UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING & INFORMATICS

CLOUD COMPUTING ADOPTION IN INSURANCE COMPANIES IN KENYA

By

AKHUSAMA PASTOR MESHACK

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Supervisor

CHRISTOPHER MOTURI

This project report is submitted in partial fulfillment of the requirement for the award of Masters of Science in Information Technology Management of the University of Nairobi.

December, 2015

DECLARATION

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

Signature:……... Date:……

Akhusama Pastor Meshack

P54/72939/2014

This project report has been submitted in partial fulfillment of the requirement of Masters of Science in Information Technology Management of the University of Nairobi with my approval as the University supervisor

Signature:……... Date:……

Christopher A Moturi

Deputy Director

School of Computing and Informatics

University of Nairobi

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May God bless you abundantly.

DEDICATION

To my mother, Emma, who’s prayers and encouragement has made this a reality.

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ACRONYMS

CC Cloud Computing

CPU Central Processing Unit

CSA Cloud Security Alliance

ERP Enterprise Resource Planning

HW Hardware

IaaS Infrastructure as a Service

ICT Information Communication Technology

IS Information Systems

IT information Technology

PaaS Platform as a Service

PC Personal Computer

R&D Research and Development

SaaS Software as a Service

SLA Service Level Agreement

SW Software

TAM Technology Acceptance Model

TOE Technology–Organization– Environment

VMs Virtual Machines

ABSTRACT

Cloud computing relies on sharing computing resources rather than have personal devices or local servers handle applications. Cloud computing can get used to describe both the type of application and platform. IT experts in financial Institutions had claimed that financial systems would never move to the cloud based systems on adoption concerns. However, these opinions appear to be shifting. As solutions to address the existent adoption issues, compliance and regulatory challenges are developed. Insurance companies are adopting the cloud in large to improve their business agility, upgrade their operations, safe on procurement, and streamline and speed up provisioning of new ICT related services. This research study aimed at identifying the extent and characteristics of cloud adoption among insurance companies in Kenya.

The study employed both descriptive and inferential research design in determining cloud computing adoption among insurance companies in Kenya. The target population for the study was 36 insurance companies in Kenya. The research used purposive sampling technique in selecting the insurance companies.

Data was collected using questionnaire administered to the executives and IT managers. The questionnaire was pilot tested on 8 Insurance companies in Nairobi. From the pretest results, a reliability coefficient was calculated using Cronbach Alpha coefficient. A reliability coefficient of 0.72 was obtained. Data was analyzed with the aid of Statistical Package for Social Scientists (SPSS). The research questions were tested using chi square and multiple regression. All tests were computed at α=0.05.

The results obtained from the research assisted in drawing recommendations and provide a roadmap for insurance companies in Kenya on the best practices in regard to cloud computing adoption in their institutions. The study found there was a relationship found between application development/deployment platform), productivity applications, Business Applications (CRM, SaaS), infrastructure on-demand (storage, network, server), finance applications, Core Business Application, databases and the adoption of cloud computing in the insurance companies p value was less than 0.05. The adoption of the Cloud computing services in insurance companies was relatively low. Cloud computing services were beneficial for the insurance companies. The study formed a bases of improving on the cloud computing services by various insurance companies.

CHAPTER ONE
INTRODUCTION

1.1 Background

Cloud Computing (CC) or cloud refers to the delivery of on-demand computing resources over the internet on a pay-for-use basis. CC relies on sharing computing resources rather than have personal devices or local servers handle applications. Cloud computing can get used to describe both the type of application and platform. As a platform it supplies, configures and reconfigures servers. The servers can be physical machines or virtual machines. On the other hand, Cloud Computing describes applications that are extended to be accessible through the internet and for this purpose large data centers and powerful servers are used to host the web applications and web services. The term 'cloud' gets used as a metaphor for 'the internet'. Therefore, the phrase 'cloud computing' refers to a type of internet based computing where different services – such as storage, servers, and applications- are delivered to an organization's devices and computers through the internet (Foster, Zhao, Raicu, & Lu, 2009).

Businesses have been striving to cut down computing costs and for that reason most of them start consolidating their Information Technology and later using virtualization technologies. For the good of enterprises, there is an innovative technology to help them in this i.e. Cloud Computing. The technology claims to take enterprises to another level and allow them to cut down costs through enhanced utilization, reduced administration and infrastructure cost and quicker development cycles (Boss et al., 2009).

The benefits of Cloud Computing as stated by different researchers make it more preferable to be adopted by enterprises i.e. Insurance companies. CC infrastructure allows enterprises to accomplish more efficient use of their IT hardware and software investments. This becomes possible by breaking down the physical barrier intrinsic in isolated systems, automating the management of the group of the systems as a single entity. Cloud Computing can also be described as in the end virtualized system and a natural evolution for data centers which offer automated systems management (Boss et al., 2009). Enterprises need to reflect on the benefits, drawbacks and the effects of Cloud Computing on their businesses and usage practices, to make decision about the adoption and use. In the enterprise, the "adoption of Cloud Computing owes much on

the maturity of organizational and cultural, including legislative, processes as the technology, so to speak (Stanoevska-Slabeva, 2010).

Kshetri, N. (2011),on overall cloud computing market in South Africa and Kenya, found that the market earned revenues of $114.6 million in 2013 and estimates this to reach $288.0 million in 2018. Software as a service will become the most popular cloud computing platform. Despite widespread awareness and the fact that cloud has been around for a couple of years in Kenya and South Africa, enterprises have understood and embraced cloud computing to varying degrees. By and large, actual adoption of these services continues to be dependent on sector, and more pertinently, on enterprise size.

While private cloud services have been the main focus of tier I competitors in the large Insurance sector, the move towards public cloud is slowly gathering pace in both countries However, security concerns and the lack of trust in third parties to manage internal IT systems are dissuading some enterprises and governments from employing data Centre services. This outlook is especially prevalent in conservative verticals, such as the financial services and healthcare sectors, where security and compliance are critical to business operations (Khajeh-Hosseini, Greenwood & Sommerville, 2010). Nevertheless, insurance companies are beginning to move applications to the cloud to reduce costs. On-core applications, such as email and customer relationship management, will be the most commonly migrated solutions as organizations look to test the reliability of cloud services. It will be crucial for service providers to demonstrate the security of their solutions in order to allay consumer concerns and boost uptake in the South African and Kenyan cloud computing domain.

1.2 Research Problem

Cloud computing offers insurance companies greater flexibility in terms of capacity, agility and costs. Insurance companies are reluctant to embrace cloud technology wholly, the emerging trend is deployment of non-core applications such as email on the cloud. According to a survey done by IBM in 2010, issues like security, lack of a clear value proposition, lack of standardization, funding and managing complexity were major barriers to adopting cloud computing (IBM, 2010), this also limits the extent to which insurance companies adopt cloud computing. Although the benefits of cloud computing are well documented and is the dominant focus for vendors and customer alike, most do not know the key IT related risks of cloud computing and the mitigation strategies, these strategies vary depending on service model that has been been adopted. A study has been carried out in the United States by Betcher, T. J. (2010) to identify the key public cloud computing IT related risks that should be considered by organizations and the mitigation strategies that can be used by organizations. Another study carried out by Wooley, P. S. (2011). identified security risks inherent in the cloud computing service known as infrastructure as a service (IaaS) but did not go further to provide mitigation strategies for this service model. Risks should always be understood in relation to overall business opportunity and appetite for risk (Martini, B., & Choo, K. K. R. (2012). which means depending on how cloud computing is utilized the inherent risks will vary from insurance to insurance. The rate of adoption of cloud computing services has been low despite the fact most insurance companies have introduced in their systems. The study therefore, focused on the adoption rate and benefits of cloud computing services in insurance companies in Kenya. The finding may guide and provide a road map for cloud computing services insurance companies in Kenya.

1.3 Research Objectives

The general objective of the study was to investigate adoption of cloud computing service and associated impact in regard to adoption rate, benefits associated with adoption, challenges among insurance companies in Kenya.

The primary objectives were as follows:

i. To investigate the current state of cloud computing adoption in insurance companies in Kenya
ii. To investigate the barriers to cloud computing adoption by the insurance companies Kenya

iii. To find out the perceived benefits for adoption of Cloud Computing in insurance companies in Kenya.
iv. To develop a roadmap that can be used to guide Insurance companies through the process of successfully adopting or migrating to cloud computing.

1.4 Research Questions

The research answered the following questions:

i. The extent and characteristic of cloud computing adoption in insurance companies in Kenya.
ii. The key barriers to cloud computing adoption by the insurance companies in Kenya.
iii. development of a roadmap to address the challenges facing cloud computing adoption
iv. The benefits for insurance companies in Kenya to adopt cloud computing.

1.5 Justification

This study of adoption of cloud computing services in insurance companies in Kenya eluded the reasons why insurance companies should invest or upscale the existing cloud computing services. Some of the reasons include: Immediate upgrades put new features and functionality into the companies and makes them more productive, companies can reduce the size of their own data centers or eliminate their data center footprint altogether. The reduction of the numbers of servers, the software cost, and the number of staff can significantly reduce IT costs without impacting an organization's IT capabilities, services are always available, there's also improved mobility i.e. Work can be done anywhere, there's improved collaboration through virtual and cloud computing

1.6 Limitations of the Study

In adopting cloud computing services the major limitation during the study was that insurance companies were reluctant to trust some services or trust more sensitive data to off-site computers. This has resulted in the insurances companies' slow adoption of the cloud computing services. In adoption of the cloud computing services, such obstacles are to be considered in the processes of adoption. Major challenges affecting the adoption of cloud computing services should be considered in any study relating to the cloud computing services.

CHAPTER TWO
LITERATURE REVIEW

2.0 Key Issues in Cloud Computing

The application of cloud computing is revolutionary. It enables companies to not only gain insight in the development aspects of the organization but also to fully understand consumer behavior, identify sales opportunities, and make data-driven decisions without hefty investments in IT infrastructure (Capobianco, 2010). Optimizing the business benefit of cloud computing requires diligent understanding of its adoption. How well the organization handles the issues in cloud computing goes a long way in determining the success of the implementation of the cloud within the organization. According to Alhamad, M., Dillon, T., & Chang, E. (2010) it is impossible to define the entire cloud operations and services by using a single label. This is because the cloud's management, ownership, location, and access right permissions must be explicitly described Omwansa, T. K., Waema, T. M., & Omwenga, M. B. (2014). The model in which a cloud service is deployed may specify different terms in order to name a phase which in itself is a predisposing factor to security breach in the cloud.

Cloud computing acceptance is faced with a number of issues. These issues are in the areas of Hardware, security, Trust, legal and compliance and organizational challenges (Buyya et al, 2009) Linked to all these is the issue of trust between clients and vendors, because cloud computing calls for enterprises to trust vendors with the administration of their IT resources including data and availability. According to Winkler, (2011) Most sources of information or data are vulnerable to misuse or use by unauthorized parties which normally calls for control measures in terms of permission of use by the relevant authorities. The impeding situation is that these measures are normally not protective enough and therefore do not offer quite substantive security to the data and information on the cloud (Wambu & Irungu, 2014).

The cloud model provides three types of services. The first is Software as a Service- SaaS. This denotes the capability provided to the consumer to use the provider's applications running on a cloud infrastructure. The access to such applications is through various thin client interfaces such as a web browser for example web-based email. The second type of service offered through the cloud is Platform as a Service- PaaS. Here, the consumer is able to deploy applications without installing any platform or tools on their local machines or devices. PaaS provides platform layer resources, including operating system support and software development frameworks that can be used to build higher-level services. The third service offered by cloud computing is Infrastructure

as a Service- IaaS. The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to work without any service.

