

**FRAMEWORK FOR ADOPTION OF CLOUD COMPUTING BY SMALL AND
MEDIUM-SIZED ENTERPRISES IN MERU COUNTY**

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DECLARATION AND RECOMMENDATION

Declaration by the Candidate

This thesis is my original work and has not been presented for a degree or any other award in any other University.

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DEDICATION

I dedicate this thesis to my parents and siblings for their continuous support and encouragement throughout the study. May God bless them abundantly.

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ABSTRACT

Cloud Computing is a technology that has emerged in the market and it is widely used across the world for data processing of information and storage capability. It is a growing trend and is seen as a game-changer to SMEs business growth and development as far as technology deployment and usage is concerned. Organizations everywhere are trying to leverage Cloud Computing to achieve business missions and goals. Many believe it's just a marketing strategy while others see it as a benefit on how information technology is delivered. In the case of Kenya, many SMEs are still struggling to survive in an on-going global business cycle for growth and development. Cloud Computing on the other hand offers many opportunities that can help such SMEs improve their business and use technology more efficiently and effectively to reduce the cost of equipment and services. The main objective of the study was to develop a framework for the adoption of Cloud Computing by SMEs, covering: identification of usage, challenges and decision making support in the process of Cloud Computing adoption. The usage of Cloud Computing is still low among SMEs in Meru County mainly because of lack of expertise to give them training. Moreover, Cloud Computing adoption is impeded by the competing interest to deal with challenges such as poor network connectivity, need to ensure ease of use, ensure manageable cost implications and competition. The study developed a framework for adoption of Cloud Computing to be used by SMEs in Meru County. The theoretical underpinning of the framework is based on the theories of reasoned action, technology acceptance model and interplay of technology, organization and environment among others. A descriptive research design was adopted in conducting this study and stratified sampling was done covering the various players in the adoption process who included ICT managers, business owners and consultants. The data analysis was both qualitative and quantitative, the data analysis tools used included a laptop and SPSS software. A survey was carried on SMEs within Meru County. Primary data was analyzed to show the relationship between independent and dependent variables. This study ensured that all ethical considerations such as confidentiality, privacy and integrity were observed. The results in this study shows that decision making, application used and the type of model used are the major factors to be considered for adoption. A framework was proposed that SMEs can adopt and reap the benefits of a systematic adoption of Cloud Computing. This framework is from the results of this study and it has been demonstrated that SMEs and other stakeholders will achieve cost cutting, reduced timeframes in embracing technology and enhanced fit in the technology ecosystem that the SMEs operate in. The study focused on storage of data.

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ACRONYMS AND ABBREVIATIONS

CAK	- Communications Authority of Kenya
CBK	- Central Bank of Kenya
DOI	- Digital Object Identifier
GDP	- Gross Domestic Product
IaaS	- Infrastructure as a Service
ICT	- Information and Communication Technology
ISP	- Internet Service Provider
IT	-Information Technology
KNCCI	- Kenya National Chamber of Commerce and Industry
M&A	- Mergers and Acquisitions
NACOSTI	- National Commission for Science, Technology, and Innovation
NIST	- National Institute of Standards and Technology
PaaS	- Platform as a Service
SaaS	- Software as a Service
SMEs	- Small and Medium-sized Enterprises
VAS	- Value Added services

DEFINITION OF TERMS

Cloud Computing- the practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than a local server or a personal computer.

Cyber attack- is an assault launched by cybercriminals using one or more computers against a single or multiple computers or networks.

Data Storage- is the collective methods and technologies that capture and retain digital information on electromagnetic, optical or silicon-based storage media.

Policy Framework- is a document that sets out a set of procedures or goals, which might be used in negotiation or decision-making to guide a more detailed set of policies, or to guide ongoing maintenance of an organization's policies

Service Model- Cloud computing is offered in three different service models which each satisfy a unique set of business requirements. These three models are known as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

Security and Privacy- is the protection of data. If the security and privacy in cloud computing is neglected, then the private information of each user is at risk, allowing easy cyber breaches to hack into the system and exploit any users' private storage data.

CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Cloud Computing is a technology that has emerged in the market and it is widely used across the world for data processing of information and storage capabilities. It is a growing trend and is seen as a game-changer to SMEs business growth and development as far as technology deployment and usage is concerned (Mikkonen, 2016).

According to Hu et al. (2017), Cloud Computing is a Technology that uses the Internet and remote servers to manage data and applications while allowing consumers to access files, data and applications from any computer across the network, without the need for installation of applications.

The cloud model comprises five components including three service categories and four deployment models. The service categories are Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) while deployment models are Public cloud, Private cloud, Community cloud and hybrid cloud (Ghahramani et al., 2017).

According to Taleb et al. (2017), infrastructure-as-a-Service provides virtualized computing resources over the internet such as network hardware alongside maintenance, support, applications and services. Platform-as-a-Service provides full hardware architecture and software framework that allows applications to run while Software-as-

a-Service provides virtual computing services including storage, server, hardware and support systems that give access over the internet.

SaaS is currently the most common type of cloud service that small offices use for delivery of many business applications including office software, messaging software among many others (Hayton et al., 2016).

According to Stergiou et al. (2018), Cloud Computing plays an important and an increasingly prominent role in modern computer networks and its environment. It is responsible for many technologies and services that we use in our everyday lives. Without the cloud, our phones and emails would not work. It makes the performance and accessibility of all IT environments to integrate and communicate with one motive of success.

The cloud is considered to be at the forefront of cutting-edge technology, and as such, the talents and expertise for Cloud Computing required for businesses, Corporations and Government institutions are in very high demand and is expected to remain so well into the turn of the next decade of generations of new plans and development of services. (Mazzei, 2017).

However, organizations of every type, size, and industry environment are using Cloud Computing for a wide variety of usage for data backup, disaster recovery, email, virtual desktops, software development and testing, big data analytics, and customer-facing web applications. For example, different sectors like healthcare companies are using the

cloud to develop more personalized treatments for patients. Financial services companies are using the cloud to power real-time fraud detection and prevention to the problems facing the sector. Video game makers are using the cloud to deliver online games to millions of players around the world (Jain, 2017).

According to Rittinghouse (2016), Cloud Computing has experienced massive adoption by individuals, corporations, and Government involvement because of the number of benefits and support it offers to them to expand and grow economically and financially on their businesses. The capability of the cloud gives accessibility to businesses to have a broad range of technology which enables them to innovate faster growth and development of good ideas for future prosperity.

Even though the benefits associated with Cloud Computing outshine it all, there are also a number of challenges as well that lead to low intake of performance and usage. Problems like security threat, privacy and reliability of data, interoperability, lack of policies, technical issues and high costs of data transfers among many others are still seen as barriers that hinders cloud technology which needs to be looked into to improve on marketing (Singh, 2017).

According to Ismagilova et al. (2019), Cloud Computing is still at its processing stage of development and therefore, there is still so much potential needs to be emphasized in helping the ongoing research and development all over the World and its environment to capture and grasp ways of coming up with new ideas and knowledge that can improve usability across the Globe.

Asatiani (2016) states that the recommendable effects of Cloud Computing in the economy has already stimulated the developed countries to deploy adoption of this technology. Nevertheless, the adoption of Cloud Computing has transformed the workflow of the organizations in the developed countries. However, the approach to the cloud adoption process in developing countries can be entirely different based on the structure of workflow and ideas.

While it has been pointed out that cloud computing can bring more advantages to developing countries, its adoption can be extremely challenging. Consequently, a set of fundamental and yet vital preparations are required to facilitate the process of cloud adoption.

According to De Donno et al. (2019), SMEs in Kenya are going to benefit from the increased number of cloud service providers and data centers that allow companies to upscale their activities without having to invest in large office spaces and IT infrastructure and services. The best Cloud Computing services provide companies with nearly unlimited storage capacity with encrypted two-stage security protection. This allows businesses to be more easily shared in terms of information across verticals, teams, and across the world to co-workers, investors, and operative in the field who are connected to the same services for compatibility

The World Bank defines an SMEs as one that fits to either of the following criteria (1) A formally registered business (2) with an annual turnover of between Kenya Shillings 8 to

100 million (3) with an asset base of at least Kenya Shillings 4 million and (5) employing between 5 to 150 employees.

While Baporikar (2020) states that Small and Medium-sized Enterprises (SMEs) is defined as a convenient term for segmenting business and other organizations that are somewhere between the small home office, small size and large enterprises. SMEs typically attract lower valuation multiples because they have less market shareholder and more owner involvement. In addition, most SMEs fall under the informal sector and by extension, the term informal refers to people in self-employment or small-scale industries Globally (Abe et al., 2015).

The informal sector is estimated to constitute 98 percent of business in Kenya while Kenya's SMEs continue to create numerous jobs and opportunities to boost the country's GDP, they are faced with a myriad of challenges that always hamper their growth development. Kenya's 2017 overall GDP growth is projected at 6.4 percent with SMEs contributing 3 percent yearly.

According to Porter (2019), in Kenya SMEs form part of the growth and development of the economy though they do not have similar resources and materials that march large companies, their essence is always entrepreneurial. This can also be attributed to improved access to financial services and growth in various sectors of the economy as well as innovations and competition in the economic sectors to make them look better to meet their goals and achievements.

However, a to a report by National Economic Survey of Central Bank of Kenya (CBK) indicates that SMEs constitute 98 percent of all businesses in Kenya which create 30 percent of the jobs annually as well as contribute 3 percent of the Gross domestic product (GDP) in the country. Small and Medium-Sized Enterprises (SMEs) are critical for developing and forming countries to have a better look in terms of the production of sales of goods and services.

According to Lindsay et al. (2017), SMEs in developing countries face a number of challenges including access to finance both domestically and internationally as well as developing international trademark linkages to resources. Entrepreneurial culture and an ethical business environment are also underlying constraints to their growth which lack corporate governance and a structured platform for information.

In addition, there is lack of awareness and sensitization among these enterprises regarding the significance of corporate governance and if there is awareness, there is a general aversion to adopting these practices because of the high cost of implementation. The development of competitive and resilient SMEs in Kenya forms an integral component of initiatives to be a globally and nationally competitive and prosperous nation with a high quality of life by 2030. The challenges posed by increased liberalization, new entrants to the market, increased standards requirements and technological developments required has created a lot of delays in performance (Wanjau et al., 2017).

Small and Medium-sized Enterprises (SMEs) play an important role in the National Economies and Global Competitiveness. SMEs contribute to job creation and improve the socioeconomic status of workers by providing work and supplying goods and services for economic development. SMEs therefore directly contribute to increasing national Gross Domestic Product (GDP) (Zafar, 2017).

1.1 Statement of the Problem

According to Kranz et al. (2016), Cloud computing increases business flexibility. Cloud-based services are ideal for business growth and development. If the needs for SMEs increases, then it is easy for them to scale up cloud capacity, hence drawing on the demands for bandwidth capacity to promote business opportunities for high productions.

Cloud adoption offers scalable enterprise IT speed that is effective and efficient to pre-requisite the ideal for gaining competitive advantage. The cloud offers the required speed for SMEs to launch new products quickly and gain competitiveness in the markets easily (Kumar, 2020).

According to Lavanya et al. (2017), Small and Medium-Sized Enterprises (SMEs) face numerous challenges in identification, setting up and making use of information technology (IT) as an enabler for business prowess. Cloud Computing could solve this problem by offering ready and low cost of entry IT solutions. Adoption of Cloud Computing among SMEs in developing countries is, however, low due to a number of

barriers such as the investment capital required for setting up and maintaining ICT resources.

Cloud adoption is a strategy used by enterprises to improve the scalability of Internet-based database capabilities while reducing cost and risk. To achieve this, businesses engage in the practice of cloud computing or using remote servers hosted on the Internet to store, manage, and process critical data

There is low uptake of Cloud Computing adoption in Meru County which was of great concern to the researcher to carry on with the study. This has been occasioned by a number of underlying factors such as inadequate policy framework, high cost of ICT infrastructure, technical issues, poor network coverage, uncontrolled cyber-attacks, lack of people to provide training on the same.

There is still no known framework on Cloud Computing performance in Meru County mainly because of the low uptake of technology in this region. The study as seen above was meant to cover the gaps in previous studies about Cloud Computing challenges whose report gap is evident from the limitation of lack of policies which can be formulated by SMEs to provide a guideline for adoption of Cloud Computing.

1.2 General Objective

The researcher will aim to develop a framework for adoption of Cloud Computing by SMEs in Meru County.

1.3 Specific Objectives

The study aimed at achieving the following objectives:

- i. To identify the extent to which SMEs in Meru County Kenya are using Cloud Computing.
- ii. To evaluate the factors that influence the decision to adopt Cloud Computing by SMEs in Meru County Kenya.
- iii. To determine the challenges faced by the SMEs in adopting Cloud Computing.
- iv. To develop an easy-to-use framework for the adoption of Cloud Computing.

1.4 Research Questions

The researcher aimed at answering the following research questions:

- i. To what extent are SMEs in Meru County using Cloud Computing?
- ii. What factors influence the decision to adopt Cloud Computing by SMEs Meru County Kenya?
- iii. What are the challenges faced by the SMEs in adopting Cloud Computing?
- iv. How can an easy to use framework developed influence the adoption of Cloud Computing?

1.5 Significance of the study

The study was important as it was informative on the rate of Cloud Computing adoption by SMEs in Kenya and their attitude towards Cloud Computing. The findings and

recommendations can be used by the government especially Communication Authority of Kenya (CAK) to distinguish barriers to Cloud Computing and general ICT acceptance among SMEs. They can, therefore, formulate policies that foster and enhance technology acceptance.

