



UNIVERSITY OF NAIROBI

**A FRAMEWORK FOR ADOPTION OF CLOUD COMPUTING IN
NON-GOVERMENTAL ORGANIZATION IN NAIROBI-KENYA**

BY

TONNY KIPROTICH ROP

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NAIROBI**

DECLARATION

This research project report is my original work and has not been submitted for a degree in any other University.

SIGNED: _____ **DATE:** _____

ROP TONNY KIPROTICH

P54/65163/2013

This research project report has been submitted for examination with my approval as the University Supervisor.

SIGNED: _____ **DATE:** _____

Dr. ABADE ELISHA

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DEDICATION

This project is dedicated to my Family for the support and guidance they gave me and the sacrifice they endured to help me reach this far. I dedicate this Project to my Son who gives me every reason to work hard every day and strive to be the best I can

ABSTRACT

Non-Governmental Organizations perform crucial functions in championing economic, social, environmental and governmental watchdog causes in the society however running ICT is not their core purpose but an enabler to enhance their operations and hence achieve their causes, missions and objectives. Cloud computing delivers a computing paradigm that modernizes the delivery of ICT services and functions, despite the value proposition that cloud computing proposes various NGO's continue to deter and lag behind in adopting cloud computing as a model to consume ICT services and prefer traditional on premise computing paradigm or even minimal usage of ICT. For these organization's to effectively and efficiently achieve their mission and purpose it's inevitable for them to adopt cloud computing but the inadequacy, barriers and other associated risk factors that hinders adoption of cloud computing forms the basis of this study towards the pursuit of an adoption framework that will drive the uptake of cloud computing within NGO's.

The study attempted to investigate why NGO's within Nairobi-Kenya have not adopted cloud computing technology by studying the factors that would drive NGO's to adopt cloud computing and if cloud computing can fit in their ICT strategy as a contributing factor to the core strategy as well look at previous or existing cloud computing adoption framework and their shortfalls which drove the formulation and testing of a proposed cloud computing adoption framework. The study further evaluated the proposed adoption framework and made recommendations as well proposed future studies.

The study adopted action research methodology as a systematic approach to undertake the research; the approach comprised of planning processes which was the problem being investigating and formed the foundation of the study, an acting process that included previous research of cloud computing technology; architecture; models adoption and migration frameworks which was conclude by defining a conceptual model with four key factors that drove the adoption of cloud computing , an observing processes that comprised of creating a questionnaire and collecting data that would drive the formulation of a proposed adoption framework; in analyzing the data statistical and sampling techniques and key factors that were highlighted that formed the adoption framework included Organizational factors, Strategic factors, Stakeholder factors, individual factors, technological factors, environmental factors and organizational factors, adoption drivers and adoption barriers and concerns each of this factors had sub factors that were measured and ranked based on their score of priority considerations and finally the reflection stage which was a reflection stage and highlights a continuous process of the proposed adoption framework evaluation .

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List of Acronyms and Abbreviations

BCP: Business Continuity Planning
Capex: Capital Expenses
DOI: Diffusion of Innovation
DR: Disaster Recovery
IaaS: Infrastructure as a service
ICT: Information and Communication Technology
IDT: Innovation Diffusion Theory
NGO: Non Governmental Organization
OS: Operating System
Opex: Operational Expenditure
PaaS: Platform as a service
POC: Proof of concept
QoS: Quality of service
SaaS: Software as a service
SCT: Social Cognitive Theory
SLA: Service Level Agreements
SLT: Social Learning Theory
SOA: Service Oriented Architecture
TAM: Technology Acceptance Model
TPB: Theory of Planned Behavior
TRA: Theory of Reasoned Action

CHAPTER 1: INTRODUCTION

Background of the study

ICT has tremendously evolved and its consumers have to keep abreast with the developments so as to remain relevant in the society and its dynamism. However, the direct and indirect costs of ICT deployments have been substantial, this is because ICT systems have traditionally been running on an “ownership” or “on-site “model, requiring huge investment in all the underlying infrastructure & applications , maintenance and upgrades of systems and finally huge manpower and skill-set as human resources . This has led many organizations to re-look at their ICT budgets and expenditure by reengineering their computing requirements, models and deployments.

As a driver to reengineer computing and a shift to “ICT as a service”, the revolution with its innovation’s has created cloud computing paradigm which offers scalability ,better utilization ,administratively cheaper and with low cost on infrastructure. (Gwendolyn at el 2014) describes the revolution as a representation and a shift away from computing as a product that is purchased, to computing as a service that is delivered to consumers over the internet from large scale data centers or clouds.

Non-Governmental Organizations and non-profit institutions perform crucial functions when it comes to championing economic, social, environmental, and governmental watchdog causes, however running ICT is not the core purpose but an enabler to enhance their operations and hence achieve their cause or mission. Moreover by offloading ICT management and its operations the institutions can leverage of cloud computing capabilities. (anonymous, 2013) concluded that Cloud computing, which circumvents the need to purchase and maintain hard- and software assets, and gives users immediate access to services they need, is playing an increasing role in helping organizations in both the public and private sectors to achieve these goals.

Cloud computing in Kenya

Kenya is the technological and economical hub of East and central Africa and this has been enabled by many factors including the rapid growth and penetration of broadband connectivity and related infrastructure, the growth of telecommunication and mobile operator and finally the landing of major undersea fiber optical cables like Seacom, Teams, Eassy and the latest Lion submarine cable which gives the region access to the globe through world wide web. The availability of infrastructure and access to the globe through World Wide Web has led to the adoption of cloud computing and related technologies which plays a major role in the development of ICT innovations, evolution and services delivery.

Cloud computing is not a new phenomenon the concept and the model borrows a lot from other computing paradigms as utility computing, grid computing and service oriented architecture, (Omwansa at el 2014) in a survey described the rapid development and adoption of cloud computing in Kenya has primarily been accelerated by the emerging computing technologies that enable reasonably priced use of computing systems and infrastructures as well as mass storage capabilities. (Mareef, 2012) NIST & ITU have defined cloud computing “as a model to enable network users on demand access to a shared pool of configured computing resources that can be rapidly provisioned and released to the client without direct service provider interaction”.

In survey done by (Omwansa, at el 2014) on cloud computing in Kenya the report concluded that cloud adaptation in Kenya is fairly recent and appreciation of the technology is fairly limited and the impact of cloud computing is fairly influenced by the cloud providers. The report as well gave an analytical evidence on the implementation model as 39% of the consumers utilize private cloud and 22% of the consumers utilizes public cloud and key issues to consider is security, in regards to adoption 80% were not aware of the policy and legal framework that is available as well as 75% were not aware of any standards available. A key consideration of the report noted that 90% of the responders concluded the country was cloud ready.

Cloud computing adoption

The possibilities of cloud computing are enormous, different ICT Service delivery, businesses models and opportunities have been born which greatly impact on the economic development and social aspect of the consumers and the providers. (Mujinga, at el 2011) describes some of the opportunities as the revolution of mobile cloud computing e.g. M-Pesa, M-Banking amongst

others. The revolution of electronic commerce e.g. online electronic payment gateways i.e. paypal, ICT resources outsourcing that have the potential to scale-on-demand with little or no up-front IT infrastructure investment costs makes cloud computing very attractive to many organizations. Cloud computing has immensely revolutionized social computing as various social network platform are available on cloud like tweeter, Facebook, Google chart among others which immensely modernizes consumers mode of communication as compared to traditional models of emails i.e. by having in premises mail exchange servers or traditional letter writing.

Cloud computing has been adopted as a computing paradigm in various parts of the world. The western and European have dominated the deployment and consumption of cloud computing services, In India the government has adopted cloud computing technologies to offer services to its citizen and enhance e-government initiatives in an economic review done by KPMG (Banerjee, Gopalakrishnan 2012-13)” A common Cloud platform will also enable local Governments and other public agencies to adopt e-Governance for better citizen services, without requiring the setting up of significant IT infrastructure”.

South Africa is one of the champions of cloud computing in Africa, the growth and penetration of South Africa technology pace has been driven by the maturity of their ICT ecosystem, availability of infrastructure, human resource capacity and frameworks that govern the provision and consumption of cloud computing, in a study done (Mvelase, et al 2013) have described the government of south Africa as keen in developing initiatives to provision governments services through Cloud computing. The government of South Africa is keen in developing a public e-government cloud to offer services to its citizen and to be a breast with modern society. Moreover the initiative will enhance the local citizen economic state by providing opportunities like government to citizen e-commerce model which will enhances the local livelihood of the citizens. Some of the computing adoption frameworks used to drive the uptake of ICT includes:

- Theory of Reasoned Action (TRA)
- Theory of Planned Behavior (TPB)
- Diffusion of Innovation (DOI)
- The Technology Acceptance Model (TAM)

- The Unified Theory of Acceptance and Use of Technology (UTAUT)
- Social Cognitive Theory (SCT)
- Motivational model (MM)
- Model of PC utilization (MPCU)

Challenges of cloud computing adoption

Despite the positive factors and drivers of cloud computing the decision to adopt Cloud Computing is challenging and in a nutshell this challenges range from strategy, technical, political, human resource capacity and social issues. The common challenges that usually affect cloud computing adoption revolves around security (Mujinga at el 2011) have highlighted the key issues to cloud adoption as security and privacy, (Bristow at el 2010) “have describes some of the challenges or drawbacks in cloud computing adoption as secure data storage, high-speed access to the internet, and standardization while privacy is still one area of security that concerns consumers of cloud computing”. Conclusively below are some of other challenges that affect the uptake of cloud computing which include;

1. Issues related to the security and privacy of Data

Security concerns cited by cloud customers range from the confidentiality of customers and organization data, Identity management and risk of identity theft, risk of data being alerted or manipulated both intentionally and unknowingly and as well the fate of data at the end of the contractual agreement between the service provider and the client.

2. Issues related to the reliability and availability of the service offered

Reliability and availability of services issues are concerns that revolve around disruption of services by systems failure, power outages, and infrastructure disruption i.e. fiber cuts etc. This poses a risk of the cloud users to access the data on the cloud platform

3. Issues over the geographical location of the data storage

The movement of data into and out of cloud services will often result in its falling under the rule of different jurisdiction. The cross border transfer of data is generally opaque to the user raising issues of control; subsequently question will rise on who is responsible for the data during its cross border movement

4. Issues over growth and spread of infrastructure

In many countries infrastructure growth is particularly concentrated on the capital cities and major town perceived to be of key economic benefit; yet the purpose of cloud computing allows flexibility in ICT services. This possess a great issue especially for organization whose core purpose and mission is off major town and cities.

5. Issues over contractual and service level agreement's

The concerns related to contractual and SLA'S revolve around geographical movement of data as well as the bonding contracts an example if a cloud service client seeks to move to a different service provider what happens to the data hosted at their current service provider! We find users locked and bonded to service providers despite the providers not meeting the SLA's.

6. Issues over standardization and measurement of quality of service

Lack of standardized architecture, design and deployments poses a great concern since there are many players in the industry and there no set standards to adhere to e.g. IEEE as well mechanism to ensure that the service providers will follow the given standards to deliver services. Lack of standardization generally culminates to poor quality of service.

Background on the NGO sector in Kenya

A Non-Government organization is an organization that is independent of the government and that was formed to pursue a certain cause in the society which impacts on humanity and not for profit-making; the causes in the society may include economic, social, cultural, religion, advocacy and governance, health, legal and environmental issues among others whose core objectives and goals are non-commercial.(Gitonga at el ,2010) in a session paper for NGO laws review in Kenya defined non-governmental organization as “ private voluntary groupings of individuals or associations, not operated for profit or for other commercial purposes but which have organized themselves regionally, nationally or internationally for the benefit of the public at large and for the promotion of social welfare, development, charity or research in the areas inclusive of, but not restricted to: health, relief, agriculture, education, industry, and the supply of amenities and services”.

In Kenya to date there are over 4,000 registered NGO .A research done in 1997 to 2005 by Kanyinga and Mitullah on the NGO sector in Kenya they establish the growth of NGO has been enormous and up to 2006 there were 4099 registered NGO's in Kenya and by 2009 in a NGO survey done by the NGO bureau there were 5929 registered NGO' in Kenya. The NGO

Coordination Board (2012) lists some of the leading non-governmental organizations to be Red Cross Kenya, Plan International, World vision, OXFARM, Catholic relief among others.

The extensive coverage and expansion of NGO's in Kenya has driven the need to employ large human resource capacity to undertake their missions Staffing levels of some of them averaging over 700 employees (NGO Coordination Board, 2012), it's obvious to state that large volumes of data and information are handled as part of the operations which rises the need to build large ICT infrastructure to support their missions. NGO in Kenya are substantially funded to run their operations (Kanyinga & Mitullah) in their research findings show that about 81% of the cash revenue comes from fees such as property income and membership fees, 14% comes from all sources of private philanthropy, including individuals, foundations, corporations, and foreign donors. Another 5 % is from the public sector (Kanyingi at el 2006). Certainly there no doubt that NGO spend huge sums to finance their current and operational expenditure which is inclusive of ICT functions.

Cloud computing in the NGO sector

The complexity of functions processes and operation in NGO's drives the adoption of new technologies to ease and streamline processes that directly impacts on the strategic plan and core mission of the NGO. Cloud computing ensures that NGOs focus on their core mandates as opposed to concentrating their efforts on ICT services and Infrastructure management. In a global survey done for the uptake of cloud computing in non-governmental organization by Tec soup Global network (anonymous 2012) reported that out of 88 countries surveyed 10,593 responders responded and the report concluded that 90% responders were using cloud computing ,60% lacked technical knowledge ,79% responded that it easier to administer software and hardware on cloud,47% responded that the low cost and ease of setup is the highest motivator for the uptake and 53% reported that it would be moving a significant portion of their ICT functions to the cloud. Net hope International is a consortium of 41 leading international humanitarian organizations whose mission is to act as a catalyst for collaboration, bringing together the knowledge and power so that the best ICT technologies and practices can be used by the NGO's to pursue their cause in the developing world. It provides NGO's with an opportunity to off load their ICT operations to specialized providers by providing mechanisms to support NGO implementation of cloud computing (Net hope's International 2012).

Key challenges that hinder adoption of cloud computing and ICT in general in the NGO sector is strategy and capacity which trickles down to low allocation of ICT budget's due to the non – appreciative factor of ICT in the sector. (Gwendolyn et al 2014) “In outlining factors that make ICT usage among NGO's, highlighted that most NGOs have no budget for the development improvement or maintenance of their ICT infrastructure. NGOs are under-budgeted when it comes to ICT”. ICT plays a very integral part in the delivery services of which ever mission an NGO is undertaking and with the evolution of cloud computing whose key characteristic is low cost on upfront expenditure, ‘pay for what you consume model’ and very scalable the NGOs are geared towards moving to cloud computing.

Statement of the problem

Cloud computing is a key driver to ICT service delivery; It promotes a model of ‘consume what you require and pay for what you have used’. The nature of NGOs is to support certain cause or mission e.g. Health, education, governance, economy, education among other whose expenditure and revenues are substantially funded by parties like membership, donor aid and philanthropist; However ICT function plays a huge role in executing this missions and it should be cascaded to the main strategy of the organization but NGO’s view ICT as a cost center and do not understand its benefits (Gwendolyn at el 2014) ‘in a survey conducted by TechSoup in April 2012, it was revealed that the NGOs operate on budgets that are less than 1.5% of the NGOs’ total operating budget”, by having better framework to adopt cloud computing paradigm in which the NGO’s can leverage off to achieve their causes and mission and manage their expenditure on ICT whose budgets are limited yet realize their return on investment and impact the society.

Currently various cloud computing frameworks exist globally but one that fits our particular context which is non-governmental institution in Kenya is yet to be developed and which we will base our research on and look at a better framework for the adaptation of cloud computing in non-governmental institutions. (Omwnasa at el 2014) in a research paper on cloud computing in Kenya highlighted the adoption of cloud computing in Kenya is fairly recent and the appreciation of the impact is rather limited.

A better adoption framework for cloud computing in the NGO sector in Kenya is important because most of previous challenges in the adoption of cloud computing have been driven by gaps in adoption frameworks which include lack of regulatory and legal frameworks, lack of cloud adoption strategy and alignment to the core strategy and NGO ‘s custom architectural design, implementation framework,(omwansa at el 2014) states that 80% of stakeholders of cloud computing in Kenya were not aware of any legal and policy frameworks Even those who were aware, majority indicated that these frameworks were not as flexible, comprehensive and effective as they would have wished. In Zimbabwe a study was undertaken on the adoption of cloud computing utilization in the NGO sector found that 55% of the respondents indicated that they were not utilizing cloud computing services for varied reasons which include lack of ICT staff, lack of budgets to implement cloud computing, difficulty in measuring return on investment, security concerns, lack of management support and use of outdated software and hardware (Gwendolyn at el 2014).

In totality this study seek to address the gap between cloud computing as a paradigm and adoption of the paradigm through a better adoption framework which will drive the uptake of cloud computing by addressing various challenges and mitigate risks that are associated with cloud computing within the NGO sector in Nairobi Kenya.

Objectives of the study

The key objective of the research is to provide an understanding of the current adoption and the impact status of cloud computing in the NGO sector in Nairobi-Kenya and recommend a better framework in adopting cloud computing based on the research problem. To realize the core objective the below sub-objectives will guide the study:

1. Investigate the adoption drivers and significance of cloud computing in NGO's in Nairobi-Kenya.
2. Investigate the relationship between cloud computing and ICT strategy as a contributing factor to the NGO's core strategy.
3. Investigate previous cloud computing adoption frameworks
4. Formulate and test a framework that will drive the adoption of cloud computing in NGO's in Nairobi-Kenya.
5. Evaluate the adoption framework of cloud computing within the NGO-in Nairobi - Kenya

Research questions

In order to achieve the stated objectives of the study the following research questions guided the research:

1. How has cloud computing adoption influenced NGO's in Kenya?
2. What are the barriers and challenges of cloud computing adoption in NGOs in Kenya?
3. What is the significance of cloud computing to the ICT strategy of NGOs'?
4. How do we align cloud computing framework to be part of the ICT strategy and drive the core mission of the NGO?
5. What are the gaps in the existing technology adoption framework?
6. What is the desired cloud computing adoption framework in the NGO sector in kenya?
7. What are the determined factors that will describe success for a better cloud computing adoption framework?

Scope

Nairobi is the technological hub of the country and east Africa as a whole, many organizations both Governments and Non-Government institutions have their headquarters located in Nairobi. The research study will be conducted in Nairobi-Kenya; the key targeted group for the study will be ICT heads, Chief Information officer, ICT Administrators, ICT directors and cloud champions in NGO-Institutions within Nairobi. The focus on the research will be the stakeholders, the technology, organization and environmental factors and adoption strategy within NGO's in Nairobi-Kenya.