From the report by Capobianco, (2010) On Cloud Connectivity in perspective 2010, Cloud authentication and permission has the greatest number of commercial solutions available to organizations. This does not mean the issue is easily solved, however. Every organization has its own way to manage permission and authorization as a way to secure data. Every organization has a duty to determine its mission critical processes and what can be done by the use of cloud Dillon, T., Wu, C., & Chang, E. (2010,).

2.1. Obstacles facing Cloud Computing Adoption

There a number of obstacles for cloud computing adoption, (Mather et al., 2009) identified the following; security, privacy, connectivity and open access, reliability, interoperability, independence from CSPs, economic value, IT governance, changes in the IT organization, and political issues due to global boundaries. Other areas include.

2.1.1. Security

Schneir (2010) argues that the psychology of security revolves around security as both a feeling and a reality. Security as both a feeling and reality are not similar. Schneir implies that the reality of security is based on the probability of different risks and how effective the various mitigation strategies are in place in dealing with the perceived risks. Security is also a feeling based on the psychological reaction to both the risks and the countermeasures.

Therefore, this means that, cloud computing needs to appeal to the feelings of the clients and address the potential security risks in a manner that clients will feel safe and secure Subashini, S., & Kavitha, V. (2011). By addressing security this way, clients will feel safer and secure and hence trust cloud service providers. Figure 2-1 shows how security and compliance can be mapped to the cloud model as proposed by Cloud security alliance (2009). This model helps in identifying the gaps existing between the organization's compliance model, the security control model, and the cloud model. By identifying the compliance requirement

and where in the security model they are required or are fulfilled the enterprises can then link the appropriate security control to its appropriate cloud infrastructure.

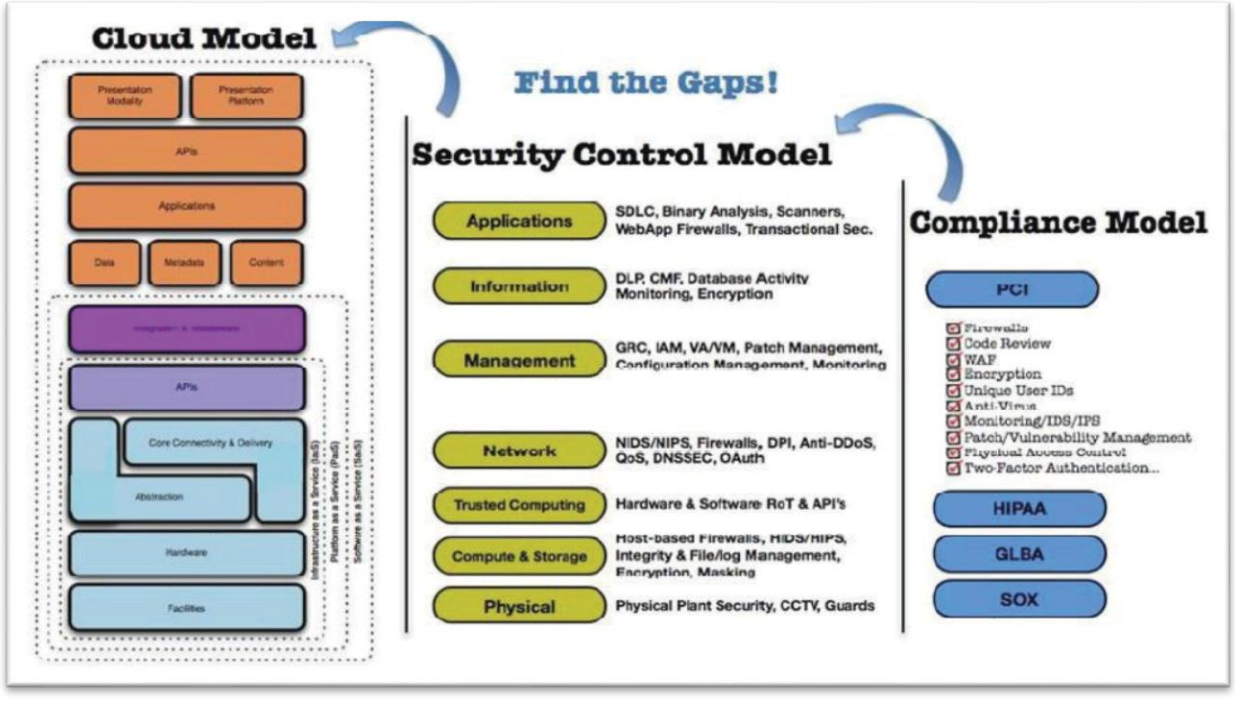


Figure 1: Mapping Cloud model to Security and Compliance Model (CSA, 2012).

2.1.2. Infrastructure

Most developing economies lack basic infrastructure to be used in telecommunications such as electricity to power the devices (Kauffmann, 2009). These infrastructures are the backbone of any development initiatives. This is not helping in the fight to bridge the digital divide. The absence of such infrastructure leads to the unavailability of internet infrastructure and escalating costs of such services and the cost of devices to access internet as is the case in Kenya

2.1.3. Hardware and Software

For a successful cloud based system, proper hardware and software must be adopted (Kshetri, 2010). Mobile service providers and ISPs, in Kenya for instance, have rolled more advanced 3G and 4G network coverage in all of the country's major towns such as Nairobi, Kisumu, and Mombasa. With the help of mobile network companies within the country, internet access has become accessible to many areas outside of the main cities for the first time (Gleeson, 2009). This has presented a challenge in bridging the gap between proper hardware and software within the

country. In an area where hardware is advancing faster than the software no proper system will sustain the over demands of the client fully.

2.1.4. Internet coverage

For cloud computing to be termed as a success then proper internet coverage is usually necessary (Jensen & Richardson, 2011). de Argaez, E. (2011). states that, Africa has 15% of the world population but it only accounts for 5.7% of internet users in the world. According to Twinomugisha (2010), a lack of infrastructure has resulted to low bandwidth and high costs. On 23 July 2009 the 17,000km SEACOM undersea fibre-optic cable went live; it provides broadband connectivity to a number of African countries (BBC, 2009). Physical location of data in cloud setups is usually in a remote datacenter and usually accessed via internet.

2.1.5. Lack of standardization

Insurance firms generally have too many IT applications and lack a high degree of data and business process standardization to be able to fully take advantage of the scalability promised by cloud computing.

2.1.6. Compliance

Compliance requirements from local regulators, as well as domestic data privacy norms, put constraints on the ownership and management of cloud-based services. Emerging data privacy regulations in the U.S., Europe and other regions may create additional uncertainty for Insurers in coming years.

2.2. Development of cloud computing in Africa

At the onset, it is significant to make it clear that cloud computing is in the infant stage in Africa. Studies have indicated a lack of cloud based awareness, even among big organizations in Africa. According to a Gartner survey conducted among large enterprises in 2011, half the respondents in emerging markets either had not heard of cloud computing or didn't know what it meant (Won Kim, 2009). The market for the cloud in developing countries is currently small, but is expanding rapidly. In Kenya, cloud demands are high in the offshoring industry and technology hubs. In South Africa, the call center industry has been a fastest growing area for cloud based technology.

A study by IDC suggested that emerging markets such as Kenya, South Africa, Nigeria and Egypt are likely to be important market forces to drive Africa toward the cloud platform.

2.2.1. The Current State of Cloud Computing in Africa

Africa is poised for the next wave of technology innovation where IT services will be instantly available to end users on request. Many countries in sub-Saharan Africa have made significant steps in IT characterized by their embracement of mobile devices. Like other emerging markets, Africa has been slow in embracing cloud computing but it is rapidly beginning to take off with tech experts touting the cloud's big and perhaps unseen potential within the continent (Conway-Smith, 2012). Experts note that Cloud computing might actually be ideal for Africa, which is characterized by little traditional internet infrastructure, unreliable electricity grids in many areas, and an ongoing boom in business and development. A major hurdle to cloud computing adoption in Africa has been the lack of knowledge about its benefits.

As mentioned in chapter 1, cloud computing refers to storing data on remote servers which is then accessed through the internet rather than the traditional storage of data on hard drives or local computers (Conway-Smith, 2012). An emerging IT industry in Africa is betting its future on serving customers and businesses through mobile cloud applications. Applications which were previously not available due to a lack of locally available skills or the need for significant up-front investment would become readily available on a pay-as-you-go business model, delivered over the network. In some parts of Africa, cloud computing is getting adopted as a business model in a bid to overcome compute capacity, power or other deficits. Cloud computing optimizes the use of scarce resources by consolidating what is available into a resource pool which is efficiently allocated to users based on their needs. This approach to IT service delivery is set for a major take off in Africa, provided certain enabling measures are put in place (Techequity, 2014).

Many organizations are exploring or preparing to introduce this new technology. More than 50% of ICT operators have begun to implement or are already using cloud computing (Techequity, 2014). Studies by the International Telecommunications Union have shown Banking and the Educational sectors as early adopters of cloud computing (Techequity, 2014). Opportunities exin retail, media and entertainment. For a local cloud computing business model to thrive, a basic

investment in data center infrastructure is needed. Many countries in Africa are in the process of building data centers capable of delivering cloud services.

In South Africa, new companies have opened two data Centers, in Cape Town and Johannesburg. These represent an attractive opportunity for international companies, which see in them a very low-cost alternative to European centers. A report published in January 2011 by the consultancy firm Balancing Act put at 112 the number of data centers within the continent, including 15 in South Africa, 11 in Egypt, Ghana and Nigeria, ten in Kenya and one in Tunisia. African companies such as Kenya Data Networks or Teraco- which operates data centers in Cape Town, Durban and Johannesburg, are contributing to the construction of new economic models, based on the use of entry-level products via the net. Using the Teraco data center based in Cape Town, the Internet access provider Webnow has launched a virtual server targeting small enterprises.

The Balancing Act report predicts that key African operators will soon be addressing the implementation of new services based solely on the cloud. It was recommended to encourage adoption of the cloud Computing and the construction of data centers in Africa to reduce service access costs. Increasing the physical proximity between cloud computing resources and end user will produce immediate savings in bandwidth budgets while accelerating access to cloud computing resources.

Despite the development of international data transmission links between Africa and the rest of the world, the costs associated with the bandwidth necessary for transferring "African data" to and from cloud computing resources located outside Africa- whether for storage or for data consultation purposes- are so high that it is more advantageous to construct data storage centers in Africa than to pay for accessing centers located tens of thousands of kilometers away from the continent. Consideration could be given to the charging of preferential, intra-African rates for the use of such data centers for data.

It is logical to use some of these countries as the study sample of cloud computing in Africa. It is also important to note that the level of development of cloud computing is directly proportional to the availability of internet connectivity. As a result we shall take the most internet connected countries as the study sample in this subtopic.

2.3. Cloud Computing in Financial Systems

IT experts in financial services had claimed that finance would never move to the cloud based on security concerns (Fenu & Surcis, 2009). However, these opinions appear to be shifting. As solutions to address the existent security and compliance/regulatory challenges are developed, so too does the financial services sector adopt the cloud. The latest research conducted by Ovum indicates that the financial services sector is increasingly investing in cloud computing (Linthicum, 2014). This has been encouraged by the growth of a multitude of applications as well as better cloud security solutions.

