning (ERP)</td>
<td>(Bradford and Florin 2003)</td>
</tr>
<tr>
<td>E-procurement</td>
<td>(Li 2008)</td>
</tr>
<tr>
<td>E-business</td>
<td>(Zhu et al. 2006a)</td>
</tr>
<tr>
<td>E-business</td>
<td>(Hsu et al. 2006)</td>
</tr>
</tbody>
</table>

2.8.4 **Technology, Organization, and Environment (TOE) adoption framework.**

Although various factors affect cloud computing adoption among prior researchers’ findings, all these factors can be classified into technological, organizational, or environmental contexts. Thus, it is feasible to apply the technology-organization-environment (TOE) framework to explore the cloud computing adoption issue. Most studies have explored the importance of the technological factors affecting cloud computing adoption. However, the influences of environmental and organizational factors on cloud computing adoption vary across different industry/organization contexts. Therefore, there is a need to analyze the determinants of cloud
computing adoption intentions in different industries to acquire a better understanding of cloud computing adoption

The TOE framework was developed in 1990 (Tornatzky and Fleischer 1990). It identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context. While the extant literature provides a fundamental understanding of cloud computing, it lacks empirical studies with broad data sets that rigorously examine the factors that might affect the adoption intentions of cloud computing (Behrend et al., 2010; Lin and Chen, 2012; Low et al., 2011). Furthermore, most current cloud adoption literature treats cloud computing as merely another IT adoption issue. However, there are many unique cloud characteristics that are very different from traditional IT innovations, such as its target customers (small and medium firms), its pricing mechanism (pay-as-you-go), and its deployment models (public/private).

(a) **Technological context** describes both the internal and external technologies relevant to the organization. These includes current practices and equipment internal to the firm (Starbuck 1976), as well as the set of available technologies external to the firm. (b) **Organizational context** refers to descriptive measures about the organization such as scope, size, and managerial structure. (c) **Environmental context** is the arena in which a firm conducts its business, its industry, competitors, and dealings with the government. Several authors used only the TOE framework to understand different IT adoptions, such as: electronic data interchange (EDI) (Kuan and Chau 2001); open systems (Chau and Tam 1997); web site (Oliveira and Martins 2008); e-commerce (Liu 2008, Martins and Oliveira 2009, Oliveira and Martins 2009); enterprise resource planning (ERP) (Pan and Jang 2008); business to business (B2B) e-commerce (Teo et al. 2006); e-business (Zhu et al. 2003, Zhu and Kraemer 2005, Zhu et al. 2006b, Lin and Lin 2008, Oliveira and Martins 2010a); knowledge management systems (KMS) (Lee et al. 2009)

Figure 2.9 Technology, Organization & Environment Framework (Tornatzky & Fleisher 1990)
For this research TOE framework will be used to identify technological context, organization context and environmental context for cloud computing adoption intentions for selected government agencies. The factors have been identified for analysis of case studies and there is commonality with factors used by other scholars using TOE framework. More important, the framework was originally developed to link Information Systems innovation adoption decisions with contextual factors, thus it can be considered to fit with cloud computing as an emerging technology (Chau and Tam1997). The TOE framework positions the influences of the factors from three contexts (Technology, Organization and Environment) on the organization’s adoption decision. The framework offers a holistic view on the multiple facets of an organization rather than focus on an individual’s viewpoint such as the Technology Acceptance Model. Studies show that the following three features influence cloud computing adoption: technological context (relative advantage, complexity, and compatibility), organizational context (top management support, firm size, and technology readiness), and environmental context (competitive and trading partner pressures). As TOE framework includes the environment context, it becomes better able to demonstrate intra-firm innovation technology adoption; therefore, we consider this model to be more exhaustive (Zhu et al., 2004) Cloud computing adoption milestones can also be mapped from the TOE framework, these milestones include: Tendering processes, Proof of concept, Vendor selection, Infrastructure service, Virtual desktop, Platform service, Enterprise software as service, Integrated cloud platform and Competitive offering.

2.8.5 Related Studies that used TOE framework for technology adoption

Several scholars have used the TOE framework to understand different IT adoptions, such as: electronic data interchange (EDI) (Kuan and Chau 2001); open systems (Chau and Tam 1997); web site (Oliveira and Martins 2008); e-commerce (Liu 2008, Martins and Oliveira 2009, Oliveira and Martins 2009); enterprise resource planning (ERP) (Pan and Jang 2008); business to business (B2B) e-commerce (Teo et al. 2006); e-business (Zhu et al. 2003, Zhu and Kraemer 2005, Zhu et al. 2006b, Lin and Lin 2008, Oliveira and Martins 2010a); knowledge management systems (KMS) (Lee et al. 2009). The variables analyzed, methods used, data, and context of empirical studies are presented in the table.
Table 2.2 Some Studies Based On TOE Model

<table>
<thead>
<tr>
<th>IT Adoption</th>
<th>Analyzed Variables</th>
<th>Methods</th>
<th>Data, context and Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI</td>
<td><strong>Technological context</strong>: perceived direct benefits; perceived indirect benefits. <strong>Organizational context</strong>: perceived financial cost; perceived technical competence. <strong>Environmental context</strong>: perceived industry pressure; perceived government pressure.</td>
<td>Factor analysis (FA), and Logistic regression</td>
<td>Letter with questionnaires was sent; 575 small firms Hong Kong (Kuan and Chau 2001)</td>
</tr>
<tr>
<td>ERP</td>
<td><strong>Technological context</strong>: IT infrastructure; technology readiness. <strong>Organizational context</strong>: size; perceived barriers. <strong>Environmental context</strong>: production and operations improve enhancement of products and services; competitive pressure; regulatory policy.</td>
<td>FA, and Logistic regression</td>
<td>Face-to-face interview, 99 firms Taiwan (Pan and Jang 2008)</td>
</tr>
<tr>
<td>E-business</td>
<td><strong>Technology competence</strong>: IT infrastructure; e-business know-how. <strong>Organizational context</strong>: firm scope firm size. <strong>Environmental context</strong>: consumer readiness; competitive pressure; lack of trading partner readiness. Controls (industry and country effect)</td>
<td>Confirmatory factor analysis (CFA)logistic regression, and cluster analysis</td>
<td>Telephone interview during 2000; 3552 firms European (Zhu et al. 2003)</td>
</tr>
<tr>
<td>E-business usage</td>
<td><strong>Technological context</strong>: technology competence. <strong>Organizational context</strong>: size; international scope; financial commitment. <strong>Environmental context</strong>: competitive pressure; regulatory support.</td>
<td>CFA, second-order factor modelling, and SEM</td>
<td>Telephone interview during 2002, 624 firms across 10 countries (Zhu and Kraemer 2005)</td>
</tr>
<tr>
<td>e-commerce development</td>
<td><strong>Technological context</strong>: support from technology; human capital; potential support from technology. <strong>Organizational context</strong>: management level for information; firm size. <strong>Environmental context</strong>: user satisfaction; e-commerce security. Controls: firm property</td>
<td>FA and OLS</td>
<td>e-mail survey, online survey and telephone interview during 2006; 156 firms. Shaanxi, China (Liu 2008)</td>
</tr>
</tbody>
</table>

2.8.6 Conceptual Framework.

Cloud computing service is a relatively new area, and there has not been much research discussing cloud computing. In this study the research model is developed from TOE framework which incorporates Technology, Organizational and Environmental contexts as determinants of the intent to adopt cloud computing. TOE was used because it looks at the organization as a whole as opposed to the other models that look at the individual level of technology adoption. The TOE framework can be used for studying different types of innovations, in addition to specific IT innovations such as Cloud Computing. Thus, TOE framework is more appropriate for this study, and it provides a good starting point for investigating and analyzing the factors
influencing the intent to adopt cloud computing because it has many consistent empirical supports. Technological characteristics are frequently studied among the three contexts in the literatures. Within this context, compatibility and complexity are found to be two most important characteristics followed by relative advantage, and so on. In the organizational context, top management support comes as the most cited factor followed by technological readiness, organization size, enterprise integration, and so on. Environmental context includes competitive pressure, external support, governmental policy, information visibility and so on.