The study has helped the SMEs in Meru County to learn new ideas and knowledge on how to keep data in the cloud by the use of google drive, dropbox and email for future references. The study aimed at covering the gaps on challenges faced by SMEs whose reports were on the limitation of lack of policies, poor network, and high cost of infrastructure among many others. Many SMEs are in need of utilizing Cloud Computing capabilities, but they are ignorant of where to expect changes when choosing a Cloud Computing concept.

1.6 Delimitations and Limitations of the study

The sample population selected for this study was limited to SMEs in Meru County. Thus, the ability to generalize the entire population of SMEs in other Counties and beyond its borders is severely limited. The sample however is similar in nature to the population of SMEs in various counties in Kenya and can thus be comprehensive.

1.7 Assumptions of the study

The study assumed that all the respondents who took part in the study were conversant with Cloud Computing, and therefore provided reliable and valid data so that the results obtained are credible.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the theoretical framework and empirical review of the study. Further it outlines the conceptual framework where the variables under the study are conceptualized. In addition, the section highlights the research gaps from the reviewed studies and the conclusion of the study.

2.1 Theory of Reasoned Action

Theory of reasoned action (TRA) posits that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of the behavior. Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior (Fishbone, 1975). It is determined through an assessment of one's beliefs regarding the consequences arising from a behavior and an evaluation of the desirability of these consequences.

Formally, overall attitude can be assessed as the sum of the individual consequence and desirability assessments for all expected consequences of the behavior (Bag, 2003). Subjective norm is defined as an individual's perception of whether people important to the individual think the behavior should be performed. The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with

the wishes of that referent. Hence, the overall subjective norm can be expressed as the sum of the individual perception and motivation assessments for all relevant referents (Law, 2010). The model has some limitations including a significant risk of confounding between attitudes and norms since attitudes can often be reframed as norms and vice versa. A second limitation is the assumption that when someone forms an intention to act, they will be free to act without limitation. In practice, constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act. The theory of planned behavior (TPB) attempts to resolve this limitation (Jae-Nam, 2005).

2.2 Technology Acceptance Model

Introduced by Davis in 1989 the Technology Acceptance Model (TAM) is merely an adaptation of Fishbone and Janzen's Theory of Reasoned Action (TRA). TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to serve as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use (Wixom, 2005).

Davis defines perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance; people are more likely to use an information system that they believe will help them perform their job better. He further defines perceived ease of use as the degree to which a person believes that using a particular system would be free of effort. Therefore, even if a system is believed to be

useful by an individual, if the system is too difficult to use, the potentially enhanced performance benefits to be derived from the system are outweighed by the effort required of having to use it. TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In practice constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act. While TRA states that people are, more often than not, rational beings who make systematic use of available information, considering the repercussions of their actions before deciding whether or not to engage in a given behavior

2.3 Theory of Technology, Organization and Environment

The three contexts include technological, organizational and environmental (TOE) influencing the process by which technological innovations are adopted and implemented, especially in small businesses.

Technological context refers to internal and external technologies applicable to the firm (Kuna, 2001). According to Rogers (2003), adopting an innovation is affected by its perceived characteristics, including relative advantage, compatibility, and complexity and trial ability. Of these, the relative advantage of the technology has been consistently identified as one of the most critical adoption factors (Iacovou, 1995; Kuan, 2001).

When perceived benefit is high, there are higher chances that the organization will allocate more managerial, financial and technological resources to implement the technological system. Srinivasan (2002) defined technological opportunism as an

organization's ability to sense and respond to new technologies. Being aware and responsive to emerging technologies allows companies to incorporate technological advancements and thus move steps ahead of their rivals to gain competitive advantage.

When a firm is characterized as a higher degree of technological opportunism, it is proactive to innovate itself on a consistent basis. Such firms have the ability, skills and accumulated knowledge to acquire information about technological opportunities and invest resources (Mishra, 2010). Srinivasan (2002) further identified two components of technological opportunism – technological-sensing capability (i.e. organizational ability to acquire knowledge about and understand new technology developments) and technological-response capability (i.e. organization's willingness and ability to respond to the new technologies it senses in its environment that may affect the organization).

However, Chandy (1998) reasoned that an organization with good technology sensing abilities may not be willing to respond to new technologies as they may cannibalize existing products, markets and organizational relationships. Yet, an organization must know how to re-engineer its business strategies to exploit the opportunities or stave off the threats posed by the new technology.

Organizational context includes several indexes regarding firm size and scope, centralization, formalization, and complexity of managerial structure and quality of human resources (Kuan, 2001). Prior research finds that larger businesses are often more well-equipped with resources and infrastructure to facilitate innovation adoption, while small firms might suffer from resource poverty (Thong, 1999). In Iacovou, Benbasat and

Dexter's study (1995) on adopting EDI in small firms, cost of investment and lack of IT expertise are two major concerns among organizational members.

Environmental context refers to a firm's industry, competitors and government policy (Kuan, 2001). Organizations operate their businesses within an environmental context which brings them opportunities and constraints. Although the external environment can provide an organization with information, resources and technology, it has regulations and restrictions on the flow of capital and information (Damanpour, 2006). Besides, the business environment within which the business operates is of key significance.

Competition increases the likelihood of innovation adoption as environmental uncertainty caused by competition helps increase both the need and rate of innovation adoption (Thong, 1999). Typically, environmental factors affecting technology adoption are usually understood as competitive pressure which is regarded as one critical factor for technological adoption in smaller firms (Iacovou, 1995).

2.4 Empirical Literature Review

This section has reviewed the methodology used by the previous studies based on the study variables and reliance on the current study.

2.4.1 The Extent to which SMEs are using Cloud Computing

According to Yu et al. (2018), the service providers for Cloud Computing should improve on the reliability of the Cloud Computing, to expedite the acquisition of SMEs. A better reliable cloud would also increase the chances of sharing and collaborating between the stakeholders and the SMEs. Cloud Computing is now the industry's buzzword that SMEs are looking into. Even though it is not a completely new concept to them, it has also become omnipresent in today's digital age due to the proliferation of the Internet availability, broadband, mobile devices, improved bandwidth and mobility requirements for all end users.

According to Pakarinen (2017), the objective of this research is to suggest a decision modelling using potentially All Pairwise Rankings of all possible alternatives to the variables affecting the implementation of Cloud Computing in SMEs. In a nutshell, Cloud Computing is a model where anything is provided as a service rather than a product, whether it is a software, hardware, or storage capacity.

In addition the term Cloud Computing refers to everything that involves the delivery of hosted services over the internet by cloud service providers along with transfers of information and data from one destination to the next with an aim of communication to market its availability to users and clients across the Globe. Cloud Computing has been described by the National Institute of Standard and Technology (NIST) as ' a model for allowing ubiquitous, easy on-demand network access to a shared pool of configurable computing resources networks, servers, storage, apps and services that can be delivered

quickly and published with minimal management effort or service provider interaction (Rittinghouse, 2016b).

According to Shambuyi (2016), even though Cloud Computing provides a fast start-up, flexibility, scalability, and cost-efficiency but, on the contrary these benefits can be realized if and only if, IT is widely spread and utilized by SMEs. SMEs in any economy represent a significant segment that are required to start adoption of the internet-based ICT to improve their competitiveness not only in the local area but also in the Global marketplace to help in the improvement of the GDP of the country's economy.

Some of the challenges encountered by SMEs include unsuitability for the type of business, security, trust of ICTs tools, limited human resource budget, lack of legal framework, and inadequate infrastructure. With all the above specified challenges, SMEs are therefore encouraged to start considering Cloud Computing solutions as an alternative to traditional (on-premises) ICT solutions to make them gain momentum and be relevant in today's market (Priyadarshinee et al., 2017a).

According to Mualla (2016), Cloud Computing can offer tremendous support and value propositions or sets of benefits to SMEs with limited budgets, physical IT assets, and human resources. In spite of the potential advantages of Cloud Computing, the shift from the traditional on-premises ICT solutions to Cloud Computing is a bit unclear and confusing amongst South African SMEs. The penetration of Cloud Computing is high and acknowledged that returns by adopters could be higher than for non-adopters. On

the other hand, Cloud Computing is asserted to have a slow rate of adoption amongst SMEs in South Africa and other developing countries.

Cloud Computing offers potential benefits such as reduced costs, flexibility, scalability, capacity utilization, higher efficiencies and mobility. It also offers SMEs satisfaction of business requirements, energy-saving and the efficiency of resource management. Time saved dealing with technology issues, and enabling staff to focus on core competencies as an additional benefit of Cloud computing (Jones et al., 2019).

2.4.2 Evaluation Factors Influencing Decision to Adopt Cloud Computing by SMEs

According to Kim et al. (2017), Cloud Computing has risen among corporate sectors and information technology (IT) professionals as one of the most discussed subjects. Small and Medium-sized companies (SMEs) with low budget and human resources are among the main organizations that tend to use Cloud Computing to achieve this technology's advantage. The adoption of Cloud Computing for SMEs is influenced by a number of variables. Before making the choice to embrace cloud-based alternatives, these crucial factors must be systematically assessed and considered at the forefront before decision making.

The objective of this research is to define these variables and determine the extent to which they affect Cloud Computing adoption for SMEs. The project therefore defines a research model based on the dissemination of the theory of reasoned action and the structure of technology, organization and environment. Based on prior study, a research

model was created to test the variables that are comparative, compatibility, safety issues, cost savings, readiness for technology, support for top managers, competitive pressure, and regulatory support to the system (Lian et al., 2014).

The Smart PLS instrument has been used for data design and analysis. The data analysis findings usually support the model as well as all the hypotheses suggested. In brief, the findings of this research showed a relative advantage, it was found that compatibility, and safety concerns, cost reductions, technology readiness, top manager support, competitive pressure and regulatory support had a considerable influence on Cloud Computing adoption. SMEs are vital players of each market's solutions. One strategy which has been proven to enhance SMEs ability to compete against larger companies is the use of appropriate and available technology for better understanding (Oliveira et al., 2014).

According to Adane (2018), even though adopting new technologies helps SMEs gain a competitive edge, it also involves the issue of high costs of resources. Cloud Computing as a fresh paradigm for computing offers many advantages to companies, especially smaller ones. Flexibility, scalability, and reduced cost are just some of the many benefits offered by Cloud Computing to SMEs.

According to Alreshidi et al. (2016), Cloud Computing has been seen as a model tool enabler for faster processing of data and information on-demand network access to a common pool of configurable computer resources such as networks, servers, storage,

apps and services that can be quickly delivered and published with minimal management or service provider interaction.

This cloud model consists of five vital features, three models of service, and four models of deployment. Cloud Computing has three distinct models of service: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). IaaS, which is the basic level of cloud service, is the provision of infrastructure services through the network to its clients for easy communication of data and information across the globe (Gapinski, 2016).

Rittinghouse (2016b) states that the second Cloud Computing level or PaaS is a Cloud Computing model by which customers have online access to all requested resources that are required to build their enterprise applications, including the business logic and application mindset to help them achieve all the required goals and services. The last and the most common Cloud Computing model or SaaS is application-based services delivered to customers over a network. Users can access the software anytime and anywhere they desire as long as they have access to the internet wherever they are located.

There are also four types of deployment models available for Cloud Computing: private, public, hybrid and community. Private cloud is a kind of Cloud Computing that exclusively offers the cloud service to a particular organization. The public cloud, which is the most common deployment model, which offers the service to the general public (Puthal et al., 2015).

According to Baig et al. (2018), cloud providers have the full ownership of the infrastructure architecture, they have their own rules, policies, and pricing models. Community cloud offers services to a group of organizations in a community, which may share a set of similar interests such as a common mission, security requirements, policies, and compliance considerations. Finally, a hybrid cloud is a fusion of two or more models as previously explained.

The rise of Cloud Computing has changed the manner in which the IT services are created, conveyed, kept up, presented, utilized and paid for. Cloud Computing can be characterized from numerous points of view. It likewise can be characterized as an innovation for giving profoundly adaptable services which enable IT chiefs to acclimate to changing business necessity by effectively getting and discharging services as required (Messerli et al., 2017).

It may also be seen as a processing design where adaptable IT-related capacities are given as an administration over the web to different outer clients, utilizing interconnected and virtualized PCs that distribute assets dependent on administration level understanding consulted between provider and customers. It can likewise be characterized as a pool, entirely versatile and disconnected framework that is equipped for encouraging end-customer applications that are charged by utilization (Rittinghouse, 2016c).

According to Harris et al. (2015), the future of information systems will rely on cloud-based technology because, while improving reliability and flexibility, it can decrease the

expenses for IT services. It is also seen as a prospective alternative to enhance the competitiveness and efficiency of IT in organizations. Three service models are available for Cloud Computing; first, infrastructure as a system (IaaS). It is known as the basic stage of cloud services, providing to the customer infrastructure services over a network such as hardware and software. The second level of Cloud Computing is the Platform as a service (PaaS).

Cloud offers online access to every resource that is needed to build an application. It offers internet access to every application-building resource required. The services typically involve; application design, creation, testing, implementation and hosting tools that provide access to languages and libraries for programs. The third model of service is Software as a service (SaaS). It is known to provide users with a piece of technology over a network such as the internet, in which clients can install the software and use the application whenever and wherever they have access to the network (Asatiani, 2016).

It also offers flexible updating for apps as the service provider hosting the application systems, performs updates that appear to take effect without seemingly any planned downtime, and helps remove legacy systems that help organizations expand their software application to other worldwide areas. (Fernandes et al., 2014).