In a survey done by the National bureau of NGO found out that in Nairobi there were 2,438 Registered NGO's the pictorial diagram below highlight the survey which will base the population of the research study:

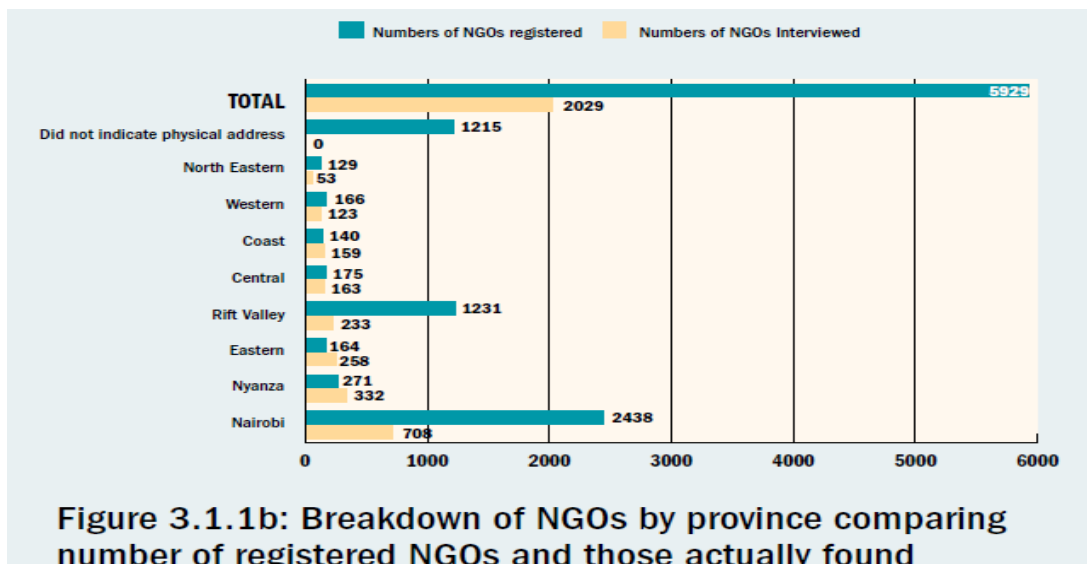


Figure 1 NGO'S Survey in Kenya: Source - NGO Coordination board of Kenya (2009)

In order to collect the required data for our analysis and recommendations in the research the study seeks to group NGO's based on their cause or mission which are well represented in Nairobi where most have their headquarters are located ,according to the NGO's board 2009 – 2012 strategic plan, the NGO board categorizes NGO based on their causes as Welfare, Water, Youth, Gender, environment, HIV/AIDs, Agriculture, Disability, Refugees, Health, Population, Relief, Governance, Children, Micro-Finance, Informal Sector, Information and Education

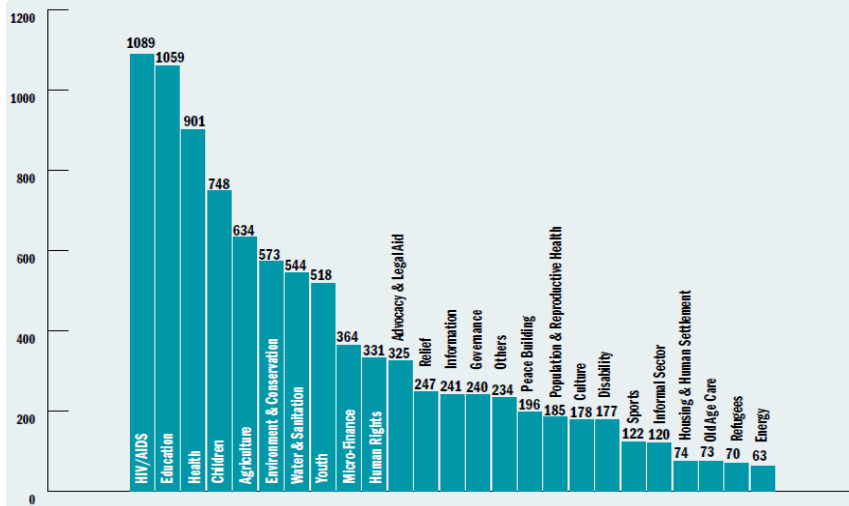


Figure 3.2.4a: a bar graph showing NGOs distribution in terms of sectors of operation

Figure 2 NGO distribution in sectors: Source - NGO Coordination board of Kenya (2009)

In order to customize a strategy on an adoption framework in our study we will apply the model as proposed by (Jeffrey et al 2009) which we help the study understand the cloud ecosystem as below:

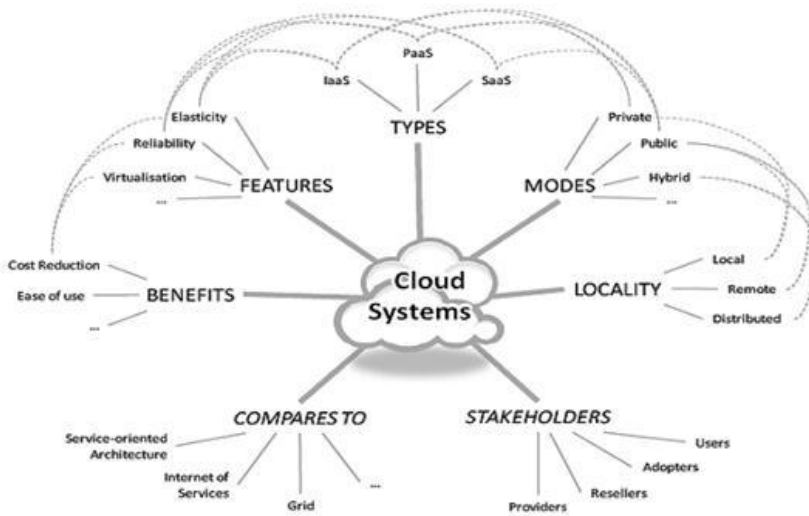


Figure 3 cloud computing Eco-system: Source- (Jeffrey et al 2009)

Justification and value of the study

The purpose of the study will deviate from the traditional focus on technology and thrusts towards an adoption strategy; in order to align the NGO's mission and purpose with the cloud technology. This will be realized through assessing NGO's cloud adoption awareness and needs then matching their needs to the cloud eco-system by developing a framework that will drive the cloud adoption. The framework will be industry specific bearing in mind that NGO's are funded organization's to carry out a specific purpose and thus ICT budgets are usually slushed and redirected to the main cause. However a better cloud adoption framework which streamlines the NGO's mission to ease of operation will enhance cloud uptake.

The core purpose and competence of NGO is to drive social and economic mission in the society, In order to drive these mission NGO's need to acquire cutting edge technologies which will enhance operations in the NGO sector and since ICT is not a core competence of the NGO, adoption of cloud computing will allow NGO's to concentrate on their mission while they leverage this services from Cloud computing service providers (Brindley 2012) Net hope in developing cloud for NGOs further argues that "Cloud-based technologies can be a good fit to solve challenges across all verticals in NGO's whether its mobile assessment of orphans and vulnerable children to increase their wellbeing or providing financial management training to increase numbers of small hold farmers without a commensurate increase in cost; many solutions can be reapplied to tackle problems in different sectors with minimal tweaking".

Other reason why NGOs need to adopt cloud computing technologies:

1. NGO are fund driven by philanthropist or donors to execute certain missions or course and therefore cloud computing provides a "pay-per-use" model which guarantees NGO's to spend on what they have consumed in terms of ICT services and resources and redirect saving to the core mission
2. Cloud computing technology provides scalability mechanisms which come in handy to the NGOs' since their missions/ causes are dynamic and the need for ICT resources may differ from time to time.
3. The complexity of deploying complex ICT infrastructure might be too cumbersome for the NGOs' (Brindley 2012) states that it is not NGOs' core competency to run data centers or computer server-farms. In order to maximize their impact in Emergency

Response, Humanitarian Development and Conservational issues NGOs would be better served by banding together to off-load IT operations tasks to solution providers who see hosting and cloud services as their core missions

4. Cloud computing adoption providers NGO's the flexibility to hire social science and non ICT related staff since cloud computing provides a mechanism to access key technical and competent human resource to manage the ICT functionality of the organization
5. Adoption of cloud computing allows NGO s to access the most current technologies since the service providers core business is ICT thus availability of current technology

Previous research done on cloud computing adoption has mainly been geared towards other sector like banking, governments, (Mukabi 2013) agriculture among others. Little research on Cloud computing adoption within NGO's has been done ,moreover the understandability and the uniqueness of NGO's either their structure , operation ,strategy and workflows should be well articulated that NGO's are not corporates companies or profit making company where experiencing new technology is an adhoc and if it fails or work a different new technology can be re-engineered which is a costly affair and therefore the sensitivity of correctly using a framework that will successful induce technology to NGO's is quite key and important to NGO's.

Researchers and scholars alike can use the report as a point of reference and a source of secondary data for future research related to cloud computing. Cloud computing providers could use this report to evaluate customer concerns, needs and preferences to enhance their cloud products and technologies offering to drive adoption to the NGO's as clients.

CHAPTER 2: LITERATURE REVIEW

The evolution of cloud computing has immensely revolutionized computing. The focus of this chapter is to re-look at cloud computing from infancy, growth, evolution and application; moreover focus on how cloud computing has been adopted by other sectors and what frameworks guided the adoption. This will form our theoretical review and guide the conceptual framework of the study.

Background of computing evolution

Utility computing which modern cloud computing borrows its characteristics was very popular in the early 1960s, a renowned computer scientist John McCarthy predicted that computer time-sharing technology will lead to a future in which computing power and even specific applications could be sold through the utility business model (McCarthy, 1961). However this could not be realized at that time because ICT technologies then could not support it.

The evolution of ICT led to the emergence of distributed computing while also reviving the utility of centralized storage model. Cloud computing utilizes the Idea of utility computing and with the modeling factor of grid computing. Grid computing provided people from different organizations the opportunity to work together to reach a common goal. Utility computing allowed people to essentially rent computing services such as Internet access which cut back on cost and made computing more attainable for smaller business.

With this preliminaries and an understanding of the characteristics of previous computing paradigm this study appreciated the phenomenon of cloud computing and its character traits. Cloud computing today is defined as a collection of services delivered via the internet and customized for a specific need or purpose to meet a user requirements'. Cloud Computing offers organization a much more flexible and customizable model than traditional on-site computing, with this evolution there certainly going to be a change on the economy and social aspects of the society

The diagram below illustrates the evolution of computing to modern computing paradigm as referenced by (BÖHM at el 2009) in cloud computing and computing evolution.

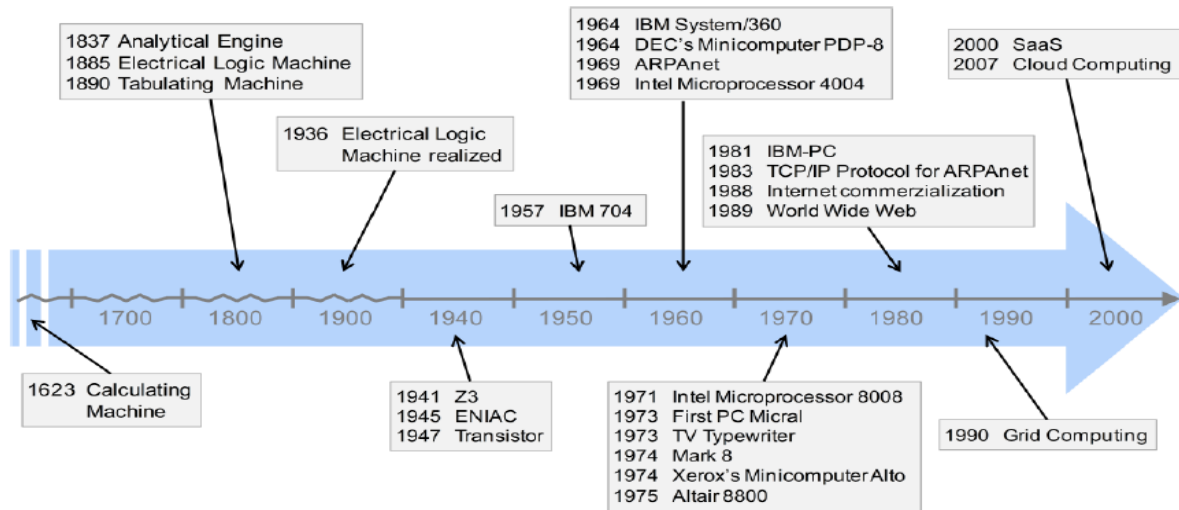


Figure 4 Cloud computing Evolution: Source- (BÖHM at el 2009)

Cloud computing definition

There is no one definition of cloud computing; various players and industry expert have defined cloud computing in various ways and herein are definition of cloud as perceived by different scholars in the below:

(Armbrust at el 2010) have defined cloud computing as “Both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services”

The National institute of standards and technology had defined cloud computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance 2011).

(Stefanie at el 2010) in conference paper on the business aspects of cloud computing suggests that (Youseff et al 2008), were among the first who tried to provide a comprehensive understanding of cloud computing and all its relevant components. They regard cloud computing as a “collection of many and few new concepts in several research fields like service oriented architecture, distributed and grid computing as well as virtualization” they further defined cloud computing as a “new computing paradigm that allowed users to temporarily utilize computing

infrastructure over the network supplied as service by the cloud provider at possible one or more level of abstraction” (Stefanie at el 2010)

From the definitions highlighted among others we can define cloud computing in this study as an ICT service which encompasses data services, platform services, Software services, Infrastructure services, human resource services and any other ICT services offered by a provider as a service ‘XaaS’ and that the service is accessed via the world wide web and is fully customized to a user’s need or requirement, the services are billed based on what you consume i.e. on a pay-per-use model.

Characteristics of Cloud computing

Cloud computing has unique characteristic that make it different from the traditional computing paradigms; in order to understand the relationship between cloud computing and its impact to economic and social development, the study will analyze the characteristics of cloud computing as proposed by (Zhang at el 2010).

1. Ultra-Large Scale

Cloud enlarges a user computing power by combining several hardware components and provisioning it as a service to a user, (Zhang at el 2010) has described this computing power by citing various examples in a conference paper “The cloud of Google has owned more than one million servers. Even in Amazon, IBM, Microsoft, Yahoo, they have more than hundreds of thousands servers.”

2. Virtualization

Cloud computing provides an environment to access services via any terminal The resources that are required come from cloud instead of visible entity. You can complete all you want through net service using a laptops or a mobile phone. Users can attain or share it safely through an easy way, anytime, anywhere. Users can complete a task that can’t be completed in a single computer.

3. High availability and reliability

The multiple redundancies on infrastructure and different geographical location guarantee a high tenacity, (Zhang at el 2010)” Using cloud computing is more reliable than local computer”

4. High Scalability

The scale of cloud can extend dynamically to meet the increasingly requirement, this really comes in handy especially when a user is not sure of their actual needs.

5. On demand service or Pay-per Use / pay as you go billing model

Cloud is a large resource pool that you can buy according to your need; cloud is just like running water and electricity that can be charged by the amount that you used.

6. Extremely available at low cost compared to the traditional computing paradigms

The billing model associated with cloud computing really makes the model inexpensive, the fact that you pay for only what you consume and thus saves an organization to paying what it does not consume; (Zhang et al 2010) states that “The versatility can increase the utilization rate of the available resources compared with traditional system, so users can fully enjoy the low cost advantage. You can spend only a few hundred dollars and a few days to accomplish a task that you must do it spending thousands of dollars and several months before. ”

Architecture of cloud computing

Cloud computing architecture borrows a lot from previous computing paradigm like distributed and grid computing. The key innovations of cloud computing lies in the way services are presented to the consumers in a layered structure (Stefanie et al 2010) suggest by citing example from previous research that “Classifying cloud computing services along different layers is common practice in the industry (Kontio 2009, Reeves et al. 2009, Sun Microsystems 2009) ”

1. Software as a service (cloud applications)

This is the abstract layer which forms the interaction between the hardware and the consumer of the service The cloud application layer is the most visible layer to the end user interaction like an example is web portals so this software provision is also referred to as Software-as-a-Service (SaaS) (Kulshrestha & Verma, 2013) . A Service in the application layer may consist of a mesh of various other cloud services, but appears as a single service to the end-customer. This model of software provision, normally also referred to as Software-as-a-Service (SaaS), appears to be attractive for many users. Reasons for this are the reduction of software and system maintenance costs, the shift of computational work from local systems into the cloud, or a reduction of upfront investments into hardware and software licenses. Also the service provider has advantages over traditional software licensing models. The effort for software upgrades is reduced, since patches and features can be deployed centrally in shorter cycles. Depending on the pricing model a continuous revenue stream can be obtained. However, security and availability aspects are issues that still need to be addressed. Also the migration of user data is a task that should not be underestimated

2. Platform as a service (Cloud Software Environment)

It's a layer that resides in between the application and the core infrastructure. The layer combines three major components as described by (Kulshrestha & Verma, 2013) they include hardware as a service, software as a service and data storage as a service. The key functionality of this layer includes the below which are not limited to Central IT function building their platform, Application owners can set up their respective applications, The use of the application, the look and feel of the application in use by different users and administration of the platform moreover The software environment also offers a set of well-defined application programming interfaces (API) to utilize cloud services and interact with other cloud applications. Thus developers benefit from features like automatic scaling and load balancing, authentication services, communication services or graphical user interface (GUI) components. However, as long as there is no common standard for cloud application development, lock-in effects arise, making the developer dependent on the proprietary software environment of the cloud platform provider.

3. Infrastructure as a service (Hardware)

This is the backbone of the layered architecture because it combines the core hardware infrastructure that supports the platform as a service and the application or software as a service. The cloud software infrastructure layer provides resources to other higher-level layers, which are utilized by cloud applications and cloud software platforms. The services offered in this layer are commonly differentiated into computational resources, data storage, and communication. Computational resources in this context are usually referred to as Infrastructure-as-a-Service (IaaS). Virtual Machines are the common form of providing computational resources to users, which they can fully administrate and configure to fit their specific needs. Virtualization technologies can be seen as the enabling technology for IaaS, allowing data center providers to adjust resources on demand, thus utilizing their hardware more efficiently. The diagram below further portrays the architecture design of cloud computing:

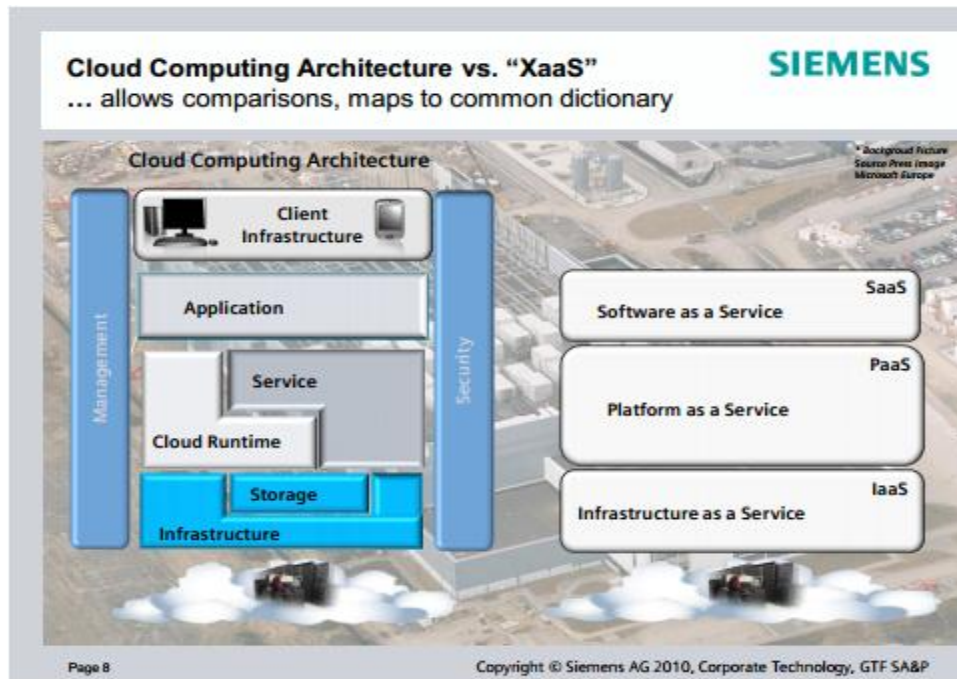


Figure 5 Cloud computing Architecture: Source- (Kaefer, Siemens 2010)

Cloud computing Implementation Models

Cloud computing can be implemented using four different models i.e. as a private cloud, public cloud, hybrid cloud or Hybrid cloud.

Public Cloud

A public cloud is a cloud computing model in which services, such as applications and storage, are available for general use over the Internet.

Private Cloud

A private cloud is exclusively owned and delivered within an organization. They are highly virtualized, joined together by mass quantities of IT infrastructure into resource pools, and privately owned however the management and operation may not always be within the organization

Hybrid Cloud

A hybrid cloud is a mix of public and private clouds which is further define by (Omwansa at el 2014) as “mixed deployment model that utilizes both private and public infrastructures”.

Community Cloud

A community cloud is an infrastructure shared by several organizations which supports a specific community or the implementations are designed with a certain community in mind or multiple organizations who have common concerns (e.g. security, interests, and missions) share cloud infrastructures (Omwansa et al 2014).

Conclusively to sum up the definition, characteristics, architecture and implementation models of cloud computing this study will adapt an illustration designed by (cloud alliance 2009) which in a pictorial representation by cloud alliance as representation as below..



Figure 6 Cloud computing Pictorial Definition: Source- NIST Working Definition of Cloud Computing (cloud alliance 2009)

Cloud computing Stake holders

The key concerned entities in the cloud eco-systems are grouped as below in this study:

The cloud computing providers – These stakeholders core role is to offer cloud services to its consumers via different business model and are usually grouped as Infrastructure providers, Software providers and platform providers. The business concept adapted by the stake holders is usually coined to 'XaaS' whereby i.e. business model the consumer chooses to adapt is offered as a service. In a survey done on cloud computing in Kenya (Omwansa et al 2014) grouped the

respondents of the study as “Infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS).”The providers further include resellers as illustrated by Jeffrey & Neidecker-lutz (2009).

The cloud computing consumers – These are the customers or users of cloud services, due to the numerous services put in the cloud and its immense characteristics like scalability, pay-per-use model among other has risen to the adoption of cloud computing by many users to access services. Today’s computing paradigm’s users are more concerned with service level agreement and quality of service they feel more in control (Zhang at el 2010) describes the adoption of cloud computing by consumers is driven by the facts that “It is to utilize the vacant resources of computer, increase the economic efficiency through improving utilization rate, and decrease the equipment energy consumption”

The cloud computing policy makers – These are the regulatory providers on the cloud computing eco-system. Their key responsibility is to providing policies that governs the provision and consumptions of cloud computing services and products and the rules to abide. (Omwansa at el 2014) has defined some of the legal and framework issues as “Protection of cloud service users, addressing cyber security challenges, guaranteeing secure online payments, privacy and data security need to be clearly outlined ”

Thou other studies have further subdivide the key stakeholders in the cloud ecosystems as below with a summary of the roles that the different actors play. Each actor is an entity (a person or an organization) that participates in a transaction or process and/or performs tasks in cloud computing

Actor	Definition
Cloud Consumer	A person or organization that maintains a business relationship with, and uses service from, <i>Cloud Providers</i> .
Cloud Provider	A person, organization, or entity responsible for making a service available to interested parties.
Cloud Auditor	A party that can conduct independent assessment of cloud services, information system operations, performance and security of the cloud implementation.
Cloud Broker	An entity that manages the use, performance and delivery of cloud services, and negotiates relationships between <i>Cloud Providers</i> and <i>Cloud Consumers</i> .
Cloud Carrier	An intermediary that provides connectivity and transport of cloud services from <i>Cloud Providers</i> to <i>Cloud Consumers</i> .