**Why Use TOE Framework in This Research**

i. Factors have be identified from analysis of case studies and their commonality

ii. Framework was originally developed to link information systems innovation adoption decisions with contextual factors thus can be considered to fit with cloud computing as an emerging technology.

iii. Lacks empirical studies with broad data sets

iv. Recent research treats cloud computing as a mere IT innovation. Its unique and has unique characteristics compared to other innovations. eg pricing mechanism.

v. TOE also looks at Organizational Perspective as opposed to majority of the framework looking at Individuals Perspective

![Conceptual Framework](image)

*Figure 2.10 Conceptual Framework*

Research hypothesis were developed from the conceptual framework in figure 2.10
a) Technology Context

Relative Advantage

In the conceptual framework, there are four factors in the technology context, relative advantage, complexity and compatibility. Support for the importance of the perceived benefits of innovative technology is abundant in the IT adoption literature (Grandon and Pearson, 2004; Venkatesh and Bala, 2012; Zhu et al., 2006a, 2006b). Perceived benefits refer to the operational and strategic benefits a firm can expect to receive from cloud computing, and some of those advantages are mobility, efficiently reducing computing costs, easy installation and maintenance, and easy performance of data analysis over the Internet. Since cloud computing delivers its service completely through the Internet, employees do not have to stay on-site to perform data analyses and other operations; with an Internet connection, mobility is greatly enhanced. Also because of cloud computing, firms no longer need to invest formidable amounts of resources on building information systems because the installation, maintenance, and upgrade routines are now managed by the cloud computing vendors, which can further reduce IT-related costs. Based on the previous explanation, cloud computing can generate an incomparable advantage (Hayes, 2008; Iyer and Henderson, 2010). Therefore, the argument above leads to the following hypothesis:

\( H_1(+) \): **Relative advantage will have a positive effect on the Regulatory body’s intention to adopt Cloud Computing Technology.**

Compatibility

Compatibility refers to the degree to which innovation fits with the potential adopter’s existing values, previous practices and current needs (Rogers, 1983). Compatibility has been considered an essential factor for innovation adoption (Cooper and Zmud, 1990; Wang et al., 2010). When technology is recognized as compatible with work application systems, firms are usually likely to consider the adoption of new technology. When technology is viewed as significantly incompatible, major adjustments in processes that involve considerable learning are required. Thus, the following hypothesis is proposed:

\( H_2(+) \): **Compatibility will have a positive effect on the Regulatory body’s intention to adopt Cloud Computing Technology.**
Complexity
The expected benefits of embedded cloud computing services include the following: speed of business communications, efficient coordination among firms, better customer communications, and access to market information mobilization (Armbrust et al., 2010; Hayes, 2008). However, firms may not have confidence in a cloud computing system because it is relatively new to them (Buyya et al., 2009). It may take users a long time to understand and implement the new system. Thus, complexity of an innovation can act as a barrier to implementation of new technology; complexity factor is usually negatively affected (Premkumar et al., 1994). The diffusion of the innovation model is inclined toward investigating the adoption of new technology (Rogers, 1983). These leads to the following hypothesis

**H$_3$**: Complexity will have a negative effect on the Regulatory body’s intention to adopt Cloud Computing Technology.

---

b) Organizational Context

The organizational context includes attributes such as size, quality of human resources, and complexity of the firm’s managerial structure (Hong and Zhu, 2006; Oliveira and Martins, 2010).

**Top Management Support.**

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

**H$_4$**: Top management support will have a positive effect on the Regulatory body’s intention to adopt Cloud Computing Technology.

**Firm size.**

Previous research has found that the size of a firm is one of the major determinants of IT innovation (Dholakia and Kshetri, 2004, Hong and Zhu, 2006; Pan and Jang, 2008). It is often
reported that large firms tend to adopt more innovations, largely due to their greater flexibility and ability to take risk (Pan and Jang, 2008; Zhu et al., 2004). Consequently, firm size is an important factor that affects the perceived strategic importance for cloud computing adoption. Thus, the following hypothesis is proposed:

\[ H_5(+) \text{Organization size will have a positive effect on the Regulatory body’s intention to adopt Cloud Computing Technology.} \]

c) Environmental Context

As shown in the model, the external pressure factor is included in the environmental context. There are three perspectives from which to discuss the external pressure: pressure from trading partners, competitive pressure, regulations and government policies (Kuan and Chau, 2001; Zhu et al., 2006a, 2006b). Trading partner pressure suggests that perceived pressure from upstream and downstream business partners influence a firm to adopt new technology in order to maintain cooperative relationships. Competitive pressure refers to perceived pressure from business competitors that force a firm to adopt new technology for the sake of maintaining competitiveness.

**Government Support.**

Regulations and government policies that support a government agency to adopt new technology increases adoption rate to the new technology. Policies need to support the organizations in order to fasten the adoption. Therefore, the arguments above lead to the following hypothesis:

\[ H_6(+) \text{Government support will have a positive effect on the Regulatory body’s intention to adopt Cloud Computing Technology.} \]

**Competitive pressure/Willingness to collaborate among government organizations**

There are abundant studies to support the idea that the greater the external pressure, the greater the motivation for a firm to adopt information technology (Grandon and Pearson 2004; Kuan and Chau 2001; Zhu et al. 2006a, 2006b). In recent cloud computing adoption research, (Low et al. 2011) mentioned that pressure from trading partners has significant influence on the adoption of cloud computing. Competitive pressure can force firms to adopt cloud computing. Competitive pressure refers to the level of pressure felt by the firm from competitors within the
industry (To & Ngai, 2006; Oliveira and Martins, 2010). They have been suggested that the experience of intense competition is an important determinant of IT adoption (Kuan and Chau, 2001; Zhu et al., 2004). By adopting cloud computing, firms will benefit greatly from better understanding of market visibility, greater operation efficiency, and more accurate data collection (Misra and Mondal, 2010). Additionally, many firms rely on trading partners for their IT design and implementation tasks (Pan and Jang, 2008). Some empirical research studies have suggested that trading partner pressure is an important determinant for IT adoption and use (Chong and Ooi, 2008; Lai et al., 2007; Lin and Lin, 2008; Pan and Jang, 2008; Zhu et al., 2004). Thus, the following hypothesis is drawn:

$$H_{7(+)Willin}$$

Willingness to collaborate among government organizations has positive effect on the Regulatory body's intention to adopt Cloud Computing Technology.
CHAPTER THREE: RESEARCH METHODOLOGY

This chapter presents the procedures that were used in conducting the study. It is organized into the following sub-headings: research design, target populations, sampling technique, research instrument, data collection procedures and sources and data analysis techniques.

3.1 Research Design

According to (De Vosh, 1998) a research design is a blue print or detailed plan on how a research study is conducted. (Kathori, 1998) says decisions regarding WHAT, WHERE, HOW, MUCH, by WHAT means concerning an inquiring or research study constitute research design. After critical analysis of the literature and careful evaluation of different research designs, exploratory design was found to be the most appropriate for this research because:

i. Investigations on models/frameworks an organization can use when it intends to adopt cloud computing are sparse.

ii. The limited number of investigating models/frameworks for adopting cloud computing means that the research in this field is young in government and therefore there is the need to be flexible and adaptable in this research.

Using empirical study, information was collected about CBK, IRB, RBA, KRA, PPOA, PC and CMA on their current intent to adopt cloud computing and ICT Infrastructure. Questionnaires were most appropriate for collecting primary data because of the following reasons:

i. It has been successfully used before in technology adoption studies using TOE model and other models.

ii. Helps prevent bias

iii. It is the appropriate tool that enables user to reach as many respondents as possible.

The questions addressed a range of issues including business goals and strategy, execution and program management, benefits realization and measurement of success, and organizational readiness of the cloud. The questions were guided by TOE framework model.
3.2 Target Population

(Polit&Beck,2004) define a population as the entire aggregation of cases that meet a given set of criteria. The target population was the aggregate of cases about which a researcher would like to make a generalization. In descriptive research the research design must make enough provision for protection against bias and must maximize reliability with due concern for economical completion of the research study. The target population was the persons that were concerned with ICT and IT in the financial regulatory bodies under the ministry of National Treasury. Eligible respondents for study were ICT officers and Senior IT managers of each of these agencies. (Polit&Beck,2004) define eligibility criteria as the criteria that specify the characteristics that people in the population must possess to be considered for inclusion in a study. These individuals were chosen because they were most likely familiar with the IT challenges facing the organizations, were likely to be involved in the formulation and implementation of ICT strategies and were likely to have a bird’s view of the effectiveness and efficiencies related to ICT investments.

3.3 Sampling Frame & Sample size

Details of the target population were obtained from Human Resource Department of these government agencies. In the Ministry of National Treasury website we have 7 regulating bodies under its supervision. All these bodies were studied. The details obtained for these people to be studied serves as the sampling frame. When field studies are undertaken, consideration of time and cost almost invariably lead to selection of respondents. The respondents selected represented the total population as much as possible in order to have good results (Kathori,2004). The homogeneity of the respondents in the target population was achieved due to their professional, academic training and orientation.

3.4 Data Collection Analysis

From the result model a questionnaire was designed to collect the primary data on each of the variables. According to (Katheri,2004) while designing data collection procedure, adequate safeguards against bias and uncertainty was ensured, Data was collected and edited to remove errors coded and entered into SPSS software for quantitative analysis. Data was analyzed according to descriptive statistics. The composite scores of the seven factors was calculated and the mean, Standard Deviation and Regression Equation developed. From the conceptual
framework, questionnaires were developed. In research model each component had its own specific questions/items to be considered or questioned. The questionnaire was structured to capture the organizations profile, drivers and barriers of cloud computing, as well as the factors (e.g. technological, organizational and environmental) that influence the intention to adopt cloud computing. All variables and constructs were measured using 5-point Likert type scales. In order to be able to select the appropriate method of analysis; the level of measurement was understood. For each type of measurement, there was an appropriate method that was to be applied rather than others. In this research, Likert scale was used, ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement degree was used in the questionnaires.

Table 3.1 Likert Scale

<table>
<thead>
<tr>
<th>Respondent</th>
<th>completely disagree</th>
<th>somewhat disagree</th>
<th>neutral</th>
<th>somewhat agree</th>
<th>completely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

The questionnaire was provided with a cover letter which explains the purpose of this research, the aim of the research and the privacy of the information in order to encourage high response. The questionnaire was composed of three parts as follows.