2.4.3 The Challenges faced by SMEs in Adopting Cloud Computing

According to Bhushan (2017), the challenges of Cloud Computing have always been there. Companies are becoming progressively conscious of the company value which

Cloud Computing brings towards a cloud transformation. A seamless transition involves a comprehensive understanding of both the benefits and the challenges involved.

As with any fresh technology, Cloud Computing adoption is also not unproblematic. Cloud Computing's primary challenge is how it addresses businesses' safety and privacy issues regarding adopting it. The fact that the precious company information is located outside the corporate firewall raises severe issues that need attention (Miles et al., 2016).

According to Loukis (2015), Hacking and multiple cloud infrastructure attacks would affect multiple clients even if they attack only one site. The use of safety apps, encrypted file systems, data loss software, and purchase of safety hardware to monitor uncommon conduct across servers can mitigate these hazards.

Because of the on-demand design of the services, it is hard to evaluate the expenses associated. Unless the vendor does have some good and similar benchmarks to offer, then it will be very difficult to budget and assess the cost. Businesses should have a real leverage to migrate into and out of a cloud and switch suppliers wherever they want, and thus no lock-in period should take place (Gupta, 2017).

According to Yousefpour et al. (2019), the on-site IT should be able to integrate Cloud Computing services smoothly. There is still no round-the-clock service for cloud suppliers; this leads to regular outages. Monitoring the service supplied through inner or third-party instruments is essential. Plans to monitor the use, SLAs, efficiency,

robustness, and company dependence of these facilities are essential. Businesses can save hardware cash, but for the bandwidth they have to invest more.

This can be a low price for smaller apps, but for data-intensive apps it can be considerably high. Sufficient bandwidth is required for the delivery of intensive and complicated information across the network. Just because of this, many companies are eagerly waiting before moving to the cloud for a decreased price. All these problems in the quest for Cloud Computing shouldn't just be regarded as roadblocks. Before embracing the technology, it is quite essential to give severe regards to these problems and the possible solutions (Mansouri, 2017).

2.4.4 Developing an easy to use framework for the adoption of Cloud Computing

According to Yousaf et al. (2017), cloud players have become essential to organizations. By constructing flexible and agile business systems such as customer relationship management systems, storage systems, complicated process automation, and leveraging online social media and mobile technologies.

Companies think this can assist them to react quicker than traditional deployments to rapidly evolving client requirements. Cloud implementation challenges, possibilities and success rates of IT feasibility and success factors in the market can deploy their apps in the cloud, to assess and record the cloud adoption stories of success, hazards and obstacles. This assessment can also provide definitive guidance for assessing the

advantages and disadvantages of cloud vendors for cloud partnerships (Rittinghouse, 2016d).

According to Silva (2018), it is a recommended approach for an efficient and effective migration. Developing a custom cloud approach is essential for organizations. They should intend to take advantage of current collateral i.e. software as a service (SaaS), infrastructure as a service (IaaS) and platform as a service (PaaS) techniques, which can be relevant in the deployment designs, architectures of reference and custom blueprint architecture designs.

To identify apps that are fast in the market and are critical to company use in terms of early adopters, income and client satisfaction, it is a valuable strategy to choose apps which are stand-alone and easy to migrate such that disruption is restricted to the implementation and hence concentrate on learning from cloud adoption procedures (Jones et al., 2019).

According to Hurwitz (2020a), for such organizations which are on the way to enhancing their client and business value via the cloud, it's a good thought to consider about IT development, productiveness, agility and effectiveness while identifying applications for potential cloud deployments and then apply their cloud experience to deploy more complicated systems.

Knowing the appropriateness of public, private or hybrid clouds and cloud models is important in SaaS, IaaS and PaaS, or a hybrid. Remember to define and document what

you expect to gain from your business-level, service contracts with your cloud vendor about what you plan to offer on quality of service to your client and what the conditions of knowledge policy and governance needed for them (Akinrolabu, 2019).

According to Elkhatib et al. (2019), this will assist in developing a cloud strategy for effective, well-managed cloud deployments, engaging the IT architect and development teams to create appropriate use cases for this deployment. Research cloud suppliers and engaging company capture teams to determine appropriate payment plans the planning and implementation stages are intimately linked and have numerous steps that need to be repeated.

For instance, while reviewing collateral during planning, understanding accessible Cloud Computing and adoption norms is similarly crucial (NIST) Guidelines, adoptability and portability standards for OpenStack, as well as applications migration methodologies. Use the cloud deployment architectures that you developed during the planning stage and develop application relocation strategies, use case studies and scripts. Identify servers, data stores, and software to perform road maps for migration (Ünver, 2019).

According to Sivarajah et al. (2017), on developer work, you can leverage IBM Cloud Computing technologies and a large body of cloud collateral. Enhancing business operations and software licenses will assist you understand the advantages of enhanced organizational effectiveness to provide organization and client with enhanced value.

During each cloud deployment you refine your procedures and techniques, create the necessary skills road maps and obviously assemble qualified resources before deployment, there are many advantages when migrating apps to cloud. Overall, more organizations are adopting cloud deployment models to promote and maintain the market advantage (Ardagna et al., 2015).

More organizations will inevitably want to migrate their apps to the cloud mainstream and be part of the digital and mobile transition that is taking place around us. Staying interconnected and accessing data rapidly is of vital importance in order to obtain a competitive advantage (Dulaney, 2015).

According to Weinman (2015), however, organizations also need to obviously identify the true benefits for themselves and assemble and implement a proven blueprint for Cloud Computing deployments. In short, evaluate your own organization's cloud value. First, plan a straightforward application deployment and gradually migrate to corporate systems planning through learning and strategic alternatives, and lastly optimize your assessments, planning, deployment techniques, and process your approach and refine it continually. I think that cloud adoption has become increasingly easier and feasible due to the cloud architecture of products, suppliers and the extensive client reference library that we have at our disposal today.

2.5 Conceptual Review

According to Jennings (2015), Cloud Computing is an elastic execution environment of resources involving multiple stakeholders and providing a metered service at multiple granularities for a specified level of quality of service. Cloud is a type of parallel and distributed system consisting of collection of interconnected and virtualized computers that are dynamically provisioned and present as one or more unified computing resource in light of administration level understandings established through negotiation between services

Cloud is made out of five fundamental attributes, three main service models and four deployment models. These essential elements include: On-request self-administration, whereby a customer can unilaterally request for provision of computing services such as storage as needed without need for human interaction. Broad network access which offers the computing capabilities over the network and are accessible through standard methods that promote use over a variety of platforms including mobile. Rapid elasticity where the capabilities are released to scale rapidly without and within to match the given demand (Vance et al., 2019).

Cloud Computing is being seen as the next utility for change, and the striking likenesses between the present advancement of Cloud Computing and the improvement of conventional utilities during the Industrial Revolution is a concern within the Industrial age and companies to create their own power by the use of water and coal nevertheless, in the current age, companies are drawing power from a central source (Mosco, 2015a).

According to Bibri (2018), similarly, Cloud Computing technologies have advanced and made it conceivable to communicate worldwide and to use remote data centers, servers and other ICT facilities that initially require access to dedicated computing resources on site, main services PaaS, SaaS and IaaS form the Cloud based services that the end users receives. Today, most businesses are making use of Cloud Computing services within the developed nations and the story is totally different in most of the developing countries.

IT is rendering services as a utility to usage on a pay per use technology basis. The amount of money the businesses would actually spend is less since they would only pay for what they need and what they want to use at that particular time. In sub-Saharan Africa and beyond, cloud based related innovations, creativity and performance of services are becoming crucial sources of economic and societal change specifically for economies that are embarking Cloud Computing (Vallejo et al., 2019).

According to Chou (2015), any cloud system be it PaaS, SaaS or IaaS can be implemented as a private cloud, a public cloud, a hybrid cloud or a community cloud. A private cloud is exclusively managed and delivered within an organization. However the management and operation may not always be within the organization. A public cloud provides services that can be accessed publicly via standard APIs over the Internet. A hybrid cloud is a blend of deployment models that utilizes both private and public infrastructures. Whereas in a community cloud implementation, multiple

organizations with common concerns on Security, interests, and missions share cloud infrastructures (Rittinghouse, 2016e).

As published in the Daily Nation Roy (2015) Microsoft introduced a new cloud infrastructure to enable business owners deploy cost-saving and IT solutions that would therefore be used on equipment. The explanation further states that Cloud Computing technologies eliminates the need for organization and businesses to invest in the cost of hardware, software and networking equipment as well as labor. There is another company operating in Kenya called Salesforce.

According to Kshetri et al. (2017), salesforce has entered Kenya through a partnership with a local company Blue Consulting to offer Financial solutions by using Cloud Computing platform for transactions. Cloud based services have also been applied in the government of Kenya, mainly by the use of the government portal e-Citizen to aid all citizens of the country to procure government services.

Kenya, South Africa, and Nigeria are the leading countries in the use of Cloud Computing in Sub-Saharan Africa since 2013. According to the survey by CISCO, 50% of South Africa's medium and large businesses are using cloud services compared to 48% in Kenya and 36% in Nigeria. The rapid acquisition and implementation of Cloud computing in Kenya and Nigeria can be found in the growing confidence that IT decision-makers have in the environment. Even though confidence is not high, distrust in the cloud has almost entirely gone (Muhammed et al., 2015).

According to Wang et al. (2015), from the survey carried out by CISCO, Private Cloud is seen to be the most popular in 2013 with 25% organizations surveyed currently deploying this compared to 13% opting for Hybrid Cloud and only 7% of companies opting for the Public Cloud based systems. There are a number of Cloud Computing services (IaaS, PaaS, and SaaS) being used for the good which include remote accessibility, secure data transfer, enhanced productivity, cost effectiveness and full customizability.

The adoption of Cloud Computing by SMEs as shown in figure 1 brings the ideas used by other researchers which can act as an example of what the researcher's framework was going to look like to adopt the same technology in the selection. Omwansa states that the technology adopted was to include relative advantage which was to help in the innovation of ideas for SMEs. Privacy and Security was also highly considered hence was to help SMEs in protecting data and information. Compatibility, complexity, ownership and investment cost have also been considered important for the adoption.

According to Karunagaran et al. (2019), the organization was also seen as a major factor to cloud adoption. The size of the organization helps the SMEs to make a decision on Cloud Computing adoption and supports the use of innovativeness, ICT knowledge and specialization in cloud adoption because it contributes in making work easier and faster for the SMEs.

Cloud Computing is enhancing business to become a paradigm of competition among SMEs today, most organizations are looking at the market scope by the use of

technology. Availability of resources which all depend on the competition in the market (Seethamraju, 2015).

Harfoushi et al. (2016) state that there are various factors that impact the adoption. These include the available external support, competitive pressure, decision makers level of knowledge on Cloud Computing and innovativeness and the information intensity or availability on Cloud Computing in the market use.

According to Adam and Musah (2015), the researcher expanded it further, that other factors as to the cloud's potential in the developing world such as Kenya, the first observation is that Cloud Computing reduces infrastructure costs and the levels for playing field for SMEs.

The other observation is that unlike client based computing which requires installation and configuration of software and update with each new release as well as revisions of other programs with every update software on the cloud would be easier to install and maintain and update for better performance. This benefit is especially important for the rural users who have less IT training and cloud services provide an adopter for flexibility.

According to Seethamraju (2015), the approach of cloud requires a low upfront investment and is thus ideal for SMEs. Cloud Computing as a software becomes free via web based applications or available in Software as a Service (SaaS) software piracy is likely to reduce cloud and can overcome barriers related to the poor broadband

deployment in developing economies. Finally, cloud allows businesses with a model in which third parties can provide cost effective security for SMEs.

Nevertheless, these underscore how economic and institutional problems remain central to the spread of Cloud Computing among SMEs in the developing world. Cloud Computing adoption issues are different for SMEs than they are for larger organizations (Sabi et al., 2018).

According to Shin (2016), Cloud Computing has recently become a hot issue in the competitive market places. Many prior researches in Information Systems (IS) discipline have implemented noteworthy variables impacting the adoption of new technologies or service solutions to the new facilities. Nevertheless, due to the novelty of Cloud Computing, selection of Cloud Computing particularly in the Small and Medium-Sized Enterprises (SMEs) seems to be one of the less explored and examined topics.

The widely invented literature on Cloud Computing has widely focused on areas such as Cloud Computing architecture, potential applications, Cloud Computing costs and benefits. However, because of the socio-technical aspects, cloud services are usually deployed in a very wide network where numerous human and non-human actors are equally important in the process of technology adoption (Gangwar et al., 2015).

According to Kranz et al. (2016), security is another crucial factor that determines the adoption of any innovation. Lutz defines Cloud Computing security as the degree to which Cloud Computing is seen as being more secure than other computing paradigms.

They support the argument by stating that it is one of the three applications which significantly influence the adoption rate of innovations.

Any new product comes with new challenges to the end users and the number of challenges determines the adaptability of the product. The ease of use of the new product is also referred to as the complexity being another factor. They define complexity as the degree to which an innovation is assumed as relatively difficult to understand and use.

According to Loukis (2015), the organizations are the end users of the Cloud Computing platform. The size of the organization is the first determinant for the adoption. A number of SMEs that fall under these categories of having five and below employees tend to be rigid in the adoption of large scale products since their number is small.

They also need to have IT competent staff that are able to utilize the new innovations. The knowledge of ICT and the hands-on skills are required in order to fully utilize the available technologies and services. Several Cloud Computing standards that are available need a team of members who are competent in the IT domain and structure.

According to Frusina et al. (2018), competition makes up the major part of the environment. The external environment has a different impact on the organization and its ability to adopt new technologies. Competition puts strong pressures on organizations to search for new and better alternatives that can improve productivity and surplus. This is also affected by the availability of resources.