Table 1 Actors in Cloud computing Source NIST - Actors in Cloud Computing

Capability of cloud computing to economic and social development

The effect of cloud computing are usually magnified beyond the technology to the real impact it has to the economy and social development issues In the review done by Ernst & Young’s to drill the actual impact of cloud computing as described (Hyek at el 2011) have listed the impacts as :

1. Maintaining freedom of information: Cloud computing provides a platform via different technologies to communicate and transmit information, when internet communications were shut down during recent unrest in Egypt, a team of international companies combined cloud services and social networking to connect in-country mobile phone networks to deliver text messages internationally via Twitter, in just a couple of days(Hyek 2011) .
2. Broadening frontiers of transformation: Despite cloud computing paradigms being around for long, the continuously falling costs of computing, data transmission and storage are constantly broadening the opportunity for cloud services to transform businesses and business models, suggesting that cloud effects, ultimately, will be ubiquitous.
3. Enabling social networking: although the widespread effects of social networking on businesses, governments and social lifestyles, it’s important to note that those effects are significant and social networking phenomenon is enabled by cloud computing. Moreover

the impact of social networking on businesses and the related improvement in productivity will be profound.

4. Accelerating technology transitions: one big difference between the successful introductions of tablet computers in 2010 from earlier failed attempts is that cloud-based services are available today to do the background computation, storage and other “heavy lifting” that make tablet computers useful tools (Hyek 2011) .

(Veigas & Chandrasekaran) have summed up the key impact of cloud computing to the economic and social development as:

1. Economics-The major benefit of cloud computing is it’s accessible and has flexible billing models which enhances innovation which creates opportunities and drives economic growth.
2. Social Impact-Any individual can use computing with minimal initial investment with only basic computer configuration which is free from others interference.
3. Agility Business agility is the ability of a business to adapt rapidly and cost-efficiently in response to changes in the business environment.
4. Job creation in the developing countries, there is a huge population, the adoption of cloud computing may lead to number of new jobs.
5. Software Piracy Reduction Adoption of cloud computing may reduce the software piracy. Many organizations were finding it as difficult, by the introduction of cloud computing which requires vey less software at the user side will definitely reduce the piracy.

With the tremendous benefits that cloud computing presents across; there’s high adoption of cloud computing services based on their characteristics and functionality in a recent survey done on the cloud computing in Kenya (Omwansa at el 2014) further described the adoption by looking at the functionality and economic consideration as illustrated on the table below:

Non-Functional aspects

Elasticity

Reliability

Quality of Service

Agility

Adaptability

Availability

Economic considerations

Cost Reduction

Pay per use

Improved time to market

Return on investment

Turning CAPEX into OPEX

Going Green

Table 2 Economic consideration in cloud computing- Source (Omwansa et al 2014)

Cloud computing adoption and utilization in NGO's

Cloud computing has the immense potential to revolution adoption of ICT in the NGO sector as a core strategy to drive the NGO mission and Vision .The definition, architecture, characteristic and design; positions the paradigm to be the next and future adopted computing paradigm within the NGO sector. More specifically, cloud computing has been described as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell and Grance 2009).

The uptake of cloud computing has been enormous among the NGO globally In a global survey done for the uptake of cloud computing in non-governmental organization by Tec soup Global network (anonymous 2012) it was reported that cloud application usage was high in the NGO sector The categories of cloud-based applications that were cited most frequently in the survey were email (55%), social networking/Web 2.0 (47%), file storage/sharing (26%), web conferencing (24%), and office productivity (23%).The high uptake has mainly been driven by the consume as you pay model of cloud computing which is an advantage to NGO whose ICT budgets are usually slashed to focus on their core missions. To further understand the utilization of different application as a service usage we adopted the below table:

Category	Types of Applications
Communications, conferencing, collaboration	Collaboration software Email Email marketing Project management Social networking/Web 2.0 SMS/text messaging Training Web conferencing Office productivity
Office productivity	Client database
Databases, file storage, backup, document management	File storage/sharing Data backup/storage/sync Disaster recovery Telephone and voice services/VoIP Antivirus/spam filtering/anti-malware
Desktop back office (VoIP, VPN, security, antivirus)	Remote access/VPN Security Data analytics Media monitoring
Enterprise back office (ERP, SCM, business intelligence, web hosting, e-commerce)	Website hosting Compliance with legal and government regulations E-commerce/transaction processing Accounting/financial management Billing and invoicing Human resources
Finance, accounting, HR	Payroll Donor management Grant management

	Volunteer management
Fund and volunteer management	Payroll Donor management Grant management Volunteer management

Table 3 Organizational Function and Application– Source - Techsoup global (2012)

Factor that Influence cloud computing adoption amongst NGO’s

1. Cost-cloud computing definition and billing models provides a low capital investments, fewer ICT staff, which equates to low expenditure on overheads and operations, finally the NGO’s can transform capital expenditure (CAPEX) to operating expenditure (OPEX).
2. Creates a platform for communication since available communication platform like social site i.e. Facebook, tweeter etc. and email platforms like Gmail, Hotmail , yahoo etc are made available via cloud computing paradigm’s, (Gwendolyn at el ,2014) reported that Brazil reveals that the most used cloud services include Google Docs, Gmail, Google Groups and Google maps. In fact NGOs are adopting communications applications such as Gmail and Facebook at a rate approaching 100% in much of the world”
3. Its administratively cheaper to NGO’s since it’s easier to access software, capability to reduces systems administration and general risk is reduces since the cloud computing architecture has been designed with high availability and this is guaranteed through SLA’s singed between the providers and the consumers of the services.
4. Improves risk management and disaster recovery, since disaster recovery cloud can be deployed to the cloud and the risk is transferred to the service provider vis a vis the NGO owning the risk.
5. It providers and environment to create partnerships and collaboration between different organization by sharing data and information whose cause a mission are similar.
6. The capability that cloud computing allows NGO’s to outsource and access human resource capacity and skills while they focus on their core mission and objects.

Barriers to cloud computing adoption amongst NGO's

1. Lack of proper skills to identify cloud solution and the great opportunities that cloud computing paradigm presents poses a great risk in the adoption of cloud computing amongst NGO's in a survey (Gwendolyn at el ,2014) reported that findings in Brazil reveal that nearly half of the respondents claim they are not using cloud computing services according to their knowledge and yet they are able to identify the different services available to them that they use on a day to day basis and finding of a research on Hong Kong NGOs released in May 2012 reveals that the NGOs generally lack knowledge of cloud solutions .In fact the (Tech Soup Global, 2012) survey results indicate that lack of knowledge is the biggest barrier to cloud adoption as cited by 86% of NGO's.
2. Data security, integrity and privacy are some of key barriers around security to cloud adoption in the NGO sector. Cloud computing is provisioned of infrastructure that is hosted by the provider and thus we cannot accurately guarantee security. Cloud computing present's specific challenges to privacy and security as the clients are entrusting their data to a third-party for storage and security. Therefore the users want to be confident that their cloud computing provider is following standard security practices which require disclosure and inspection
3. Attitude towards cloud computing is a key barrier since users especially the ICT resources view cloud computing as retrenchment driver since ICT is moved away from onsite to an outsource model and thus resistance to the technology will be paramount by the ICT or affected staff.
4. Management consent to the cloud technology is as well a great barrier since ICT should be part of the corporate strategy (Gwendolyn at el ,2014) in a survey of cloud computing amongst NGO's in Zimbabwe noted that 55% of the respondents indicated that there was no one driving the use of cloud services at all in their organizations. This was an indication that management support was not evident towards the use of cloud computing services which is why the respondents said they were not utilizing cloud computing services. Without top management support, adoption of new technologies is less likely to occur.

5. Maintained of the status quo is a major barrier to adoption of cloud computing ,traditionally we find the ICT function stuck on the traditional on premises computing and may suffer from “Fear of the unknown ”especially when ICT is perceived by NGO’s as a cost center .

Migration frameworks to cloud computing

Cloud computing provides organizations with new ways of implementing and consuming ICT services in organization by allowing them to access services effectively ,efficiently and with cost consciousness. Cloud computing possess a promising computing paradigm but before organizations can move to the cloud its paramount they understand and appreciate the need, purpose and use of cloud by accessing factors that will influence the adoption of the paradigm which include strategic ,technical ,functional and economical perspectives. It will be prudent for organizations looking at moving to cloud computing to re-look at their existing ICT strategy, ICT setup and deliberate on the advantages and disadvantage as well as good-will from the stakeholders; Cloud space brings a lot of opportunities but different sectors and industry domains will have their unique drivers and constraints for Cloud computing adoption (Dhiman 2010).In this study we will focus on the NGO as a scope by looking at the adoption cycle of cloud computing using different framework.

Decision Framework

The decision to adopt cloud computing in Organization is driven by various factors which include cascading down of the ICT strategy, functionality, human resource, cost, agility, and flexibility among others; from the core structure of a decision framework, at a high level there will be a steering committee which will comprise of key stakeholders in the organizations. They will work on the need of going to the Cloud computing through a business case and incorporate the paradigm to the ICT strategy. Once the Cloud migration strategy is in place, the readiness of organization and its capacity to move to Cloud will be assessed through pilots and prototypes. The results of pilots and readiness testing will drive the approval from stakeholders of the Cloud migration initiative. A generic Cloud migration decision framework consists of the described steps from the need, business case and approval as highlighted by (Dhiman 2010).

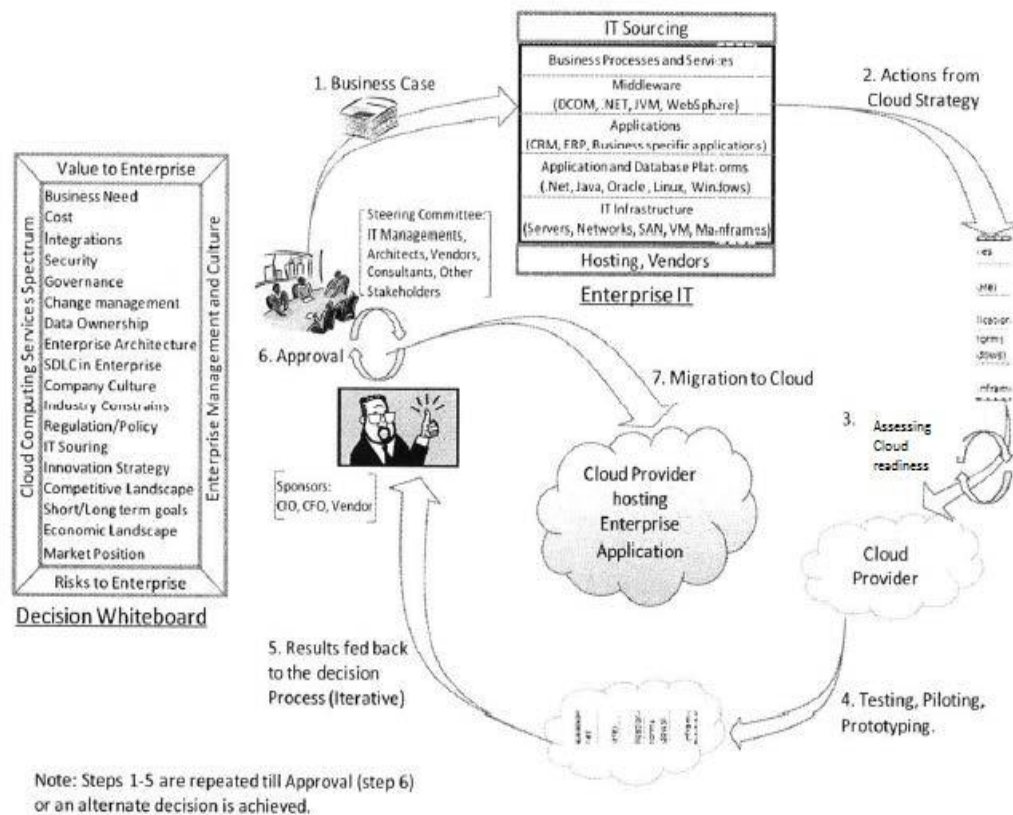


Figure 7 Cloud migration decision framework: source-Cloud migration decision framework –Dhiman (2010)

The diagram depicts the cycle of the decisions to move to cloud computing this is illustrated by the below stapes:

1. Development of Business case: The initial step before moving to Cloud computing would be the creation of business case. A business case will include all the parameters and metrics indicating the current ICT paradigm in place e.g. onsite computing; it gaps; the proposed cloud computing and its strengths and benefits; required financial input and anticipated output; turnaround time and the capacity to uptake or shift to cloud computing.
2. Cloud migration strategy: Once the business case is in place the next steps would be to come up with a Cloud computing migration strategy by aligning the investigation with the ICT strategy and core mission or the organization this will be described by showing how it can deliver value, lead to changes that will affect the organization and the ICT architecture environment. An important part of the strategy will be to work with key stakeholders to identify business needs.

3. Assessing Cloud readiness: Next, evaluate which cloud computing models, architectures, technologies and best practices will be appropriate to implement in the organization. Other factors to assess include the budgetary, resource and technical requirements necessary to prepare the organization for pilot/ testing phase of investigation. From a financial perspective develop a total cost of ownership analysis which can be done easily via various calculating tools available on line to calculate the return on investments (ROI) and establish the exact saving percentile going the cloud way and review established policies for assessing risks and change management.
4. Testing, Piloting and Prototyping: Identify the application/business processes within organization which will be good candidates for testing / piloting in the Cloud. For most organizations these will be non-mission critical applications yet important ones to be able to show performance and cost benefits.
5. Results / Observations: Develop and implement the pilot/prototype and communicate the results. Note down any specific observations which might be of interest to the iterative decision making process.
6. Feedback to Decision process: Steering committee will analyze the findings of readiness assessment and pilot/prototype effort. Depending on the results they might revise the strategy and business case creating subsequent iterations in the decision process. Results and findings are also presented to key stakeholders and operational leaders to get their inputs and direction.
7. Decision: Depending on the assessment outcome, steering committee might work with sponsors to make a decision for or against Cloud computing adoption. Decision might include parameters like choice of Cloud architectures, applications to migrate, change in business process and their management among others.

Cloud requirement framework

Cloud computing requirement framework consist of two parts i.e. it the targeted achievements or dimension which may include cost savings or increasing flexibility and the requirement dimension which are the exact requirement to achieve the targeted dimension. The framework defines processes to better articulate cloud computing user requirements and the correct technology to achieve the perceived requirements as well a platform to measure key achievement against the targeted requirement using various indicators.

This is further illustrated by a pictorial representation below (Jonas et al):

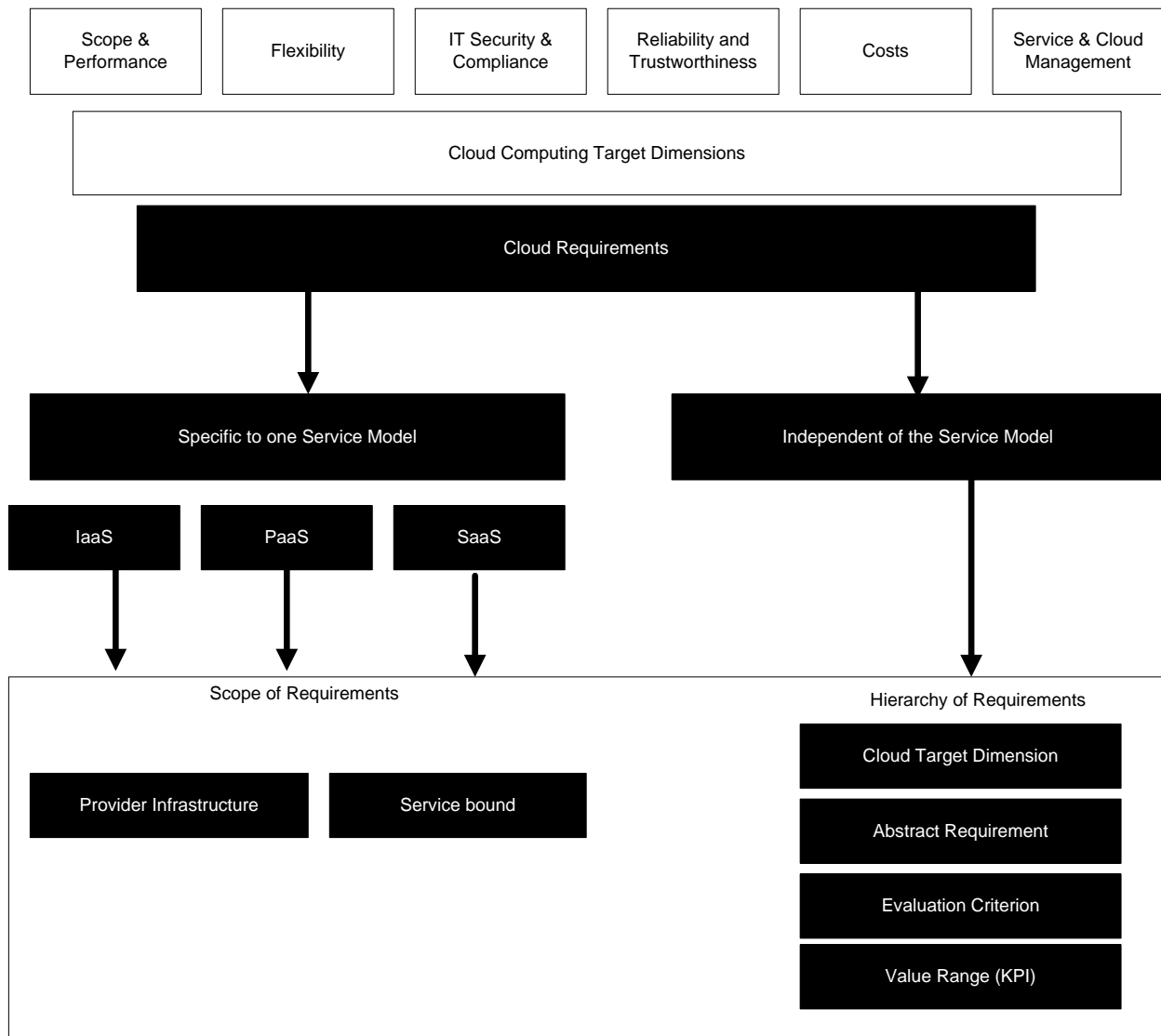


Figure 8 Cloud Requirement framework: source-Cloud Requirement framework – (Jonas et al)

As described by (Jonas et al) the breakdown of the framework is defined as:

Scope & Performance - this covers the functionality and performance of the Cloud service and consists of four abstract requirements: service characteristics, service optimizing, hardware, and performance.

Flexibility - This describes the ability to respond quickly to changing capacity requirements and competition pressure. It is divided into four abstract requirements: interoperability, portability, delivery model, and atomization levels.

ICT Security & Compliance - summarizes everything related to protection and safety and is composed of four abstract requirements: datacenter protection, network protection, operations protection and ICT compliance

Reliability & Trustworthiness - describes how certain the customer can be that the service from the Cloud has the guaranteed availability. It is divided in three abstract requirements: reliability, trustworthiness and service level agreements

Costs – It's characterized through monetary aspects like small capital commitment or low acquisition costs and consists of three abstract requirements: pricing model, payment and service charging

Service & Cloud Management - This includes aspects necessary for the Cloud management and the maintenance of the relationship between customer and provider. ICT can be differentiated according to three abstract requirements: provider management, service management and transformation management

The specific targeted dimensions are cascaded around the specific cloud requirement models and technologies that will help achieve them these targets this can be achieved by i.e. putting everything on the cloud or picking a particular model to achieve the targeted dimension this may include Infrastructure as a service (IaaS), Platform as a service (PaaS), or Software as a service (SaaS).

The dimensions can be broken down into Cloud requirements that are comparable. The Cloud requirements are structured as described below:

1. The cloud target dimension which is defined as the abstract requirement, evaluation criteria and key measurable indicators.
2. The abstract requirements - which are defined and mapped to the target dimensions
3. The evaluation criteria are described as those are comparable but not necessarily measurable.
4. The value range level finally defines the key measurable indicators.

The following abstract requirements and evaluation criteria are independent from the specific Cloud service model (SaaS, PaaS, IaaS) and cover all target dimensions.

Service & Cloud management -Provider management contains support and contact information of the provider. This criteria that considers all facts regarding support and customer service, e.g. which support is offered and under which conditions.

Costs -Payment and pricing models are shaped by monetary considerations regarding the decision to choose Cloud Computing and a particular provider. The payment opportunities include the possible payment method (e.g. credit card or bank transfer), the time of payment (pre-paid or post-paid) and which level of granularity is priced e.g. 1 MB, 100 MB etc

IT Security & Compliance -IT compliance is separated into provider requirements for privacy (e.g. encryption of data) and compliance (e.g. location of data center). Even standards, identity management and other data privacy requirements are considered

Reliability & Trustworthiness -Trustworthiness characterizes the provider, its infrastructure and its business activities, including performance and service transparency (e.g. reports, service description), market experience, the number of customers or the annual revenue

Flexibility - Provisioning and set-up time are subsumed under the associated flexibility advantage of Cloud Computing. Resources, for instance, can be allocated and de-allocated as required. The provisioning time is shorter compared to traditional outsourcing and the set-up time to get in contact with the provider (e.g. register or set up a new account) is shorter as well

Scope & Performance - Usability and customizability refer to the usability and adaptability of the surface of the web portal, the user interacts with. The Usability mainly represents the structure and the ease of use following the self-service concept.

The Migration Framework

The migration framework is a roadmap for implementing functions and processes to the cloud. The framework will define the Migration, Operations strategy which includes the planning, implementations models and architecture and the Feedback mechanism to get feedback for future recommendations (Dhiman 2010).

Migration and Operations strategy

Migration and operation strategy involves defining an understanding of the various functions and process on how they will be moved to the cloud. This is articulated by looking at the business priorities and work on a strategy that offers a balance between the migration costs and getting

expected business benefits within a defined time. This also involves looking at all the internal and external technology and business dependencies and deriving the most optimal way from the available options. Migration strategy should include discussion on data integration, change management of business processes, outsourcing, user training, documentation and architectural implication. The migration framework has a direct relationship with decision and cloud requirements framework objectives.