**Part A**: General Personal Information, which consisted of 9 items

**Part B**: Intent to Adopt Cloud Computing. (Likert scale questions), consisted of 17 items

**Part C**: Intent To Adopt Cloud Computing (guided questions), consisted of 4 items

In the development of the questionnaire, I took into account the questions formulation covering all aspects of literature review, and meeting all the requirements and variables affecting the research hypotheses, taking into account that most of the questions were clear and their endings were closed for ease and speed to answer and ease to analysis. The majority of questionnaires were distributed personally to population members, in order to explain the questionnaire and to clarify any ambiguity in it taking into account the seriousness in answering it. Table 3.2 shows how the distribution of questions in the questionnaire
Table 3.2 Distribution of Question per each Paragraph Construct

<table>
<thead>
<tr>
<th>No</th>
<th>FIELD</th>
<th>Items for each Field</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relative advantage</td>
<td>10,11,12 &amp; 13</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Compatibility</td>
<td>14,17,18,19 &amp; 20</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Complexity</td>
<td>27,28,29 &amp; 20</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Top Management Support</td>
<td>21,22 &amp; 23</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Firm size</td>
<td>5,7 &amp; 34</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Government Support</td>
<td>24,25 &amp; 32</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Willing to collaborate with other government organizations</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Organizational readiness (financial &amp; Technical)</td>
<td>26,30,36,2 &amp; 9</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Intent to adopt cloud computing</td>
<td>15,16,33,37,38,39 &amp; 40</td>
<td>7</td>
</tr>
</tbody>
</table>

All paragraphs of the questionnaire 40

3.5 Research Procedure:

First, main fields of the questionnaire and items for each field were identified, and then a preliminary questionnaire was prepared for use in the data and information collection. The questionnaire was submitted to the supervisor, in order to test their suitability for data collection, and then modify the questionnaire primarily according to the vision of the supervisor. The final form of the questionnaire was distributed to the organizations under study. Finally, the data retrieved from questionnaires was coded and entered into SPSS statistical software for analysis and statistical results obtained.

3.6 Validity

Valid research is about the appropriateness of the choices you make in terms of your research strategy and data collection analysis techniques. The primary objectives of validity is to reduce errors and biases in a study (Yin, 2003). The following proposed questions were used to test validity (Sauders et. al, 2009).
i. Will the measures yield the same outcome on other occasions?
ii. Will comparable observations be achieved by future observers?
iii. Is it clear how sense was made from raw data?

### 3.7 Reliability

Reliability in research is the concept of trust; can your results be trusted? The research is reliable if it uses valid strategies and techniques appropriate to research objectives. Also one should have detailed record of the research plan and its implementations. Questions will be raised about the ability of the researcher to collect unbiased response or data. The unbiasness was reduced by informing the participants of the purpose of the research, the use of the data collected, and the manner in which the participants assist me the researcher and finally within the period of conducting the research and analyzing the findings, I avoided meeting the participants either formally/informally to avoid influencing their thought on cloud computing.
CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter contains analysis of the findings from the study. The data was collected by filling questionnaires. Since the purpose of this research is to identify the factors/concerns/barriers and challenges of the adoption of the Cloud Computing in regulating bodies; the descriptive analytical approach was used in this research. In order to analyze the qualitative and quantitative data of the research, the questionnaire was used as a main tool for collecting primary data, and was analyzed through SPSS statistical software. The research population consisted of senior ICT staffs who were involved in decision making concerning ICT/IT policies in these organizations. Completed questionnaires were edited for accuracy, consistency and completeness. Summary of the findings were presented by use of percentages, frequencies, means, standard deviation and tables.

4.1 Preliminary Results

This section covers the preliminary results of the study. The result includes response rate, reliability test and validity test.

4.1.1 Response Rate

A total of 42 questionnaires were issued out. The completed questionnaires were edited for completeness and consistency. Of the 42 questionnaires used in the sample, 42 were returned. The returned questionnaires’ represented a response rate of 100%; this is above 10% (Mugenda and Mugenda) which the study considered adequate for analysis.

4.1.2 Reliability Test

(Trochim&William 2006) reliability has to do with the quality of measurement. Reliability refers to the consistency of measurement and is assessed using the internal consistency reliability test. This test is preferred due to the fact that it does not require either splitting of a scale or the subject retaking the test for a given construct. It requires a single administration and provides a unique quantitative estimate of the internal consistency of a scale. Since Cronbach’s Alpha is the most commonly used measure of co-efficient of internal consistency, the study adopted the Cronbach’s Alpha. A co-efficient of 0.70 or more implies that there is a high reliability of data (Saunders,Lewis & Thornhill, 2009). The study therefore used 0.70 as a bench mark to determine the reliability of the questionnaire to be used. The questionnaire in Appendix I was subjected to
Cronbach’s alpha test and the 38 item instrument resulted $\alpha = 0.737$, meaning the questionnaire was very reliable.

Table 4.1 Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.737</td>
<td>38</td>
</tr>
</tbody>
</table>

### 4.2 Demographic Information

This section covers the response obtained from the respondents in terms of the general information. More specific, the findings refer to the respondents rating on gender, level of education, age bracket, years of experience, and years since establishment, role of respondents on ICT matters at work and level of conversance with cloud computing issues.

Table 4.2 Demographic Results

<table>
<thead>
<tr>
<th>Sub Items</th>
<th>Frequency</th>
<th>Percentage %</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td><strong>Academic Level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>12</td>
<td>28.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Masters</td>
<td>19</td>
<td>57.1</td>
<td>85.7</td>
</tr>
<tr>
<td>PhD</td>
<td>11</td>
<td>14.3</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 30</td>
<td>20</td>
<td>42.9</td>
<td>42.9</td>
</tr>
<tr>
<td>30-40</td>
<td>22</td>
<td>57.1</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Years of Experience</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>6</td>
<td>14.3</td>
<td>14.3</td>
</tr>
<tr>
<td>5-&lt;10</td>
<td>18</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>10-&lt;15</td>
<td>18</td>
<td>42.9</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Years since Establishment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>12</td>
<td>28.6</td>
<td>28.6</td>
</tr>
<tr>
<td>&gt;10</td>
<td>30</td>
<td>71.4</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

The following can be noted from the results in table 4.2 above.
i. The respondents were asked to indicate their gender. 83% were male while 17% were female. This showed gender imbalance in these organizations.

ii. The respondents were asked to state their highest level of education. The results indicated that majority (57.1%) of the respondents were masters holders, 28.6% were first degree graduates and the rest 14.3% had PhD level of education. This showed that the respondents had the right qualification to understand cloud computing issues.

iii. The study sought to determine the age distribution of the respondents. The respondents were distributed across all the age brackets used in the study. More specific; 57.1% of the respondents were of age bracket 30-40 years and the remaining 42.9% were of age below 30 years.

iv. The study sought to investigate the length in years’ experience amongst the respondents. 42.9% of the respondents had work experience ranging from 5 to 15 years while only 14.3% had worked for less than 5 years. This showed that the respondents had wealth of knowledge on their respective roles in the organizations.

v. The respondents were asked to state the number of years since the establishment of their firms. The findings showed that majority of the firms had been in existence for over 10 years. On the other hand 28.6% of the firms had been in operation for a period of 1 to 5 years. In general most firms have operated for long period of time and as such understand the dynamics of the industry. Hence need to understand cloud computing well.

**4.3 Distribution of Respondents by Role in ICT Matters at Work**

When asked to state their roles at work, 57.1% of the respondents were responsible for formulating policy in ICT matters at work, 28.6% were concerned with developing and deploying software and 14.3% were tasked with user support and maintenance at their respective firms.

<table>
<thead>
<tr>
<th>Role in ICT matters</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulating policy in ICT matters at work</td>
<td>24</td>
<td>57.1</td>
<td>57.1</td>
</tr>
<tr>
<td>Developing and deploying software</td>
<td>12</td>
<td>28.6</td>
<td>85.7</td>
</tr>
<tr>
<td>User support and maintenance</td>
<td>6</td>
<td>14.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>
**Distribution of Respondents by level of conversant with cloud computing**

When asked to state their level of conversant with cloud computing, 85.7% of the respondents indicated moderate level of conversant with cloud computing while the remaining 14.3% were very conversant with cloud computing. There is need for training on the same to raise the level of conversant with cloud computing amongst majority of the respondents.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Conversant</td>
<td>36</td>
<td>85.7</td>
</tr>
<tr>
<td>Very Conversant</td>
<td>6</td>
<td>14.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**4.4 Statistical Analysis for Each Dimension of Questionnaire**

This section covers the questions posed to the respondents on the intention to adopt cloud computing. In order to test the fields of research tool (questionnaire), and paragraphs analysis, parametric tests were used (One-sample T test, Independent Samples T-test, Analysis of Variance- ANOVA), these tests are considered appropriate in the case show that the distribution of the data follow a normal distribution. The findings are presented in terms of mean and standard deviation. **Testing paragraphs of each research variables about the average score equal to answer neutrality (degrees approval medium).** If the Sig.>0.05 (Sig. greater than 0.05), according to SPSS program results, it cannot reject the null hypothesis, so in this case the average views of respondents on the phenomenon under study does not differ materially from “Agree” which is 3 in Likert scale. On other hand, if the Sig.<0.05 (Sig. less than 0.05), that it can reject the null hypothesis, and accept the alternative hypothesis that the average views of respondents varies materially from the medium approval degree “Agree”. So in this case, can determine if the average answer increases or decreases significantly than the degree of “Agree”. Using the mean and standard deviation, R and R² were calculated which determined the sig.F change, F ratio in ANOVA table was used to test the regression model and finally a table of Coefficients was calculated and a regression equation developed. The main hypothesis stated that there is a significant effect between independent variables (Relative Advantage, Compatibility, Complexity, Top Management Support, Firm Size, Government Support and Organizational...
Readiness and the Intention to adopt Cloud Computing in these organizations (at level of significance $\alpha= 0.05$).