Financial services organizations adopt the cloud in large part to improve their business agility, upgrade their operations, save on procurement, and streamline and speed up provisioning of new infrastructure resources (Pourghomi & Ghinea, 2012). All these benefits add up to greater elasticity, scalability, and the opportunity to create a better fit between technology resources and business needs: vital components to a competitive advantage. The migration to the cloud for the financial services sector has been a long time coming. The nature of business carried out by the sector has ensured that the industry undertook a careful adoption of cloud computing (Fenu & Surcis, 2009). Financial services sector deals with some of the most sensitive and personal customer information available out there. The breach and/or theft of consumers' financial and personally identifiable information can be disastrous to the individual and catastrophic to the business. That's why financial firms must labor under a web of data privacy and security regulations, like SOX, GLBA, and PCI DSS, which govern how they store and use data and who can access it, and that mandate stiff penalties for noncompliance.

Presently, however, a new generation of cloud information protection and cloud data security solutions has emerged that enable financial services organizations to leverage the benefits of the cloud without creating security vulnerabilities or violating relevant data privacy regulations. Technologies like persistent encryption from the client side into the cloud, tokenization for extra-sensitive data, and DLP to detect potential violations all go a long way towards protecting data and controlling its access and usage. In fact, in some cases, cloud computing can actually improve security. By emphasizing on the following four mechanisms, cloud computing can prove a major win for financial organizations i.e. Insurance and banks; Awareness of regulatory and data privacy

obligations; Clear policy and governance to meet those obligations; the right technology to protect your data; the right systems to control data use and enforce policies.

Table 1: Perceived Benefits of Cloud Computing Adoption

Area	**Benefit**
Big Data Analytics	Integrating customer data across cloud based system platforms to enable near real-time insights
Business services	Extending and incorporating third-party services to extend the cloud system ecosystem to support customer's everyday transactions
Collaboration	Enabling employees across distributed branches to access statements and systems through a security-rich cloud infrastructure
Desktops and devices	Deploying a private cloud to centralize management of desktops allows for greater remote flexibility without sacrificing control, while enabling
Development and testing	Enabling a System development teams to quickly and easily create virtual environments thus increasing the agility of development and testing
Industry	Enabling payment providers to standardize and modernize transaction
Infrastructure compute	Allowing capacity to be allocated, expanded and reallocated efficiently gives systems flexibility and agility while resolving the issues of complexity and cost increases related to scaling up traditional network models to
Infrastructure storage	Providing scalable storage solutions to ensure that the real-time demands of today's trading and analytics processes are maintainable
Managed backup	Backing up a critical business data to ensure that in the event of a disaster a financial institution can bounce back rapidly and easily
Security	Enforcing active security and endpoint management to ensure corporate governance and IT policies are maintained

2.4. Cloud Computing in Financial Systems in Kenya.

Kenya's financial systems are relatively well developed and diversified. However, major structural impediments prevent it from reaching its full potential (Mwangi, 2012). A well-developed financial system widens access to external finance and channels resources to the sectors that need them most (Nicoletti, 2013). Finally, effective financial institutions and markets can help economies cope better with exogenous shocks such as terms of trade volatility and move them away from natural resource based development (Guangming, 2012).

Kenya just like any other African market is yet to fully adopt cloud based systems due to trust and security concerns (Mwangi, 2012). Cybercrime poses a threat in economic crime committed using computers and the internet. Cybercrime in the financial systems and services sector, diverse product lines, and mobile banking system solutions open up financial services organisations to increased cybercrime, unless they implement appropriate controls to safeguard customers and improve information security (Gathungu, 2012).

Financial systems are now embracing the cloud approach in Kenya and outsource some of the non core services (Mwangi, 2012). Kenya is slowly developin as an ICT region of interest. The Mpesa system is termed as a great innovation and a lot of countries are now trying to adopt the same Lule, I., Omwansa, T. K., & Waema, T. M. (2012).

The adoption of Cloud based financial systems in kenya has been slow due to the following reasons: Privacy/ Security Concerns ; Compliance requeremets from IRA; Lack of intergration where the systems are made from different architectures; High costs associated with hardware and software purchase.

2.5. Emerging Cloud Computing Issues

Expected to be an inflection point for cloud computing, 2015-2016 holds a great potential for innovation driven by a surge in demand for reliable, secure, high speed and resilient financial systems (Winkler, 2011). According to the Cisco Global Cloud Index, financial systems will be core for development. Global cloud computing traffic will increase 12-fold from 130 exabytes to reach a total of 1.6 zettabytes annually by 2016. Cloud is the fastest growing component of data center traffic, growing to more than 33 per cent of the total by 2018. As the adoption of cloud computing advances, access modes within the SaaS and PaaS cloud environment is to increase with leading financial systems vendors looking to strategically partner with, or acquire companies who can provide the right solutions to the ever changing demands(Subashini & Kavitha, 2011). Some other trends foreseen in this space include:

2.5.1 Mobile Cloud

The concept of 'Bring Your Own Device'- BYOD, will continue to gain momentum in the coming years, as more financial organizations understand the benefits like cost savings and increased employee productivity Hamel, G. (2012) With more businesses becoming mobile, there will be a move towards cloud in the financial system space as organizations begin to shift IT assets from their own data centers to the cloud. As they adopt the cloud, enterprises will begin to host at least parts of their data on the cloud, even mission-critical workloads (Furht, 2010).

2.5.2. Big Data

Big data consolidates data resources with different structures and data models, all in a massive, financial distributed storage system. Enterprises would need a very good backend infrastructure encompassing several servers to process distributed queries across multiple data sets and return result sets in record time. The big data gained from financial systems can provide deep insight into spending and saving habits across its corporate clients and walk in clients. Digital payment histories can allow individuals to build credit histories, making them candidates for loans and other credit-based financial services.

2.5.3. Pay-As-You Go

Enterprise adoption of pay-as-you-go model will pick up in 2016. The financial systems will services on demand rather than buying perpetual hardware and software along with separate maintenance contracts. Only the needed modules will be adopted in the business systems models.

2.5.4. Social Commerce

Social commerce is the use of the available social networks in the use of business transactions (Li, B. H., Zhang). Social media is now a buzz and financial system integration has taken shape. Shoppers do not arrive at a site alone but bring their entire social networks with them (Ting, I., Lin, C. H., & Wang, C. S. (2011). Services integrated within financial systems include Facebook, twitter, and Instagram where financial systems gather the information. Social commerce aims to assist companies in achieving the following purposes. First, social commerce helps companies engage customers with their brands according to the customers' social behaviors. Second, it provides an incentive for customers to return to their website. Third, it provides customers with a platform to talk about their brand on their website. Fourth, it provides all the information customers need to

research, compare, and ultimately choose you over your competitor, thus purchasing from you and not others (Crain's Chicago Business, 2012).

2.6. Cloud Computing Models

Cloud service models offer institutions the option to move from a capital-intensive approach to a more flexible business model that lowers operational costs. The key to success lies in selecting the right cloud services model to match business needs (Teece, D. J. (2010).). The various models for Cloud Computing Services operations and deployment include Software-as-a-Service- Saas, in which a cloud service provider houses the business software and related data, and users access the software and data via their web browser. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings (Christiansen, et al., 2010). Platform-as-a-Service- Paas, where a cloud service provider offers a complete platform for application, interface, and database development, storage, and testing, this allows businesses to streamline the development, maintenance and support of custom applications, lowering IT costs and minimizing the need for hardware, software, and hosting environments.

The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations (Christiansen et al., 2010). Infrastructure-as-a-Service- (Iaas), where rather than purchasing servers, software, data center space or network equipment, this cloud model allows businesses to buy those resources as a fully outsourced service. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed 14 applications, and possibly limited control of select networking components like host firewalls (Christiansen et al., 2010). There are three ways service providers most commonly deploy clouds, Private Clouds where the cloud infrastructure is operated solely for a specific company. It may be managed by the company or a third party and may exist on or off the premises. This is the most secure of all cloud options. The second model that can be utilized is public clouds where the cloud infrastructure is made available to the general public or a large industry group and is owned by an organization that sells cloud services and the third one is

hybrid clouds where the cloud infrastructure is composed of two or more clouds- private or public, that remain unique entities but are linked in order to provide services.

National Institute of Standards and Technology- NIST, is a well-accepted institution all over the world for its work in the field of Information Technology. I shall present the working definition provided by NIST of Cloud Computing. NIST defines the Cloud Computing architecture by describing five essential characteristics, three cloud services models and four cloud deployment models (Cloud Security Alliance, 2009).

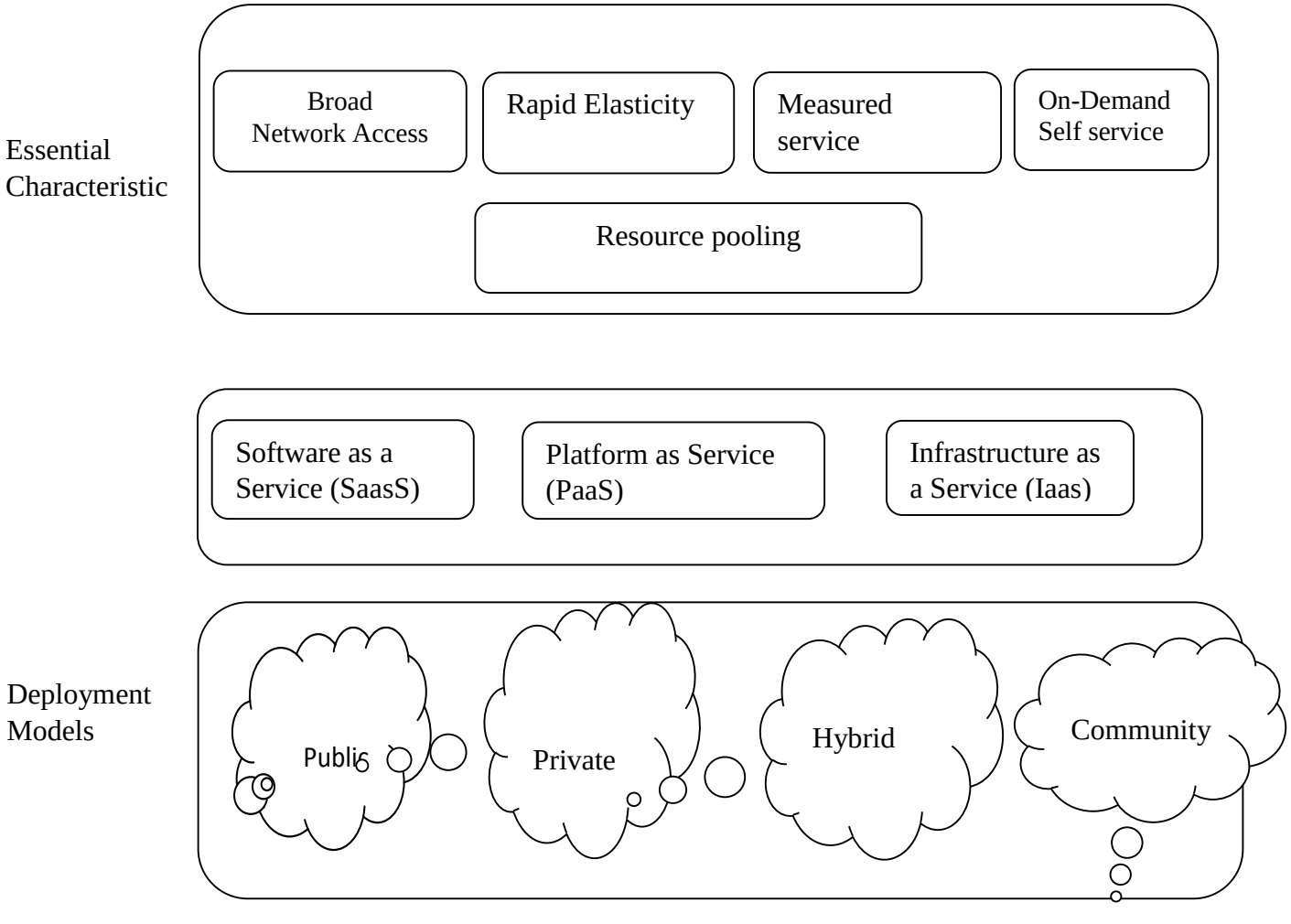


Figure 2: Visual model of NIST Working Definition of Cloud Computing (Cloud Security Alliance, 2009).