If the required resources are scarce, then availability of the internet and the adaptation of Cloud Computing becomes hard since the required resources are not available to users. There are a few exchanges about the advantages of receiving Cloud Computing among which give the most relevant context. Although benefits are split into non-functional, financial and technical elements, some of their descriptions are duplicates of current points.

Their reviews state non-functional benefits of cloud provide users flexibility of customers in choosing the quantity and size of the supported information by an application or the number of concurrent users. Schubert was also talking about the quality of Service as the capability to guarantee services which includes response time and input for better services (Almallah, 2015).

According to Rittinghouse (2016a), reliability provides the ability to guarantee continuous system operation without interruption, including no data loss, and is usually accomplished by decreasing redundancy. IaaS as a service which is relevant for adoption by SMEs because in today's economic environment, organizations especially SMEs are looking for ways to improve the modes of operation to reduce cost and efficiency.

In today's generation, there is a growing awareness amongst senior business managers of the possibilities in consumer IT raising doubts that IT really requires the special skills, large budgets and long project cycles that have traditionally been involved states that Worldwide use of Cloud Computing has shown that there are clear benefits. SMEs have been slow in adopting infrastructure as a Service (IaaS), an important element of Cloud

Computing mainly because of concerns about security and privacy of data and information.

There are concerns about where their data is being kept and whether a solution designed for individual consumers is viable for a professionally minded organization. A number of large Global businesses are turning to IaaS solutions and gaining the benefits of large cost savings and greater operational flexibility and effectiveness (Kowalkiewicz et al., 2017).

There are a number of IT suppliers emerging to meet the needs of professionally minded SMEs who want the cost savings, flexibility and functionality of hosted IaaS resolutions and don't want the costs, complexities and delays of a cumbersome enterprise solution. Most of the IaaS that are being supplied are hosted at specific locations in high grade facilities that would be unaffordable for most SMEs (Kabanda et al., 2018).

These services are turned from modified projects into productized solutions and delivered from secure equipment used only by them, over encrypted networks that ensure data privacy and security. IaaS enables every SME to have access to very high quality, secure solutions of the sort previously available only to large enterprises (Coleman et al., 2016).

According to Street et al. (2017), SMEs that are very keen on reducing the cost of Information Technology and improve their ability to respond to the needs of the business, will find that the use of IaaS enable them to achieve these objectives to know

where their data is, and how it meets data protection regulations to be in a position to achieve higher standards of security and quality of infrastructure and get resolutions that are designed primarily for SMEs. IaaS helps SMEs align IT with their business imperatives and deliver a wide range of benefits.

It enables SMEs to provide new infrastructure and services rapidly and scale the use of these resources up or down as business conditions dictate and explains. This can also be achieved as part of practical moving IT improvement approaches and not high risk and costly changes. IaaS providers design high grade servers in high quality data centers which are quite costly for SMEs organizations to implement. The SMEs thus get infrastructure that is of high quality and also get support for highly qualified staff (Priyadarshinee et al., 2017b).

According to Xue (2016), IaaS makes it easy for SMEs to switch IT costs from capital expenditure to an operational expense and pay exactly for what the organization needs when they want it and its delivery value. The SMEs get relevant cost savings and a quality of service that would otherwise be unaffordable. IaaS resolutions are designed with inbuilt redundancy, system replication and service resilience. SMEs in all business sectors can benefit widely from the adoption and use of IaaS models

SMEs are exposed to the following business drivers and well suited to maximizing the cost savings, operational benefits and competitive advantage offered by IaaS. Multiple, spread locations and the need for geographical flexibility diverse, fragment uncoordinated IT infrastructure derived from organic or acquisitive growth and a

requirement to get cost savings in IT and balance investment on the budget across all business sectors and networks.

According to Botta et al. (2016), Cloud Computing growth is moving fast, as adoption of the technology and media attention increases. A number of researchers have addressed the emerging need to organize the outcomes of studies and provide reviews on the knowledge accumulated. The past reviews created an overview of the business perspective of cloud and identified the need for research on specific issues organizations face during adopting Cloud Computing. Since its inception, Cloud Computing has emerged with a high growth rate of companies.

This innovation of information technology (IT) services delivery model, Cloud The changing trend of IT strategy towards Cloud Computing is all about innovation, flexibility and economic growth, organizations cannot take this for granted that it is truly the benchmark of transformation. The current Cloud Computing capabilities are mainly to transform business processes, deliver real time applications, lower IT expenditures, unlimited computing power and mobilization; organizations consider cloud-based solutions to achieve business effectiveness and efficiencies (Marinescu, 2017).

According to Asatiani (2016), there is general and several related research and studies providing overview of clouds in specific contexts and evaluation. These studies provide a broader picture of cloud research identifying popular themes and topics. The general shift from technical to SMEs perspective is seen in the literature observations where adoption is one of the most popular topics being discussed by researchers in the IT

industry. Furthermore, the mentioned reviews are recognized and for that matter, a need for thorough research into concrete issues, such as adoption, security and deployment of cloud services should be put into considerations.

Cloud Computing is an evolving paradigm aimed at providing hardware infrastructure and software applications as services that clients can use on a pay-per-use basis. It is the process and storage of information through the web. Computing and storage become services instead of physical resources. Files and different information is held within the cloud and can be accessed from any web association devices (Khan, 2016).

According to Khan (2015), it is some way of computing wherever IT-related capabilities are provided as a service, permitting users to access technology enabled services from the web, or cloud while not data of, experience with or management over the technology infrastructure that supports them. Cloud separates application, info and resources from the infrastructure, and also the mechanism won't deliver them. It's a technology that uses the central server remotely and web to main application and information, and permitting businesses and customers to use applications while not installation and additionally permits them to access personal files at any pc with web access capability

The interest towards Cloud solutions is rapidly growing. As a result, they are adopted in several eventualities like social networking, business applications, and content delivery networks. Cloud Computing is that the begin of network primarily based computing over the web that is taken into account to be the component of all new computing models, the consumer of Cloud Computing and also the Terminal Cloud Computing which might

produce whole generations of applications and business activities (Palos-Sanchez et al., 2017).

It's conjointly seen because the starting of a brand new net primarily based service economy like the web centrally, Web based, on demand, Cloud applications and computing economy worldwide. A structured definition is given by Buyya et al. World Health Organization justify a Cloud as a sort of parallel and distributed system consisting of a group of interconnected and virtualized computers that are seen to be dynamically provisioned and given together or additional unified computing resources supported by service level agreement.

According to Lavanya et al. (2017), one of the key highlights describing Cloud Computing is the capacity of conveying both foundation and programs as services predominantly to convey services to clients. Cloud Computing is for the most part dependent on a major head of reusability of IT abilities and that is as per the IEEE Computer Society Cloud Computing which they term as a worldview in which data is for all the time put away in servers on the Internet and reserved incidentally on customers that incorporate work areas, stimulation focuses, table PCs, note pads, divider PCs, handhelds and a lot more to come.

Cloud Computing draws on advancements and structures by incorporating every one of these models, Centralizing processing power, utility computing and programs as an administration to clients. The incorporation requires a greater amount of computing focus of capacity to move from handling units to the network servers. Berkeley Report

discharged in Feb 2009 expressed that Cloud processing, the long-held dream of computing as a utility can possibly change an enormous piece of the IT business, making programs significantly increasingly alluring as a service and powerful to its customers (Smith, 2017).

Cloud Computing intend to control the cutting edge server firms by architecting them as a system of virtual services equipment, database, UI, application rationale with the goal that clients can get to and convey applications from anyplace on the planet on interest at focused expenses relying upon clients Quality of Service (QoS) prerequisites and applications utilized for the administration rendered.

Cloud upgrades joint effort, spryness, scaling, and accessibility of items and services which gives the possibility to decrease cost through improved and proficient computing of information, correspondence and innovation. In an uncommon manner, cloud depicts the utilization of services, applications, data, connections, coordinated efforts.

According to Rittinghouse (2016a), Cloud Computing is worldwide and gives administration to the many, running from the end clients who host their own records on the Internet to endeavors who are redistributing their whole IT framework to outside server firms and capacity abilities. Administration/service Level Agreements (SLAs), which additionally incorporate QoS prerequisites, are set up among clients and Cloud suppliers.

SLA indicates the subtleties of the administration to be given and regarding measurements settled upon by all gatherings, and punishments for damaging the desires, SLAs go about as a guarantee for clients, who are prepared to move all the more easily with their business to Cloud. There is a computing power in cloud processing conditions that is provided by an accumulation of server firms, which are normally introduced with hundreds to thousands of servers and clients (Raj, 2016).

According to Vyas (2016), there are various arrangements which are accessible to move from the conventional science lattices and grasp the Cloud standards and difficulties. A portion of the sellers incorporate, for example, Amazon Web Services and VMware base their offering on equipment level virtualization and give exposed PC and capacity assets on interest dependent on clients and capacity limit. Google AppEngine and Microsoft Azure are for the most part centered on application level virtualization and incorporate virtualizations.

The different arrangements sellers furnish end clients with a stage for creating Cloud applications that can depend on the web and make some out of the current arrangements no matter how you look at it. Cloud Computing is predominantly concentrating on conveyance of solid administration, secure, deficiency tolerant, maintainability and adaptable frameworks for facilitating Internet based application services and programs (Kashyap, 2018).

It can likewise to a limited degree, be viewed and considered as the common development of matrix Cloud Computing, taking into account that it was imagined and

conveyed to fulfill the new requests of clients who, when acquainted with utilizing the web 2.0 services, seen by the need to move quite their very own bit information onto the web or distributed storage.

According to Hanlon (2019), Cloud Computing clients and clients don't commonly possess the physical framework filling as host to the product stage being referred to, rather, they maintain a strategic distance from capital use by leasing use from an outsider supplier and the specialist co-op.

They likewise expend assets as an administration and pay just for assets rendered. Many Cloud Computing contributions utilize the utility processing model, which is similar to how conventional utility services, for example, power are devoured and utilized while others bills on a membership premise are taken care of and overseen (Mosco, 2015).

According to Ali et al. (2015), Cloud Computing is the combination of innovations around the world, where virtualization applications are isolated from foundation. Software is administered where applications are accessible on interest relevant to all clients. Cloud Computing can likewise be the capacity to lease a server or a huge number of servers and run on the most dominant framework instruments accessible anyplace and it's inside the framework necessities.

It tends to be the capacity to lease a virtual server, load programs on it, turn it on and off voluntarily, or clone it multiple times to meet an unexpected outstanding burden prerequisites and interest for clients and applications in it.

According to Trivedi (2017), it can be put away and verify tremendous measures of information that is available just by approved applications and clients. It may very well be bolstered by a cloud supplier that sets up a stage that incorporates the OS, Apache, MySQL database, Perl, Python, and PHP with the capacity to scale consequently because of changing burdens and space to stack different applications locally available.

Cloud Computing can have the capacity to utilize applications on the Internet that store and secure information while giving an administration anything including email, deals power mechanization, ERP and expense planning. It can likewise be utilizing a capacity cloud to hold application, business, and individual information in the framework to keep records for future reference (Rossiter, 2016).

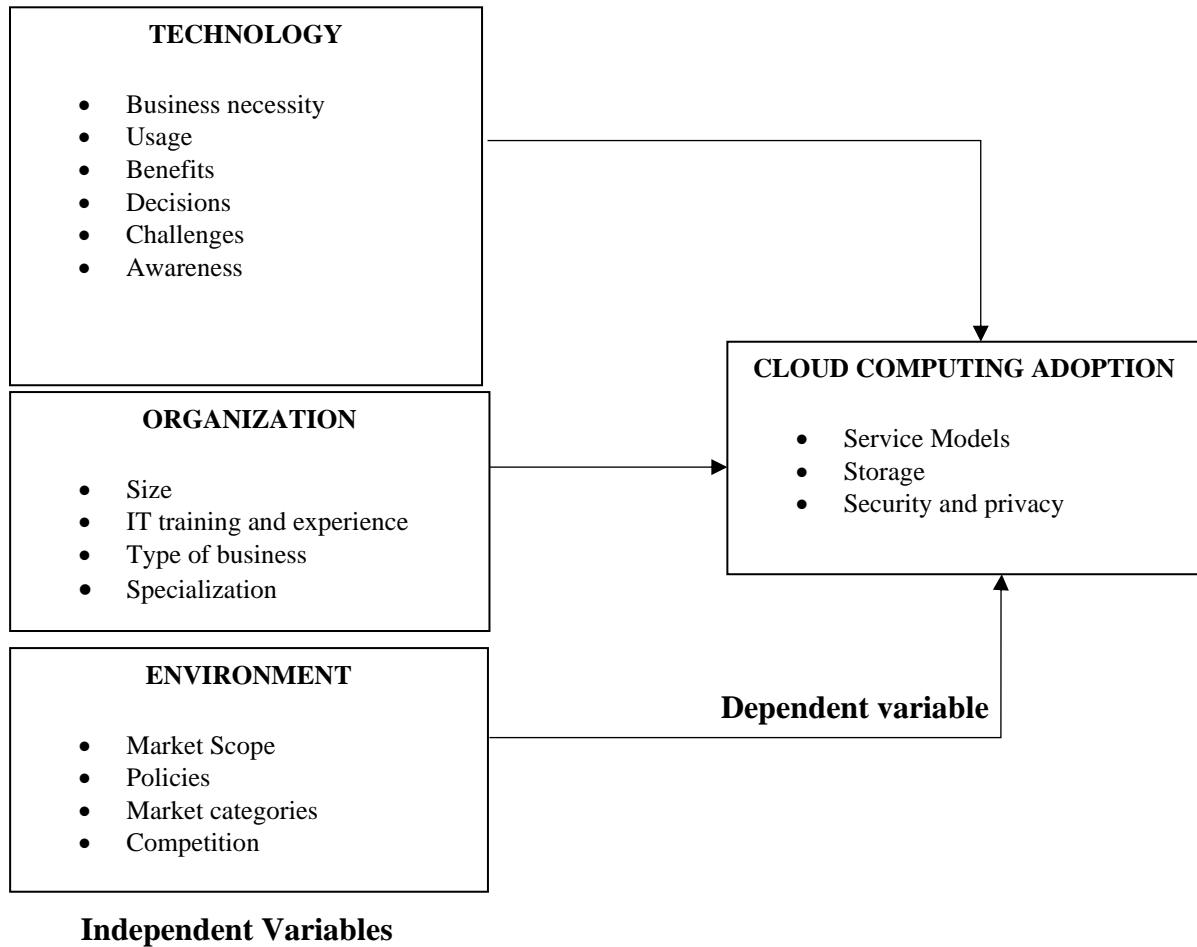
The study aimed at covering the gaps on challenges faced by SMEs whose reports were on the limitation of lack of policies, poor network, high cost of infrastructure, technical issues, poor network coverage, uncontrolled cyber-attacks and lack of expertise to provide training on the same.