4.4.1 Descriptive Statistics for each paragraph

Table 4.5 shows the descriptive statistics for each paragraph

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Statements</th>
<th>Mean Statistic</th>
<th>Std.Deviation Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>Cloud computing would improve performance in my job</td>
<td>3.8571</td>
<td>.89974</td>
</tr>
<tr>
<td></td>
<td>Cloud computing aims to reduce cost in running business</td>
<td>4.4286</td>
<td>.53452</td>
</tr>
<tr>
<td></td>
<td>I expect additional benefits in using cloud computing</td>
<td>3.8571</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>Cloud computing can enhance effectiveness in my job</td>
<td>3.5714</td>
<td>.53452</td>
</tr>
<tr>
<td>COMP</td>
<td>I expect higher flexibility in our IT by using CC</td>
<td>4.1429</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>CC is compatible with my organizations IT infrastructure</td>
<td>3.8571</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>Attitude towards CC adoption in my organization is favorable</td>
<td>3.8571</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>CC is consistent with my organizations beliefs and values</td>
<td>3.8571</td>
<td>.48795</td>
</tr>
<tr>
<td></td>
<td>CC is consistent with my organizations business strategy</td>
<td>3.2857</td>
<td>.75593</td>
</tr>
<tr>
<td>COMP</td>
<td>I am worried that cloud resources can be susceptible to malicious activity</td>
<td>4.8571</td>
<td>.37796</td>
</tr>
<tr>
<td>X</td>
<td>I am worried that data transit may increase exposure to eavesdropping threats</td>
<td>4.8571</td>
<td>1.1691</td>
</tr>
<tr>
<td></td>
<td>I am worried that there is inadequate data storage &amp; retrieval</td>
<td>3.1667</td>
<td>1.1691</td>
</tr>
<tr>
<td></td>
<td>CC is consistent with my organizations business strategy</td>
<td>3.2857</td>
<td>.75593</td>
</tr>
<tr>
<td>TM</td>
<td>TM in my organization accept CC as important</td>
<td>2.8571</td>
<td>1.34519</td>
</tr>
<tr>
<td></td>
<td>TM in my organization has shown support for CC adoption</td>
<td>2.4286</td>
<td>1.13389</td>
</tr>
<tr>
<td></td>
<td>TM in my organization is interested in adopting CC</td>
<td>2.5714</td>
<td>.78680</td>
</tr>
<tr>
<td>FS</td>
<td>Nature of the industry in which our firm operates influences our CC adoption decision</td>
<td>4.7143</td>
<td>.48795</td>
</tr>
<tr>
<td></td>
<td>Years of experience</td>
<td>2.2857</td>
<td>.75593</td>
</tr>
<tr>
<td></td>
<td>Years since establishment</td>
<td>3.4286</td>
<td>.97590</td>
</tr>
<tr>
<td>GS</td>
<td>Does government fund new investment in your organization</td>
<td>3.0000</td>
<td>.81650</td>
</tr>
<tr>
<td></td>
<td>Government is pressuring our organization to adopt CC</td>
<td>1.8571</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>It is necessary to have adequate technical support after adoption of CC</td>
<td>4.8571</td>
<td>.37796</td>
</tr>
<tr>
<td>OR</td>
<td>I can distinguish between SaaS, PaaS and IaaS</td>
<td>4.5714</td>
<td>.53452</td>
</tr>
<tr>
<td></td>
<td>I am worried there is limited expertise to support cloud services</td>
<td>3.1429</td>
<td>1.4639</td>
</tr>
<tr>
<td></td>
<td>It is necessary to have adequate technical support after adoption of CC</td>
<td>4.8571</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>Academic Qualification</td>
<td>1.8571</td>
<td>.69007</td>
</tr>
<tr>
<td></td>
<td>Level of conversant with CC</td>
<td>2.1429</td>
<td>.37796</td>
</tr>
<tr>
<td>ITAC</td>
<td>My organization intents to adopt CC</td>
<td>3.2857</td>
<td>.95119</td>
</tr>
<tr>
<td></td>
<td>It’s likely my organization will take steps to adopt CC in future</td>
<td>4.1429</td>
<td>.37796</td>
</tr>
<tr>
<td></td>
<td>Security systems built into CC services are strong enough to protect our data</td>
<td>3.7143</td>
<td>.49603</td>
</tr>
<tr>
<td></td>
<td>Firm situation description</td>
<td>1.7143</td>
<td>.75593</td>
</tr>
<tr>
<td></td>
<td>Information systems applications adopted by the firm</td>
<td>4.0000</td>
<td>.91485</td>
</tr>
<tr>
<td></td>
<td>Does your firm intend to adopt any type of cloud services in the next 3 years</td>
<td>3.0000</td>
<td>.09545</td>
</tr>
<tr>
<td></td>
<td>Cloud computing type</td>
<td>2.5714</td>
<td>.78680</td>
</tr>
</tbody>
</table>

From table 4.5 above the following can be concluded from each paragraph.

i. Relative Advantage: This field was used to know the Relative Advantage of the adoption of Cloud Computing technology in these organizations. The respondents unanimously agreed that to a great extent (somewhat agree/completely agree) that the relative advantages from cloud computing would be; cost reduction in running business (mean of 4.4286), improved performance in job (mean of 3.8571), additional benefits in government (mean of 3.8571)
and enhanced effectiveness in my job (mean of 3.5714). There was low disparity in the opinion of the respondents as indicated by the low values of standard deviation.

ii. Compatibility: This field was used to know the Compatibility of the adoption of Cloud Computing technology in these organizations. To a great extent the respondents were of the opinion that in terms of compatibility; they expected higher flexibility in their IT by using cloud computing (mean of 4.1429), Cloud computing is compatible with my organizations IT infrastructure (mean of 3.8571) and The attitude towards cloud computing adoption in my organization is favorable (mean of 3.8571)

iii. Complexity: This field was used to know the Compatibility of the adoption of Cloud Computing technology in these organizations. To a great extent the respondents were of the opinion that in terms of compatibility; they expected higher flexibility in their IT by using cloud computing (mean of 4.1429), Cloud computing is compatible with my organizations IT infrastructure (mean of 3.8571) and The attitude towards cloud computing adoption in my organization is favorable (mean of 3.8571)

iv. Top management support: This field was used to know the top management support of the adoption of Cloud Computing technology in these organizations. Top management support rating was very low across all the firms. More specific to a least extent (somewhat disagree/neutral); Top management in my organization accepts cloud computing as important (mean of 2.8571) and Top management in my organization is interested in adopting cloud computing (mean of 2.5714).

v. Firm Size: This field was used to know the Firm Size to the adoption of Cloud Computing technology in these organizations. The respondents were of the opinion that to a great extent the nature of the industry, in which our firm operates, influences our adoption decision (mean of 4.7143). On the other hand, Years since establishment had a moderate influence on adoption decision with Years of experience being the least influence on adoption decision of cloud computing.

vi. Government Support: This field was used to know the Firm Size to the adoption of Cloud Computing technology in these organizations. The respondents were of the opinion that to a great extent the nature of the industry, in which our firm operates, influences our adoption decision (mean of 4.7143). On the other hand Years since establishment had a moderate
influence on adoption decision with Years of experience being to the least influence on adoption decision of cloud computing.

vii. Organizational readiness (financial & Technical): This field was used to know the Government Support of the adoption of Cloud Computing technology in these organizations. The respondents unanimously agreed that it was necessary to have adequate technical support after adoption of cloud (mean of 4.8571). On the other hand to a moderate extent government does fund new investment in our organization (mean of 3.000). The respondents further indicated that to a least extent government was pressuring their organization to adopt cloud computing (mean of 1.8571).

viii. Intent to adopt cloud computing: As shown above, the respondents completely agreed that; It was likely their organization would take steps to adopt cloud computing in future (mean of 4.1429), transaction processing systems (payroll, order tracking) were information systems applications adopted by the firm (mean of 4.000), firms have already adopted some cloud services (mean of 1.7143) and the firms intent to adopt a complete operating system and software package available via cloud service (mean of 3.000).

4.4.2 Model Summary of each paragraph.

Using the mean and standard deviation of each paragraph coefficient of determination $R^2$ was calculated which was used to determine the $sig. F$ change of each paragraph.