In the migration strategy Organizations have following options i.e.

1. Infrastructure – private, public, hybrid and community.
2. Migration paths – Infrastructure as a service(IaaS), Software as a service (SaaS) or Platform as a service (PaaS)

The choice is driven by business priorities such as economics, scalability, on-demand provisioning, and pay-as-you-go model and constrained by factors such as security, migration costs, existing ICT investments, etc.

The degree of sharing between Cloud tenants increases as you move from Private to Public Cloud. Private Cloud (Internal Cloud) is ideal for organizations that are risk averse and have sensitive data which they do not want to see outside their enterprise perimeter. Hosted Clouds (Hybrid) is good first step for non-critical applications or good second step for critical applications after an organization has gained enough experience and confidence from Cloud technologies and are looking at further enhancements. Public Cloud offers maximum cost savings and performance benefits and might be only type of Cloud in future but till it matures to that extent. During migration planning, understand the variables and their effect on the business process.

At the corporate level, the stakeholders should be involved early in the process so that they have vested interest in the success of Cloud migration. Identify the dependent upstream/downstream applications and processes and facilitate clear communication through a well-documented communication plan. Buy in support of stakeholders outside the organization (vendors and business partners); they should see the benefits of migrating applications to the Cloud.

ICT services and operations should also be involved from early on to get their input on any support implications and anything additional they might have to support during the transition period. Early involvement will give ICT operations the window to hire needed resources to support the migration of applications and processes to the cloud. In addition, there might be changes needed on the support process (helpdesk calls, SLAs, Knowledge base,) to make sure users continue to get service during migration processes.

Cloud gives instant access to computing resources for innovation in business but it can easily create a nightmare for the ICT operations team. The fact that it is so easy to provision computing resources and integrate them with on-premise ICT, users might add to the complexity of the systems used by enterprises. ICT operations and enterprise architecture groups should be involved during these decisions to make sure the enterprise standards are followed and that applications are supported. For example, ICT operations group and enterprise architect can agree on a limited agreed stack of technologies which can solve the enterprise’s range of business ICT operations group and enterprise architect can agree on a limited agreed stack of technologies which can solve the enterprise’s range of business needs (Golden, 2010). The migration framework has further been describes by (Dhiman 2010). As indicated below

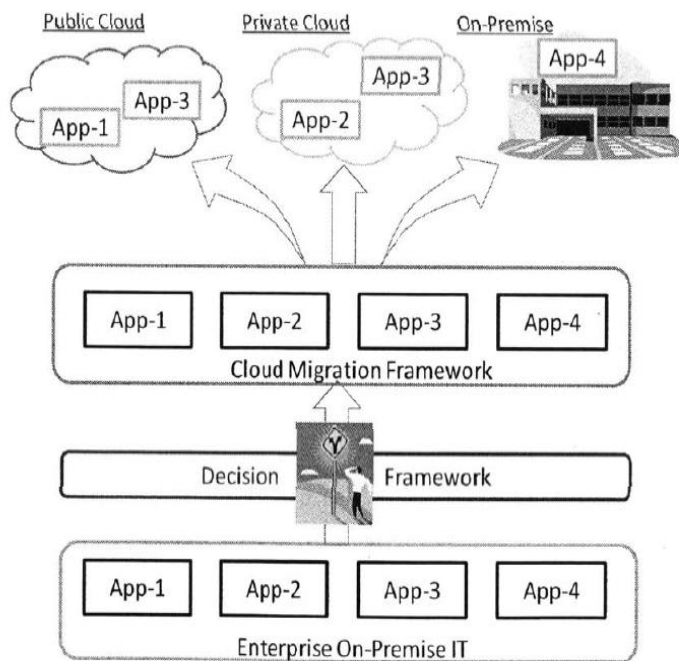


Figure 9 Cloud Migration paths for enterprises: Source-Cloud Migration paths for enterprises –Dhiman A (2010)

Feedback mechanism

The feedback mechanism presents an opportunity to learn from the implementation, user experience, and vendor experience, performance metrics, cost savings and Return on Investment. Feedback in regards to new issues, new discovered risks and success stories to the migration strategy so that future Cloud adoption can be adjusted accordingly. In conclusion the frameworks can be coupled together to improvise synergy which drives a conclusive framework to drive the adoption of cloud computing in organization, this is illustrated from the diagram below:

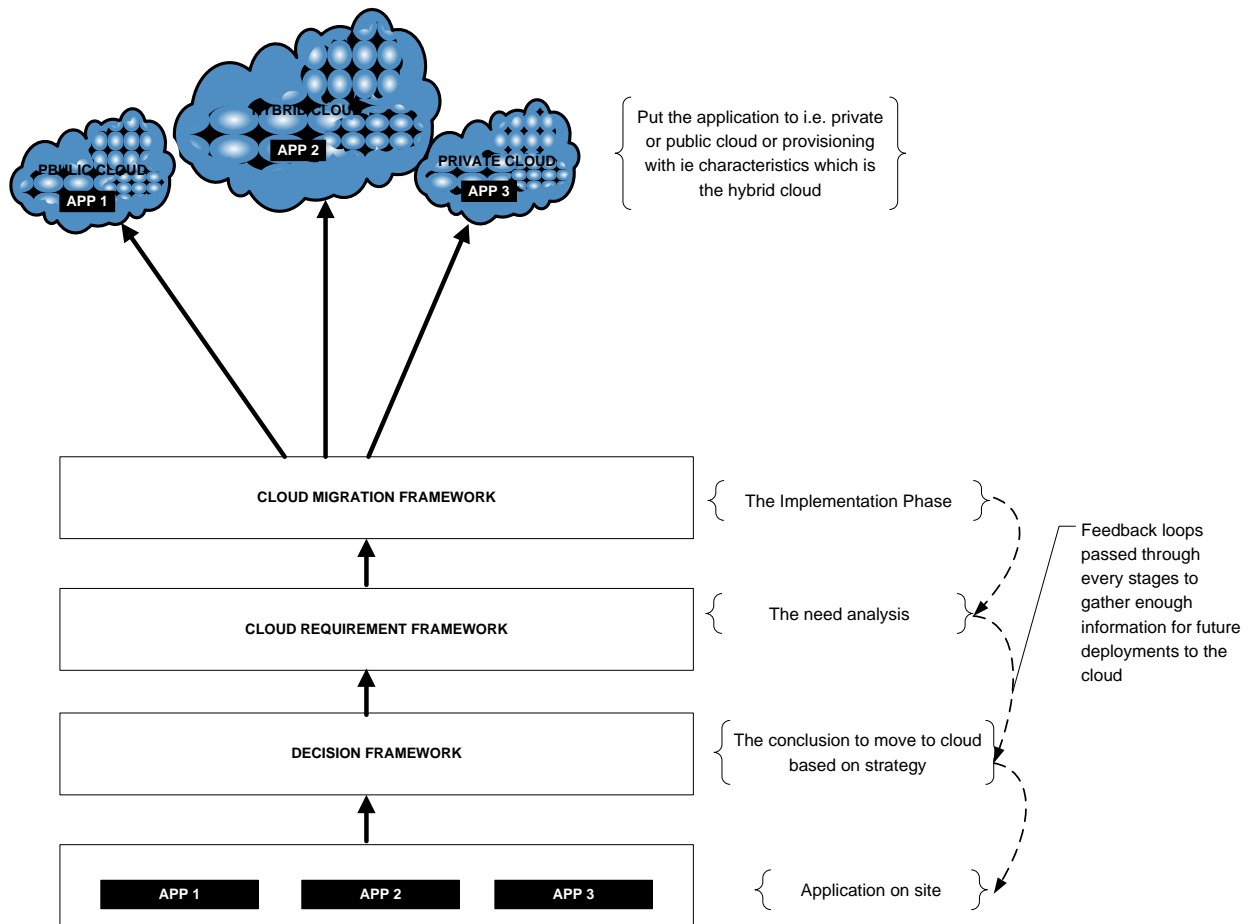


Figure 10 Own compilation - Cloud Adoption: Own compilation

Cloud computing adoption in other sectors (governments)

Case study: A framework for cloud adoption in South Africa Government

South Africa is referred to as cloud champion in Africa; Surveys done in cloud adoption in South Africa reported that many organizations were incorporating cloud computing to their operations. In a survey that was done by cisco it was reported In 2013, “50% South African medium and large businesses are using Cloud services; while a slightly lower proportion - 48% - are using the Cloud in Kenya. Nigeria lags substantially behind, with only 36% of businesses there currently use of the Cloud”. The government of South Africa has been spear heading cloud uptake in South Africa by providing service using cloud computing as a platform

The table below summarizes the benefit based (Maluleka & Ruxwana 2013)

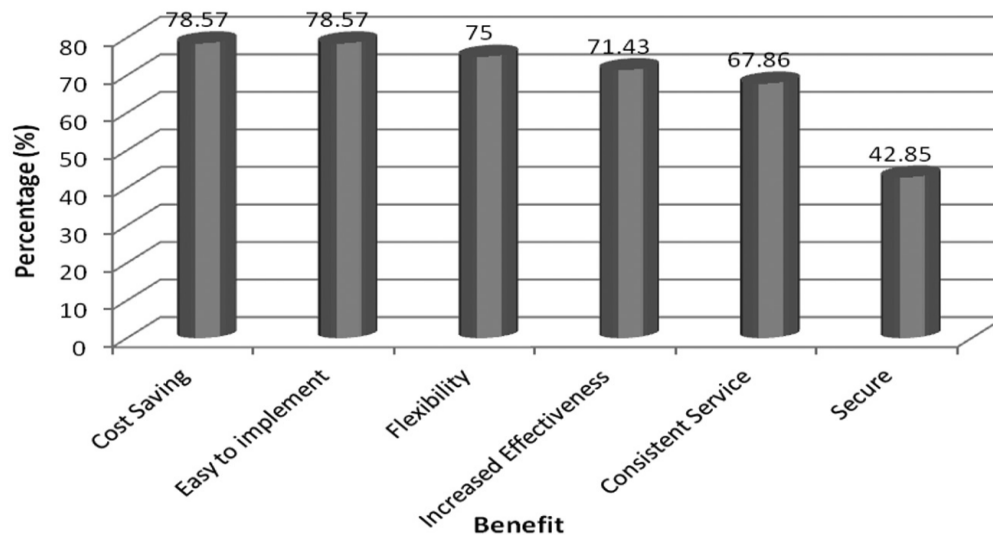


Figure 11 Cloud Adoption in South Africa: Source - A Framework for Cloud Computing Adoption in South African Government

To aid the adoption process, a study undertaken by (Maluleka & Ruxwana 2013) recommended a Cloud Computing adoption framework for SA government based on the study findings to aid Cloud Computing adoption process. Framework for Cloud Computing adoption as illustrated below:

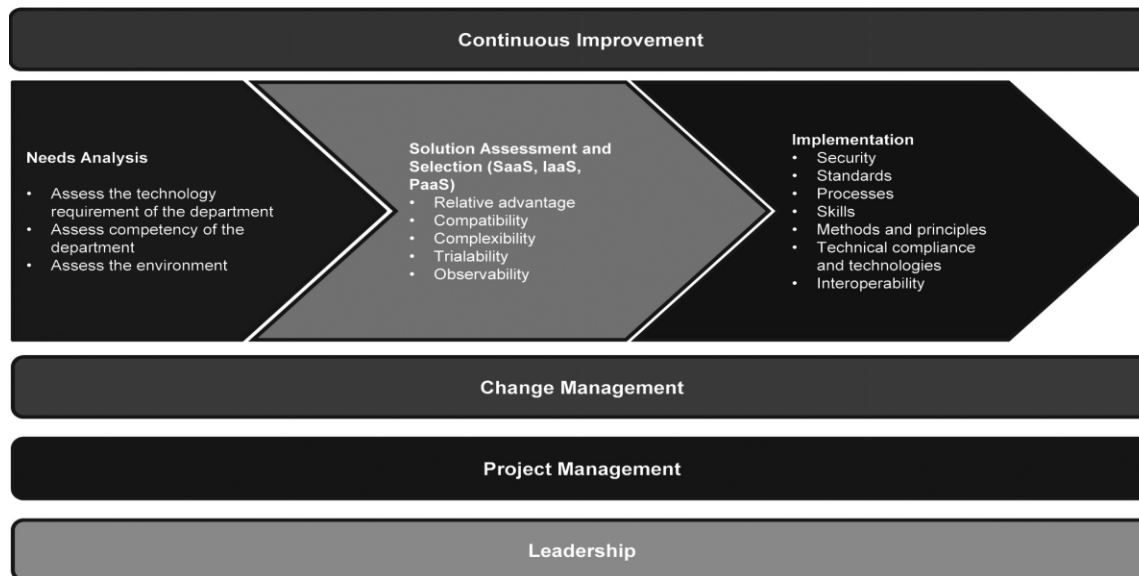


Figure 12 Cloud Computing Adoption Processes: Source - A Framework for Cloud Computing Adoption in South African Government

Case study: Cloud Computing in Brazil

Brazil is considered as one of the early adopter of cloud computing, (Li, 2013) in a research done on the future of cloud computing in Brazil it reported that 78% of the Brazilian businesses surveyed confirmed that they were either deciding or had decided on a strategy to adopt cloud computing. Outsourcing is a key component of Brazil's IT market which in a major accelerator of cloud computing. The adoption of cloud computing in Brazil has been accelerated by the presence of many cloud services providers (veigas at el) has sited some of the Brazilian examples as Among Brazilian-based companies such as Locaweb, Tecla and Ci&T have grown to become major players not just in the local region but across Latin America and the globe, and have started to follow North America and Europe's lead by utilizing regional data centers to offer their customers software as a service as cloud services.

Case study: Cloud Computing in Japan

The Digital Japan Creation Project was initiated to produce new ICT markets to strengthen the Japanese economy. The main focus of this project is to put in action a nationwide cloud called Kasumigaseki Cloud by 2015. The main purpose of this cloud is to establish high level of collaboration and integration and to unite hardware (by using virtualization technology) and infrastructure among different ministries in order to create platforms for shared functions. Japanese claim that Kasumigaseki Cloud would be so comprehensive that it will eliminate the

need for ministries and government agencies to keep their own ICT infrastructure and be able to access their required services conveniently by accessing Kasumigaseki Cloud (Shoushtari 2013)

Conceptual Framework

In order to develop a better framework for adoption of cloud computing for NGO's it's of importance to review existing ICT adoption frameworks. These approaches are important in this study since they will provide a foundation on which to develop a better adoption framework based on their theories and gaps, according to (Manueli et al) he has defined these approaches as: the diffusion approach, the adoption approach, the domestication process.

The Diffusion Approach

Roger's Diffusion of Innovation theory (Manueli et al) argues that media and interpersonal contacts provide information that influences a person's opinion and judgment. The theory comprises four elements: invention, diffusion through the social networks, time and consequences. (Ami-Narh et al 2012) highlight the event of the decision processes as the innovation, communication channels, time, and the social system. Information filters through the networks and depending on the nature of the networks and the roles of its opinion leaders, new innovations are either adopted or rejected. Opinion leaders influence an audience through personal contact while intermediaries such as change agents and gatekeepers also contribute to the process of diffusion. Roger further claims that there are five adopter categories that include: innovators, early adopters, early majority, late majority, and laggards as described below:

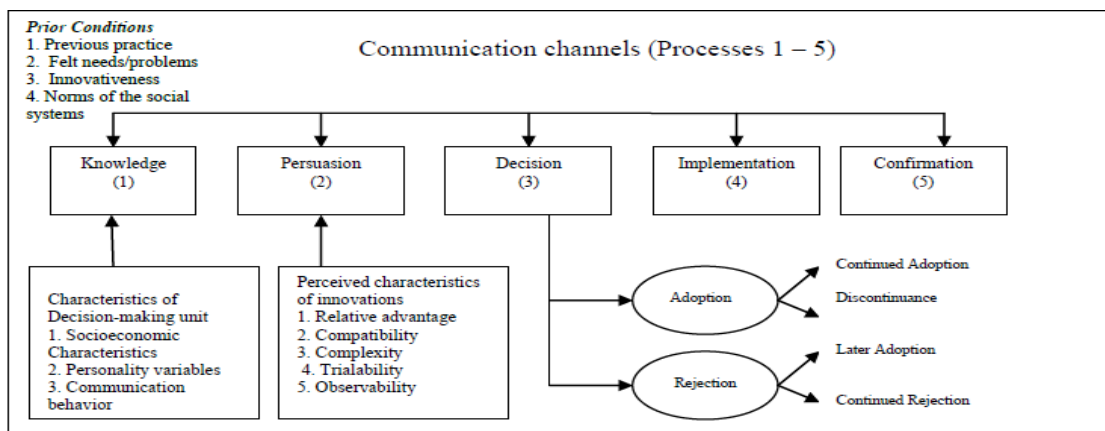


Figure 13 - Innovation Decision Processes: Source - A model of stages in the Innovation-Decision Process - (Ami-Narh et al 2012)

Critique on the diffusion innovation theory framework in relation to cloud computing adoption framework for NGO's

The framework assumes that NGO's have the capability to adopt new technology, yet based from previous theory NGO's core mission is to drive social – economic issues in the society. The framework does not align the core strategy of an NGO with the technology that the NGO need to adopt. The framework assumes we need a technology but what is the purpose of the technology and what will be the impact of the technology and therefore issues affecting NGO;s adoption of technology like cost, scalability and access to human resource capacity which are neglected in this framework.

Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) and - suggests that when a user is presented with a new technology, a number of factors influence their decision regarding how and when they will use it. This includes its perceived usefulness and its perceived ease of use. (Ami-Narh at el 2012) further suggested that Technology acceptance model, which was also developed from theory of reasoned action, focuses on the attitudinal explanation of intention to use a specific technology or service, the development of Technology acceptance model was the starting point for researchers wanting to predict end-user acceptance of ICT.

The below diagram further describes the framework

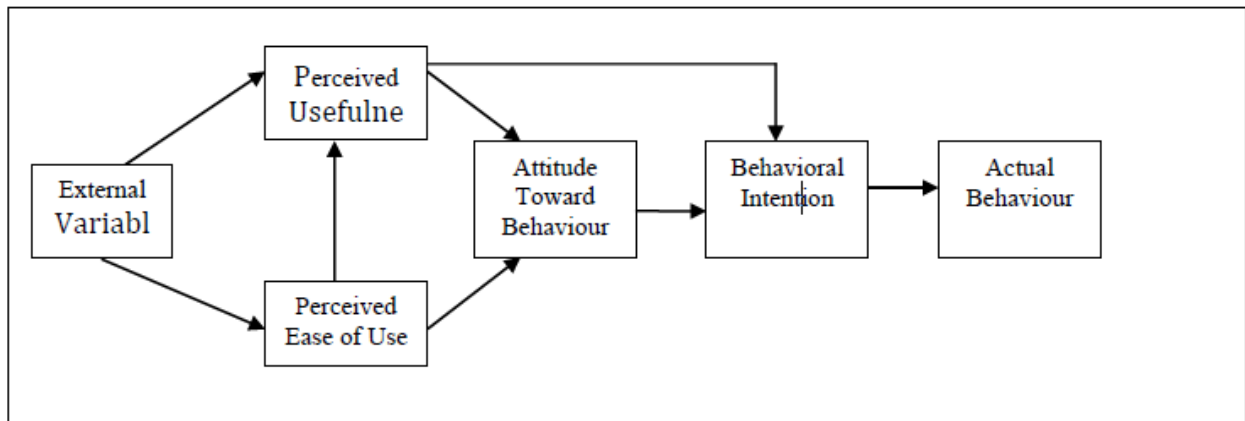


Figure 14 Technology Acceptance Model– Source Technology Acceptance Model (Ami-Narh at el 2012)

Critique on the Technology Acceptance Model (TAM) framework in relation to cloud computing adoption framework for NGO's

The Technology acceptance model does not account for the influence and personal control factors behavior. Other factors such as economic factors, outside influences from suppliers,

customers and competitors are also not considered by the model. The model assumes that NGO's have the technical capability and as well it does not consider other factors that drive adoption of cloud like NGO's strategy ,availability of funds .The model as well assumes that the NGOs are ready to adopt the technology and as highlighted by (Net hope 2012) NGO are “technology shy”.