2.6.1 Essential Characteristics of Cloud Computing

As described above, there are 5 essential characteristics of Cloud Computing which explains their relation and difference from the traditional computing.

i. On-Demand-Self-Service

Consumer can provision or un-provision the services when needed, without the human interaction with the service provider.

ii. Broad Network Access

It has capabilities over the network and accessed through standard mechanism.

iii. Resource Pooling

The computing resources of the provider are pooled to serve multiple consumers which are using a multi-tenant model, with various physical and virtual resources dynamically assigned, depending on consumer demand.

iv. Rapid Elasticity

Services can be rapidly and elastically provisioned.

v. Measured Service

Cloud computing systems automatically control and optimize resource usage by providing a metering capability to the type of services -e.g. storage, processing, bandwidth, or active user accounts. (Cloud Security Alliance, 2011).

2.7. Conceptual Framework

The aim of this Framework is to provide a practical reference to help insurance companies' Information Technology-IT, and business decision makers as they analyze and consider the adopting cloud computing in their business. The research shall adopt Technology–Organization– Environment (TOE) framework. The framework explains that technological context, the organizational context, and the environmental context influence technology adoption decisions. The technological context includes all of the technologies that are relevant to the enterprise i.e. the Insurance, both technologies that are already in use at the enterprise as well as those that are available within the market but not currently in use. A firm's existing technologies

are important in the adoption process because they set a broad limit on the scope and pace of technological change that a firm can undertake Qian, H., Medhi, D., & Trivedi, K. (2011, May).

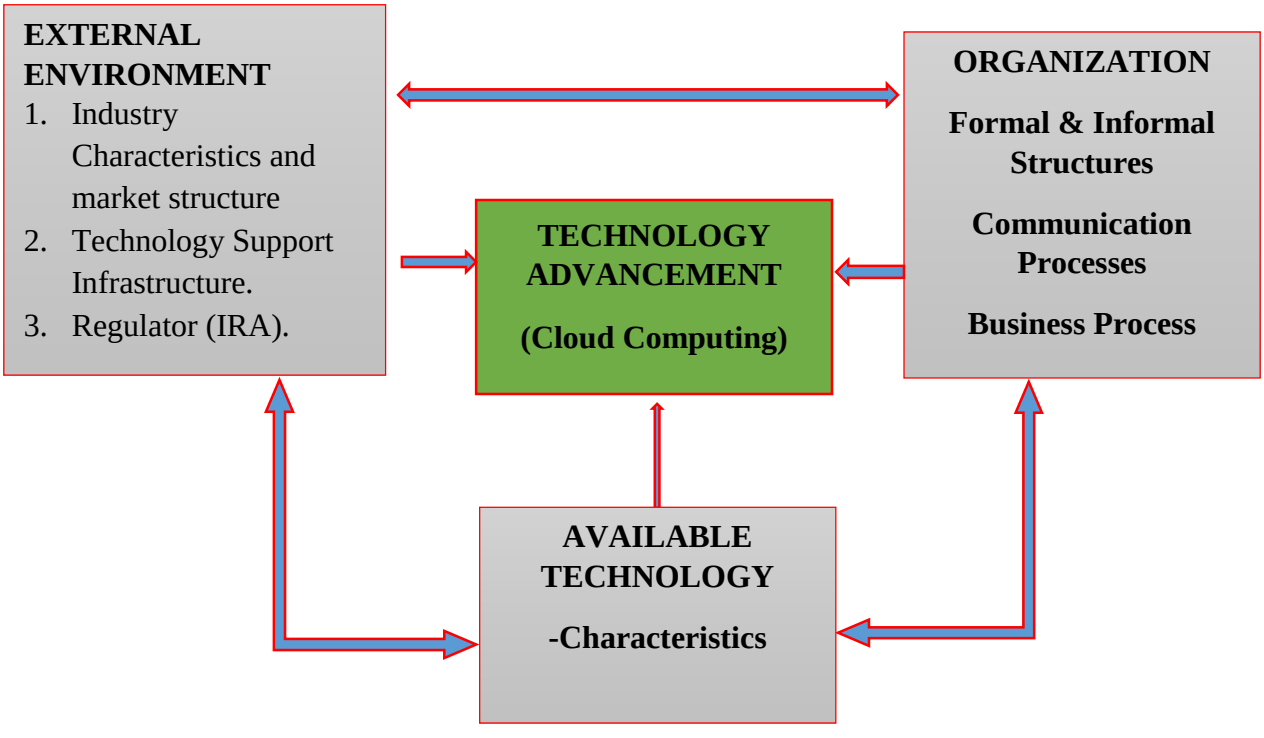


Figure 3: Technology-organization- environment (TOE) Adaptation

The TOE framework includes the steps, along with guidance and strategies, designed to help the decision makers evaluate and compare adoption offerings in key areas from different environments both internal and external. When considering a move to use cloud computing, consumers must have a clear understanding of potential benefits and risks associated with cloud computing, and set realistic expectations with their cloud provider (Luis et al, 2011). Consideration must be given to the different models of service delivery: Infrastructure as a Service -IaaS, Platform as a Service- PaaS, and Software as a Service- SaaS, as each model brings different requirements and responsibilities Omwansa, T. K., Waema, T. M., & Omwenga, M. B. (2014).

As consumers of cloud such as insurance companies transition their applications and data to use cloud computing, it is critically important that the level of security provided in the cloud environment be equal to or better than those provided by their traditional IT environment. Failure to ensure appropriate adoption could ultimately result in higher costs and potential loss of business thus eliminating any of the potential benefits of cloud computing Foster, I., Zhao, Y., Raicu, I., & Lu, S. (2008).

The interaction between independent, dependent and intervening variables is shown in Figure 5.

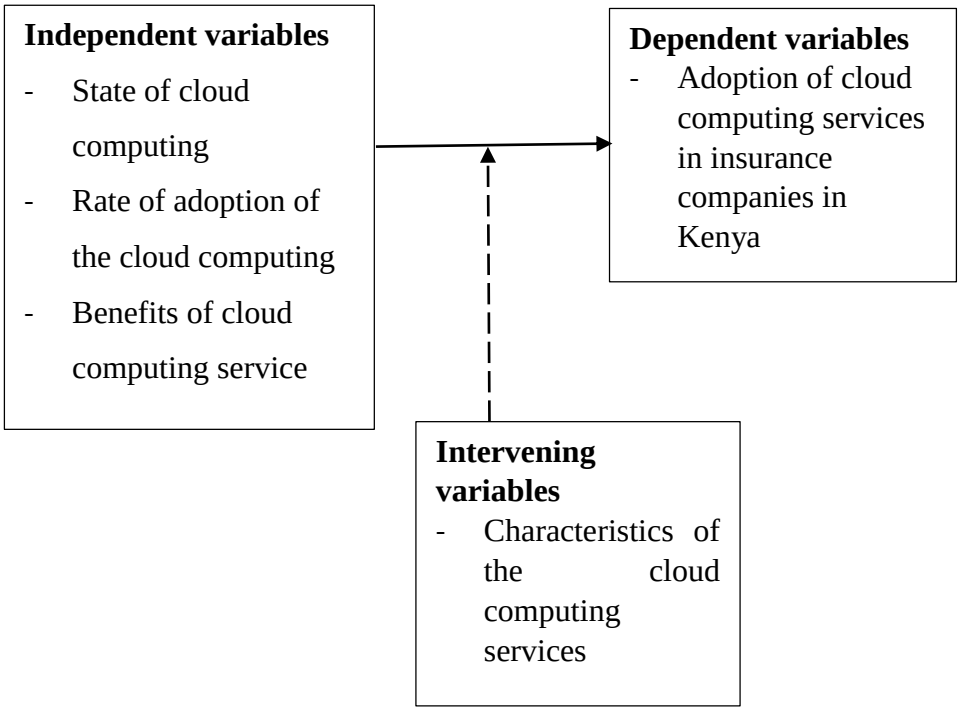


Figure 4; Interaction between Independent, Dependent and Intervening Variables

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

The research methodology covered the choices made in relation to the collection, measurement and analysis of data. The research design outlined aimed to assist in answering the research questions of study. It outlined the rationale behind the collection, processing and analysis of the data for the study.

3.1 Research Design

This study adopted a descriptive survey research design. Descriptive research design is a fact finding operation, with adequate interpretation, generally used to describe phenomena. The adoption of these methodologies enabled the researcher to triangulate the findings (Saunders, Lewis & Thornhil, 2011). This approach helped to analyze and describe the state of cloud computing adoption among insurance firms in Kenya.

The area of study for the research was Nairobi, the capital city of Kenya. Nairobi was purposively selected for the study as it houses the head offices for the majority of insurance companies in the country. Nairobi is also well advanced in internet connectivity compared to other major towns and cities within the country. This enables for cloud computing adoption to become much easier. This made it suitable for conducting research on cloud computing in comparison to the other towns and cities.

3.2 Study Population

The target population for the study was 36 insurance companies in Kenya. The companies of various services in public and private sector. The companies have branches in major towns in country. The insurance companies have the following technical carders of employees from the CEO Chief Information Officer, Systems administrator and other non-technical staff

3.3 Sample Size and Sampling Technique

Sampling involves any procedure that draws conclusion based on measurement of a portion of the population (Kothari, 2004). Purposive sampling technique was employed to select the area of study which is Nairobi City. The area is purposively selected as it represents the country's economic capital and therefore houses most of the major insurance firms in the country. The research used a systematic sampling technique to select the big and small players in the insurance sector in Kenya

The research targeted 36 insurance companies within Nairobi. The 36 insurance companies were clustered in two basing on the gross premium. The first cluster comprised five (5) insurance companies with high gross premium of more than Kenya shillings 5 billion and 5(five) insurance companies with low gross premium of less than Kenya shillings 700 million gross premium. Purposive sampling was then used to select the respondents during the pre-test who included the following carders: Chief Information Officer, Application Manager, Infrastructure Manager, Systems Administrator, Computer User and other people who use computing resources in each insurance company. A total of the respondents should be familiar with cloud computing. This targeted population assisted the researcher to collect appropriate data in regard to cloud computing adoption within the various insurance firms.