Table 4.6 Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std Error of the Estimate</th>
<th>Change Of Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>.898</td>
<td>.806</td>
<td>.611</td>
<td>.33333</td>
<td>.806</td>
</tr>
<tr>
<td>COMP</td>
<td>.842</td>
<td>.708</td>
<td>.417</td>
<td>.57735</td>
<td>.708</td>
</tr>
<tr>
<td>COMPX</td>
<td>.425</td>
<td>.181</td>
<td>-.365</td>
<td>.95407</td>
<td>.181</td>
</tr>
<tr>
<td>TP</td>
<td>.942</td>
<td>.888</td>
<td>.831</td>
<td>.46574</td>
<td>.888</td>
</tr>
<tr>
<td>FS</td>
<td>.440</td>
<td>.194</td>
<td>-.209</td>
<td>.53654</td>
<td>.194</td>
</tr>
<tr>
<td>GS</td>
<td>.560</td>
<td>.314</td>
<td>-.209</td>
<td>1.15045</td>
<td>.314</td>
</tr>
<tr>
<td>OR</td>
<td>.645</td>
<td>.417</td>
<td>-0.750</td>
<td>.50000</td>
<td>.417</td>
</tr>
</tbody>
</table>
From the table 4.6 the following can be noted.

i. For Relative Advantage. The "R Square" (coefficient of determination) a value of 0.806, indicated a good level of prediction. It further indicates that independent variables (improve performance in my job, reduce costs in running business, additional benefits in government) explain 80.6% of the variability of the dependent variable (enhance effectiveness in my job), leaving only 18.4% unexplained (error term).

ii. For Compatibility. The coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) $R^2$ equals .708, that is, flexibility, organization beliefs and values, attitude, IT infrastructure explain 70.8 percent of variation in Compatibility (business strategy). The P-value of 0.024 < 0.05 implies that the model is significant at the 5 percent significance.

iii. For Complexity. The coefficient of determination $R^2$ equals .181, shows that 18.1% of the variation in complexity of cloud computing could be explained by the changes in susceptibility of cloud resources, eavesdropping threats and adequacy in data storage and retrieval, leaving 81.9% unexplained. P-value of 0.741 > 0.05 implies that the model is not significant at the 5 percent significance.

iv. For Top Management Support. The coefficient of determination $R^2$ equals .888, shows that 88.8% of the variation in top management support of cloud computing could be explained by the changes in top management acceptance and top management interest in cloud computing, leaving only 11.2% unexplained. The P-value of 0.013 < 0.05 implies that the model is significant at the 5 percent significance.

v. For Firm Size. The coefficient of determination $R^2$ equals .194, indicates that only 19.4% of the variation in firm size could be explained by the changes in years since establishment, years of experience, leaving 80.6% unexplained. The P-value of 0.650 > 0.05 implies that the model is not significant at the 5 percent significance.

vi. For Government Support. The coefficient of determination $R^2$ equals .314, indicates that only 31.4% of the variation in government support could be explained by the changes in pressure from government, funding of new investment, leaving 68.6% unexplained. The P-value of 0.471 > 0.05 implies that the model is not significant at the 5 percent significance.
vii. For Organizational readiness. The coefficient of determination $R^2$ equals .417, indicates that only 41.7% of the variation in Organizational readiness (financial & Technical) could be explained by the changes in qualification, technical support, limited expertise, models, leaving 58.3% unexplained. The P-value of 0.826 > 0.05 implies that the model is not significant at the 5 percent significance.

4.4.3 F-Ratio and Regression model for each paragraph.

Using the sig.F, the F ratio in ANOVA table was used to test the regression model coefficient table to develop the regression model. The table below gives the summary for each paragraph construct.

Table 4.7 F-Ratio & Regression Model

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Dependent variable</th>
<th>Independent Variable</th>
<th>F- ratio</th>
<th>Regression model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_1$</td>
<td>Intent to adopt cloud computing</td>
<td>Relative advantage</td>
<td>$F(21,21)=4.143, p=0.013 &lt;0.05$ regression model is a good fit for the data.</td>
<td>Relative advantage $=0.014 + 0.500$ improve performance in my job - $1.226E-16$ reduce costs in running business + $0.167$ additional benefits in government</td>
</tr>
<tr>
<td>$H_2$</td>
<td>Compatibility</td>
<td>Compatibility</td>
<td>$F(21,21)=2.429, p=.024 &lt;0.05$, regression is a good fit for the data.</td>
<td>Compatibility $= 3.500 + 1.500$. Beliefs and values -2.000 Attitudes + 0.500 IT infrastructures</td>
</tr>
<tr>
<td>$H_3$</td>
<td>Complexity</td>
<td>Complexity</td>
<td>$F(20,21)=.331, p=.741 &gt;.05$, regression model not a good fit for the data.</td>
<td>Predicted Complexity $= 7.615 - .962$ Eavesdropping Threats $1 + 0.115$ Adequacy in Data Storage and Retrieval</td>
</tr>
<tr>
<td>$H_4$</td>
<td>Top management support</td>
<td>$F (20, 21) = 15.782, p=.013 &lt;.05$ i.e. the regression model is a good fit of the data.</td>
<td>Top Management Support $= -.353 + .412$ interest + .603 acceptance</td>
<td></td>
</tr>
<tr>
<td>$H_5$</td>
<td>Firm size</td>
<td>$F (20, 21) =.481, p=.650 &gt; .05$ i.e the regression model is not a good fit of the data.</td>
<td>Firm size (nature of the industry) $= 5.061 + .121$ Years of experience - .182 Years since establishment</td>
<td></td>
</tr>
<tr>
<td>$H_6$</td>
<td>Government support</td>
<td>$F (20, 21) =.914, p=.471 &gt; .05$ i.e., the regression model is not a good fit of the data.</td>
<td>Government support $= .941 + .882$ Funding of new investment + .529 Pressure from government</td>
<td></td>
</tr>
</tbody>
</table>
The $F$-ratio in the ANOVA table tested whether the overall regression model was a good fit for the data. The following was noted on each paragraph construct.

i. Relative Advantage: The results showed that the independent variables statistically significantly predict the dependent variable, $F(21, 21) = 4.143$, $p = .013 < .05$ (i.e., the regression model was a good fit of the data). The equation for predicting relative advantage (enhance effectiveness in my job) from improve performance in my job; reduce costs in running business, additional benefits in government become:  

*Regression Equation for Relative Advantage in Intent to adopt cloud computing*  
$= 0.014 + 0.500$ improve performance in my job $- 1.226 \times 10^{-16}$ reduce costs in running business $+ 0.167$ additional benefits in government. Using the p-values to test the null hypothesis of; there was no significant relationship between improved performance in my job, reduced costs in running business, additional benefits in government and enhanced effectiveness in my job against the alternative hypothesis of there is a significant relationship between improved performance in my job; reduced costs in running business, additional benefits in government and enhanced effectiveness in my job. The finding showed that only reduced cost in running business was significant in the model ($p$-value<0.05). *Hence the main relative advantage gained from cloud computing by all firms was reduced costs in running business.*

ii. Compatibility: The coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) $R^2$ equals .708, that is, flexibility, organization beliefs and values, attitude, IT infrastructure explain 70.8 percent of variation in Compatibility (business strategy). The P- value of 0.024 < 0.05 implied that the model was significant at the 5 percent significance  

*Regression Equation for Compatibility (business strategy)*  
$= 3.500 + 1.500$ Beliefs and values $- 2.000$ Attitudes $+ 0.500$ IT infrastructures . Using the p-values to test the null hypothesis of; there was no significant relationship between Beliefs and values, Attitude, IT infrastructure and Compatibility (business strategy) against the alternative hypothesis of there was a significant relationship between significant relationship between Beliefs and values, Attitude, IT infrastructure and Compatibility (business strategy). The result indicated that Beliefs and values and attitudes are significant in the model. *Hence compatibility was gained from cloud computing through Beliefs and values of the organizations and attitudes of the organizations (p-values<0.05).*
iii. Complexity: The $F$-ratio tested showed that the overall regression model was not a good fit for the data. The results showed that the independent variables are not statistically significantly predicting the dependent variable, $F(20,21)=.331, p=.741>.05$ (i.e., regression model not a good fit for the data). \textit{Regression Equation for Complexity (business strategy) = 7.615 - .962 Eavesdropping Threats 1 + 0.115 Adequacy in Data Storage and Retrieval.} Using the p-values to test the null hypothesis; there was no significant relationship between adequacy in data storage and retrieval, eavesdropping threats and Complexity (business strategy) against the alternative hypothesis There is a significant relationship between adequacy in data storage and retrieval, eavesdropping threats and Complexity (business strategy). The result indicates that adequacy in data storage and retrieval and eavesdropping threats are not significant in the model (p-values>0.05).