The theory of reasoned action (TRA)

The theory of reasoned action (TRA) was introduced by Ajzen and Fishbein, it is a more general theory than the Technology acceptance Model. The TRA model included four general concepts namely: behavioral attitudes; subjective norms; intention to use; and actual use The TRA focuses on the role of attitudinal, social influence, and intention variables to predict behavior (Ami-Narh at el 2012) argues that “an individual’s behavior is a function of his or her intentions that attitudes and subjective norms are mediated through behavioral intention and that behavioral and normative beliefs are mediated through their attitude and subjective norm”

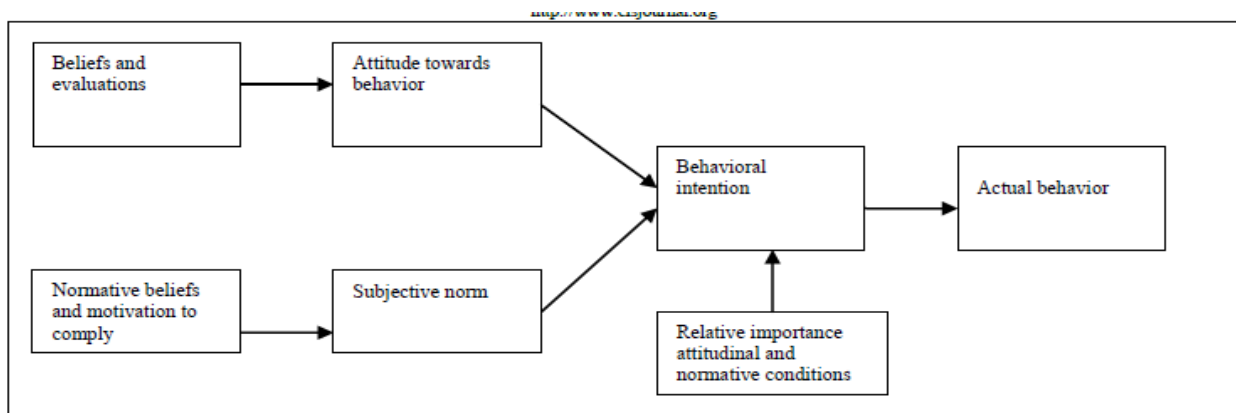


Figure 15 Theory of reasoned action – Source theory of reasoned action (Ami-Narh at el 2012)

Critique on the theory of reasoned action (TRA) framework in relation to cloud computing adoption framework for NGO's

This is a theory driven framework, which everything is perceived as an attitude or a norm towards acceptance of technology .The theory assumes to match technology and user’s attitude yet so many factors can influence a user attitude towards technology. The model assumes that NGO's have the idea of cloud computing and it's all about convincing the users to accept cloud computing .The model does not align strategy with technology and only concludes social influence can drive users to accept cloud computing as a technology which then poses great challenges like failure to achieve what really the technology was meant to do. The framework

does not define how the adoption of a technology was arrived at, either user driven need, ICT strategy driven need or any purpose of the technology to satisfy a user requirement.

Theory of Planned Behavior (TPB)

Theory of Planned Behavior (TPB) was developed by Ajzen in 1991 and deals with conditions where the individual has no control of their behavior. TPB suggest that an individual’s behavior is determined by a joint function of intention and perceived behavioral control, Behavioral intention in turn is determined by a function of the attitude toward the behavior, subjective norms and perceived behavioral control

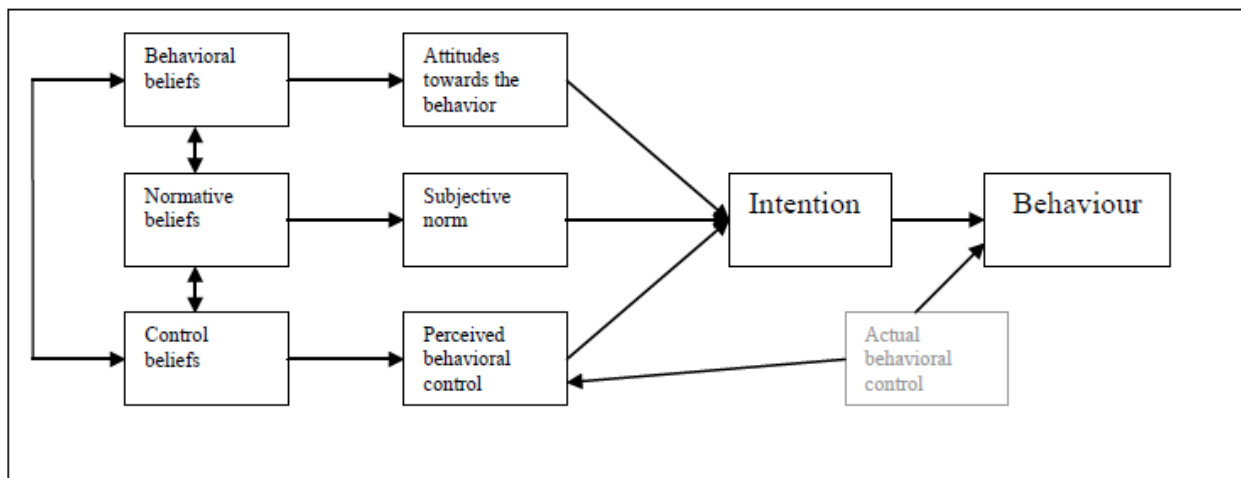


Figure 16 Theory of Reasoned Action – Source theory of reasoned action (Ami-Narh et al 2012)

Critique on the Theory of Planned Behavior (TPA) as a framework in relation cloud computing adoption framework for NGO’s

The framework is theory driven which uses perceptions and attitudes to drive the acceptance of technology. It’s assumes technology can be forced to a user and the user doesn’t have ability to air their views. The framework does not give a user of technology the opportunity to perform certain task differently and the theory assumes whatever technology had been availed it’s upon the user to make use of it and his/her behavior or attitude will change as they interact with the technology .The frameworks does not mention strategy and initial purposes of the technology, the framework does not clearly define why we need to adopt this technology and what are the requirements and how the technology is affiliated with the organization strategy.

Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology was developed by (Venkatesh et al) to present an integrated view of user acceptance and usage of new technology .UTAUT integrates four key determinants of intention and usage with up to four moderators of key relationships the four key constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, affect intention to use. The key moderators in the model are gender, age, voluntariness and experience

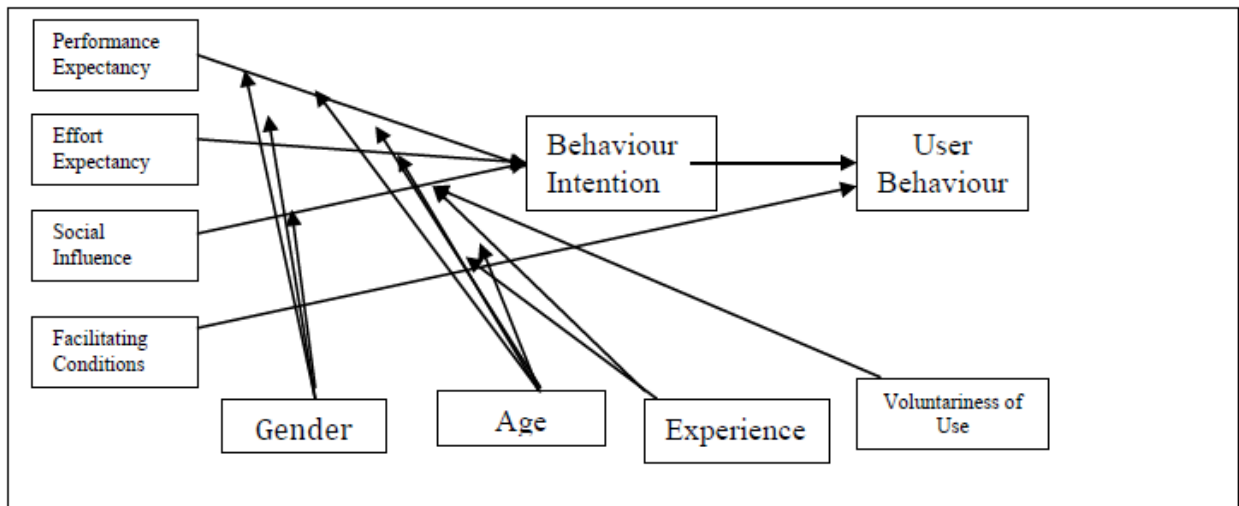


Figure 17- Unified Theory of Acceptance and Use of Technology– Source Unified Theory of Acceptance and Use of Technology (Ami-Narh et al 2012)

Critique on the Unified Theory of Acceptance and Use of Technology (UTAUT) as a framework in relation computing adoption model for NGO's

The framework has deeply engaged in to theoretical perception by defining key factors that can influence acceptance of technology and influence the behavior and user perception, however the framework does not define how the ICT strategy is aligned to the framework, it assumes prior knowledge of technology competence and other factors that are key to NGO's like funding, suppliers and external support, innovativeness and integration of the end-user feedback are clearly not thought out in this framework. The model borrows a lot from the previous frameworks but it misses out on the key which is the alignment of the ICT core strategy and the purpose of the technology as well it does not show why we should adopt the technology.

Social Cognitive Theory (SCT)

Social Cognitive Theory was developed by Bandura in 1986 the development was influenced by the Social Learning Theory (SLT). SCT evolved under the umbrella of behaviorism, which is a subset of psychological theories intended to explain why people and animals behave the way that they do. The SCT model is widely used to understand and predict individual and group behavior. The SCT has been widely used in the area of public health services. However, the theory is also applicable to predict an individual's behavior toward technology. The diagram below further illustrates the theory

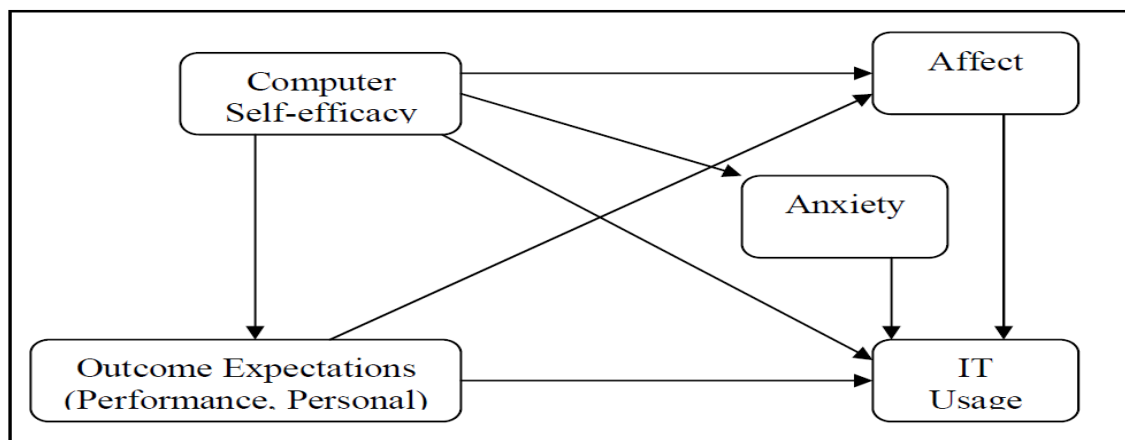


Figure 18 Social Cognitive Theory – Source IT usage based on the SCT concept (Mukabi 2013)

Critique on the Social Cognitive Theory (SCT) as a framework in relation computing adoption model for NGO's

The framework clearly depicts emotions and perceptions of acceptance of technology. The framework focuses on the results or feedback of introducing new technology but misses out a holistic view of adoption of technology. It does not highlight origination strategy, supplier, and human resource capability and environmental capability like policy and regulation among others.

Summary of the Critique of existing cloud computing adoption Framework in relation to NGO's

By definition the purpose and cause of non – government institution are purely driven by support funds and donations from philanthropist and therefore the alignment of the cooperate strategy and the ICT strategy should provide enabling technology to efficiently and effectively with cost cautiousness deliver the NGO's core mandate, in review of existing cloud computing adoption frameworks the following gaps were noted:

1. The Frameworks are not aligned to the core strategy of Non-governmental institutions and therefore the framework focuses on the technology but not geared towards alignment of NGO's core strategy and technology as an enabler.
2. External factors like Data security and privacy issues have not been addressed by the current adoption frameworks
3. The frameworks assume the technical capability human resource capacity to adopt cloud computing in the NGO's whose core business is not ICT.
4. The frameworks provide a thin line for the key stakeholders to contribute or participate in the strategy to adopt cloud computing
5. The frameworks are designed to be a generic adoption of cloud computing and not architecture towards a certain industry since the needs, purposes and intentions are quite different.

In summary the adoption models as highlighted have summed up the adoption of ICT technology to be driven by the following key factors: Attitude, behaviors, Social Influence and norms other adoption models Model of PC Utilization and Motivational Model (MM) which as well are driven by perceived behaviors, conditions, attitudes and norms which limits the need of the technology and the purpose and match to the core purpose and requirements.

Analytical thought in developing better Adoption framework for cloud computing in NGO's

In the review of the different adoption frameworks and their applications in different sectors which mainly focused on the behaviors, perception and social aspect we will however focus and reflect on the factors that surround a better adoption framework of cloud computing technology from a holistic view in this study; the factor includes:

1. Technological factors (Interoperability, scalability, flexibility, compatibility and prototyping)
2. Stakeholder factors this includes (Attitude, technology experience, innovativeness)
3. Environmental factors this includes (External support, government and regulatory pressure, user pressure)
4. Organization Factors (Financial factors, e-readiness, ICT strategy)

The diagram below further illustrates the conceptual model:

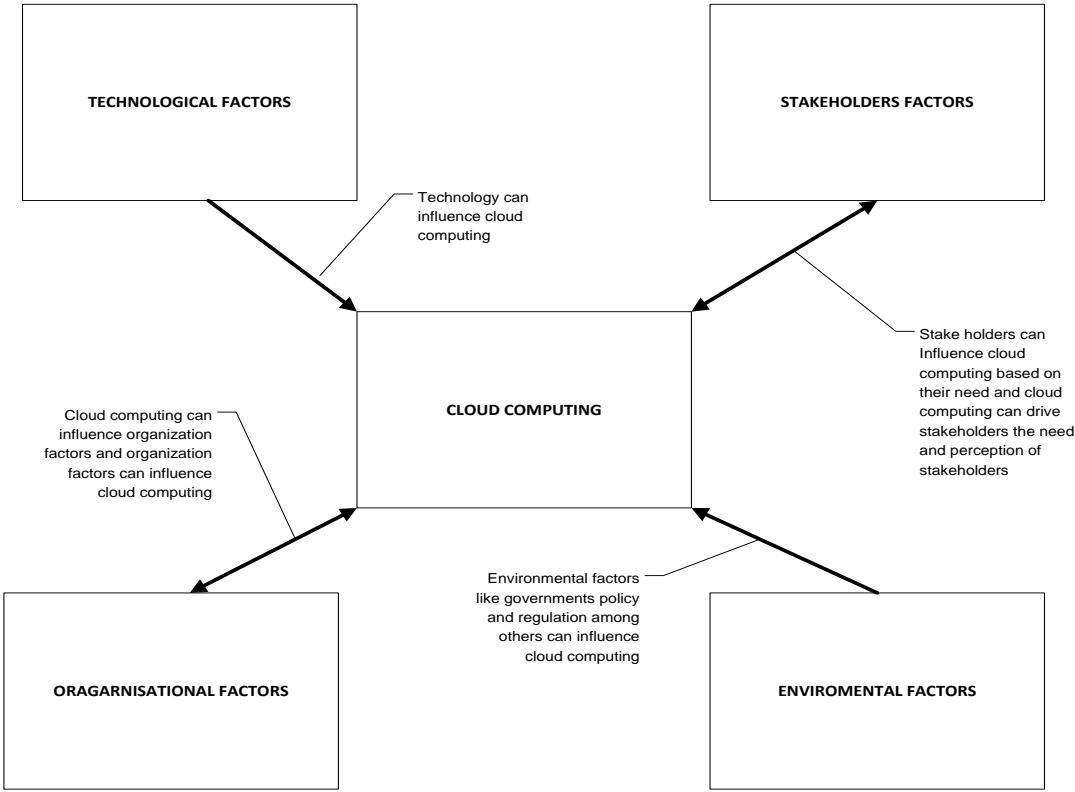


Figure 19 - Conceptual Model: Conceptual Model

CHAPTER 3: METHODOLOGY

Research design

This is the overall plan, structure and strategy that will integrate the different components of the study in a coherent and logical way which will ensure we effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data in order to come up with a conclusive suggestion or recommendation. In this study we will be guided by action research design based on our research problem.

The essentials of action research design follow a characteristic cycle whereby initially an exploratory stance is adopted, where an understanding of a problem is developed and plans are made for some form of interventional strategy. The intervention is carried out (the "action" in Action Research) during which time; pertinent observations are collected in various forms. The new interventional strategies are carried out, and the cyclic process repeats, continuing until a sufficient understanding of (or implement able solution for) the problem is achieved. The processes is iterative or cyclical in nature and is intended to foster deeper understanding of a given situation, starting with conceptualizing and particularizing the problem and moving through several interventions and evaluations.

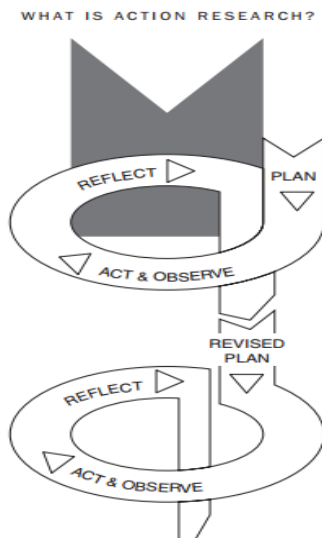


Figure 20 - Action Research: Source what is action research (Koshy at el 2010)

Application of Action Research in the study

The research problem we are undertaking is to bridge the gap between cloud computing as a better computing paradigm and enabler of achieving NGO's core mission and a better framework to drive the adoption of cloud computing, However various adoption framework exists but the challenges associated with cloud computing seems to be on the rise yet the appetite for cloud computing in NGO's is high as clearly analyzed in the literature review .Moreover the frameworks which currently exists are not specific to the NGO sector considering its cause and mission which is to enhance social ,economic and other related issues in the society.

Action research design presents a systematic, step by step approach in undertaking a research by breaking it down to an iterative or cyclic process with four stages as highlighted below:

Planning - Exploratory stance where an understanding of a problem is developed and plans are made for some interventional strategy which is reflected by the problem statement of the study and the innervations are presented through the theoretical and conceptual review which we have undertaken a look at past research studies on ICT adoption frameworks previously developed to drive the adoption of cloud computing and through the gaps that we found ,as an intervention it will help the study develop a better cloud adoption framework for the NGO's

Acting - The intervention are carried out (the "action") during which time the pertinent data will be collected using a data collection tool that best suit our scope and guarantees relevant and accurate data from the field which we intend to use questionnaires .The sample population for data collection will be NGOs within Nairobi and grouped by various causes or mission as stipulated by the NGO's bureau which will base our sample size on.

Observation –The observation processes defined the analysis of collected data and make meaning out of the data and build use-cases and prototype that will formulate the development better adoption framework for cloud computing in NGO's.

Reflecting – The reflection phase define the evaluation of the prototype adoption framework that will be tested and analyzed to check if it solved the research problem ,however the processes is iterative and cyclic and therefore the design will provide a processes of building up on a prototype until we solve the problem we are undertaking in the research .

Research Population and sample frame

A research population is also known as a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait. The research population for this study is driven by the scope of the study which is NGO's within Nairobi. The study proposes to survey at least an ICT staff i.e. (ICT heads, Chief Information officer, ICT Administrators, ICT director's or ICT cloud champions) of the sampled organizations and two other Non-IT staff to get the general behavioral factors that influence adoption of cloud computing technology in the NGO sector. The study proposes the targeted population to have a feel from the technical perspective as well a feel from the end user perspective whose results will steer the development of a prototype of cloud adoption framework.

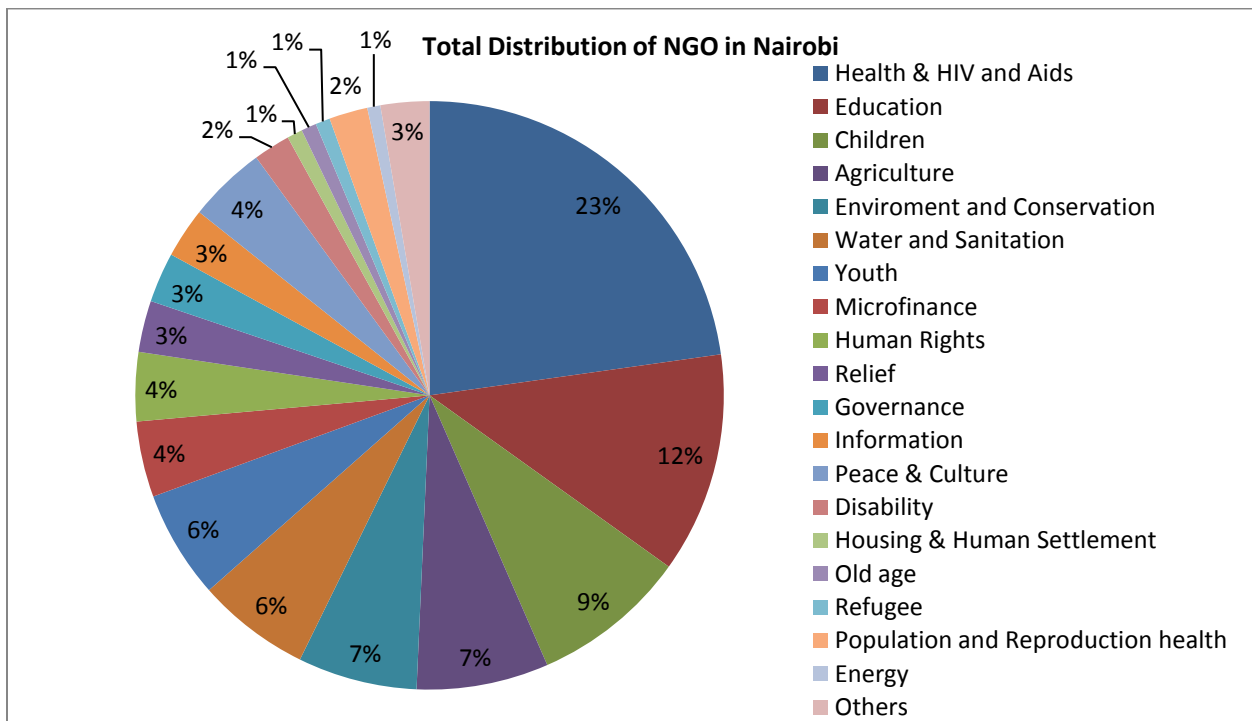


Figure 21 NGO's distribution Chart - Source NGO Coordination board of Kenya (2009-2012)

	Criteria	Number of Registered NGO's - NGO Coordination board of Kenya (2009-2012)	Registered NGO within Nairobi - NGO Coordination board of Kenya (2009-2012)	Samples % Of Total sample
1	Health & HIV and Aids	1990	995	23%
2	Education	1059	530	12%
3	Children	748	374	9%
4	Agriculture	634	317	7%
5	Environment and Conservation	573	287	7%
6	Water and Sanitation	544	272	6%
7	Youth	518	259	6%
8	Economic	364	182	4%
9	Human Rights	331	166	4%
10	Relief	247	124	3%
11	Governance	240	120	3%
12	Information	241	121	3%
13	Peace & Culture	374	187	4%
14	Disability	177	89	2%
15	Housing & Human Settlement	74	37	1%
16	Old age	73	37	1%
17	Refugee	70	35	1%
18	Population and Reproduction health	185	93	2%
19	Energy	63	32	1%
20	Others	234	117	3%
		8739	4370	100%

Table 4 - NGO distribution by Percentage Source NGO Coordination board of Kenya (2009-2012)

Data collection procedures', instruments and analysis tool

The key objective of this study is to find out the extent to which cloud computing technologies have been adopted by the NGO in Nairobi and to come up with a better framework which will drive the adoption of cloud computing from the tradition computing paradigms like on premises computing among others. The research study intends to sample data using two techniques i.e. qualitative and quantitative techniques.