2.6 Conceptual Framework

The conceptual framework below was used to determine the difference between the independent variables and dependent variables, and how they related to form the study. It is out of this framework that the researcher came up with ideas and knowledge that form the adoption of Cloud Computing used by SMEs in Meru County.

Figure 2:1

Conceptual Framework: source (author, 2021)



2.6.1 Technology

The available technology determines the capabilities that can be adopted by the SMEs in Meru County. The most required was the availability of Internet services with which the SMEs can access the cloud facilities. The challenges faced were all considered in terms of usage.

2.6.2 Organization

On the other hand, the organization was to be the main determinant of the adoption of Cloud Computing. If the size of the SME is less than 20 employees, then the organization may decide not to implement any Cloud Computing functionalities to the business processes. Also the availability of competent ICT technicians and trainers was to influence the ease of adopting Cloud Computing.

2.6.3 Environment

The environment was the external factor which dictates the usability of the Cloud Computing facilities. If the target scope of the organization is minute, then the adoption of decisions may be postponed to a later date since there is no economic advantage due to lack of economy of scale.

2.7 Conclusions

In conclusion, the adoption of Cloud Computing in Kenya is a growing demand and local ISPs and international companies joining the group of Cloud Computing service providers are in demand. The adoption of Cloud Computing is also being established in Kenya at large by providing cloud services like the registration of items like driving licenses among many other Ecitizen services.

According to Loukis and Kyriakou (2015), the fact is that the Cloud services market is crowded and has many players. To make things even more complicated, “one size

doesn't fit all" is true in this context as SMEs are being challenged to find one single Cloud offering that can meet all their IT needs.

According to Wang et al. (2017), SMEs adopting Cloud services have to run a hybrid sourcing model. To demonstrate this a little bit more, SMEs should be prepared to run some of their IT stack in-house while other IT capabilities are being distributed from various service providers. In reality, the IT organizations of SMEs become an IT service broker, sourcing services from both internal and from external service providers.

Small and medium sized enterprises (SMEs) assure economic growth. Generally, many SMEs are struggling to survive in an ongoing global recession and are often reluctant to release or pay for staff training. Cloud Computing offers many opportunities and could help companies to improve their business and use technology more efficiently.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the approaches used for the study. It outlines research design, target population, sample and sampling techniques, data collection procedure and data analysis. The study focused on investigating and finding a suitable framework for the adoption of Cloud Computing by small and medium-sized enterprises in Meru County.

3.1 Research Design

Research design is an arrangement for data collection together with analysis. It can be explained as organizing research activity, including the collection of data in ways that are most likely to acquire the research aims (Gravetter, 2018).

The purpose of the research was to look into the extent of Cloud Computing acquisition by SMEs, in order to design the best framework that SMEs could use to acquire Cloud Computing. The study adopted descriptive design and user survey methods. The flexibility of the design allowed the researcher to gather the correct data for both qualitative and quantitative data. The researcher used a descriptive design to help in the investigation, design, analysis and testing and to also help in the determination of the dependent and independent variables. Meru County is a potential region for future growth and development as far as SMEs are concern. The researcher focused the study

to Meru County mainly because of low uptake of Cloud Computing, and this was triggered by lack of expertise to provide training, poor network and high cost of infrastructure.

3.2 Target Population

Population is the total group of individuals, the study is intended for and from which a sample is derived. The study population was SMEs within Meru County. According to KNCCI (2017), the total number of SMEs within Meru County was 1200 as shown in the table below.

Table 3:1

Selected SMEs in Meru County

	ICTManagers	Business Owners	Business Consultants	Total
Total	250	450	500	1200
Population				
Sample Size	50	100	150	300

3.3 Sampling

Stratified sampling technique was used in choosing the sample size from the targeted population. This technique is very efficient as it also deselected repetitive clusters from sampled sets making it economical to the target population. Stratified random sampling

method was used within the clusters to make sure that all industries that SMEs function in are added in the sample. Taro Yamane (1967) formula for estimating the sample size was applied to determine the study sample as shown below.

3.4 Formula

Equation (i) - $n=N/ (1+N (e)^2)$

Where:**n**: Sample size =300

N: Total population of the study =1200

e: Signifies the margin error = 0.05

(ii) - $n=1200/ (1+1200(0.05)^2)$

(iii) - $n=1200/ (1+1200(0.0025)$

(iv) - $n=1200/ (1+3)$

(v) - $n=1200/4$

(vi) - $n =300$

The equation above shows that the sample size was 300 from the total population of 1200 which was a lower number from the respondents to maintain a 95% confidence interval level. ICT managers (1) Business owners (2) business consultants (3) giving a total of 6 questionnaires per organization. This then implies that out of 50 organizations sampled each received 6 questionnaires giving a total of 300 questionnaires given out in the field.

3.5 Data Collection

Primary data sources included SMEs business owners, ICT managers in SMEs and the business consultants for the SMEs within Meru County. Semi-structured questionnaires were used to gather data from the respondent and follow up interviews were used to collect certain qualitative data. Secondary data sources were mainly from organizational documents and organization strategic plans of SMEs in Meru County. The main aim of the limit was to provide up to date and current information.

3.6 Pilot Study

A pilot study was conducted in some selected SMEs in Meru County, which was not included in the main study. This was an aid in the construction and validation of the data collection tool and the procedures. The data collected was then analyzed in order to help with the standardization of the research instruments used.

3.7 Validity of the Instrument.

The validity of the instrument used for the pilot study was based on the use of a prototype tool which was first approved by the supervisors and other stakeholders before it was taken to be the instrument of the study.

To further validate the instrument, the prototype tool was used for the pilot study to ensure that the research was successful when the tool was used. The pilot study was conducted in Meru County to help in the road map, the prototype instrument was standardized and taken as the instrument of study. To accomplish this, the researcher

developed a draft questionnaire with the help of the study supervisors. The draft questionnaire was then presented and necessary amendments done prior to the actual study. This ensured that the questionnaire adequately and accurately measured the variables as was expected by the researcher.

3.8 Reliability of the Instruments

Reliability of the instrument was tested by the use of Cronbach's Alpha method whereby the scores which are in the range of 0 - 0.6 indicate a low level of dependability. While scores of 0.7 and above indicate that the equipment has a high level of internal constancy and is reliable. In this case, it was above 0.7 which explained that the reliability of the equipment was valid and was relevant for the researcher to continue with the study.

3.9 Data Analysis

The data generated was both qualitative and quantitative. The researcher therefore defined the questionnaires by coding in the SPSS. Measure priorities were set using descriptive statistics, the data collected was analyzed using the regression model to determine the connection between dependent and independent variables. The interpretation output of results was done in the form of tables, figures and graphs as it is indicated in chapter four of this document.

3.10 Ethical Considerations

The researcher got permission with a support letter from Kenya Methodist University and NACOSTI to help in the data collection process. The privacy of respondents was taken into consideration which indicated that their rights were respected. The primary data was handled with utmost professionalism to ensure anonymity and confidentiality. The respondents were not required to include their names in the questionnaires. The information from the data collected was used for academic purposes only.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the result and discussions of the findings and the interpretation of the same findings on the framework for adoption of Cloud Computing by small and medium-sized enterprises in Meru County. Out of 300 questionnaires sent out in the field, 294 questionnaires were returned back representing a 74% response rate.

The findings of the study are outlined according to the specific research objectives of the study based on the responses derived from the duly filled questionnaires and data gathered as per the research questions.

4.1 Extent of Cloud Computing Usage

The first objective of this research was to study the extent to which SMEs in Meru County are using Cloud Computing. Out of 294 SMEs sampled, it was noted that 233 were using some form of Cloud Computing representing 79% of the total sample. Several factors were studied to determine their influence on Cloud Computing usage including, IT training experience, size of the organization, market scope of the organization, the type of cloud models used, and the application used for data storage.

The correlation between IT training experience and Cloud Computing usage shows that the majority who were using Cloud Computing represented a total of 233 SMEs.

Similarly, those who had IT training and experience alone represented a total of 150/233. Out of 233 SMEs who were using cloud, 41 were found to be using Cloud Computing without IT training experience. This then showed that IT training experience of IT staff in a given SME in an organization was a key factor in the usage of Cloud Computing as shown below.

Table 4:1

IT training experience and usage of cloud computing

		IT Training Experience	
		Yes	No
		Count	Count
Usage Of Cloud Computing	Yes	150	83
	No	41	20

The data collected from the field also indicated that the majority of organizations that had employees between 0-49 represented 43% and 26% represented organizations with more than 100 employees. It was further shown that out of 233 organizations that were using cloud computing, a bigger percentage was from organizations with less than 50 employees followed by those with employees between 50-100 employees. This then implies that organizations that had less employees had a major impact on usage of Cloud Computing compared to the rest of the organizations as shown below.

Table 4:2*Size of the organization and usage of cloud computing*

		Size Of The Organization		
		0-49	50-100	100-above
		Count	Count	Count
Usage Of Cloud Computing	Yes	98	74	61
	No	29	17	15

The organizations with fewer employees tend to be using Cloud Computing more than those with larger numbers of employees. This can be associated with the need to reduce cost of infrastructure and other services through the use of available Cloud Computing services. With respect to the market scope of the organization, the majority in all categories were found to be using Cloud Computing. This shows that usage was not dependent on the market of the organization as shown below.

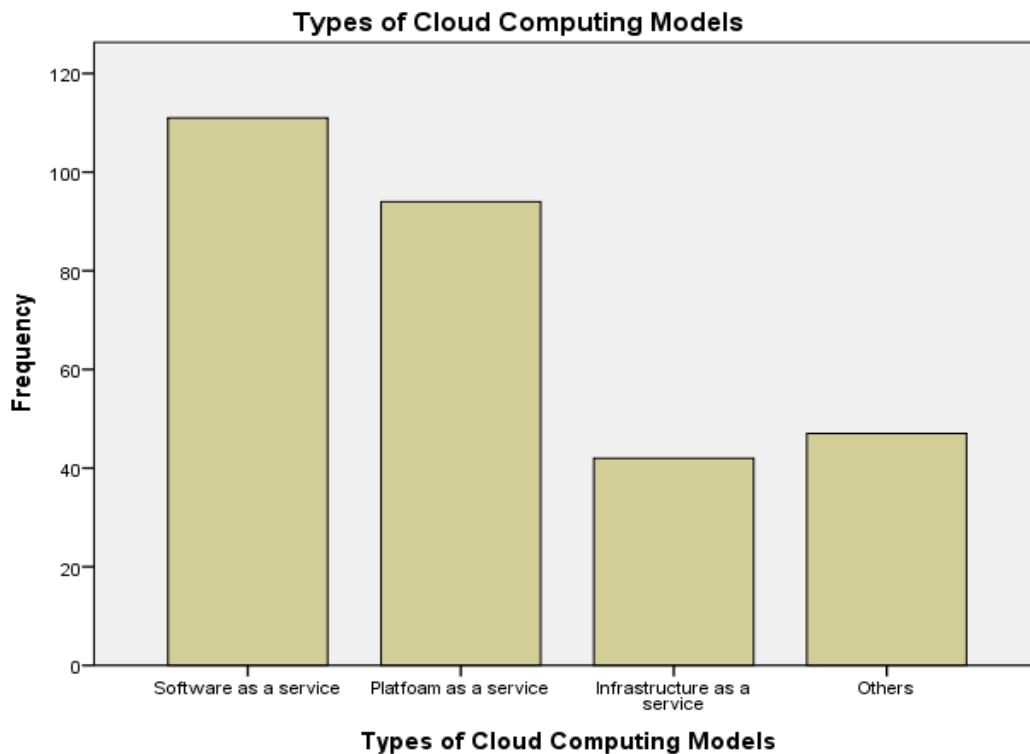
Table 4:3*Market scope of the organization and usage of Cloud Computing*

		Market Scope Of The organization				
		Single Market	Within a County	Nationally	Internationally	Others
		Count	Count	Count	Count	Count
Usage Of Cloud Computing	Yes	77	83	37	18	18
	No	17	19	8	11	6
	Total	94	102	45	29	24

Most of the organizations used software as a service and platform as a service respectively mainly to reduce the cost of software and storage capacity. Infrastructure as a service was not widely used mainly because of its high cost of maintenance and storage capacity as shown below.