iv. Top Management Support: The $F$-ratio tested whether the overall regression model was a good fit for the data. The results showed that the independent variables are statistically significantly predicting the dependent variable, $F (20,22) =15.782, p=.013<.05$ (i.e., the regression model was a good fit of the data). \textit{Regression Equation for Top Management Support = -.353 + .412 interest + .603 acceptance.} Using the p-values to test the null hypothesis of; there was no significant relationship between top management interest and acceptance of cloud computing and top management support of cloud computing against the alternative hypothesis of there was a significant relationship between top management interest and acceptance of cloud computing and top management support of cloud computing. \textit{The result indicates that top management acceptance of cloud computing influences top management support of cloud computing (p value <0.05).}

v. Firm Size: The $F$-ratio in the ANOVA table tests whether the overall regression model was a good fit for the data. The results showed that the independent variables are not statistically significant predicting the dependent variable, $F (20, 22) = .481, p=.650>.05$ (i.e., the regression model was not a good fit of the data). \textit{Regression Equation for firm size (nature of the industry) = 5.061 + .121 Years of experience - .182 Years since establishment.} Using the p-values to test the null hypothesis of; there was no significant relationship between years since establishment, years of experience and firm size against the alternative hypothesis of there was a significant relationship between years since establishment, years of experience and firm size. \textit{The result indicates that years since establishment, years of experience does
not influence the firm size (nature of the industry in adoption of cloud computing decision (p value >0.05).

vi. Government Support: The $F$-ratio tested whether the overall regression model was a good fit for the data. The results showed that the independent variables was not statistically significantly predicting the dependent variable, $F = .914$, $p = .471 > .05$ (i.e., the regression model was not a good fit of the data). **Regression Equation for government support = .941 + .882 Funding of new investment + .529 Pressure from government.** Using the p-values to test the null hypothesis of; there was no significant relationship between pressure from government, funding of new investment and government support against the alternative hypothesis of there is a significant relationship between pressure from government, funding of new investment and government support. **The result indicated that pressure from government, funding of new investment did not influence government support in adoption of cloud computing decision (p value >0.05).**

vii. Organizational readiness (financial & Technical): The $F$-ratio tested whether the overall regression model was a good fit for the data. The results showed that the independent variables were not statistically significantly predicting the dependent variable, $F (22, 20) = .357$, $p = .826 > .05$ (i.e., the regression model was not a good fit of the data). **Regression Equation for government support = 2.000 + .500 models - .167 limited expertise - .333 technical support + 1.007E-17 Academic Qualification.** Using the p-values to test the null hypothesis of; there was no significant relationship between technical support, limited expertise, models, academic qualification and Organizational readiness (financial & Technical) against the alternative hypothesis of there was a significant relationship between technical support, limited expertise, models, academic qualification and Organizational readiness (financial & Technical). **The result indicated that technical support, limited expertise, models, academic qualification does not influence Organizational readiness (financial & Technical) in adopting cloud computing (p value >0.05).**
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents the summary, conclusions and recommendations of the findings of the study. It also highlights the limitations of the study and recommendations for further research, policy and practice. The summary is drawn from the findings and data analysis and guided by the objectives and conclusion.

5.2 Summary of Results

From the analysis of the results, the table below shows ranking of factors that affect and influence the Intent to Adopt Cloud Computing in these regulating bodies.

Table 5.0 Summary of ranking of TOE Factors

<table>
<thead>
<tr>
<th>TOE FACTORS</th>
<th>RELATIVE IMPORTANCE INDEX</th>
<th>IMPORTANCE LEVEL</th>
<th>IMPORTANCE RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Support</td>
<td>0.888</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td>Relative Advantage</td>
<td>0.806</td>
<td>High</td>
<td>2</td>
</tr>
<tr>
<td>Compatibility</td>
<td>0.708</td>
<td>High</td>
<td>3</td>
</tr>
<tr>
<td>Organizational Readiness</td>
<td>0.417</td>
<td>Medium</td>
<td>4</td>
</tr>
<tr>
<td>Government Support</td>
<td>0.314</td>
<td>Low</td>
<td>5</td>
</tr>
<tr>
<td>Firm Size</td>
<td>0.194</td>
<td>Low</td>
<td>6</td>
</tr>
<tr>
<td>Complexity</td>
<td>0.181</td>
<td>Low</td>
<td>7</td>
</tr>
</tbody>
</table>

It shows that relative advantage, top management support and compatibility influence most the intent to adopt cloud computing in these regulating bodies, with all having influence of 80.6%, 88.8% and 70.8% positive influence respectively. Complexity and firm size have the least influence in intent to adopt cloud computing of 18.1% and 19.4% respectively.

5.3 Key Findings
The conceptual framework developed from modified TOE framework had seven constructs these are: relative advantage, top management support, compatibility, complexity, firm size, government support and organizational readiness. According to the results all the seven
constructs had influence in the intent to adopt cloud computing at different degree as it will be discussed below.

i. **Relative Advantage.**

According to the results there *is Positive* statistical relation between **Relative advantage** and the intention to adopt Cloud Computing (at level of significance $\alpha= 0.05$). This is consistent with the findings of prior researchers (Kuan & Chau 2001) that it positively influences the intent to adopt cloud computing. This is because these organizations plan to adopt cloud computing simply because of reduced cost in running business, improve performance, fear of being left out, foster their image and reputation within their industry. Relative advantage in marketplace the more intense the competition in business, the more pressure is on an organization to adopt a new technology and technology (Doolin & Troshani 2007). To achieve this these organizations should convert business processes to business process-as-a-platform (BPaaS).

ii. **Knowledge on cloud computing**

14.3% of the respondent are *very conversant* with cloud computing while 85.7% are *moderately conversant* with cloud computing. This shows that there is no enough competence among IT staff about this technology. It’s made worse by knowing that 54% of this staff interviewed formulate policy in ICT and also develop and deploy software. They have high academic papers but little competence in cloud computing. This research is consistent with the findings of the research (Angela et al., 2012), Which concluded that many IT professionals do not have an in-depth understanding of the cloud nor are they aware of its benefits to businesses. These bodies should train its employee more on cloud computing so as to make easy during deployment of the cloud computing.

iii. **Compatibility**

There *is Positive* statistical relation between **Compatibility** and the intention to adopt Cloud Computing (at level of significance $\alpha= 0.05$). Results indicate that Beliefs, values and attitudes are significant in the model. Hence compatibility is key for cloud computing adoption through Beliefs and values of the organizations and attitudes of the organizations ($p$-values<0.05). This research is consistent with the findings of the research (Chinyao et al., 2011), Which concluded that the technology is recognized as compatible with work application systems, firms are usually likely to consider the adoption of new technology. Compatibility is important facilitator for cloud computing adoption since new solutions must work smoothly with already installed IT solutions.
on premise. Additionally, the competence of cloud vendor, after-sales support upon adoption, presence of existing technological infrastructure and resistance to new technology by employees are other prime factors that influence the adoption of cloud computing in developing economies. Best way to achieve this enhancing factor the organizations should be able apply its business logic as SaaS e.g HR applications or CRM.

iv. Complexity

There is **Negative** statistical relation between **Complexity** and the intention to adopt Cloud Computing (at level of significance $\alpha=0.05$). *The result indicates that adequacy in data storage and retrieval and eavesdropping threats are not significant in the model (p-values>0.05)*. This research is consistent with the findings of the research (Christian, 2011), Which concluded that the security issues are considered one of the main obstacles on the adoption of Cloud Computing. Nonetheless, several of these companies recognize that they lack of expertise in such a field of security. Sensitivity of the data handled by these regulating bodies influenced negatively the intent to adopt cloud computing these data include quotations for various tenders, company databases and financial data. Therefore complexity is a barrier to cloud computing adoption mostly when using SaaS (Misra & Mondal, 2011).

v. Top Management Support

There is **Positive** statistical relation between **Top Management Support** and the intention to adopt Cloud Computing (at level of significance $\alpha=0.05$). *The result indicates that top management acceptance of cloud computing influences top management support of cloud computing (p value <0.05)*. This research is consistent with the findings of the research (Chinyao et al., 2011),Which concluded that the top management support is critical for creating a supportive climate and for providing adequate resources for the adoption of new technologies (Lin and Lee, 2005; Wang et al., 2010). As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation (Lee and Kim, 2007; Pyke, 2009). Top management plays an important role because Cloud Computing implementation may involve integration of resources and reengineering of processes. Moreover, some empirical studies have indicated that there is a positive relationship between top management support and adoption of new technology (Pan and Jang, 2008; Zhu et al., 2004).
vi. **Firm Size**

There is *no* statistical relation between **Firm Size** and the intention to adopt Cloud Computing (at level of significance $\alpha = 0.05$). *The result indicates that years since establishment, years of experience and nature of the industry in does not influence so much the intent to adopt cloud computing decision (p value >0.05).* This is because in government the procedure for procurement of a new technology is the same and doesn’t depend on the firm size. The decisions are made at the top management independent of the firm size. Firms with fewer employees with adequate ICT knowledge were generally not ready with adoption as opposed to those whose employees were having ICT skills.

vii. **Government Support**

There is *no* statistical relation between **Government Support** and the intention to adopt Cloud Computing (at level of significance $\alpha = 0.05$). *The result indicates that pressure from government, funding of new investment does not so much influence government support in adoption of cloud computing decision (p value >0.05).* This is because the government has no relevant legal and regulatory framework concern with cloud computing so it will have very little influence in the intent to adopt cloud computing.