Qualitative techniques intend to seek data such as:

1. individuals Perception of adoption on new technologies within NGO's
2. Perceived factor that will influence adoption of new technologies
3. Level of understanding and perception of Cloud computing technology
4. Perceived feel ,attitude and thoughts of Cloud technology
5. Concerns towards adopting Cloud technology

Quantitative techniques intend to seek data such as:

1. Number of NGO's using cloud computing technologies
2. Rating of understanding of Cloud computing technologies
3. Number of applications which NGO's have deployed in the cloud

The research intends to design questionnaires as a tool to collect data with the targeted population and Telephone conversation. The data will be analyzed using an excel sheet as analysis tool.

Pilot test strategy

In the study we intend to pretest the data collection tool, and use Quantitative and qualitative approach to test the data collected using statistical analysis with a small sample population to ascertain the relevance and adequacy of the targeted data being collected for conclusive summary. Key pointers in our pre-testing strategy of the data collection tool will be:

1. Relevance of the questions to our research objectives
2. Ease and flow of responding to questions
3. Relationship between the conceptual model and questionnaire

Foreseen Limitation of the methodology

The cyclic nature of the action research design we intend to adopt allow build up design to better improve a prototype, though it's an engaging methodology with the end user of the framework, the allocated research time limits access to participation of each of the expected user to share their view in regards to the proposed cloud computing adoption framework as well the scope of the project limits the intense engagement with the end-user since the projects scope and expected population sample for the research will be driven by classification adopted from the NGO bureau board. In order to overcome this challenges we intend to spread our sample population and use quantitative and qualitative approach to access data from the NGO-within Nairobi.

CHAPTER 4: RESEARCH FINDINGS, ANALYSIS AND DISCUSSIONS

Preliminary

The data collected for this study was from a primary sources and a questionnaire was used to collect the data, the questionnaire was designed using both qualitative and quantitative approach and closed and open end response option. The targeted sample population was NGO's located within Nairobi with the source of sample population being NGO bureau of Kenya which is the coordinating and regulatory body managing NGO's in Kenya. In the data analysis statistic techniques were applied to draw conclusions using various statistical analysis techniques like standard deviation, mean and sampling and analyzing the data using descriptive statistics. Microsoft Excel was used as an analysis tool to generate and Plot graphical data presentation.

Questionnaire Pre-Testing

The purpose of pre-testing the questionnaire was,

1. Identify questions that will not make sense for the purpose of this study
2. Identify errors on the questionnaire e.g. ambiguous questions
3. Identify questions that may lead to bias answers
4. Identify questions that will not be of use in data analysis

A total of six questionnaires were issued and the below table represent the feedback results:

Number of Pre-test Questionnair Issued	6	100%
Number of Respondent	5	83%
Number of Questionnair fully filled out	4	67%
Number of Questions responded missed out	1	3%
Number of Questions responded answered off available answeres	6	19%

Table 5 Questionnaire Pretesting - Respondent Analysis

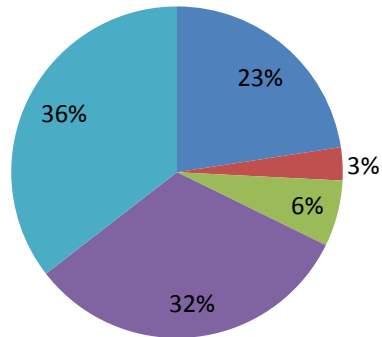
Below is a feedback analysis of the response:

Co-relation between Response to questions and Research Objectives		
Objective	Number of Questions Associated with objective	Percentage of Total Questions
Adoption Cloud computing and ICT strategy as a contributing factor to NGO core strategy	7	23%
Adoption drivers/Issues and significance of cloud computing	1	3%
Current adopted computing model	2	6%
Concerns and issues in cloud computing	10	32%
Relationship between conceptual model and questions	12	35%

Table 6 Questionnaire Pretesting Analysis

Feedback Analysis on Questionnaire Pre-Testing

- Adoption Cloud computing and ICT strategy as a contributing factor to NGO core strategy
- Adoption drivers/Issues and significance of cloud computing
- Current adopted computing model
- Concerns and issues in cloud computing
- Relationship between conceptual model and questions



The following analysis was made on the feedback response:

1. Responded 2 did not respond to the question using the given options
2. Adoption drives were not adequately captured on the questionnaire and therefore difficulties in drawing conclusions
3. The questionnaire had a bias in collecting data from ICT staff and neglected non-ICT
4. The available options from the closed end questions were too cumbersome in options available thus making selecting an option a tedious processes

Questionnaire Pre-Testing Conclusions

The following changes were made on the questionnaire:

1. The questionnaire was made all inclusive for both ICT and NON-ICT
2. The objective and conceptual model was well addressed in the questionnaire
3. The closed end question were given few response options
4. The questionnaire was clearly aligned to the purpose of the research

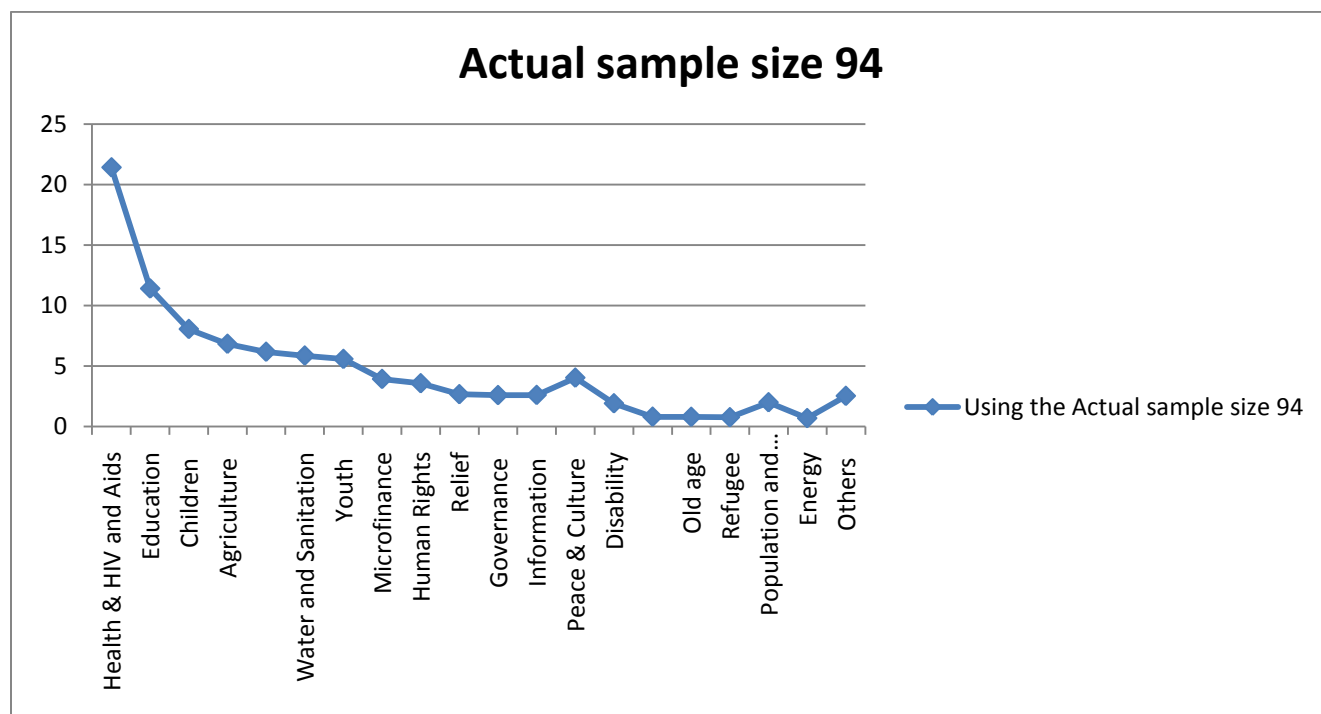
Sample Distribution

In the study to get the actual sample distribution a statistical technique was used with the following parameters

Formulae : $Z\text{-score} \times (Z\text{-score}) \times STDEV(1-STDEV) / \text{Margin of error}$	
confidence level	95% or Z-Score 1.96
Confidence Interval/Margin of Error	+ or -10
Sample population (NGO's in Nairobi) according NGO bureau	4370
Standard Deviation	218
Actual Sample size	94

Table 7 -Sample Distribution Formulae

In conclusion and precision with a confidence level of 95% and a margin error of + or – 10 the actual sample population for our research would be 94 with a distribution graph as below:

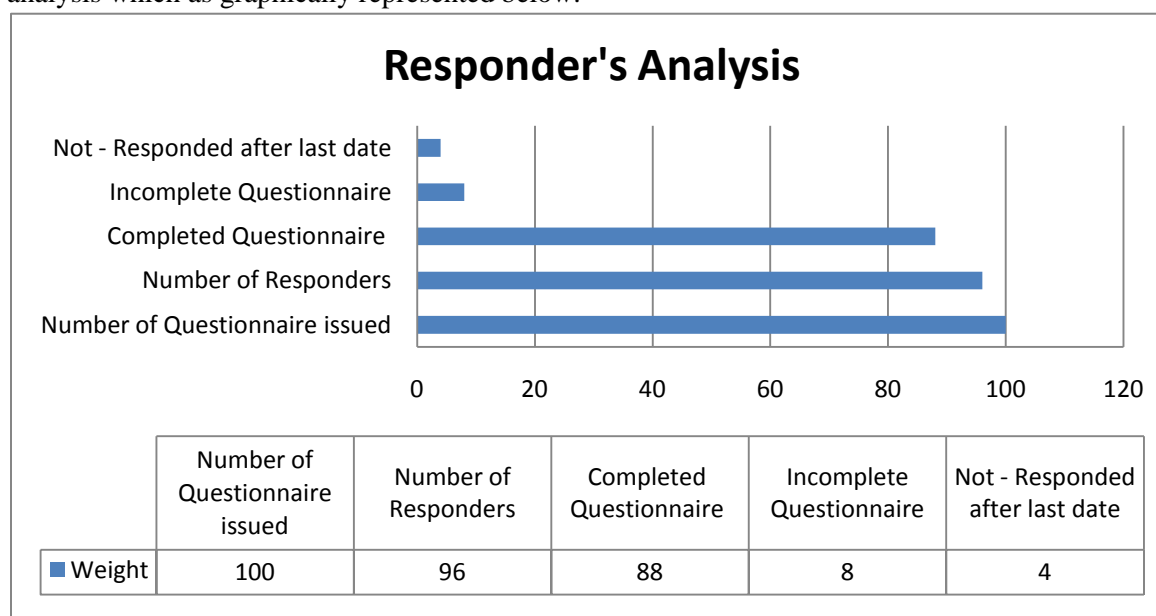


In conclusion the sample was further spread as below so as to get different view for criteria of NGO's

	Criteria	Number of Registered NGO's - NGO Coordination board of Kenya (2009-2012)	Registered NGO within Nairobi - NGO Coordination board of Kenya (2009-2012)	Samples % Of Total sample	Using the Actual sample size 94
1	Health & HIV and Aids	1990	995	23%	21
2	Education	1059	530	12%	11
3	Children	748	374	9%	8
4	Agriculture	634	317	7%	7
5	Enviroment and Conservation	573	287	7%	6
6	Water and Sanitation	544	272	6%	6
7	Youth	518	259	6%	6
8	Microfinance	364	182	4%	4
9	Human Rights	331	166	4%	4
10	Relief	247	124	3%	3
11	Governance	240	120	3%	3
12	Information	241	121	3%	3
13	Peace & Culture	374	187	4%	4
14	Disability	177	89	2%	2
15	Housing & Human Settlement	74	37	1%	1
16	Old age	73	37	1%	1
17	Refugee	70	35	1%	1
18	Population and Reproduction health	185	93	2%	2
19	Energy	63	32	1%	1
20	Others	234	117	3%	3
		8739	4370	100%	94

Response Analysis

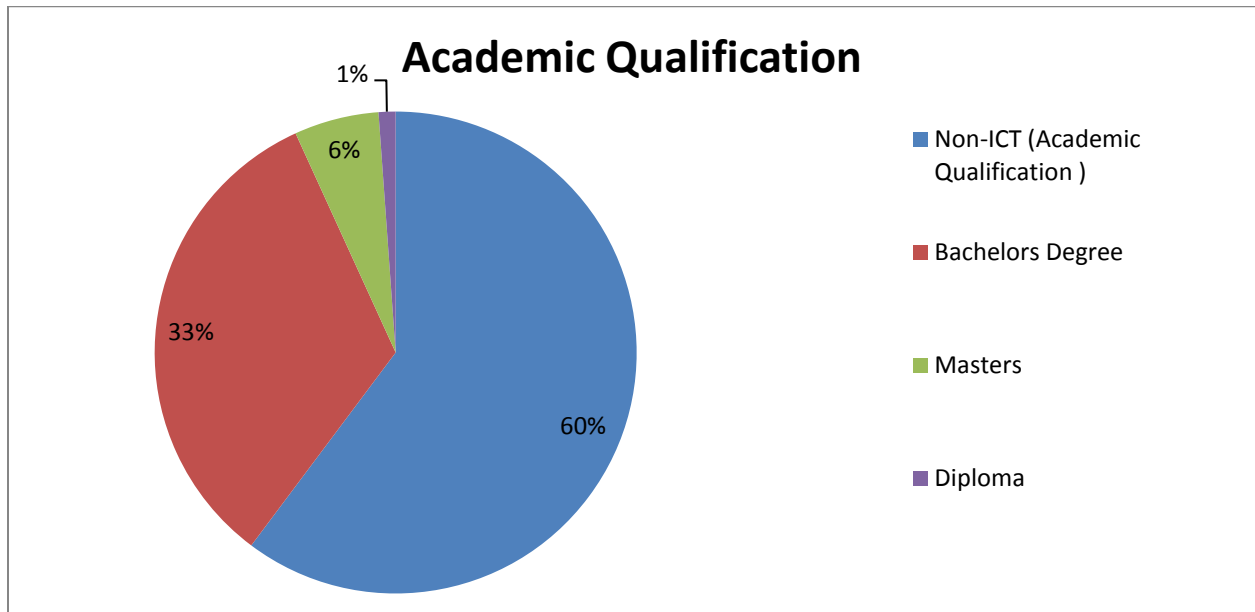
From a total of 100 questionnaire issued 96 responders responded within the given stipulated time which was 96% response rate. Out of the 96 responders 8 questionnaires were not completed which was 8% and therefore the questionnaires could not be used for analysis and only 88 questionnaires were usable for analysis which as graphically represented below:



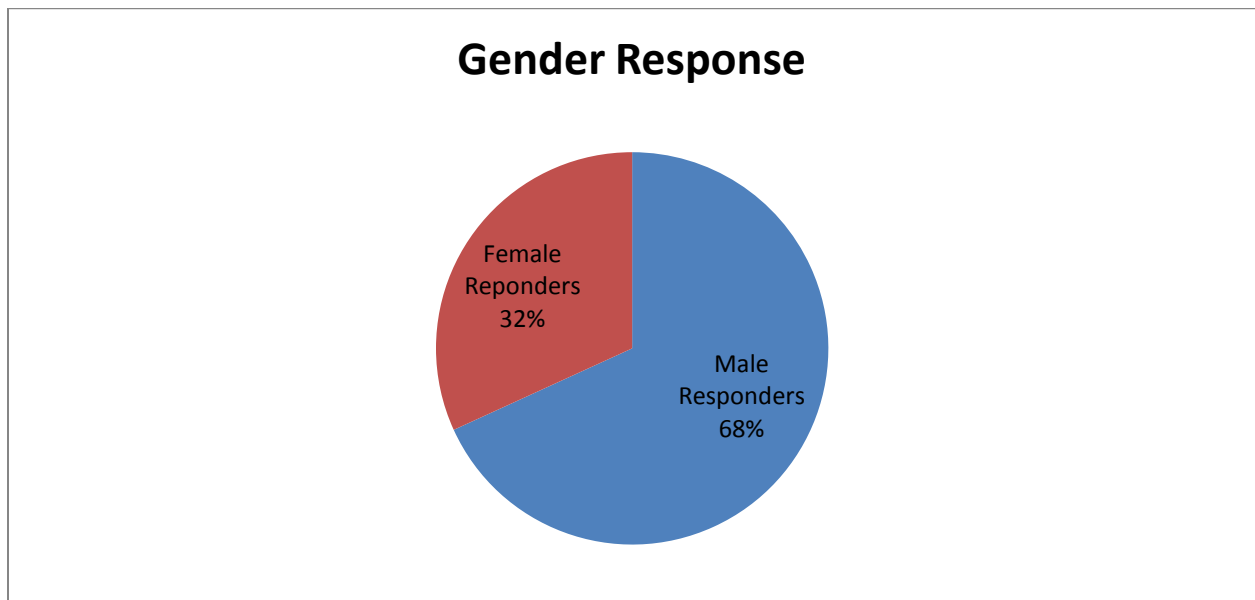
The Figure below shows a graphical presentation

Demographic Information

The respondents were selected from various criteria of NGO and distribution within NGO available criteria and sample size distribution. Out of the total responders 42% were ICT responders and 58% were non-ICT responders and therefore views from ICT and non-ICT were collected which gives the study a balance of true perception of the targeted sample population. The average respondent in ICT had a bachelor's degree with over 6 years of experience in the ICT sector and therefore conclusively the ICT respondent were well informed below is a graphical representation:



The average age of the respondent was 33.5 years with 68% male responder's and 32% Female responder's



In conclusion the targeted respondent population was achieved and thus the data collected could be used to present a true and fair view in regards to the objective of the study. In summery the table below further describes the respondent analysis:

Category	Weight	Percentage
ICT Responders	37	42%
Non ICT Responders	51	58%
Average Age	33.5	
Male Responders	60	68%
Female Reponders	28	32%
Average ICT Expirience 6 years and Above	25	28%
Average ICT Expirience 4years to 6 Years	12	14%
Non-ICT (Academic Qualification)	53	60%
Bachelors Degree	29	33%
Masters	5	6%
Diploma	1	1%

Table 8 - Demographic Analysis

Investigating the relationship between Cloud computing and ICT strategy as contributing factor to the core strategy

In order to evaluate the relationship between cloud computing and ICT strategy as a contributing factor to the core strategy the responders were asked a set of questions which had a close end response to **YES** , **NO** and **I don't know** ,being a descriptive statistic the following was the analysis and response.