Figure 4:1

Types of Cloud Computing models

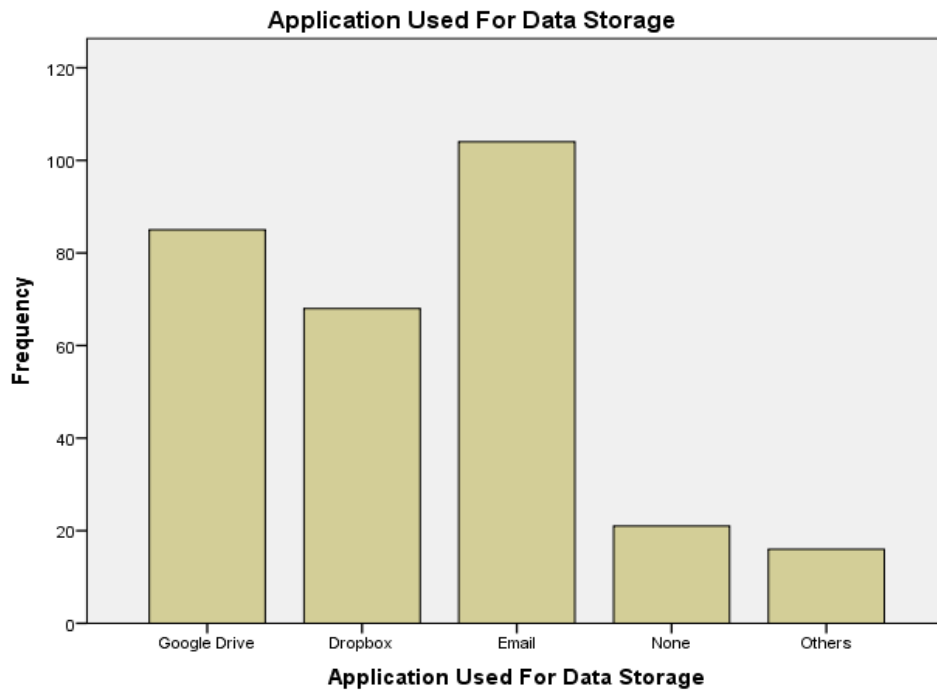


Majority of the organizations used Email applications for storage capacity mainly because of its existence in the market for some time compared to other cloud based applications such as Google drive and Dropbox which were invented in the market just

the other day. Some organizations were not using any of the applications mainly because of lack of internet and power supply in their regions as shown below.

Figure 4:2

Application used for data storage



4.2 Factors Influencing Adoption

The second specific objective was to study the factors that influence the decision to adopt Cloud Computing by SMEs. Several factors were studied to determine their influence on Cloud Computing adoption including, the necessity of Cloud Computing, factors that influence decision, benefits of Cloud Computing and lastly the usage of Cloud Computing for marketing organization.

There was an overwhelming positive view on Cloud Computing as a necessity for business investment with a major factor considered influencing the adoption of decision being the ease of use, security and privacy, cost and competition in the order of importance as shown below.

Table 4:4

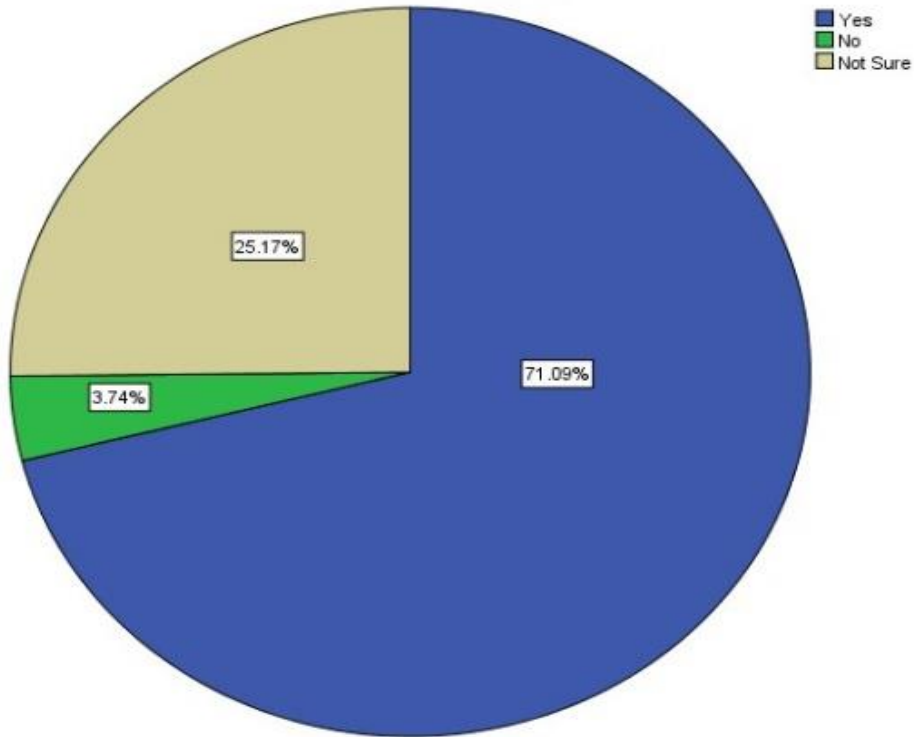
Factors for decision making and cloud computing necessity for business

		Factors For Decision Making			
		Competition Security and Privacy		Ease of use Cost	
		Count	Count	Count	Count
Cloud Computing Necessity For Business Investment	Yes	62	69	79	56
	No	9	6	5	8
	Total	71	75	84	64

Findings in Figure 4:3 below shows that majority of the respondents 71% indicated Yes to show that Cloud Computing offers a greater advantage to organizations, 25 % indicated No to show that usage of Cloud Computing does not offer any advantage to their organizations and lastly 3% was a group of respondents who were not sure whether Cloud Computing offers a greater advantage or not.

Figure 4:3

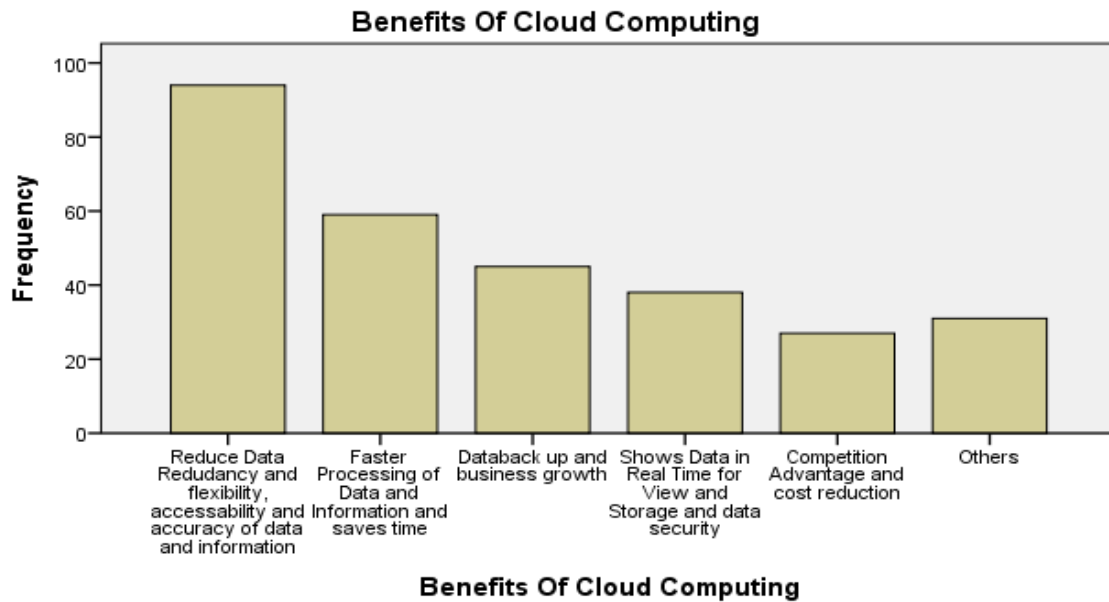
Cloud Computing advantages



The main benefits perceived by the respondents were the reduction of data redundancy and flexibility, accessibility and accuracy of data and Information. Whereas the least was competition advantage and cost reduction as shown below.

Figure 4:4

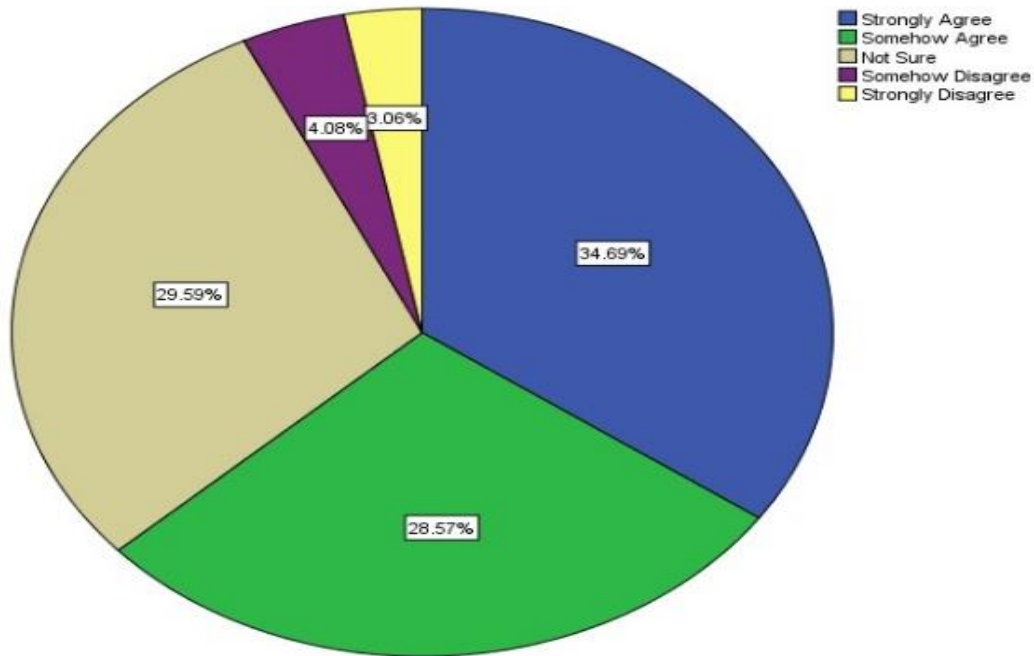
Benefits of Cloud Computing



The respondents were to provide this perception on usage of Cloud Computing in marketing of the organization. Majority of the respondents 34% strongly agreed that Cloud Computing can be used as a tool for marketing the organization, 29% were not sure of what to conclude 28% somehow agreed, whereas a small margin of 4% and 3% somehow disagreed and strongly disagreed respectively. This implies that marketing of the organizations contributed to the usage of Cloud Computing through the use of internet services as shown below.

Figure 4:5

Marketing of the organization



4.3 Challenges of Adoption

The third specific objective was to determine the challenges faced by SMEs in adoption of Cloud Computing in relation to usage and performance. Several factors were studied to determine their challenges on Cloud Computing adoption including, usage of Cloud Computing, measures for security and privacy of data, policies, market categories and services and lastly area of specialization.

The findings in Table 4:5 below shows that the majority of the respondents who had IT training experience faced a bigger challenge with adoption because of poor network and technical issues. High cost of infrastructure, cyber-attack, high bandwidth cost and lack

of skills and expertise to create awareness also were found to be part of challenges which were affecting adoption though not to a bigger extent. This implies that even though Cloud Computing was a factor to SMEs; it also had some drawbacks that hindered it.

Table 4:5

IT training experience and challenges of cloud computing

		IT Training Experience	
		Yes	No
		Count	Count
	Technical issues	35	20
	High Cost of Infrastructure	27	15
	Poor Network	37	14
Challenges Of Cloud Computing	High Bandwidth Cost and Lack of Skills and Expertise to create Awareness	27	19
	Cyber attack	32	24
	Others	33	11
	Total	191	103

Majority of the respondents were not aware of Policy Framework for Cloud Computing and thus affected the adoption of cloud and hence it contributed to the challenges which SMEs were facing as shown below.

Figure 4:6

Policy Framework for Cloud

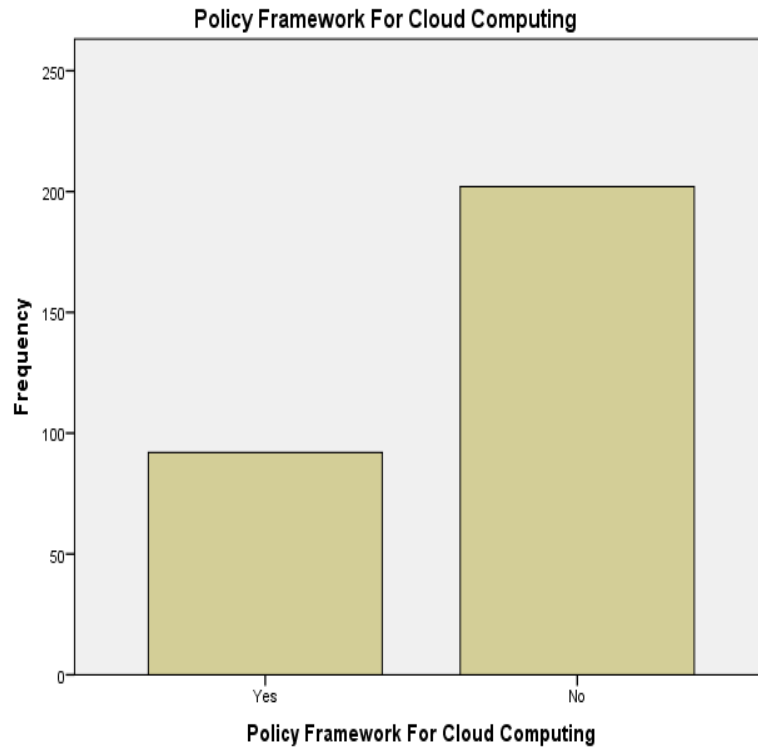


Table 4:6 below shows that the majority of the SMEs who were using Cloud Computing were highly affected by cyber-attacks in their organizations. Technical issues and high cost of infrastructure were also seen to be other factors affecting Cloud Computing as shown below.