viii. **Organizational readiness (financial & Technical)**

There is *no* statistical relation between **Organizational readiness (financial & Technical)** and the intention to adopt Cloud Computing (at level of significance $\alpha = 0.05$). *The result indicates that technical support, limited expertise, models, academic qualification does influence Organizational readiness (financial & Technical) in adopting cloud computing (p value >0.05).* The reason why it has very little influence in intent to adopt cloud computing is cost of investment and lack of technical skills hamper the intent to adopt cloud computing. Its consistent with literature on cloud computing adoption.
5.4 Conclusions

Cloud computing has emerged as the fastest growing segment of the IT industry. This research has contributed to develop and validate a theoretical adoption based on TOE framework. The relevance of the organizational context highlighted specifically the importance of top management support and technology readiness. The second context affecting the adoption of cloud computing is the technological context, for this, it was noted that despite complexity being perceived as an inhibitor for adoption, its influence resulted in being less relevant through our results. However, the benefits that cloud computing offers and the feasibility to integrate this technology to current IT infrastructure seem to be high determinants for adoption. On the other hand, the environmental context resulted to be the minor determinant of cloud computing adoption. In this research we have also seen that TOE Framework: Relative advantage (Improve performance, reduce cost and Enhance effectiveness), Compatibility (IT infrastructure, Attitude, Values and Believes) and Top management support (acceptance, support and creating awareness) are the main factors that will determine the intention to adopt cloud computing in these regulating bodies under the ministry of finance.
5.5 Recommendations:

Based on results from the research there are some of the recommendations to adopt Cloud computing technology in KRA, PPOA, IRA, PC, RBA, CBK & CMA. Government should develop a national cloud strategy. Which will assist KRA, PPOA, IRA, PC, RBA, CBK & CMA to develop their own cloud computing strategy. This strategy should include the following:

i. Adopt Cloud Computing technology in their operations, which attract technological and economic benefits to these organizations.

ii. The top management should enhance the development of legal framework and awareness of cloud technologies.

iii. Develop plans which are flexible enough to accommodate any changes required by the adoption of Cloud Computing technology. E.g., develop the human resource capacity.

iv. A future plan to adopt Cloud Computing, and plans to get rid of obstacles that hinder the use of Cloud computing technology.

v. Can create a hybrid cloud, which consists of a Public Cloud to put non-sensitive and public applications and also from the Private Cloud to maintain the confidentiality and security of data.

5.6 Achievements

From literature review was able to review different adoption models, find out that TOE is the best because it looks at the organization as a whole opposed to the other adoption frameworks. Top management support is ranked highest compared to other TOE factors that influence cloud computing adoption this is because Top management in Government Institutions make the most decisions. Government support, Firm size and Organizational readiness don’t influence the intent to adopt cloud computing these regulating bodies while complexity is a barrier to adopt cloud computing.

5.7 Limitations

As in all other studies, this one had some limitations. Firstly, the sample size in this study is not enough to generalize the opinions of all ICT officers in the government. Secondly, we did not analyze the impact of the sex, age and voluntariness to use moderators which cannot be controlled. The sample structure of this research may attribute sampling bias. Selection of sample was judgmental instead of random.
5.8 Future Research

Although the study was conducted among ICT senior officers in the Regulating bodies under the ministry of national treasury which is a public sector, the data can be useful to other sectors in order to validate the adoption of cloud computing. The research model did not consider the influence of Age, Sex, level of education, type of organization, Experience and Voluntariness to Use. Conduct a study to measure the effects Cloud Computing technology has on the Enterprise Resource Planning (ERP).
REFERENCES


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APPENDICES

Appendix 1: QUESTIONAIRES USED DEVELOPED FROM TOE MODEL

University of Nairobi
School of computing and informatics

Questionnaire

Dear All…….

I kindly put in your hands this questionnaire prepared for the collection of data about a study entitled:

“Cloud Computing Adoption in Kenyan Government State Corporations (Case study of Regulatory bodies under the Ministry of National Treasury).”

The study is being done in partial fulfillment of requirements for the award of Masters in Science (Information Systems), School of Computing and Informatics, University of Nairobi, Kenya.

I hope you will cooperate and provide information to assist in the completion of this study, that we aim to illustrate the benefits, barriers and challenges in the intention to adopt cloud computing and also propose a framework for adopting cloud computing in these agencies.

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

Please accept my best regards

Researcher

Mr. Paul NyamweyaOngige.
Definition of Cloud Computing:

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

Research Variables:

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Independent Variables</th>
<th>Moderator Variable</th>
</tr>
</thead>
</table>
| ✓ Intent to adopt cloud computing | ✓ Relative Advantage  
✓ Complexity  
✓ Compatibility  
✓ Top management  
✓ Firm size  
✓ Government support  
✓ Willingness to collaborate | ✓ Organizational Readiness  
(Technological readiness and Financial readiness) |
Questionnaire

PART A: Personal Functional Information

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

1. Gender: Male □ Female □

2. Qualification: Bachelor □ Master □ PhD □ Others □ ……………

3. Age (in years)
   Below 30 □ 30 – below 40 □ 40 – below 50 □ above 50 □

4. Position held……………………………………

5. Years of Experience
   Less than 5 □ 5 – less than 10 □ 10 – less than 15 □ Above 15 □

6. Name of the Organization…………………………..

7. Years since establishment.
   Less than a year □ 1-5 years □ 5 – less than 10 □ above 10 □

8. Role of respondent in ICT matters at work.
   □ Formulating Policy on ICT infrastructure, budget & procurement
   □ Developing and Deploying Software
   □ Network administration.
   □ Technical support and Maintenance
   □ User support and help desk
   □ Any other (Specify) ……………………………

9. How conversant are you with cloud computing issues?
   Not conversant □ moderately conversant □ Very conversant □
**PART B: Intent To Adopt Cloud Computing.**

In this section factors that determine the intention to adopt cloud computing will be generated. Please tick (√) the appropriate box to indicate the level of your agreement or disagreement with the following statements on a scale of 1 to 5, where 1 = completely disagree, 2 = somewhat disagree, 3 = neutral (neither disagree nor agree), 4 = somewhat agree, 5 = completely agree

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Agreement Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Cloud computing would improve performance in my job.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11. Cloud computing aims to reduce costs in running business.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>12. I expect additional benefits in government by using cloud computing</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>13. Cloud computing can enhance effectiveness in my job</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>14. I expect higher flexibility in our IT by using cloud Computing</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>15. My organization intents to adopt cloud computing.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16. Its likely that my organization will take steps to adopt cloud computing in future.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17. Cloud computing is consistent with my organizations beliefs and values</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>18. The attitude towards cloud computing adoption in my organization is favorable.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>19. Cloud computing is compatible with my organization's IT infrastructure.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>20.</strong></td>
<td>Cloud computing is consistent with my organizations business strategy.</td>
</tr>
<tr>
<td><strong>21.</strong></td>
<td>Top management in my organization is interested in adopting cloud computing.</td>
</tr>
<tr>
<td><strong>22.</strong></td>
<td>Top management in my organization accepts cloud computing is important.</td>
</tr>
<tr>
<td><strong>23.</strong></td>
<td>Top management in my organization has shown support for cloud computing adoption.</td>
</tr>
<tr>
<td><strong>24.</strong></td>
<td>Does the government found new investment in your organization,</td>
</tr>
<tr>
<td><strong>25.</strong></td>
<td>Government is pressuring our organization to adopt cloud computing.</td>
</tr>
<tr>
<td><strong>26.</strong></td>
<td>I can distinguish between SAAS, PAAS and IAAS</td>
</tr>
<tr>
<td><strong>27.</strong></td>
<td>I am worried that Cloud resources can be susceptible to malicious activity</td>
</tr>
<tr>
<td><strong>28.</strong></td>
<td>I am worried that data transit may increase exposure to eavesdropping threats</td>
</tr>
<tr>
<td><strong>29.</strong></td>
<td>I am worried that there is inadequate data storage and retrieval in the clouds.</td>
</tr>
<tr>
<td><strong>30.</strong></td>
<td>I am worried there is limited expertise to support cloud services</td>
</tr>
<tr>
<td><strong>31.</strong></td>
<td>I am worried that there could be Security and privacy breaches risk</td>
</tr>
<tr>
<td><strong>32.</strong></td>
<td>I am worried that foreign legislation may be inconsistent with local legislation</td>
</tr>
<tr>
<td><strong>33.</strong></td>
<td>The security systems built into the cloud computing services are strong enough to protect our data</td>
</tr>
<tr>
<td><strong>34.</strong></td>
<td>The nature of the industry, in which our firm operates, influences our adoption decision</td>
</tr>
</tbody>
</table>
35. Our firms' market scope influences our adoption decision

36. It is necessary to have adequate technical support after adoption of cloud

PART C: INTENT TO ADOPT CLOUD COMPUTING.

37. Which of the following phrases best describes your firms’ situation?
   - [ ] We have already adopted some cloud services
   - [ ] We intend to adopt cloud services in the next 3 years
   - [ ] We don’t intend to adopt any cloud services for the foreseeable future.

38. What "Information Systems Applications" has your firm adopted?
   - [ ] Basic Internet services (email and web)
   - [ ] Web site with simple e-commerce functions
   - [ ] Web site with advanced e-commerce functions
   - [ ] Transaction Processing Systems such as: Payroll, Order Tracking etc...
   - [ ] Decision-Support Systems such as: Sales region analysis, cost analysis.
   - [ ] Management Information Systems such as: Sales management, inventory control, etc...