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error +5	Confidence Level of 99% - margin of error +5	Total Avarage
ITS1	Does your organization have an ICT strategy	83	88	64	69	74	69
ITS2	Does Cloud computing form part of the ICT strategy	76	88	60	64	69	64.3333333
ITS3	Can cloud computing align to your ICT strategy	85	88	65	70	76	70.3333333
	calculating the location of the mean	81.33333333	88	63	67.66666667	73	67.8888889
CS1	has your ICT been deployed in the cloud	73	88	58	62	66	62
CS2	Does your organization host any applications in the Cloud	84	88	65	70	75	70
CS3	Select the implementation model that the organization has adopted	84	88	65	70	75	70
	calculating the location of the mean	80.33333333	88	62.66666667	67.33333333	72	67.3333333
COM1	Cloud technology is compatible with most aspects of the organization's work	86	88	66	71	77	71.3333333
COM2	Cloud technology fits with the Organizations working style	86	88	66	71	77	71.3333333
COM3	I think that using Cloud computing fits well with the way I like to work	85	88	65	70	76	70.3333333
	calculating the location of the mean	85.66666667	88	65.66666667	70.66666667	76.66666667	71
ITS-Presence of ICT strategy in NGO's , CS-Cloud computing as an ICT strategy component ,COM-Compatibility of using Cloud computing to execute core strategy							

Table 9 - Analysis on the relationship between Cloud Computing and ICT strategy

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors used to test the relationship between cloud computing and ICT strategy were computed and ranked as follows:

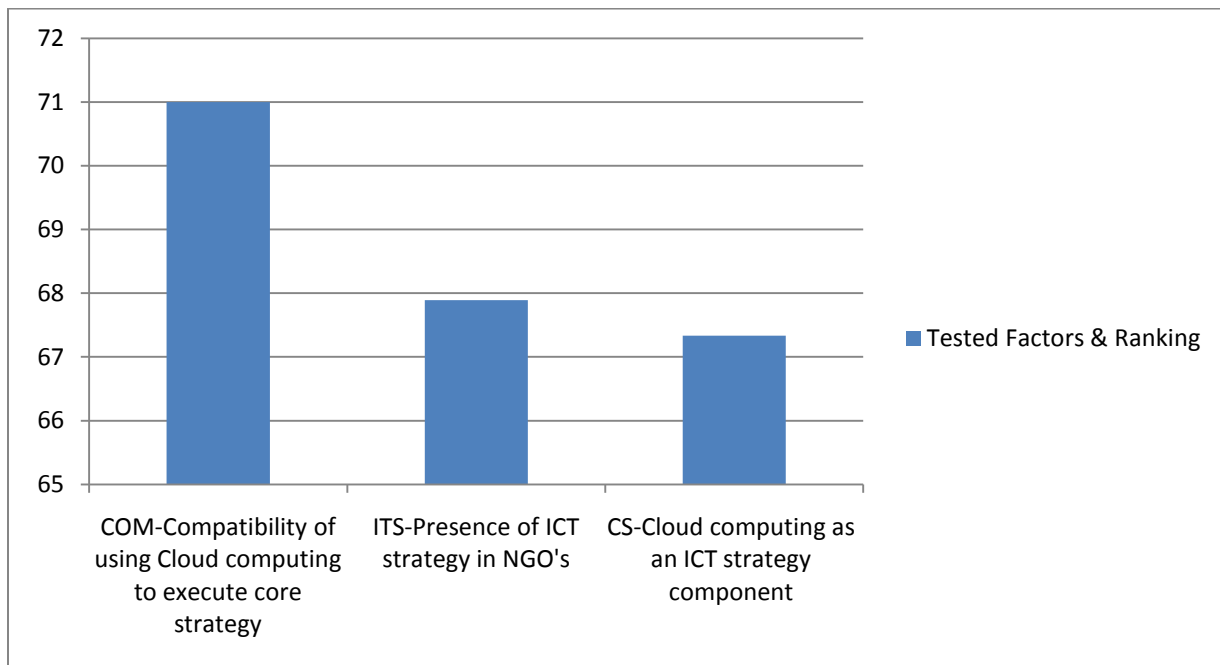
$$ITS1+ITS2+ITS3/3 = 67.88888889$$

$$CS1+CS2+CS3/3 = 67.33333333$$

$$COM 1+COM2+COM3 = 71$$

Tested Factors & Ranking	
COM-Compatibility of using Cloud computing to execute core strategy	71
ITS-Presence of ICT strategy in NGO's	67.88888889
CS-Cloud computing as an ICT strategy component	67.33333333

Therefore the factors that define the relationship between cloud computing and ICT strategies as a contributing factor were further graphically presented as below:



Individual factors affecting adoption of cloud computing

In order to evaluate the individual factors affecting the adoption of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error +5	Confidence Level of 99%- margin of error +5	Total Avarage
ATT 1	I believe that adopting Cloud technology by my firm is a wise decision	84	88	65	70	75	70
ATT 2	I believe that Cloud applications are effective tools in my firm	85	88	65	70	76	70.333333
ATT 3	I believe that Cloud technology is easy to use	83	88	64	69	74	69
ATT 4	I think that using Cloud computing fits well with the way I like to work	85	88	65	70	76	70.333333
ATT 5	I believe that it is easy to use an application hosted in the Cloud the way I would normally use it when hosted in a traditional on premise environment	84	88	65	70	75	70
ATT 6	Users' behaviors indicate that the NGO needs to have implemented Cloud computing technology	84	88	65	70	75	70
	calculating the location of the mean	84.16666667	88	64.83333333	69.83333333	75.16666667	69.944444
SN1	People who are important to me think that I should use Cloud applications	86	88	66	71	77	71.333333
SN2	People who influence my behavior think that I should use Cloud applications	84	88	65	70	75	70
	calculating the location of the mean	85	88	65.5	70.5	76	70.666667
SE1	I could administer applications hosted on the cloud platform if there was no one to tell me what to do	86	88	66	71	77	71.333333
SE2	I could administer applications hosted on the cloud platform if there were reference manuals to use	84	88	65	70	75	70
SE3	I could administer applications hosted on the cloud if there was someone to call for help if I got stuck	86	88	66	71	77	71.333333
	calculating the location of the mean	85.33333333	88	65.66666667	70.66666667	76.33333333	70.888889
ATT-Attitude , SN-Subjective Norm , SE-Self Efficacy							

Table 10 - Individual Factor Affecting cloud Computing

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The respective individual factor affecting individual adoption were calculated and ranked as follows:

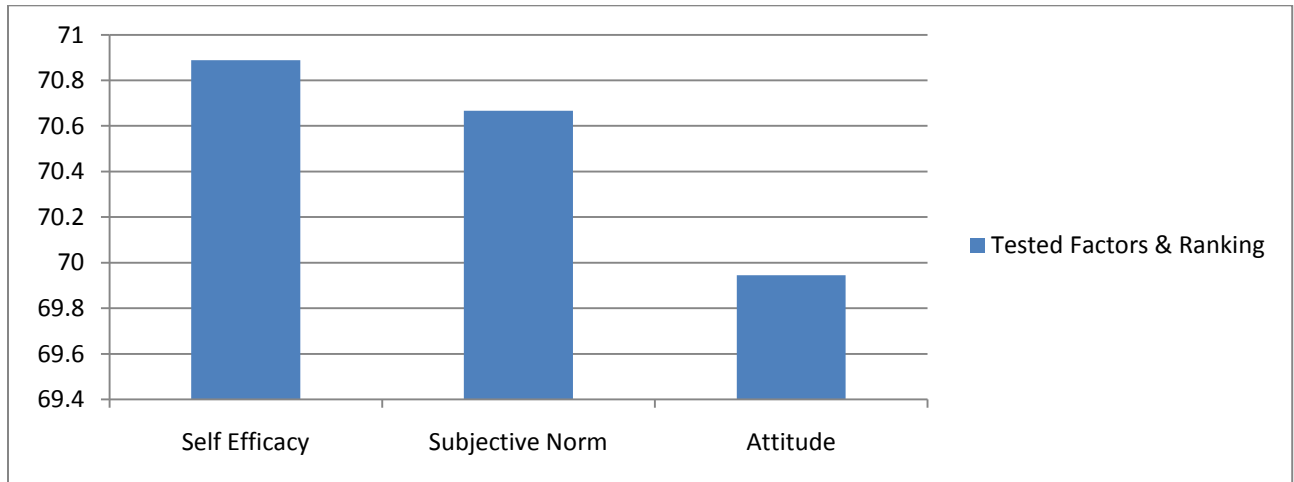
$$ATT1+ ATT2+ ATT3+ ATT4+ ATT5+ ATT6 / 6 = 69.94444444$$

$$SN1+SN2/2 = 70.66666667$$

$$SE1+SE2+SE3 /3 = 70.88888889$$

Tested Factors & Ranking	
Self Efficacy	70.88888889
Subjective Norm	70.66666667
Attitude	69.94444444

Therefore the individual factors that affect the adoption of cloud computing were graphically represented as follow:



Organizational factors affecting the adoption of cloud computing

In evaluating organizational factors affecting the adoption of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error	Confidence Level of 99% - margin of error	Total Avarage
FIN 1	My Organization has the financial resources to adopt Cloud computing	86	88	66	71	77	71.33333
FIN 2	Does the organization have the financial capability to access consultancy services from vendors in adopting cloud computing	85	88	65	70	76	70.33333
FIN 3	Cost of migrating services to the Cloud	85	88	65	70	76	70.33333
FIN 4	Avoiding capital expenditure in hardware, software, IT support, Information	86	88	66	71	77	71.33333
	calculating the location of the mean	85.5	88	65.5	70.5	76.5	70.83333
TE1	My Organization has technical staff to maintain Cloud applications	84	88	65	70	75	70
TE2	The availability of support from cloud computing vendors a factor in organization decision to adopt Cloud computing	85	88	65	70	76	70.33333
	calculating the location of the mean	84.5	88	65	70	75.5	70.16667
SR1	Is it a strategic necessity to deploy cloud computing to achieve organization objective	84	88	65	70	75	70
SR2	Cloud computing should be part of the core strategy	85	88	65	70	76	70.33333
	calculating the location of the mean	84.5	88	65	70	75.5	70.16667
Pol Reg 1	Are you aware that there are policies by the government that regulate the adoption of cloud computing	67	88	54	58	61	57.66667
Pol Reg 2	Are you aware of any adoption framework for cloud computing in NGO's	76	88	60	64	69	64.33333
Pol Reg 3	Are you aware of any industry regulations in cloud computing	65	88	53	56	60	56.33333
	calculating the location of the mean	69.33333333	88	55.6666667	59.33333333	63.33333333	59.44444
FIN-Financial Resources , TE-Technological Expertice , Pol Reg-Policy Regulation , SR- Strategic Refrence							

Table 11 Organizational Factors Affecting Cloud Adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The respective Organizational factor affecting organizational adoption were calculated and ranked as follows:

$$FIN1+FIN2+FIN3+FIN4 /4 = 70.83333333$$

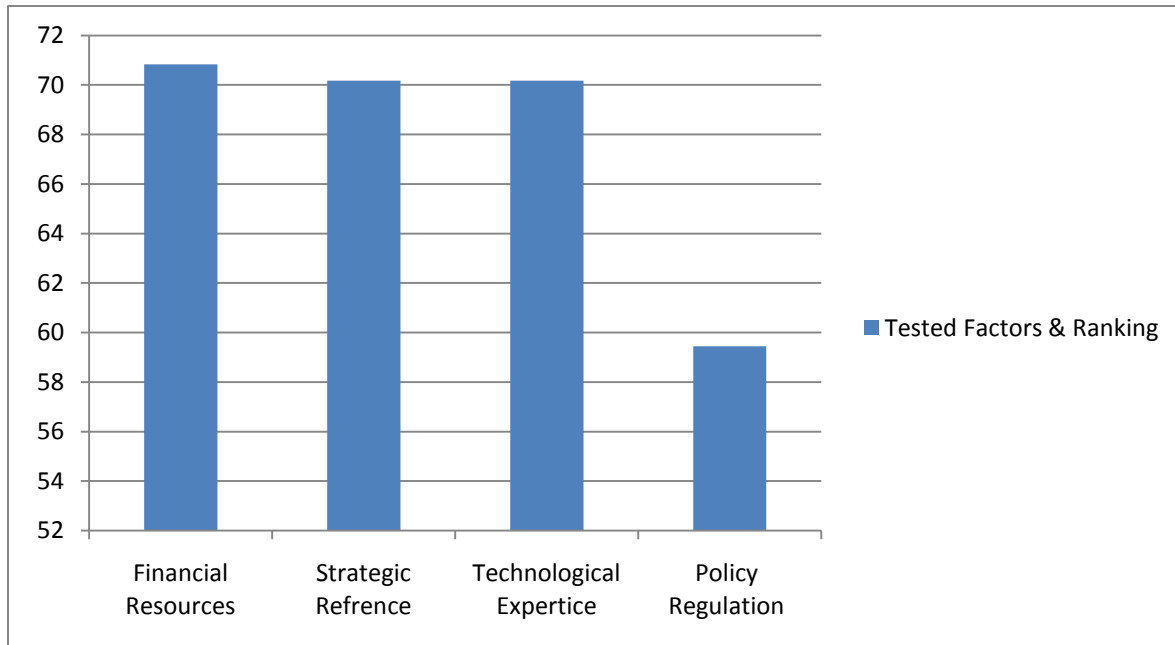
$$TE1+TE2/2= 70.16666667$$

$$SR1+SR2= 70.16666667$$

$$PolReg1+PolReg2+PolReg3 = 59.44444444$$

Tested Factors & Ranking	
Financial Resources	70.83333333
Strategic Refrence	70.16666667
Technological Expertice	70.16666667
Policy Regulation	59.44444444

Therefore the Organizational factors that affect the adoption of cloud computing were graphically presented as follow:



Technological factors affecting the adoption of cloud computing

In evaluating Technological factors affecting the adoption of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YE S)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +-5	Confidence Level of 95% - margin of error +	Confidence Level of 99%- margin of error	Total Avarage
COM ADV 1	Cloud computing enables high productivity	84	88	65	70	75	70
COM ADV 2	Using cloud the organization offers its services seamlessly	85	88	65	70	76	70.33333
COM ADV 3	Cloud allows us to work from anywhere	84	88	65	70	75	70
	calculating the location of the mean	84.33333333	88	65	70	75.33333333	70.11111
CON LEV APP 1	ERP Application	65	88	53	56	60	56.33333
CON LEV APP 2	Payroll	58	88	53	51	54	52.66667
CON LEV APP 3	Accounting and finance	58	88	48	51	54	51
CON LEV APP 4	Email	84	88	65	70	75	70
	calculating the location of the mean	66.25	88	54.75	57	60.75	57.5
CON LEV INF1	Virtual machine	78	88	61	65	70	65.33333
CON LEV INF2	Data center /colocation	76	88	60	64	69	64.33333
CON LEV INF3	Security service	76	88	60	64	69	64.33333
CON LEV INF4	Adding redundancy to increase availability and resilience	84	88	65	70	75	70
CON LEV INF5	Business Continuity and Disaster recovery capabilities	86	88	66	71	77	71.33333
	calculating the location of the mean	80	88	62.4	66.8	72	67.06667
FIN IMP 1	Avoiding capital expenditure in hardware, software, IT support, Information	85	88	66	70	76	70.66667
	calculating the location of the mean	85	88	66	70	76	70.66667
SCAL1	Flexibility and scalability of ICT resources	85	88	66	70	76	70.66667
SCAL2	Diversification of ICT systems	84	88	65	70	75	70
SCAL3	Increasing computing capacity and business performance	86	88	66	71	77	71.33333
	calculating the location of the mean	85	88	65.66666667	70.33333333	76	70.66667
COM1	Cloud technology is compatible with most aspects of the organization's work	85	88	66	70	76	70.66667
COM2	Cloud technology fits with the Organizations working style	85	88	66	70	76	70.66667
COM3	I think that using Cloud computing fits well with the way I like to work	86	88	66	71	77	71.33333
	calculating the location of the mean	85.33333333	88	66	70.33333333	76.33333333	70.88889

COM ADV- Competitive Advantage ,CON LEV APP-Confidence level in cloud Application , Confidence Level in cloud Infrustrcture , FIN IMP-Financial Implication Cloud Adoption , SCAL-Scalabilit

Table 12 Technological Factors Affecting Cloud Adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The Technical Factor affecting adoption were calculated and ranked as follows:

$$\text{COM ADV1} + \text{COM ADV2} + \text{COM ADV3} / 3 = 70.11111111$$

$$\text{CON LEV APP1} + \text{CON LEV APP2} + \text{CON LEV APP3} + \text{CON LEV APP4} / 4 = 57.5$$

$$\text{CON LEV INF1} + \text{CON LEV INF2} + \text{CON LEV INF3} + \text{CON LEV INF4} + \text{CON LEV INF5} / 5 = 67.06666667$$

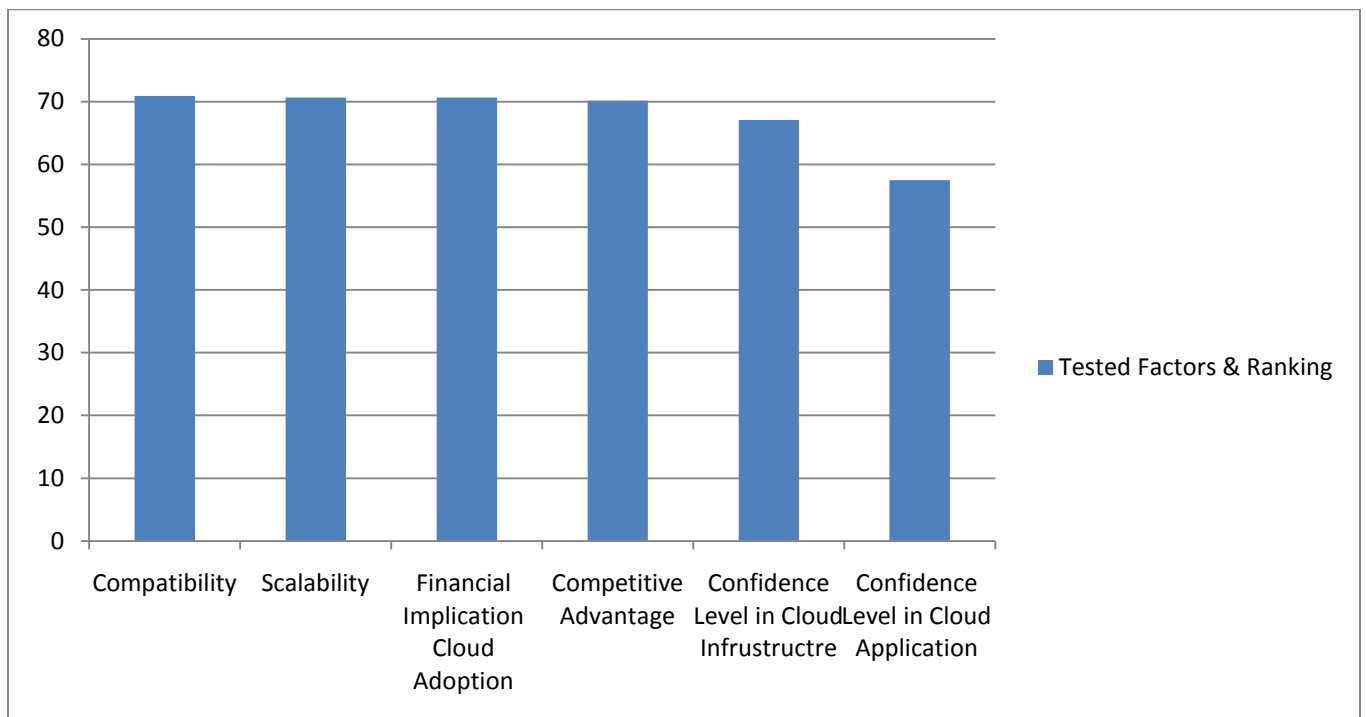
$$\text{FIN IMP1} / \text{FIN IMP1} = 70.66666667$$

$$\text{SCAL1} + \text{SCAL2} + \text{SCAL3} / 3 = 70.66666667$$

$$\text{COM1} + \text{COM2} + \text{COM3} / 3 = 70.88888889$$

Tested Factors & Ranking	
Compatibility	70.88888889
Scalability	70.66666667
Financial Implication Cloud Adoption	70.66666667
Competitive Advantage	70.11111111
Confidence Level in Cloud Infrustrctre	67.06666667
Confidence Level in Cloud Application	57.5

Therefore the Technological factors that affect the adoption of cloud computing were graphically presented as follow:



Stakeholders factors affecting the adoption of cloud computing

In evaluating Stakeholder factors affecting the adoption of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% margin of error +-5	Confidence Level of 95% margin of error +-5	Confidence Level of 99% margin of error	Total Avarage
MGT SUP1	Does the management support ICT as a driving factor of achieving organization goal	84	88	65	70	75	70
	calculating the location of the mean	84	88	65	70	75	70
PER EAS1	Users can access services easily (minimal or non-complexity) if they are hosted on the cloud	86	88	66	71	77	71.33333
PER EAS2	Users can access services anywhere in they are hosted on the cloud	84	88	65	70	75	70
	calculating the location of the mean	85	88	65.5	70.5	76	70.66667
USER SAT 1	Users are content with the availability of services if they are hosted on the cloud	86	88	66	71	77	71.33333
USER SAT 2	Users are not concerned where the applications are hosted	85	88	65	70	76	70.33333
	calculating the location of the mean	85.5	88	65.5	70.5	76.5	70.83333
Ind Pre1	The overall operational practices in my industry pressure me to adopt Cloud computing	83	88	64	69	74	69
Ind Pre2	It is a strategic necessity to use Cloud computing technology to compete in my industry	84	88	65	70	75	70
	calculating the location of the mean	83.5	88	64.5	69.5	74.5	69.5
Ext Supp1	The availability of support from technology vendors is a factor in my decision to adopt Cloud computing	84	88	65	70	75	70
Ext Supp2	I know there are technology vendors, who provide technical advice and support for Cloud computing	83	88	64	69	74	69
Ext Supp3	I know that the government has policies and initiatives encouraging companies to adopt Cloud computing technology	67	88	54	58	61	57.66667
Ext Supp4	I am aware of the existence of governmental agencies providing services toward Cloud computing adoption	58	88	54	57	61	57.33333
	calculating the location of the mean	73	88	59.25	63.5	67.75	63.5
MGT SUP - Management Support , PER EAS - Percieved Ease of use , USER SAT - User satisfaction , Ind Fact -Industry Pressure , External Support							