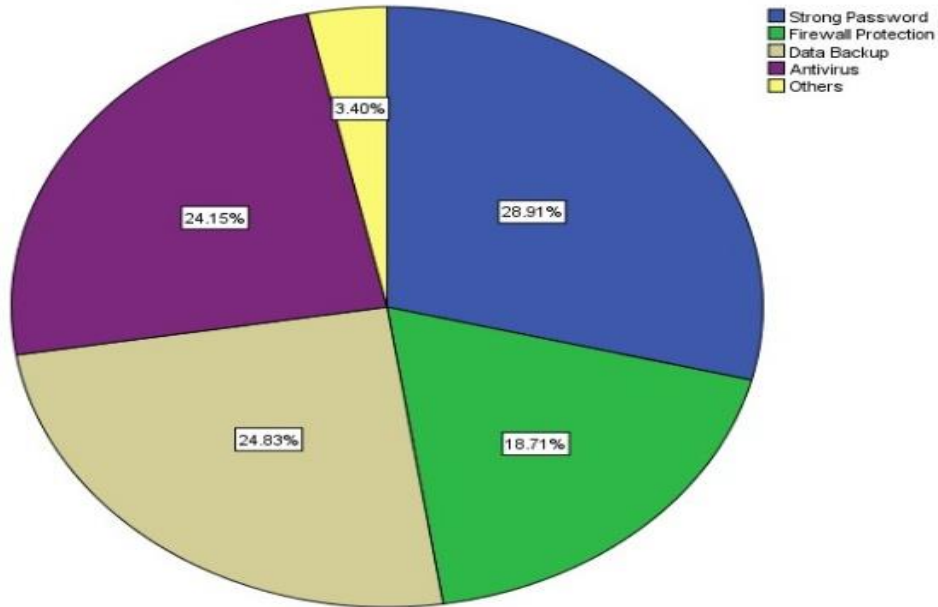
Table 4:6*Usage of Cloud Computing and challenges*

	<i>Usage Of Cloud Computing</i>	
	Yes	No
	Count	Count
Technical issues	42	13
High Cost of Infrastructure	40	2
Poor Network	37	14
High Bandwidth Cost and Lack of		
Challenges Of Cloud Computing Skills and Expertise to create Awareness	34	12
Cyber attack	46	10
Others	34	10
Totals	233	61

The findings in the Figure 4:7 shows that majority of the respondents 29% were using strong password to secure their data, 25% of the SMEs opted to use data backup for data security, while 24% of the SMEs were using antivirus as a measure of security, 18% of the respondents preferred using firewall protection as a measure for security and lastly a category of others with a 3% saw the need of using other measures which were not mentioned by the researcher.

Figure 4:7

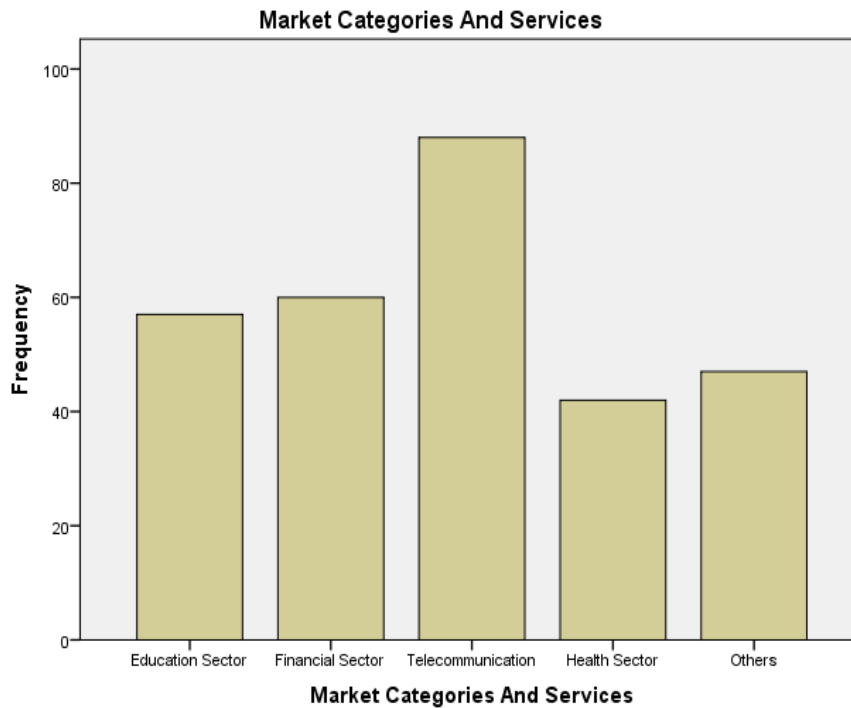
Measures for security and privacy of data



Telecommunication sector was found to be on the higher rank in market categories and services followed by the financial sector and Education sector respectively. Others and the health sector took the least rank as shown in Figure 4:8 below. This implies that the telecommunication sector had a high percentage usage of Cloud Computing because of its networking environment.

Figure 4:8

Market categories and services



The findings showed that the majority of SMEs had training in computer packages as their area of specialization. Networking was coming second followed by management information systems and Information technology which was coming third in the rank and lastly telecommunication and database management and software developers became the least in the category because of the technicality of the applications required for knowledge based systems which was not of use to them as SMEs as shown below.

Table 4:7*Area of specialization*

	Frequency	Percent	Valid Percent	Cumulative %
Computer Packages	98	33.3	33.3	33.3
Networking	69	23.5	23.5	56.8
Systems Administration and Telecommunication	27	9.2	9.2	66.0
Management Information Valid Systems and Information technology	39	13.3	13.3	79.3
Database Management and software developers	21	7.1	7.1	86.4
Others	40	13.6	13.6	100.0
Total	294	100.0	100.0	

4.4 Develop an easy to use Framework for Adoption

The fourth specific objective was to develop an easy to use framework for adoption of Cloud Computing. A linear regression analysis was carried out on the following; the type of models used, the applications used and the level of decision making for the determination of the p-value which is less than 0.05 and is within the margin of error to prove the significance of the results. The results from the linear regression analysis formed a conclusion for a proposed framework for the study as indicated below.

The findings in Table 4:8 and Table 4:9 below indicate that IT training experience and Cloud Computing necessity for business is significant to the types of Cloud Computing as indicated in the matrix below.

$$Y = 0.417 + 0.233x_1 + 0.109x_2 + 0.169x_3$$

$$SE = 0.271 + 0.214 + 0.045 + 0.125$$

$$P\text{-value} = 0.125 + 0.000 + 0.066 + 0.003$$

Where: X1= Business necessity

X2= level of decision

X3= IT training and experience

As shown in Table 4:9 below the coefficient of x1 and x3 are significant as indicated by a p-value of less than 0.05 however, the coefficient of x2 is slightly insignificant as indicated by a p-value of 0.066 which is >0.05 though within the margin of error.

Table 4:8

ANOVA^b Dependent Variable: Types of Cloud Computing models

ANOVA^b						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	42.336	3	14.112	13.801	.000 ^a
	Residual	296.538	290	1.023		
	Total	338.874	293			

a. Predictors: (Constant), IT Training Experience, Cloud Computing Necessity For Business Investment, Decision Making On Cloud Computing

b. Dependent Variable: Types of Cloud Computing Models

Table 4:9*Coefficients^a Dependent variable: Types of Cloud Computing model*

		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.417	.271		1.537	.125
	Cloud Computing Necessity For Business Investment Decision Making On Cloud Computing IT Training Experience	.852	.214	.233	3.974	.000
		.083	.045	.109	1.847	.066
		.380	.125	.169	3.043	.003

a. Dependent Variable: Types Cloud Computing Models

The findings in Table 4:10 and Table 4:11 below indicate that Cloud Computing necessity for business, decision making and IT training experience is significant to the application used for data storage as indicated with the matrix below.

$$Y = 0.853 + 0.199x_1 + 0.153x_2 + 0.109x_3$$

$$SE = 0.289 + 0.228 + 0.047 + 0.133$$

$$P\text{-value} = 0.003 + 0.001 + 0.011 + 0.053$$

Where: X1= Business necessity

X2= Decision making

X3= It training and experience

As shown in Table 4:11 below the coefficient of x1, x2 and x3 are significant as indicated by a p-value of less than 0.05 which is within the margin of error.

Table 4:10

ANOVA^b Dependent Variable: Application used for data storage

ANOVA^b						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	39.339	3	13.113	11.276	.000 ^a
	Residual	337.250	290	1.163		
	Total	376.588	293			

a. Predictors: (Constant), IT Training Experience, Cloud Computing Necessity For Business Investment, Decision Making On Cloud Computing

b. Dependent Variable: Application Used For Data Storage

Table 4:11*Coefficients^a Dependent Variable: Application Used For Data Storage*

		Coefficients^a				
		Unstandardized Coefficients		Standardized		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.853	.289		2.950	.003
	Cloud Computing Necessity For Business Investment Decision Making	.767	.228	.199	3.355	.001
	On Cloud Computing IT Training Experience	.123	.048	.153	2.564	.011
		.259	.133	.109	1.940	.053

a. Dependent Variable: Application Used For Data Storage

The findings on Table 4:12 and Table 4:13 below indicate that Cloud Computing necessity for business, Cloud Computing advantages and market for organization is significant to decision making as indicated with the matrix below.

$$Y = 0.491 + 0.270x_1 + 0.126x_2 + 0.162x_3$$

$$SE = 0.304 + 0.267 + 0.080 + 0.096$$

$$P\text{-value} = 0.108 + 0.000 + 0.034 + 0.007$$

Where: X1= Business necessity

X2= Market of organization

X3= Cloud Computing advantages

As shown in Table 4:13 below the coefficient of x1, x2 and x3 are significant as indicated by a p-value of less than 0.05 which is within the margin of error.

Table 4:12

ANOVA^b Dependent Variable: Decision Making On Cloud Computing

ANOVA ^b						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	98.431	3	32.810	19.938	.000 ^a
	Residual	477.232	290	1.646		
	Total	575.663	293			

a. Predictors: (Constant), Cloud Computing Advantages, Cloud Computing

Necessity For Business Investment, Marketing Of The Organization

b. Dependent Variable: Decision Making On Cloud Computing

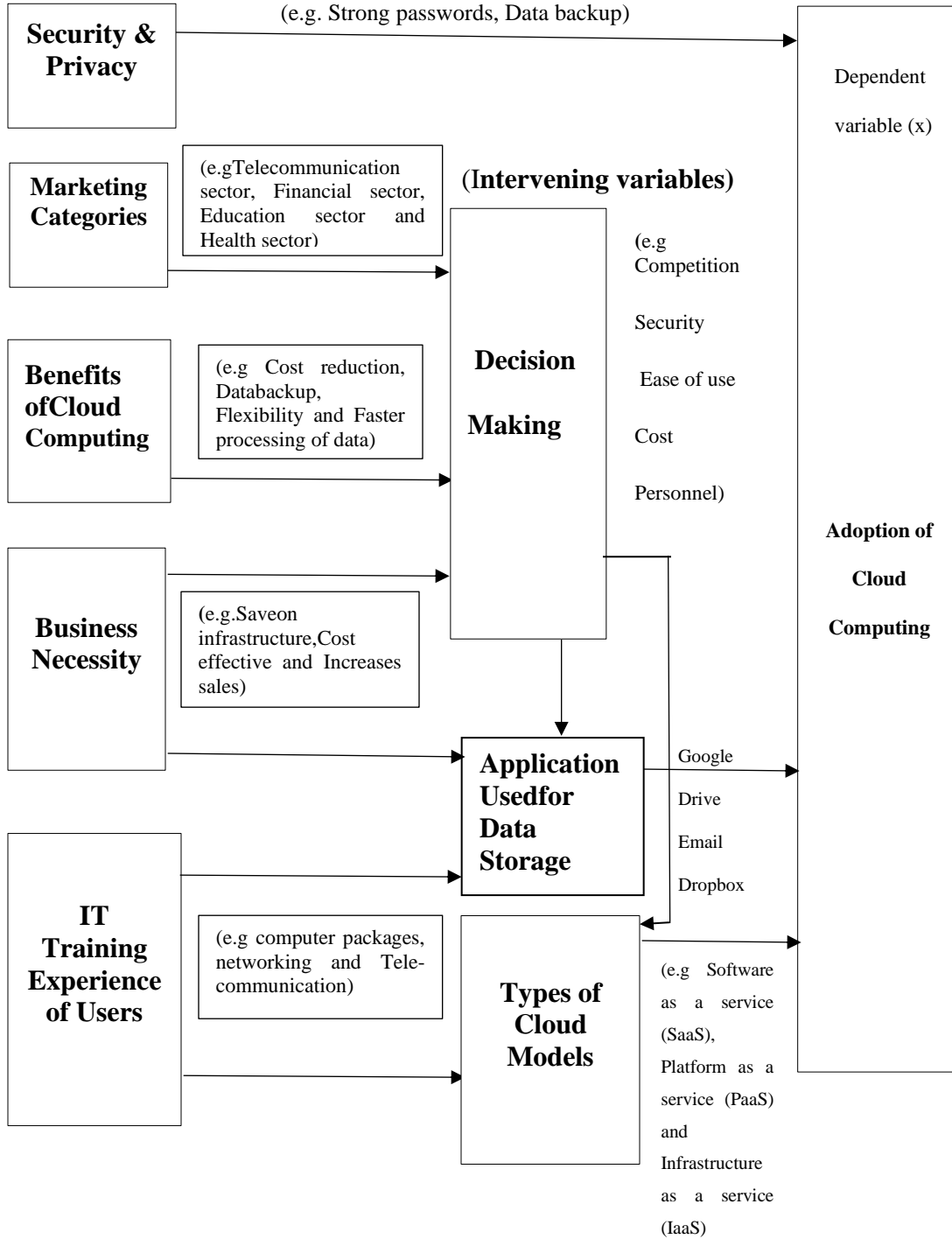
Table 4:13*Coefficients^a Dependent Variable: Decision Making On Cloud Computing*

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.491	.304		1.614	.108
	Cloud Computing Necessity For Business Investment	1.285	.267	.270	4.803	.000
	Marketing Of The Organization	.171	.080	.126	2.129	.034
	Cloud Computing Advantages	.262	.096	.162	2.724	.007

Figure 4:9

Proposed Framework for Cloud Computing Adoption

Y= Independent variables



Based on the discussion above, the following framework was proposed for use in Meru County. The findings collected were as follows; Security and privacy was influencing usage of Cloud Computing directly. Marketing categories, advantages of Cloud Computing and necessity for cloud business were influencing decision making on Cloud Computing.