3.4 Data Collection Tools

There were 2 main data sources for the research study- primary and secondary. To collect data for this research study both sources were used. One of the vital rules in data collection emphasized on exhausting all secondary data sources before undertaking primary study.

i. **Secondary sources**

Secondary was versatile and got used for many purposes. To collect secondary data, the researcher first reviewed articles related to the research objectives that appeared in the literature. Key journals and proceedings were systematically scanned for any articles related to the research topic (Saunders, Lewis & Thornhil, 2011). The researcher also searched for key words in peer reviewed journals. The study and review of peer-reviewed material from past studies on adoption of cloud computing in the financial services sector with specific regard to insurance firms. This method was

used to determine the benefits and challenges other countries have faced and how different the cloud computing differs from the rest of the world.

ii. **Interviews**

Interviews enabled face-face discussion with the respondents targeted for the study. Interviews were recorded for better future reference and memory. An interview schedule was drawn up and combined both closed and open ended questions. Interviews were be used to establish what effect the use of cloud computing has with security based instruction and financial systems and the use of traditional onsite methods. Interviews helped to understand what structures and systems the Insurance organizations currently have in place, how they work, how effective they have been with the cloud computing and the challenges they face.

iii. **Questionnaires**

Questionnaires always provide a logical and easy way of collecting data from respondents. However, they may prove difficult to design and obtain the required information based on the responses from the respondents. The questionnaire was therefore, designed in a manner that the questions were clear and for easier reliability and data management (Saunders, Lewis & Thornhil, 2011). The questionnaire for this study was designed based on the research questions, objectives framework and issues pertinent to cloud computing adoption in insurance firms in Kenya. The questionnaires were able to find out cloud computing adoption among insurance firms in Kenya. The research employed both open-ended and closed questionnaires.

iv. **Observation**

The research employed observation as a data collection tool. The Insurance Companies that are using cloud computing were observed to check on the business processes in place and how the data is transferred into the cloud. What was observed was the data preparation and what goes into the cloud. The objective of observation was to check whether best practices were put into place.

3.5 Ethical Consideration

This study seeks consent from the study target population before the study by explaining the purpose of the study to them. The study also assured the respondents that their confidentiality. The

study also explained to the subjects on the procedure of study and the direct and indirect benefits of the study to them.

3.6 Data Analysis

This research adopted quantitative research methodology in analyzing the data. The data collected was checked for errors, coded and analysed with the aid of the statistical procedure and service solution (SPSS) version 22. The initial analysis included an examination of descriptive statistics of demographic variables with frequencies and percentages. The researcher used inferential statistics for all the objectives to explain the relationships between the independent variables and dependent variables. These included regression analysis, factor analysis to explain the strength of relationship of the independent variables on the dependent variable. Multiple regression test for the relationship between the independent and dependent variable and showed the strength of association between the two variables.

Pilot testing was done using 10 respondents pilot testing was done to ensure that there were no deficiencies and ambiguities in the final Questionnaire. Reliability tests were conducted to check for consistency of data, factor analysis was also performed. After pilot testing, reliability of the questionnaire was estimated using the Cronbachity coefficient test. According to Fraenkel and Wallen (2000), a reliability of 0.70 or higher is preferable for research purposes. The resultant variables of the factor analysis were used to see the strength of relationship as well as strength of explaining ability of the variables. These regression tests involved calculating and comparing to gain insight into the nature of the relationship between independent variables and dependent variables (Saunders, Lewis & Thornhil, 2012).

3.6.1 Validity

Internal Validity: This is established when the research demonstrates a causal relationship between two variables (Saunders, Lewis, & Thornhill, 2012, p. 76). To enhance internal validity the questionnaires was designed in a simple, well understood and easy to administer. Further to this, triangulation of data sources was ensured by using both questionnaires and interviews.

External Validity: This refers to the extent to which the findings of the research can be generalized to other relevant settings or groups (Saunders, Lewis, & Thornhill, 2012). This research studied insurance companies in Nairobi and the representativeness of the sample therefore added to the external validity of the study.

3.6.2 Objectivity

Objectivity was used, the avoidance of (conscious) bias or subjective selection during the conduct or reporting of research. This also showed the free of biasness i.e. any influence or conditions which singly or together distort data (Saunders, Lewis, & Thornhill, 2012, p. 85). To ensure objectivity a standardized questionnaire was used.

3.7 Limitations of Methodology

The study represented entire insurance population in Kenya. Time was a limiting factor and minimal funding obtained for the research. Insurance being a financial institution some information was hard to be disclosed. The researcher had to explain the intended purpose before access was given to the data and information.

CHAPTER FOUR
RESULTS

4.0 Introduction

This chapter of the study comprises of the data analysis presentation and interpretation of the study findings. The data was collected using Questionnaires and Interviews, The data are presented in sub-sections which include the general information in relation to cloud computing and the study objectives. Data is presented in tables and charts. The response rate for the study was 33 out of the 36 Insurance Companies which translates to a response rate of 92 %.

4.1 Descriptive Analysis

The Data was analyzed for frequencies and percentages and presented in tables and charts under the following sub-titles.

4.1.1. Introduction and rate adoption of cloud computing services.

Out of the 33 companies' one introduced cloud computing services in less than a year, while 11 companies introduced a year ago. Twenty one (21) companies introduced services more than a year. Since the information technology is relatively new and expensive, most companies, most companies took slightly longer in adopting the cloud computing services. Furthermore the staff have not been inducted or trained on how to apply the cloud computing services in the companies system. Armbrust et, al., (2010).

According to the study, 16 companies had adopted cloud computing system the adoption was due to the fact that; cloud computing helps solve sophisticated problems involving huge data, data analysis, fast analysis, fast data processing, ease of storage and retrieval of data. However, (11) had insufficient knowledge on adoption of cloud computing systems. Six companies expected to adopt cloud computing services within 12 months. Four (4) companies did not have any intention of adopting cloud computing service. Finally, two (2) companies would adopt the services in more than 12 months to solve an active need, because everyone is adopting, saves on costs through proper resource allocation,

4.1.2 Level of adoption of cloud computing services

The findings showed that 19 Insurance Companies were experimenting on cloud computing systems, while 9 were utilizing a combination of cloud computing services. However, 5 of the Insurance Companies were not sure. Cloud computing may not be fully trusted in this case as most are enjoying the benefits but are yet to fully decide. Technology decisions may change before you fully accept the change (Low, Chen, & Wu, 2011). The results are shown in Figure 5 below.

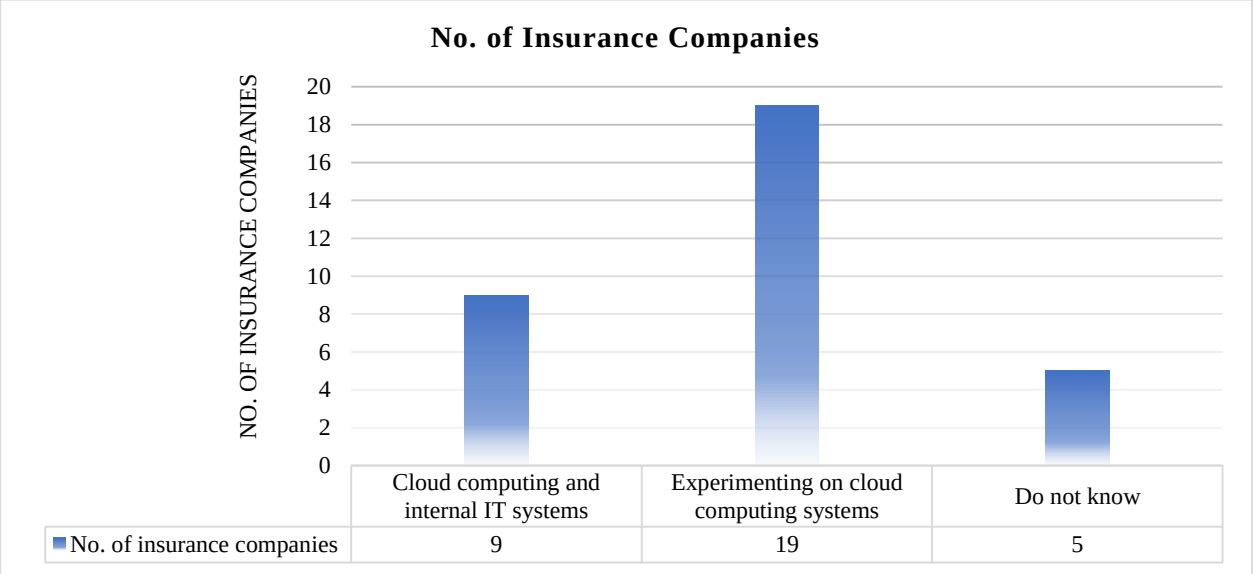
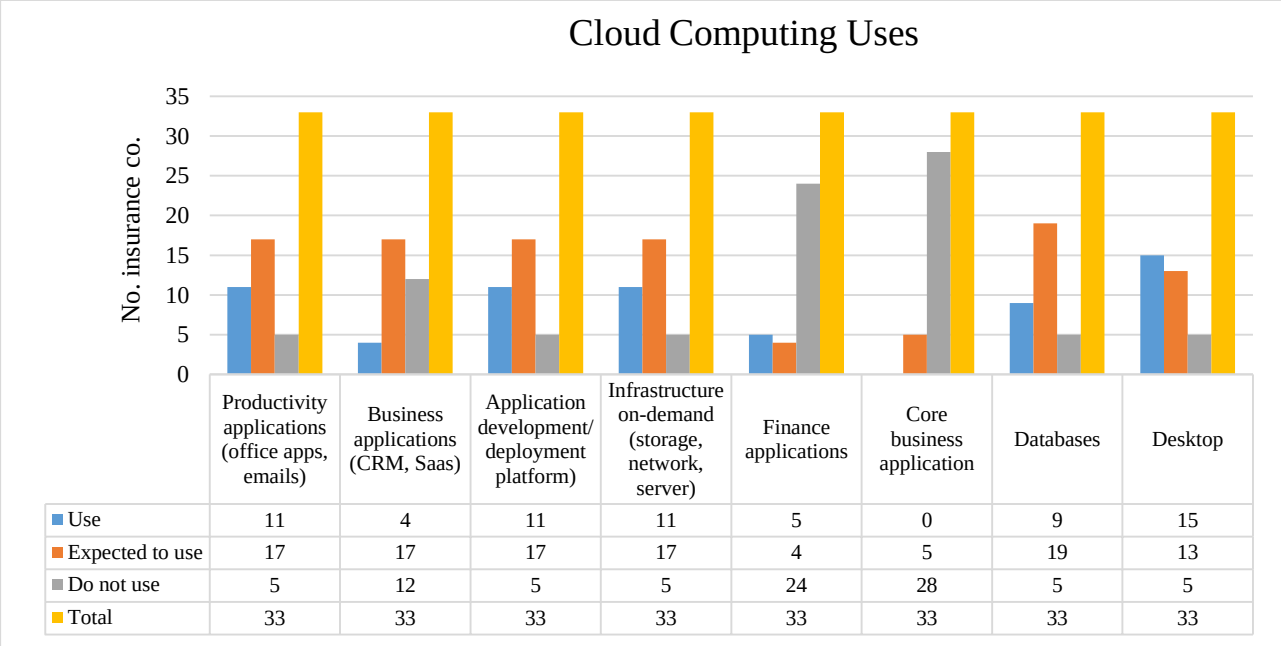


Figure 5: Level of Adoption of Cloud Service

The high level on the experimenting companies may be due to the system being new and the companies needs to be sure before fully operationalizing of the service in the system.

4.1.3 The Use of Cloud Computing Services in insurance companies

According to the findings, 18 Insurance companies that had adopted cloud computing services in productivity applications, business application development platform, infrastructure on-demand, databases and desktop. However, the companies did not use finance applications and core business applications in cloud computing. This may have been due to the levels of understanding and maintenance issues of the cloud computing systems. Figure 6 below shows the results of the findings.