39. Does your firm intend to adopt any type of the Cloud services in the next 3 years?
   - [ ] Individual software packages
   - [ ] Infrastructure services such as storage, network capacity etc
   - [ ] A complete operating system and software package available via cloud services
   - [ ] Security services in the cloud
   - [ ] Specify if any…………………………..

40. Which of the following cloud computing types has your firm adopted or intend to adopt in the next 3 years?
   - [ ] Public cloud
   - [ ] Private cloud
   - [ ] Hybrid cloud

Thank You for Your Time

END

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Appendix 2: LIST OF REGULATORY BODIES

Under the ministry of Finance they are seven regulating bodies (regulating government agencies). These are: **PC, IRA, CBK, PPOA, RBA, CMA, SARSA and KRA**.

**Kenya Revenue Authority (KRA)**

Was established by an Act of Parliament. The Authority is charged with the responsibility of Assessment, Collection, Administration and Enforcement of laws relating to revenue. The Authority is a Government agency that runs its operations in the same way as a private enterprise. In order to offer better single-window services to taxpayers cloud computing is a solution. KRA is divided into five Regions as follows: Rift Valley Region, Western Region, Southern Region, Northern Region and Central Region. It has the following departments: Customs Services, Domestic Taxes, Road Transport, Support Services and Investigations & Enforcement departments. Each Department is headed by a Commissioner. In addition to the four divisions the Authority has seven service Departments that enhance its operational efficiency.

**Insurance Regulatory Authority (IRA)**

The Insurance Regulatory Authority is a statutory government agency established under the Insurance Act (Amendment) 2006, CAP 407 of the Laws of Kenya to regulate, supervise and develop the insurance industry. It is governed by a Board of Directors which is vested with the judiciary responsibility of overseeing operations of the Authority and ensuring that they are consistent with provisions of the Insurance Act.

**Capital Markets Authority (CMA)**

The Capital Market is part of the Financial Market that provides funds for long term development. This is a market that brings together lenders (Investors) of capital and Borrowers (companies that sell securities to the public) of capital. The Capital Markets Authority was set up in 1989 through an Act of Parliament (Cap 485A, Laws of Kenya). The Authority is a body corporate with perpetual succession and a common seal. The main mandate of CMA is to promote, regulate and facilitate the development of an orderly, fair and efficient Capital Markets
in Kenya.

Central Bank of Kenya (CBK)

Was established through an Act of Parliament - the Central Bank of Kenya Act of 1966. The Central Bank of Kenya Act of 1966 set out objectives and functions and gave the Central Bank limited autonomy. Central Bank of Kenya core mandate is to formulate and implement monetary policy, foster the liquidity and solvency and proper functioning of a stable market-based financial system. It has five regional office and head office in Nairobi. It is headed by a governor and has 13 departments including Finance and information system department.

Retirement Benefits Authority (RBA)

The main objectives are: Regulate and supervise the establishment and management of retirement Benefits schemes, Protect the interest of members and sponsors of retirement Benefits schemes, Promote the development of the retirement Benefits industry, Advise the Minister of Finance on the national policy to be followed with regard to the retirement Benefits industry and Implement all government policies relating to retirement benefits. It has supervision, Internal & risk management and Research departments.

Privatization Commission (PC)

The Privatization Commission is a corporate body established under Section 3 of the Privatization Act (2005) to:

1. Formulate, manage and implement the Privatization Programme;
2. Make and implement specific proposals for privatization.
3. Carry out such other functions as are provided for under the Act; and
4. Carry out other such functions as the Commission considers advisable to advance the Privatization.
Public Procurement Oversight Authority (PPOA)

The Public Procurement and Disposal Act, 2005 created the Public Procurement Oversight Authority (PPOA), the Public Procurement Advisory Board (PPAB) and the continuance of the Public Procurement Complaints, Review and Appeals Board as the Public Procurement Administrative Review Board (PPARB). The PPAB and PPARB are autonomous bodies. PPOA is to: Ensuring that procurement procedures established under the Act are complied with, Monitoring the procurement system and reporting on its overall functioning, Initiating public procurement policy and Assisting in the implementation and operation of the public procurement system.

Sacco Societies Regulatory Authority (SARSA)

The Sacco Societies Regulatory Authority (SASRA) is a Government Agency under the Ministry of Industrialization and Enterprise Development. It is a creation of the Sacco Societies Act 2008 and was inaugurated in 2009 charged with the prime responsibility to license and supervise Deposit Taking Sacco Societies in Kenya. Has the dual objectives of protecting the interests of Sacco members and ensuring that there is confidence in the public towards the Sacco sector and spurring Kenya’s economic growth through the mobilization of domestic savings.
Appendix 3: PROJECT MANAGEMENT AND PLAN

3.1 Project schedule

The project schedule involves several activities each with several tasks to accomplish within a period of 6 months program that begins with identification of the project with the help of lecturers, ideas from fellow students, IT experts in the field and from past completed projects. The next stage was to give the project proposal and complete plan of activities to be carried out to till the completion of the project. There will be reiterations between the stages. A detailed plan is shown in table 4.1 below that will be followed in this research.

*Table 3.1 project schedule*

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TASK</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project identification</td>
<td>Consult SCI lecturers and fellow Students, Reading books, journals and published papers</td>
<td>1st Oct 2014-30th Oct 2014</td>
</tr>
<tr>
<td>Title selection and proposing Supervisor</td>
<td>Identify thematic areas &amp; problems that have been associated with this domain &amp; propose a supervisor &lt;br&gt; Identify project title, consult the supervisor &amp; Register the project title</td>
<td>1st Nov 2014-15th Jan 2015</td>
</tr>
<tr>
<td>Research proposal development and writing</td>
<td>Literature review, Background information to the study, Define significance of study, Specify project objectives, &amp; Research methodology</td>
<td>16th Jan 2015-2nd April 2015</td>
</tr>
<tr>
<td>Milestone 1</td>
<td>Proposal presentation to supervisor &amp; oral presentation to Panel 4</td>
<td>7th April-12th April 2015</td>
</tr>
<tr>
<td>Design</td>
<td>Adoption framework/model development and testing</td>
<td>22nd May 2015 – 23rd June 2015</td>
</tr>
<tr>
<td>Milestone 2</td>
<td>Oral presentation of findings and the presentation of the framework/model to panel 4</td>
<td>23rd June 2015 – 4th July 2015</td>
</tr>
<tr>
<td>Milestone 3</td>
<td>Final Presentation</td>
<td>4th August 2015 – 15th August 2015</td>
</tr>
</tbody>
</table>
3.2 Gantt chart

<table>
<thead>
<tr>
<th>ID</th>
<th>TASK NAME</th>
<th>DURATION</th>
<th>START</th>
<th>FINISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project identification</td>
<td>30 days</td>
<td>Tuesday1/10/14</td>
<td>Thursday31/10/14</td>
</tr>
<tr>
<td>2</td>
<td>Title selection &amp; proposing supervisor</td>
<td>76 days</td>
<td>Friday1/11/14</td>
<td>Wednesday15/1/14</td>
</tr>
<tr>
<td>3</td>
<td>Research proposal development &amp; writing</td>
<td>56 days</td>
<td>Thursday 16/1/15</td>
<td>Saturday 15/3/15</td>
</tr>
<tr>
<td>4</td>
<td>Milestone 1</td>
<td>8 days</td>
<td>Monday7/4/15</td>
<td>Friday 12/04/15</td>
</tr>
<tr>
<td>5</td>
<td>Evaluation</td>
<td>60 days</td>
<td>Friday 13/04/15</td>
<td>Thursday22/05/15</td>
</tr>
<tr>
<td>6</td>
<td>Design</td>
<td>30 days</td>
<td>Thursday22/05/15</td>
<td>Tuesday22/06/15</td>
</tr>
<tr>
<td>7</td>
<td>Milestone 2</td>
<td>14 days</td>
<td>Monday23/06/15</td>
<td>Friday 4/07/15</td>
</tr>
<tr>
<td>8</td>
<td>Report writing</td>
<td>30 days</td>
<td>Friday 4/07/15</td>
<td>Monday4/08/15</td>
</tr>
<tr>
<td>9</td>
<td>Milestone 3</td>
<td>14 days</td>
<td>Monday 4/08/15</td>
<td>Friday 15/08/15</td>
</tr>
</tbody>
</table>

3.3 Resources Used

This study will require the following resources

i. Application software for documentation.
ii. SPSS software for analyzing data collected.
iii. Laptop.
iv. Internet

3.4 Money budget

<table>
<thead>
<tr>
<th>ITEM/ACTIVITY</th>
<th>AMOUNT(Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationery</td>
<td>7000</td>
</tr>
<tr>
<td>Typing &amp; Printing</td>
<td>14000</td>
</tr>
<tr>
<td>Compaq 515 Laptop</td>
<td>70000</td>
</tr>
<tr>
<td>Project Fees</td>
<td>72000</td>
</tr>
<tr>
<td>Travelling costs</td>
<td>10000</td>
</tr>
<tr>
<td>Internet access</td>
<td>15000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>12000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>200000</strong></td>
</tr>
</tbody>
</table>