IT training experience of users influenced both application use and choice of Cloud Computing models. Decision making on Cloud Computing was influencing the application used and choice of Cloud Computing models. Necessity for business cloud was influencing the decision making on Cloud Computing and application used.

Choice of Cloud Computing models was influencing usage of Cloud Computing and on the other hand it was being influenced by IT training experience of users and decision making on Cloud Computing. Application used was influencing usage and usage of Cloud Computing was being influenced by choice of Cloud Computing models, application used and security and privacy.

In conclusion further research can be carried outside Meru County to validate the findings and also to help in testing the models from the same validity.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the major findings of the study and gives conclusions which attempt to give answers to specific questions that were investigated. It also presents recommendations and suggestions for further research.

5.1 Summary

The study focused on Framework for adoption of Cloud Computing by small and medium-sized enterprises in Meru County. Cloud Computing services and models which were used by SMEs included SaaS, IaaS and PaaS. Majority used SaaS and PaaS in order to reduce the cost of storage and infrastructure. The findings also showed that Cloud Computing was becoming a game-changer for small and medium-sized enterprises (SMEs) by offering them with a scalable infrastructure and capabilities available as a service.

The usage of Cloud Computing by SMEs was proved to be less costly and more efficient. On the other hand Cloud Computing technology and business models had not yet reached maturity, but severe business risks and challenges were involved to achieve the promised business advantages of Cloud Computing. The main disadvantages

included security, policy and loss of control, unstable cost structure, potentially decreased business flexibility, integration problems and technical problems.

The study variables included the dependent variables which were models, services and privacy and security. Independent variables included technology, organization and environment. The specific objectives of the study was to identify the extent to which SMEs in Meru County are using Cloud Computing, factors that influence the decision to adopt, challenges faced and to develop an easy-to-use framework for the adoption. The study adopted descriptive design and employed a survey method.

The flexibility of the design allowed the researcher to collect the appropriate data which was both qualitative and quantitative. The total population for SMEs in Meru County was 1200 and this was according to the report from Kenya National Chambers of Commerce and industry in Meru County. Stratified sampling technique was used in selecting a sample from the target population with the help of Taro Yamane method. Out of 300 questionnaires sent out in the field, 294 were returned back safely.

The Primary data sources included SMEs business owners, ICT managers and the business consultants for the SMEs within Meru County. A pilot study was conducted within Meru County. The privacy of respondents was taken into consideration which indicated that their rights were respected. The expected results showed a clearly defined framework that can be used to implement Cloud Computing usage by SMEs in Meru County.

5.2 Conclusions

The study in general aimed to design the framework for adoption of Cloud Computing by SMEs in Meru County. Out of 294 questionnaires sampled, it was noted that 233 SMEs were using Cloud Computing. The findings from the objectives of the study indicated the following. The extent of Cloud Computing usage in Meru county, showed that IT training experience of IT staff in a given SMEs in an organization was a key factor to usage of cloud.

The data collected from the field also indicated that usage was not dependent on the market of the organization. The organization with fewer employees tends to be using Cloud Computing more than those with larger numbers of employees to work on reduction of cost and infrastructure.

Most of the organization used Software as a service and Platform as a service respectively mainly to reduce the cost of software and storage capacity. Majority of the organization used Email applications for storage because of its existence in the market for some time compared to other cloud based applications such as Google Drive and Dropbox which were invented in the market just the other day.

In all categories of decision making, the major applications were mainly Google Drive and Dropbox. Electronic email was also a far major application which was used. There was an overwhelming positive view on Cloud Computing as a necessity for business investment with a major factor considered influencing the adoption of decision. Majority

of the respondents strongly agreed that Cloud Computing can be used as a tool for marketing the organization. Majority who had IT training experience faced a bigger challenge with adoption because of poor network and technical skills.

The findings also showed that the majority of the respondents were not aware of the policy framework for Cloud Computing and thus affected the adoption of cloud and hence increasing the rise of challenges faced by SMEs. A number of SMEs were affected with cyber-attacks and technical issues in their businesses.

The findings indicated that the majority of respondents were using strong passwords for protection to secure their data and information and to reduce the challenges facing Cloud Computing. Telecommunication sector was found to be on the higher rank in market categories and services because of its networking capability and position in IT.

The findings further showed that a number of SMEs had training in computer packages as their area of specialization. The usage of Cloud Computing was slow among SMEs, as SMEs required services more in the area of offering a platform and Software as a service. A number of issues discussed above, had a greater impact on cloud adoption among small and medium-sized enterprises.

The study and analysis of these issues had led to a proposition of a framework for Cloud Computing adoption which gave the understanding and a roadmap to SMEs on how to approach cloud vendors or specifically how to adopt Cloud Computing and minimize potential barriers. Such a framework was to ease up cloud migration by assessing

organization's readiness for the cloud through parameters like governance, risks involved, standards, data classification and responsibilities.

5.3 Recommendations

The recommendations have been grouped into two sections which include recommendations on research findings and recommendations for further research.

5.3.1 Recommendations on Research Findings

Based on the findings, the usage of Cloud Computing among SMEs in Meru County was low mainly because of lack of expertise to provide training and to create awareness. The Government of Meru County should help empower SMEs by training them on the benefits of adoption of Cloud Computing to help them reduce the cost of infrastructure and storage capacity hence increasing sales in their businesses.

The challenges like poor network and power failure are issues that are affecting SMEs in their businesses in Meru County and hence reducing the adoption rate. These issues can be addressed for action from the office of Meru Kenya power and the internet service providers respectively, to come up with a permanent and a better solution for SMEs in remote areas to help in boosting usage and performance of the adoption of Cloud Computing in Meru County.

Majority of the SMEs were not aware of the Policy framework for cloud and therefore, they were faced with a lot of challenges. Cyber security and technical issues were found

to be on the rise because of poor management and lack of skills and training on the same. The Meru county Government of Kenya should come up with a proper decision making mechanism to form a clear policy guideline to help arrests and prosecute offenders and to provide sensitization programs on cyber security among law enforcers, prosecutors and judicial officers to enable them deal with cyber security effectively.

5.3.2 Recommendations for Further Research

The study mainly focused on the storage of data, further research should be carried on other applications on Cloud Computing to incorporate the same and to help improve organizations performance, usage and decision making. The sample size should be increased throughout Kenya and if possible beyond the boundaries to incorporate large organizations as well as small organizations to help enrich research and provide support for adoption of Cloud Computing.

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APPENDIX I: INTRODUCTION LETTER

Eunice Achieng Odero,
Kenya Methodist University,
P.O.Box 267 – 60200,
Meru.

Dear Respondent,

RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH STUDY

I am a student at Kenya Methodist University undertaking the Master of Science degree in Computer Information Systems. My aim is to carry out research on the framework for the adoption of cloud computing by Small and Medium-sized Enterprises (SMEs) in Meru County.

I wish to carry out the study based on your organization. This study is to ensure all ethical considerations such as confidentiality, privacy and integrity. The information collected will be used for academic purposes.

Thank you in advance and your corporation will be highly appreciated.

Yours sincerely,

Eunice Achieng Odero.

APPENDIX II: SAMPLE QUESTIONNAIRE

KENYA METHODIST UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE

CLOUD COMPUTING ADOPTION BY SMEs IN MERU COUNTY

Dear Respondent,

Thank you for your willingness to contribute towards this study on Cloud Computing and SMEs in Meru County. The objective of this study was to find out the status, direction, usage and exploitation of Cloud Computing services by Small and Medium-Sized Enterprises (SMEs) in Meru and in turn make recommendations for the adoption of cloud computing within the County. Through this study, the researcher hopes to identify key areas that need change in order to ease the adoption of Cloud Computing and in the process identify opportunities that stakeholders could tap into as participants in market growth, providers and also consumers.

1	In your own opinion, do you think Cloud Computing is a necessary business investment? <input type="checkbox"/> Yes <input type="checkbox"/> No
2	Does your organization use Cloud Computing? <input type="checkbox"/> Yes <input type="checkbox"/> No
3	What measures have you put in place for Security and Privacy of data? Strong password <input type="checkbox"/> Firewall protection <input type="checkbox"/> Data backup <input type="checkbox"/> Antivirus <input type="checkbox"/> Others <input type="checkbox"/>

4	<p>What type of Cloud Computing service Model do you use in your organization?</p> <p>Software as a Service (SaaS) <input type="checkbox"/></p> <p>Platform as a Service (PaaS) <input type="checkbox"/></p> <p>Infrastructure as a Service (IaaS) <input type="checkbox"/></p> <p>Others <input type="checkbox"/></p>
5	<p>Are you aware of any Policy Framework for Cloud Computing in Kenya?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
6	<p>Which of the following market categories are you serving?</p> <p><input type="checkbox"/> Telecommunication</p> <p><input type="checkbox"/> Financial Sector</p> <p><input type="checkbox"/> Education Sector</p> <p><input type="checkbox"/> Health Sector</p> <p>Other _____</p>
7	<p>Who makes decisions based on Cloud Computing services?</p> <p>ICT Manager <input type="checkbox"/></p> <p>Director <input type="checkbox"/></p> <p>Technical support Team <input type="checkbox"/></p> <p>Top Management <input type="checkbox"/></p> <p>Others _____</p>
8	<p>What factors did you consider when making decisions/based on cloud computing?</p> <p>Competition <input type="checkbox"/></p> <p>Security and Privacy <input type="checkbox"/></p>

	<p>Ease of use <input type="checkbox"/></p> <p>Cost <input type="checkbox"/></p>
9	<p>Does the use of Cloud Computing offer any advantages to your organization?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Sure <input type="checkbox"/> Others</p>
10	<p>Does the use of Cloud Computing help in Marketing your organization?</p> <p><input type="checkbox"/> Strongly agree <input type="checkbox"/> Somehow agree <input type="checkbox"/> Not Sure <input type="checkbox"/> Somehow disagree <input type="checkbox"/> Strongly disagree</p> <p>Others _____</p>
11	<p>What is the Market scope of your organization?</p> <p>Single Market <input type="checkbox"/></p> <p>Within a County <input type="checkbox"/></p> <p>Nationally <input type="checkbox"/></p> <p>Internationally <input type="checkbox"/></p> <p>Others _____</p>
12	<p>In your own words, what would you state as the challenges of Cloud Computing?</p> <p>_____</p> <p>_____</p>
13	<p>Which application do you use for data storage?</p> <p>Google drive <input type="checkbox"/></p> <p>Dropbox <input type="checkbox"/></p> <p>Email <input type="checkbox"/></p> <p>None <input type="checkbox"/></p> <p>Others _____</p>

14	Do you have any IT training and experience? Yes <input type="checkbox"/> No <input type="checkbox"/>
15	If yes, please state your area of specialization _____
16	What is the size of your organization population? a. 0- 49 <input type="checkbox"/> b. 50- 100 <input type="checkbox"/> c. 100- above <input type="checkbox"/> d. others <input type="checkbox"/>
17	What benefits if any, do you think Cloud Computing will add to your organization? _____ _____

Thank you



Kenya Methodist University

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26th September, 2016

NACOSTI
P.O Box 30623-00100
Nairobi, Kenya

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

SUBJECT : RESEARCH AUTHORIZATION - MS. ODERO EUNICE ACHIENG

The above subject matter refers.

The Department of Computer Science held proposal defenses for MSc. Computer Information Systems postgraduate students on 30th March 2016. Subsequently, the students were allowed to make requisite corrections on their proposals before approval from the school to collect data.

Having fulfilled all the requirements, this is to therefore request for your assistance in enabling **Ms. Odero Eunice Achieng (Registration: MCS-3-0629-2/2014)** to obtain a research permit to conduct a study titled **Framework for Adoption of Cloud Computing by SMEs in Meru County.**

Looking forward to a favorable response from you.

Yours Sincerely,

Dr. Geoffrey S. Sikolia, PhD
Dean, SST



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The Future is Here!