	Productivity applications (office apps, emails)	Business applications (CRM, Saas)	Application development/ deployment platform)	Infrastructure on-demand (storage, network, server)	Finance applications	Core business application	Databases	Desktop
Use	11	4	11	11	5	0	9	15
Expected to use	17	17	17	17	4	5	19	13
Do not use	5	12	5	5	24	28	5	5
Total	33	33	33	33	33	33	33	33

Figure 6: Users and expectations to use cloud computing services

The study revealed that, most insurance companies used or expected to use cloud computing service applications, the services offered the companies with unmatched flexibility in terms of usage policies and scalability. Data storage is one of the major resources that insurance companies moved to the cloud. With data storage on the cloud, the companies would pay for the volume of space consumed.

Core software application has not been adopted due to security concerns and lack of technology. Those interviewed feel that financial institutions i.e. banks and insurance companies are always a security threat and hackers will always try to penetrate the networks. Most feel that they will eventually go cloud as the world is now moving towards that area

Cloud computing service were also adopted since they were cost effective and flexible in terms of resource utilization which leads to reduced operational costs as well as controlled financial spending on large scale upgrade. Another reason for the use of clouds computing services in the insurance companies was that data was available when required thus lowering the risks. The insurance companies also used cloud computing services trust the cloud for its security and data integrity.

It was noted in the study that, using cloud computing services led to the ability to work form anywhere and from multiple devices hence, resulting in innovative work cultures in the insurance companies

4.1.4 Platform in insurance companies

According to the respondent interviewed (58%) indicated that platform used were; software services (email, database access, back-up, enterprise application) as a platform in the insurance company, Platform as a Service (PaaS) (use of operating systems, development environments, software's, packages). This is because the platforms were user friendly and being used for basic transactions on day to day terms. Lastly the use of infrastructural IaaS (hardware, storage, and network) resources (infrastructure-as-a -service) was reported by 52%. Table 2 below.

Table 2: Platform used in insurance company. n=33

Platforms	Yes		No		Total	
	f	**%**	**f**	**%**	**f**	**%**
Use of software services (email, database access, back-up, enterprise application)	19	58	14	42	33	100
Use of operating systems, development environments, software's, packages (platform-as a-service)	19	58	14	42	33	100
Use of infrastructural (hardware, storage, network) resources (infrastructure-as-a -service)	17	52	16	48	33	100

The use of various platforms in cloud computing services enabled the insurance companies to turn ideas into innovations faster. With SaaS, the insurance companies reported that it was easy for the companies to streamline their maintenance and support, these was so because everything was managed by vendors: application, runtime, data, middleware, OSes, virtualization, serves storage and networking.

In the study SaaS delivery model in the insurance companies reduced costs, while easing the deployment and updating of applications. However, it was found out that developing SaaS applications is challenging in most insurance companies.

4.1.5 Factors influencing rate of adoption of cloud computing services.

According to the study, security, infrastructure, hardware and software, internet coverage and lack of standardization influenced rate of adoption of cloud computing services in the insurance company. Studies by Low, Chen, & Wu, (2011) showed that the eight factors examined in this study are relative advantage, complexity, compatibility, top management support, firm size, technology readiness, competitive pressure, and trading partner pressure.

Table 3: Factor influencing rate of adoption of cloud computing services n=33:

Influence on rate of adoption	Highly Influence		Moderately Influence		Lowly Influence		Total	
	f	%	f	%	f	%	f	%
Influence of security on rate of adoption of cloud computing services	31	94	1	3	1	3	33	100
Influence of infrastructure on rate of adoption of cloud computing services	19	29	14	21	0	0	33	100
Influence of hardware and software on the rate of adoption of cloud computing services.	22	34	11	17	0	0	33	100
Influence of internet coverage influence on rate of adoption of cloud computing services	29	44	4	6	0	0	33	100
Influence of standardization on the rate of adoption of cloud computing services.	18	28	15	23	0	0	33	100

It was reported that (94%) of the respondents indicated that security of data was very important and therefore influence rate of adoption in terms of keeping data safe and its integrity. Influence of infrastructure on rate of adoption was reported by 29% of the respondents, while 34% indicated influence in the rate of adoption by hardware and software. 44% of the respondents noted that internet coverage influenced the rate of adoption since the cloud computing squarely depends on the internet coverage. Finally, 24% respondents showed that standardization influence that rate of adoption, there was no clear standards set in the whole industry of insurance companies therefore, the rate of adoption was low.

4.1.6. Benefits from Cloud Computing Services.

The results of the study indicated that 50% of the respondent agreed that cloud computing services assisted the insurance company to be more flexible, allow the company focus on the core business, the company react more quickly to the market and completion, facilitate to the latest technologies,

provides the ability to immediately tap computing power and software, makes it is easy to collaborate, enhance security, promotes green it and mobile and ubiquitous access to it application and services as shown in Table 4 below.

Table 4: Benefits from Cloud Computing Services n=33

Cloud Computing Services	Yes	Did not know	No	Totals
	%	%	%	%
Helps the company be more flexible	58	42	0	100
Allow the company to focus on its core business	55	55	0	109
Helps the company react more quickly to market conditions and competition	58	42	0	100
Facilitate to the latest technologies	58	42	0	100
Provides the ability to immediately tap computing power and software	45	55	0	100
Makes it is easy to collaborate	58	42	0	100
Enhance security	58	42	0	100
Promotes green IT	45	12	42	100
Mobile and ubiquitous access to it application and services	58	42	0	100

4.2 Inferential statistics

The researcher performed multiple regression analysis, chi-square analysis of the variables which included the independent and dependent variables in order to test for the research questions. The results are presented under the following sub-topics

4.2.1 State of cloud computing services adoption

The state of cloud computing in terms of productivity application was tested and the results presented in table 5 below

Table 5; Chi-square for productivity application and state of cloud computing services n=33

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	51.082[a]	8	.000
Likelihood ratio	55.424	8	.000
Linear-by-linear association	35.029	1	.000
N of valid cases	33		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .30.

A chi-square test was performed and a relationship was found between productivity applications and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 51.082, p =.000. This implied that productivity applications were very important and that is way the rate of adoption was very high.

Table 6: Chi-square tests for business applications and state of cloud computing services

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	62.324[a]	8	.000
Likelihood Ratio	78.031	8	.000
Linear-by-Linear Association	45.105	1	.000
N of Valid Cases	33		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .24.

A chi-square test showed a relationship between business applications (CRM, SaaS) and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 62.324, p =.000. Since insurance companies are business and the most of the activities involves transactions, business application was very key in the operations of the insurance companies.

Table 7: Chi-square tests for application development/deployment platform and state of cloud computing services

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	51.082[a]	8	.000
Likelihood Ratio	55.424	8	.000
Linear-by-Linear Association	35.029	1	.000
N of Valid Cases	**33**		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .30.

There was a relationship found between application development/deployment platform) and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 51.082, p =.000.

Table 8: Chi-square tests for infrastructure on-demand and state of cloud computing services

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	51.082[a]	8	.000
Likelihood Ratio	55.424	8	.000
Linear-by-Linear Association	35.029	1	.000
N of Valid Cases	33		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .30.

A chi-square test was performed and a relationship was found between infrastructure on-demand (storage, network, server) and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 51.082, p =.000. Storage and network among the departments in the insurance companies was very important for the security and integrity of the data.

Table 9: Chi-square tests for finance applications and state of cloud computing services

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.297[a]	8	.001
Likelihood Ratio	33.486	8	.000
Linear-by-Linear Association	18.553	1	.000
N of Valid Cases	33		

a. 13 cells (86.7%) have expected count less than 5. The minimum expected count is .24.

There was a relationship between finance applications and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 26.297[a], p =.001 Table 10.

Table 10: Chi-square tests for core business application and state of cloud computing services

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.522[a]	4	.014
Likelihood Ratio	16.394	4	.003
Linear-by-Linear Association	10.074	1	.002
N of Valid Cases	33		

a. 7 cells (70.0%) have expected count less than 5. The minimum expected count is .30.

According to chi-square results, there was a relationship between core business application and adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 12.522[a], p =.001

Table 11: Computing Services in Databases and cloud computing services

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	53.068[a]	8	.000
Likelihood Ratio	56.831	8	.000
Linear-by-Linear Association	33.179	1	.000
N of Valid Cases	33		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .30.

A chi-square test showed a relationship was found between cloud computing services in databases and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 53.068[a], p =.000

Table12: Computing Services in databases and adoption of cloud computing

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	69.221[a]	8	.000
Likelihood Ratio	75.956	8	.000
Linear-by-Linear Association	46.474	1	.000
N of Valid Cases	33		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .30.

A chi-square test was performed and a relationship was found between cloud computing services in databases and the adoption of cloud computing in the insurance company, X^2 (8, N = 33) = 69.221[a], p =.000

4.3.1 Adoption rate of cloud computing services.

Table 13 shows the model summary where R value is .97 which indicates that 97 % of the variations observed in the dependent variables is caused by the independent variables. The other 3 % of variations observed may be due to other factors not captured in the study.

Model Summary

Table 13: Adoption rate of cloud computing services in insurance company

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.953	.949	.19288

a. Predictors: (Constant), Core Business Applications, Infrastructure on-Demand, Finance Applications, Productivity Application, Application Development/Deployment Platform, Business Applications (CRM, SaaS) in the Insurance Company.

Table 14 shows that the observed significance level in the model is 0.000 which is less than 0.05 which indicates that the model is statistically significant in predicting adoption rate of cloud computing with the independent variables (Core business applications, infrastructure on-demand (storage, network, server), finance applications, productivity application, application development/deployment platform) business applications (CRM, SaaS) in the Insurance Company).

Table 14: ANOVA[a] adoption rate of cloud computing

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44.835	4	7.473	200.851	.000[b]
	Residual	2.195	28	.037		
	Total	47.030	32			

a. Dependent Variable: Rate of Adoption of Cloud Computing Services
b. Predictors: (constant), adoption rate of in core business applications, adoption rate of in infrastructure on-demand(Storage, Network, Server), adoption rate of in finance applications, adoption rate of productivity application, adoption rate of in application development/deployment platform), adoption rate of business applications(CRM, SaaS).

Table 14 shows a regression summary of the influence of the independent variables on the dependent variable. The predictor variables were (In- Core business applications, infrastructure on-demand (Storage, Network, Server), finance applications, productivity application, application development/deployment platform), business applications (CRM, Saas). The first variable (constant) represents the constant, (it is the predicted value) rate of adoption of cloud computing services when all other variables are 0.

The values for regression equation for predicting dependent variable from the independent variable are as follows: The coefficient for productivity application is .086. So for every unit increase in productivity application, a .086 unit increase in Adoption rate of cloud computing services is predicted, holding all other variables constant.

Business applications (CRM, Saas) For every unit increase in Business applications (CRM, Saas), we expect a 0.177 unit increase in the Adoption rate of cloud computing services score, holding all other variables constant. Infrastructure on-demand (storage, network, server)

The coefficient for Infrastructure on-demand (storage, network, service) is 0.179. So for every unit increase in .18, we expect an approximately 0.179 point increase in the Adoption rate of cloud computing services score, holding all other variables constant.

The coefficient for Application development/deployment platform is 0.137. So for every unit increase in Application development/deployment platform, we expect a 0.14 point increase in the Adoption rate of cloud computing services score. For every unit increase in Finance applications, we expect a 0.103 unit increase in the Adoption rate of cloud computing services score, holding all other variables constant.

The coefficient for core business applications is 0.018. So for every unit increase in 0.018, we expect an approximately 0.018 point increase in the Adoption rate of cloud computing services score, holding all other variables constant.

Table 15: Regression summary of adoption rate of cloud computing services

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	95.0% confidence interval for b	
		B	Std. Error	Beta			Lower bound	Upper bound
1	(constant)	1.16	.18		5.86	.000	.701	1.42
	Productivity application	.17	.09	.26	1.97	.053	-.002	.340
	Business applications (CRM, Saas).	-1.77	.18	-2.06	-9.98	.000	-2.12	-1.41
	Infrastructure on-demand (storage, network, server)	1.79	.18	1.99	10.04	.000	1.44	2.15
	Application development/deployment platform	.72	.13	.796	5.32	.000	.455	1.00
	Finance applications	-.15	.10	-.123	-1.44	.153	-.355	.057
	Core business Applications	.00	.02	.000	-.012	.990	-.036	.035

a. Dependent variable: Rate of adoption of the cloud computing services

Using an alpha of 0.05, the coefficient for productivity application (0.169) is not statistically significantly different to adoption rate of cloud computing services from 0 because its p-value of 0.053 slightly larger than 0.05. The coefficient for Business applications (CRM, SaaS), (-1.769) is statistically significant to adoption rate of cloud computing services, because its p-value of 0.000 is less than 0.05.

The coefficient for Infrastructure on-demand (storage, network, server) (1.799) is statistically significant to adoption rate of cloud computing services, because its p-value of 0.00 is less than 0.05.

The coefficient for application development/deployment platform (0.73) is statistically significant because to adoption significant because to adoption rate of cloud computing services its p-value of 0.00 is less than 0.05.

The coefficient for Finance applications is .103. The intercept is not statistically significantly different to adoption rate of cloud computing services, from 0 because its p-value (0.153) is larger than 0.05. Financial applications were not very popular among the insurance companies and were not widely used.

The coefficient for Core business Applications is (0.018). The intercept is not statistically significantly different to adoption rate of cloud computing services from 0 because its p-value (0.990) is much larger than 0.05.

4.2.2 Platform used in insurance companies in Kenya

Table 16 shows the model summary where the R value is .833 which indicates that 83 % of the variations observed in the dependent variables is caused by the independent variables. The other 17 % of variations observed may be due to other factors not captured in the study.

Table 16: Platform Used in Insurance Companies in Kenya Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.912[a]	0.83	0.82	0.36

a. Predictors: (constant), testing on Saas model, use of infrastructural resources (infrastructure-as-a-service), use of operating systems, development environments, software's, packages (platform-as a-service) as a platform in the insurance company.

Table 17 shows that the observed significance level in the model is 0.00 which is less than 0.05 which indicates that the model is statistically significant in predicting platform used with the independent variables (testing on SaaS model, use of infrastructural (hardware, storage, network) resources (infrastructure-as-a-service), use of operating systems, development environments, software's, packages (platform-as a-service) as a platform in the insurance company).

Table 17: ANOVA of platform used in the insurance company

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.15	2	13.05	102.76	.000[b]
	Residual	7.87	32	0.12		
	Total	**47.03**	**34**			

a. Dependent variable: rate of adoption of the cloud computing services
b. Predictors: (constant), testing on Saas model, use of infrastructural resources (infrastructure-as-a -service), use of operating systems, development environments, software, packages (platform-as a-service) as a platform in the insurance company.

Table 18 shows a regression summary of the influence of the independent variables on the dependent variable. The predictor variables were (testing on Saas model, use of infrastructural (hardware, storage, network) resources (infrastructure-as-a -service), use of operating systems, development environments, software, packages (platform-as a-service) as a platform in the insurance company). The first variable (constant) represents the constant, (it is the predicted value) rate of adoption of cloud computing services when all other variables are 0.00.

The values for regression equation for predicting the dependent variable from the independent variable are as follows: Use of operating systems, development environments, software, packages (platform-as a-service) as a platform in the insurance company. The coefficient for use of operating systems, development environments is 0.322. So for every unit increase in 0.322, we expect an

approximately 0.322 point increase in the Adoption rate of cloud computing services score, holding all other variables constant.

The coefficient for application development/deployment platform is .189. So for every unit increase in application development/deployment platform, we expect a .189 point increase in the Adoption rate of cloud computing services score.

The coefficient for use of infrastructural (hardware, storage, network) resources (infrastructure-as-a -service) is .189, for every unit increase in Use of infrastructural (hardware, storage, network) resources (Infrastructure-as-a -service) we expect a 0.18 point increase in the adoption rate of cloud computing services score. The coefficient for testing on Saas model is 0.260, for every unit increase in testing on SaaS model we expect a 0.26 point increase in the adoption rate of cloud computing services score.

Table 18: Regression of the influence services on rate of adoption of cloud computing services

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	.563	.762		.739	.463
	Use of operating systems, development environments, software, packages (platform-as a-service) as a platform in the insurance company	1.438	.322	.842	4.462	.000
	Use of infrastructural resources (infrastructure-as-a -service)	.563	.189	.333	2.976	.004
	Testing on Saas Model	.438	.260	.258	1.684	.097

a. Dependent variable: Rate of adoption of the cloud computing services.

Using an alpha of 0.05, the use of operating systems, development environments, software, packages (platform-as a-service) as a platform in the insurance company (1.438) is statistically significantly different from 0 because its p-value of 0.00 less than 0.05.

The coefficient for Use of infrastructural (hardware, storage, network) resources (infrastructure-as-a -service), (0.563) is statistically significant because its p-value of 0.004 is less than 0.05.

The coefficient for Testing on Saas Model (0.438). The intercept is not statistically significantly different from 0 because its p-value (.097) is larger than 0.05. The testing on Saas does not influence the rate of cloud computing services in the insurance companies.

4.2.3. Main concerns regarding the use of cloud computing

According to the study, Table 21 shows that the observed significance level in the model is 0.000 which is less than 0.05 which indicates that the model is statistically significant in predicting adoption rate of cloud computing with the independent variables (is compliance issues a concern in cloud computing services in the company, is immature technology a concern in cloud computing services in the company).

Table 19: ANOVA for concerns in cloud computing services

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.444	3	5.722	10.130	.000[b]
	Residual	35.586	31	.565		
	Total	47.030	34			

a. Dependent variable: rate of adoption of the cloud computing services
b. Predictors: (constant), is compliance issues a concern in cloud computing services in the company, is immature technology a concern in cloud computing services in the company.

The first variable (constant) represents the constant, (it is the predicted value) rate of adoption of cloud computing services when all other variables are 0. Table 22 shows. The values for regression equation for predicting the dependent variable from the independent variable are as follows:

The coefficient for immature technology as a concern in cloud computing services in the company is 0.322, therefore, for every increase in in immature technology as a concern there's a 0.322 increase in the rate of adoption of cloud computing services in the insurance company. The coefficient For compliance as a concern in cloud computing services in the company is 0.544.

Table 20: Regression of the influence of concerns on the rate of cloud computing services

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.000	.812		3.696	.000
	Immature technology as a concern in cloud computing services	1.276	.322	.435	3.959	.000
	compliance issues a concern in cloud computing services	-1.276	.541	-.259	-2.360	.021

a. Dependent Variable: Rate of adoption of the cloud computing services

The p value for immature technology as a concern in cloud computing services in insurance company is 0.000, which is less than 0.05. Therefore Immature technology as a concern is statistically significant to the rate of adoption of cloud computing services. On the other had compliance issues are not statistically significant to the adoption rate of the cloud computing services since the p value is 0.21 which is greater than 0.05.

4.2.4. Type of knowledge/expertise lacking/insufficient within regarding cloud computing

Table 21: ANOVA services insufficient in regard to cloud computing services

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.525	2	4.131	8.261	**.000[b]**
	Residual	30.505	32	.500		
	Total	**47.030**	**34**			

a. Dependent variable: rate of adoption of the cloud computing services

b. Predictors: (constant), is compliance insufficient/lacking, is security insufficient within, is technology and implementation insufficient or lacking, is legal insufficient within in insurance companies

The most statistically significant factor according to the regression model was Insufficient or lacking technology and implementation with a beta coefficient of -.337 and a p value of 0.002 less than alpha 0.05 and the least contributing factor was insufficient security with a beta coefficient of -.348 with a p value of 0.578 greater than alpha 0.05. Other observations included Insufficient legal

(-1.072, p-value .005 less than 0.05) and Insufficient/lacking compliance (-1.420 and p value of .007 less than 0.05) Table 24 shows.

Table 22: Regression summary of the influence of insufficient services in adoption of cloud computing services

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	7.954	.838		9.490	.000
	Insufficient security	-.348	.622	-.071	-.559	.578
	Insufficient legal	-1.072	.371	-.365	-2.889	.005
	Insufficient or lacking technology and implementation	-.695	.218	-.337	-3.188	.002
	Insufficient/lacking compliance	-1.420	.511	-.288	-2.780	.007

a. Dependent Variable: rate of adoption of the cloud computing services

4.3 Roadmap and Summary of the Results

a. Technology Factor

From the ANOVA analysis, the findings found a significant impact of technology drivers on Insurance Banks and Bank Assurance Organization in Kenya; this implies stronger influence by items such as compatibility, ease of use and relative advantage. From regression testing, both large and small companies are expected to be 4 times more likely to adopt cloud if the technology factor is improved. Security scored high contributor to the technological factor p-value 0.000 less than .05.

Table 23: ANOVA on technology factor

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	8.2626	2	2.251	4.135	.000[b]
	Residual	15.252	32	.500		
	Total	**23.5146**	**34**			

a. Dependent variable: Technology Factor

b. Predictors: (constant), compatibility, ease of use and relative advantage

b. Organizational Factor

In the ANOVA, it was found that organizational elements related significantly differently across varying sizes of insurance companies based on the premium collected. The insurance companies

that responded are keen to improve not just their performance but also bottom-line effects. This comes strongly from cloud technology adoption. From the findings senior management support is critical at this stage.

Table 24: ANOVA on Organizational Factor

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.3625	2	11.069	33.171	.000[b]
	Residual	5.9025	32	0.02		
	Total	35.265	34			

a. Dependent variable: Organizational elements
b. Predictors: (constant), Senior management support, Internal processes, Availability of the human resources

c. Environmental Factor

Client pressure weighed in higher than competitor pressure. This is supported by a wide range of customer demands to get value for money. On insurance regulatory authority support and skills, these items scored poorly across the insurance industry, Regulator scored a mean 2.3 in its current structure, based on the TOE, and the strong negative influence by items such as Regulator and government support weigh down on the relevance of the factor toward cloud adoption. The effects of client pressure and competition are encouraging. Alam and Noor (2009) who suggest that the enablement of ICT accessible requires environmental support to make services like e-commerce more affordable, by regulatory or partnerships with industry, or tax incentives; else broadband adoption is not encouraged.

Table 25: ANOVA on environmental factors

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.3625	2	8.854	33.171	.000[b]
	Residual	4.426875	32	0.11		
	Total	26	34			

a. Dependent variable: Environmental Factor
b. Predictors: (constant), Regulator, Government support, competition

As the findings have demonstrated, a successful cloud computing adoption must focus on the areas of security, Infrastructure, Environment, Organizational issues and the standards. This summary

integrates the critical issues from the findings into a roadmap for successful cloud computing adoption. Insurance companies, Bankasurance and Insurance Regulatory Authority (IRA) can use this roadmap to address strategic issues that are common to all of them Edwin (2007).

The Roadmap to be used is based on the Technology- Organization- Environment (TOE) Adoption Model. The Model in this paper has been customized for the insurance and Bankasurance environments. For adoption to be successful in insurance companies a project plan is further to be adopted to make sure it captures all the areas.

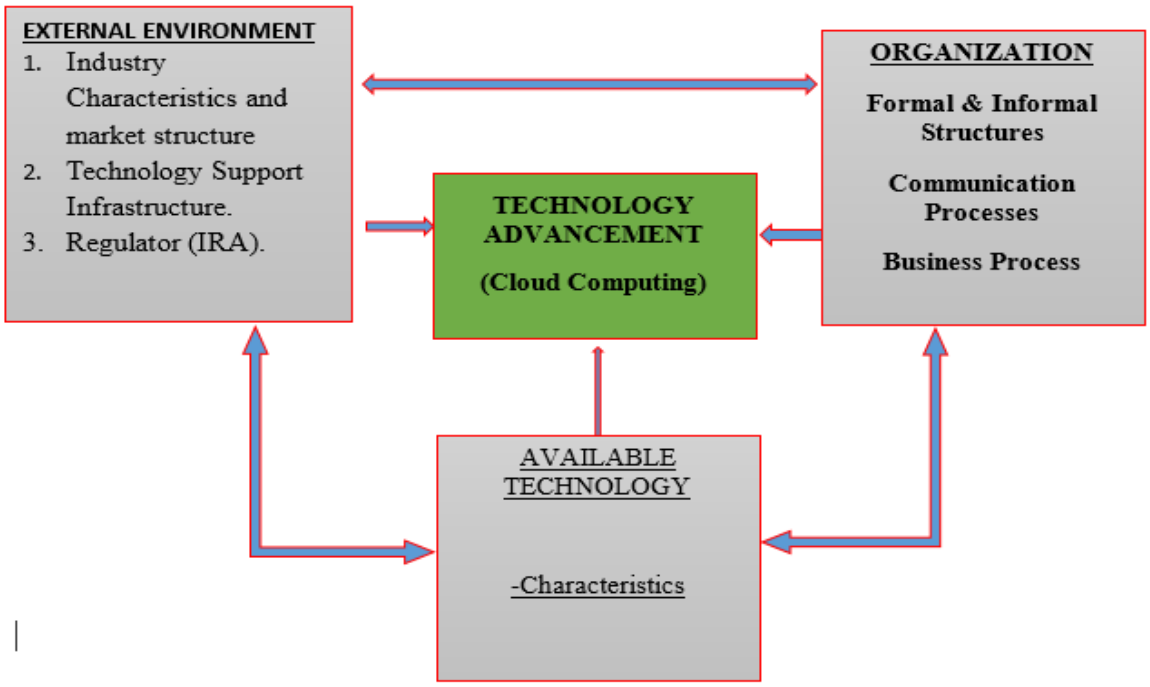


Figure 7: Technology- Organization- Environment (TOE) Adoption Model

The TOE components are external environment representing the outside of the Insurance Companies. From the findings the external environment is supporting the adoption, through making technology reachable. Technology such as fiber optic is now are reach thus makes it easy. For any technology to be adopted external environment must be conducive. From the findings areas that had bad environments had a rough time in the adoption process this fosters better communication within the organization. The organization represents the Insurance internal organization. For successful adoption then structures must exist. Based on the research the insurance companies that

had some forms of structures made the adoption much easy. Reporting lines is key decisions are made based on the facts Giné, X., & Yang, D. (2009).

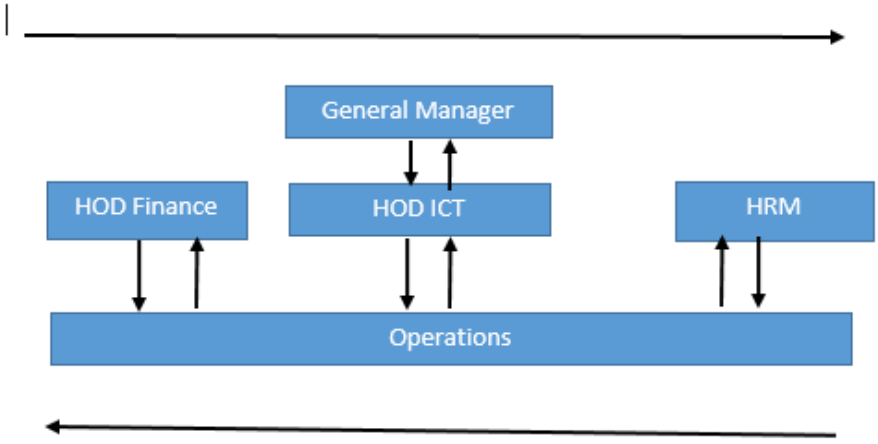


Figure 8: Organization Structure, Communication and Business Process

The insurance companies that adopted seamless had a defined business process and a way of introducing new technologies. Before introducing any business process then a proper business process had to be developed and understood.

4.3.1 Proposed Cloud Computing Adoption Roadmap

The roadmap proposes four (4) phases in the adoption of cloud computing project. These are: analysis, planning, adoption, monitoring and evaluation. Figure 9 below shows the relationship between planning, adoption, monitoring and evaluation

ANALYSIS [1]

1. Analysis by use of TOE model and intergrate the key areas
1. Analyze success and hindrance factors ie security in cloud model
2. Analyze usability in the Insurance

PLANNING [2]

2. Material and resources
3. Infrastructure to be used
4. Standard to be used
5. Financial availability
6. Time allocation

Figure 9 Proposed Cloud Computing Adoption Roadmap

i. Analysis Stage 1.

At the analysis stage the use of the model is to be used, based on the results expected and whether it captures all the areas. TOE factors environment, technology and Organization. All areas and the project plan must be analyzed at this stage. Other areas are to check the readiness of the organization. With all software projects, the initial stage understands what the business requires in order to determine whether the technology adoption is feasible. It is at this stage that the initial requirements, feasibility, project scope, costs and initial plan will be developed. During this phase of the project, the business case is developed. Thought should be given to how the existing systems strengths and opportunities can be maximized, weaknesses and threats minimized.

ii. Planning Stage 2.

Planning is key as it manages all the resources needed to effectively run a technology adoption process. Planning makes availability of all the ingredients available and also shall specify the standards to be used at this stage. At this stage the materials needed and resources are planned. The Infrastructure to be used is well planned and the standards and compatibilities planned.

iii. Adoption Stage 3.

The implementation after successful analysis and planning. Adoption is key as it may involve system changeover and planning is involved to avoid future conflicts. The application modules, application migrations, rollout, change management are some of the areas that need to take care of. Adoption may involve many aspects based on the TOE model. This phase is a preparation phase for the actual migration of systems and/or applications selected to the cloud platform and infrastructure of choice. In this phase systems/ application integration is done to ensure that the candidate applications will be able to function with the internal applications that are not migrated to the cloud and also with the cloud infrastructure of choice.

iv. Monitoring and evaluation Stage 4.

The cloud computing adoption project now fully operational in the cloud; however, contract and dealer management, training, testing and maintenance, user support and review should be ongoing for several months to years subsequent to launch. The system metrics or benchmarks developed and set based on the TOE model can be used as indicators of project success and should be monitored Security standards compliance, SLAs, regulator requirements and compliance issues, IT governance

best practices and cost management are desirable metrics that need to be monitored and evaluated. Documentation of lessons learnt and best practices during the project should be documented and communicated to all stakeholders that are taking part in the project. Figure 10 shows the proposed cloud computing adoption roadmap.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter summarizes the major findings of this study and to draw conclusions based on the same results. It also provides recommendations for adoption of cloud computing services. The chapter entails summary and discussions.

5.1 Summary of the study

The purpose of this study was to investigate the adoption of cloud computing services in insurance companies in Kenya. The study sought to answer four research questions which were; the extent and characteristic of cloud computing adoption in insurance companies in Kenya. The key barriers to cloud computing adoption by the insurance companies in Kenya. Development of a roadmap to address the challenges facing cloud computing adoption and the benefits for insurance companies in Kenya to adopt cloud computing. The researcher conducted a literature review based on the study objectives and research questions from published articles and available material from internet sources. The researcher adopted a descriptive design. The study sampled 33 insurance companies with executive and information technologist staff being the respondents of the questionnaire. The data collected was captured through the SPSS for analysis. The study conducted descriptive and Inferential statistics which summarized the data into percentages and frequencies presented in tables and pie charts. Inferential statistics was conducted to test the research questions.

5.2 Achievements of the study

The study found that insurance companies in Kenya had adopted cloud computing. However, the adoption of cloud computing has been slow. There are some obstacles influencing rate of adoption of cloud computing services in the insurance company. Which includes; security, infrastructure, hard ware and software, internet coverage and lack of standardization. While the benefits included flexibility collaboration and security.

5.2.1 State and Rate of Cloud Computing Adoption in Insurance Companies in Kenya

Cloud computing applications studied (Productivity applications, Business Applications, application development/deployment platform, infrastructure on-demand, finance applications Core Business Application, and databases) influenced the adoption rate of cloud computing services in the insurance company. The applications were necessary for he insurance Companies operations. This was important in terms of increasing service delivery among the clients and increase in profits for increased.

5.2.2. Platform Used in Insurance Companies in Kenya

The use of operating systems, development environments, software, packages (platform-as a-service) and use of infrastructural (hardware, storage, network) resources (infrastructure-as-a -service), as a platform in the insurance company was statistically significantly. However, the testing on Saas does not influence the rate of cloud computing services in the insurance companies.

5.2.3 Main concerns regarding the use of cloud computing

Immature technology as a concern was statistically significant to the rate of adoption of cloud computing services. On the other had compliance issues were not statistically significant to the adoption rate of the cloud computing services.

5.2.4 Type of knowledge/expertise lacking/insufficient within regarding cloud computing

The rate of adoption was low in most insurance companies due to insufficient or lack of technology. Cloud computing experts were few slowing the adoption rate of the cloud computing services in the insurance companies.

5.3 Conclusion

The study concludes that technological factors were the most significant factors influencing adoption of cloud computing in Insurance Companies in Kenya .This was attributed to the perceived benefits of cloud computing to the Insurance Companies. Perceived usefulness is a significant factor towards adoption of information technology according to the Technology- Organization-Environment (TOE). The framework explains that technological context, the organizational context, and the environmental context influence technology adoption decisions. This shows that

an organization is more likely to adopt information technology based on the benefits, ease of adoption, environmental factors ie competition. Overall performance is also a key factor

5.4 Recommendations

Based on the study findings the following are the recommendations;

- Insurance companies to invest in infrastructure for the cloud computing services to increase the effectiveness and the efficacies of their operations
- Insurance Companies to invest highly in the areas of security
- Insurance companies to improve on the hardware and software of the cloud computing services.
- The companies' carryout capacity building of the staff to improve on the use of cloud computing services.
- Concerns on the use of cloud computing should be considered in the development of a road map. The concerns include but not limited to; security, privacy, vendor lock, legal issues, immature technology, compliance, compliance, insecure availability, security insufficient, compliance.

a. Aspects of cloud computing to be improved.

The study revealed that the following aspects to be improved Security, Privacy, Transparency and cost model, Functionality/customization, Integration with existing IT according to all the 33 responsibility. This may improve the provision of services to the client in a more efficient and effective manner.

b. Benefits of adopting Cloud Computing

All the 33 respondents moderately agreed that efficient and effective data analysis, sharing information among the employees as a benefit, centralized control management, centralized control management as a benefit as far as adoption of cloud computing services is concern.

5.5 Recommendations for Further Studies

1. Impact of cloud computing services in insurance companies
2. Mobile Cloud computing services that are suitable for service delivery in Financial sector
3. Cloud Computing security concerns in Financial institutions in Kenya

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