Table 13 Stakeholders Factors Affecting Cloud Adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The Stakeholder Factor affecting cloud computing adoption were calculated and ranked as follows:

$$\text{MGTSUP1}/1= 70$$

$$\text{PER EAS1}+ \text{PER EAS2}/2 = 70.66666667$$

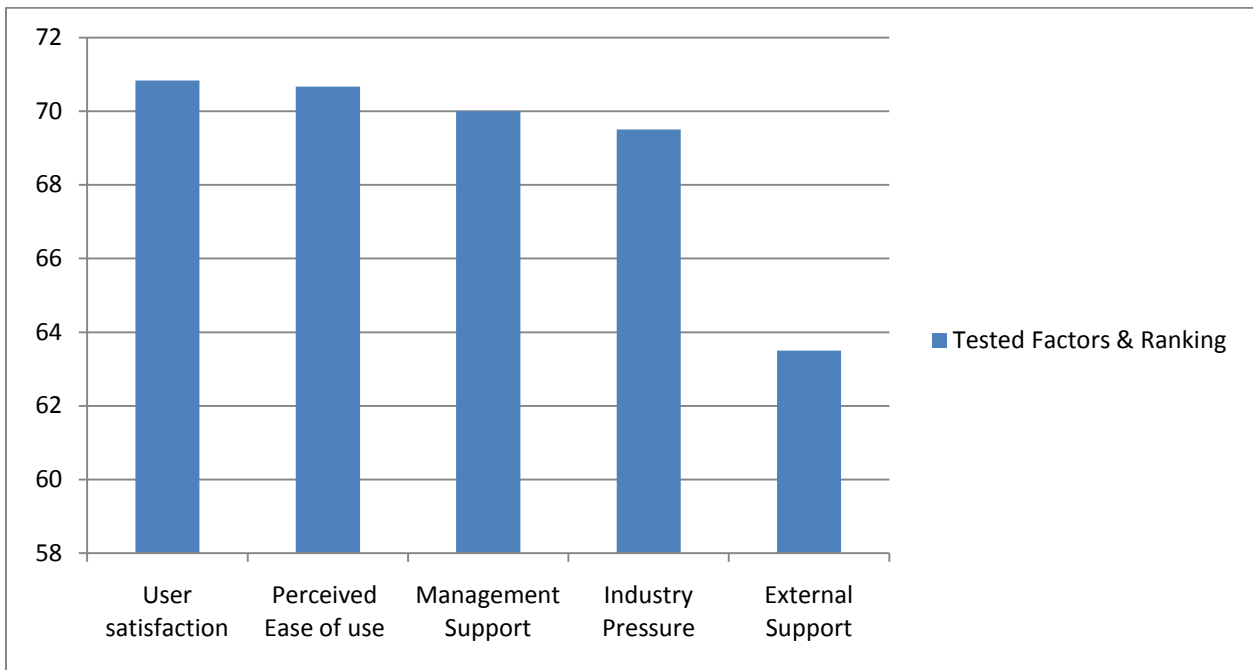
$$\text{USER SAT1}+\text{USER SAT2}/2= 3 70.83333333$$

$$\text{Ind Pre1}+\text{Ind Pre2}/2 = 69.5$$

$$\text{Ext supp1}+ \text{Ext supp2}+ \text{Ext supp3}+ \text{Ext supp4}/4= 63.5$$

Tested Factors & Ranking	
User satisfaction	70.83333333
Perceived Ease of use	70.66666667
Management Support	70
Industry Pressure	69.5
External Support	63.5

Therefore the Stakeholder factors that affecting the adoption of cloud computing were graphically presented as follow:



Environmental factors affecting the adoption of cloud computing

In evaluating Environmental factors affecting the adoption of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of	Confidence Level of 95% - margin of	Confidence Level of 99% - margin of error	Total Avarage
GOV SUPP1	Are you aware that there are policies by the government that regulate the adoption of cloud computing	67	88	54	57	61	57.33333333
GOV SUPP2	I am aware of the existence of governmental agencies providing services toward Cloud computing adoption	58	88	48	51	54	51
GOV SUPP3	I know that the government has policies and initiatives encouraging companies to adopt Cloud computing technology	67	88	54	57	61	57.33333333
	calculating the location of the mean	64	88	52	55	58.66666667	55.22222222
EXT SUPP1	Are you aware of any adoption framework for cloud computing in NGO's	76	88	60	64	69	64.33333333
EXT SUPP2	Are you aware of any industry regulations in cloud computing	65	88	53	56	60	56.33333333
	calculating the location of the mean	70.5	88	56.5	60	64.5	60.33333333
EXT PRESS 1	People who are important to me think that I should use Cloud applications	84	88	64	69	75	69.33333333
EXT PRESS 2	People who influence my behavior think that I should use Cloud applications	86	88	66	71	77	77.6
	calculating the location of the mean	85	88	65	70	76	73.46666667
GOV SUPP 1-Government Support , EXT SUPP-External Support , EXT PRESS -External Pressure							

Table 14 Environmental Factors Affecting cloud Adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The Environmental Factor affecting cloud computing adoption were calculated and ranked as follows:

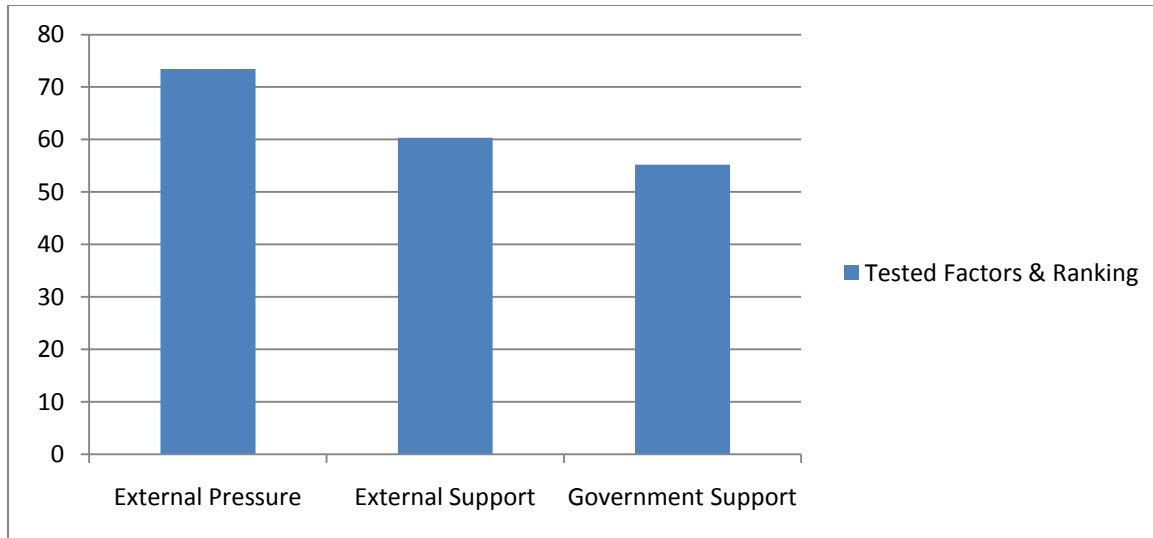
$$\text{GOV SUPP1} + \text{GOV SUPP2} + \text{GOV SUPP3} / 3 = 55.22222222$$

$$\text{EXT SUPP1} + \text{EXT SUPP2} / 2 = 60.33333333$$

$$\text{EXT PRESS1} + \text{EXT PRESS2} = 73.46666667$$

Tested Factors & Ranking	
External Pressure	73.46666667
External Support	60.33333333
Government Support	55.22222222

Therefore the Environmental Factors that affecting the adoption of cloud computing were graphically presented as follow:



Cloud computing Adoption Drivers

In evaluating adoption drivers that affect the uptake of cloud computing the responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% margin of error +5	Confidence Level of 95% margin of error +5	Confidence Level of 99% margin of error +5	Total Avarage
COM 1	Using Cloud technology is compatible with most aspects of the organization's work	84	88	64	69	75	69.33333
COM 2	Using Cloud technology fits with the Organizations working style	85	88	65	70	76	70.33333
COM 3	I think that using Cloud computing fits well with the way I like to work	85	88	65	70	76	70.33333
	calculating the location of the mean	84.6666667	88	64.6666667	69.6666667	75.6666667	70
PER EAS 1	I believe that Cloud technology is easy to use	83	88	64	69	74	69
PER EAS 2	Learning to use services in the Cloud is easy for me	83	88	64	69	74	69
PER EAS 3	I believe that it is easy to use an application hosted in the Cloud the way I would normally use it when hosted in a traditional on premise environment	84	88	64	69	75	69.33333
	calculating the location of the mean	83.3333333	88	64	69	74.3333333	69.11111
TRI 1	Before deciding whether to adopt Cloud application, I am a	85	88	65	70	76	70.33333
	calculating the location of the mean	85	88	65	70	76	70.33333
Awa 1	I have noticed that Cloud technology is being used by other firms	76	88	60	64	69	64.33333
Awa 2	I am aware of the existence of Cloud computing technology in the market	84	88	64	69	74	69
Awa 3	I know which firms offer Cloud services	85	88	65	70	76	70.33333
	calculating the location of the mean	81.6666667	88	63	67.6666667	73	67.88889
COM - Compatibility , PER EAS - Persieved Ease of Use , TRI - Triability , Awa - Awareness							

Table 15 Cloud Computing Adoption Drivers

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .The adoption factors affecting the uptake of cloud computing were calculated and ranked as follows:

$$\text{COM1+COM2+COM3}/3 = 70$$

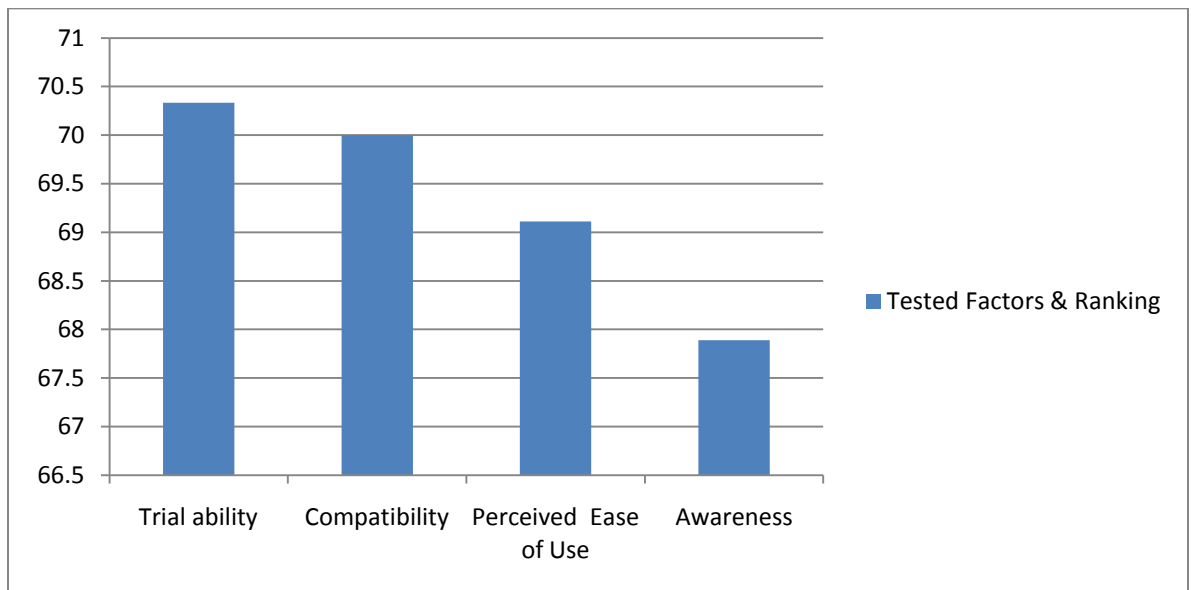
$$\text{PER EAS1+PER EAS2+PER EAS3}/3 = 69.11111111$$

$$\text{TRI1+TRI2}/2 = 70.33333333$$

$$\text{Awa1} + \text{Awa2} + \text{Awa3}/3 = 67.88888889$$

Tested Factors & Ranking	
Trial ability	70.33333333
Compatibility	70
Perceived Ease of Use	69.11111111
Awareness	67.88888889

Therefore the adoption drivers that affect the uptake of cloud computing were graphically presented as follow:



Cloud computing adoption barriers and concern

In evaluating cloud computing adoption barriers and concerns that affect the uptake of cloud computing the responders were asked a set of questions which had a close end response to **YES**, **NO** and **I don't know**, being a descriptive statistic the following was the analysis and response:

Ref	Test Parameters	Number Responders(YES)	Total Number Responders (Sum N)	Confidence Level of 90% margin of error +5	Confidence Level of 95% margin of error +5	Confidence Level of 99% margin of error +5	Total Average
Data Sec 1	Data Security	85	88	65	70	76	70.33333
Data Sec 2	Availability of services and/or data	86	88	66	71	77	71.33333
Data Sec 3	Integrity of services and/or data	85	88	65	70	76	70.33333
Data Sec 4	Confidentiality of corporate data	85	88	65	70	76	70.33333
Data Sec 5	Privacy	83	88	64	69	74	69
Data Sec 6	Loss of control of services and / or data	86	88	66	71	77	71.33333
	calculating the location of the mean	85	88	65.16666667	70.16666667	76	70.44444
Tec Exp 1	Lack of knowledge in the subject area	84	88	64	69	75	69.33333
Tec Exp 2	Difficulty of migration to the Cloud (legacy software)	85	88	65	70	76	70.33333
	calculating the location of the mean	84.5	88	64.5	69.5	75.5	69.83333
Fin Imp 1	Losing current investments	83	88	64	69	74	69
Fin Imp 2	Cost of migrating services to the Cloud	85	88	65	70	76	70.33333
	calculating the location of the mean	84	88	64.5	69.5	75	69.66667
Contr 1	Lack of liability of providers in case of security incidents	86	88	66	71	77	71.33333
Contr 2	Unclear government regulations	85	88	65	70	76	70.33333
Contr 3	Unclear industry regulations	85	88	65	70	76	70.33333
Contr 4	Unclear scheme in the pay per use approach	86	88	66	71	77	71.33333
Contr 5	No guaranteed Service Level Agreement (SLA) and Quality of Service (QoS) by Cloud providers	85	88	65	70	76	70.33333
Contr 6	Intra-clouds (vendor lock-in) migration	86	88	66	71	77	71.33333
	calculating the location of the mean	85.5	88	65.5	70.5	76.5	70.83333
Data Sec- Data security , Tec Exp - Technical Expertise , Finacial Implications ,Contra - Contractual issues							

Table 16 Cloud Computing Adoption Barriers

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL .Cloud computing adoption barriers and concerns affecting the uptake of cloud computing were calculated and ranked as follows:

$$\text{Data sec 1} + \text{Data sec 2} + \text{Data sec 3} + \text{Data sec 4} + \text{Data sec 5} + \text{Data sec 6} / 6 = 70.44444444$$

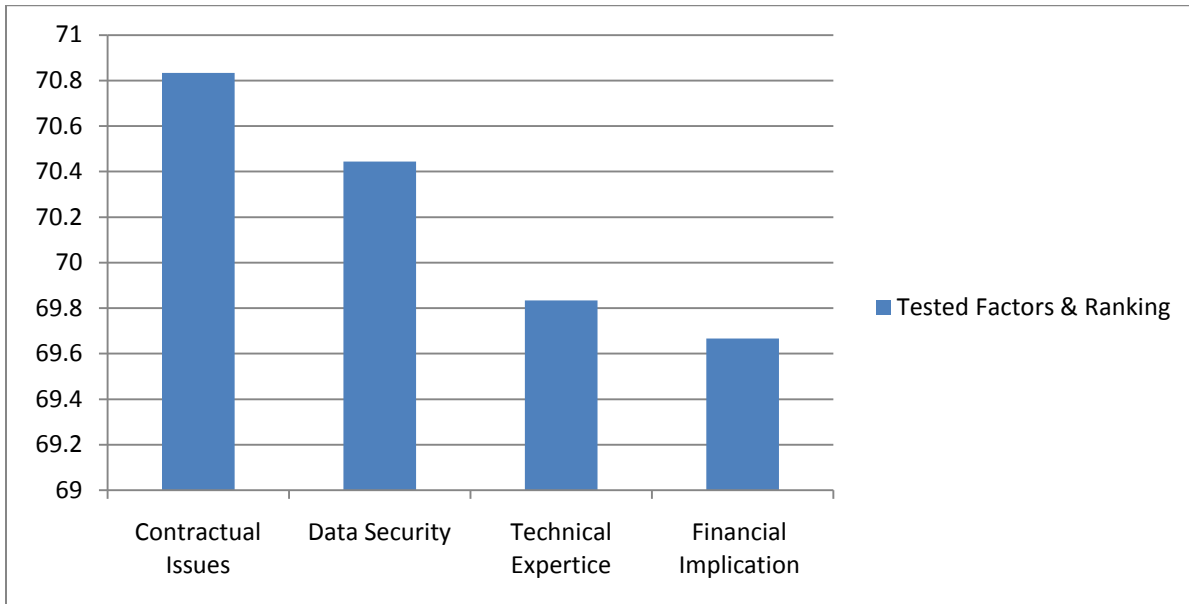
$$\text{Tec Exp 1} + \text{Tec Exp 2} / 2 = 69.83333333$$

$$\text{Fin Imp1} + \text{Fin Imp2} / 2 = 69.66666667$$

$$\text{Contr1} + \text{Contr2} + \text{Contr3} + \text{Contr4} + \text{Contr5} + \text{Contr6} = 70.83333333$$

Tested Factors & Ranking	
Contractual Issues	70.83333333
Data Security	70.44444444
Technical Expertise	69.83333333
Financial Implication	69.66666667

Therefore the Cloud computing adoption barriers and concerns were graphically presented as follow:



Analysis of Research Findings

In the analysis and conclusions of the research findings the following observations were made which were in line with the objectives of the study and the conceptual model which basically highlighted:

1. The relationship between cloud computing and ICT strategy as a driving factor in achieving core strategy
2. Individual factors affecting the adoption of cloud computing
3. Stakeholder factors affecting the adoption of cloud computing
4. Technological factors affecting the adoption of cloud computing
5. Adoption drivers influencing adoption of cloud computing
6. Concerns and barriers affecting the adoptions of cloud computing
7. Proposed cloud computing Adoption framework

The relationship between cloud computing and ICT strategy as a driving factor in achieving core strategy

In this evaluation three factors were tested and ranked, these factors were

- Compatibility of cloud computing in executing core strategy – In the introductory section on the background of NGO's we defined NGO as non-profit making organization which relied heavily on donor to fund their mission, In the research we observed that NGO's execute their work mainly in the fields and the nature, architecture, pay-per-use model and other characteristics of cloud computing fitted well with NGOs mission. The factor was highly rated and therefore it should be highly prioritized when NGO's are executing their core strategy. The factor should be given high priority
- Presence of ICT strategy in NGO's – The purpose of this factor was to evaluate if NGO's have an ICT strategy which basically forms the master plan of driving ICT agenda's. The factor was ranked second which concludes cloud computing should be part of the ICT strategy and thus this factor should be given medium priority
- Cloud computing as an ICT strategy component –The purpose of this factor was to establish the importance of cloud computing being part of the ICT strategy and thus becomes key tool in the execution of ICT strategy, this factor should be as well given priority with low considerations compared to the two above as an ICT executing strategy

Individual factors affecting the adoption of cloud computing

Individual factors contained the following determinant factors affecting the adoption of cloud computing:

- Self-efficacy – This is an individual factor of one's ability to achieve or succeed in specific situations which plays a major role on how an individual approaches a given task. This was key drivers as an individual factor and should be highly prioritized
- Subjective Norm-This is basically social pressure to engage or decline an issue and based on the research findings and ranking in should be given a medium priority
- Attitude –Attitude has been known to be highest driver in technology adoption but in this study it was ranked the least which basically means that we have other key factors that drive adoption of technology apart from individuality and therefore it should be given the least priority in adoption decision.

Organization factors affecting the adoption of cloud computing

The organization factors contained the following determinant factors:

- Financial Resources - firm that has financial resources is better prepared to adopt new technology. This factor is ranked first within the organizational context It therefore means that financial resources should be given high priority when making the decision to adopt Cloud technology.

- Strategic reference –The adoption technology being part of the ICT strategy can influence its adoption which should have a high priority
- Technical Expertise- Availability of technological expertise inside the organization has a direct influence on the decision to adopt new technology
- Policy Regulation –This determinant factor may drive or hinder the adoption of cloud computing technology since we rely on third party (policy makers) to advice as well they may inversely affect the adoption by having strict rules which may hinder adopting cloud technology. Therefore key attention need to be given to this factor.

Technological factors affecting the adoption of cloud computing

The organization factors contained the following determinant factors:

- Compatibility - When making the adoption decision, organizations should ensure that the new technology is compatible with existing technology e.g. (applications) in order to get full support and ease of implementations, the determinant factor was ranked first and therefore it should be given high priority.
- Scalability- This means how elastic in terms of growth can the technology be with minimal technicalities or ease of expanding which should be given high priority
- Financial Implications in cloud adoption –The imaginary factor of losing already invested Assets gives this determinant a strategic perception in terms of investing in new technology
- Competitive Advantage –Being a step ahead drives away competition especially in the NGO sector whereby it can lead to attracting donor’s to fund missions since adopting technology easily stipulated availability of clear processes.
- Confidence level in cloud Application - This is a key determinant on the level of confidence we have in deploying critical organization application in the cloud..
- Confidence level in cloud Infrastructure – The level of confidence we have in deploying critical organization infrastructure.

Stakeholder factors affecting the adoption of cloud computing

The stakeholder determinants affecting the adoption of cloud computing included the following determinant:

- User Satisfaction-Its basically how comfortable and confidence users are in adoption technology the determinant was ranked first the findings and therefore key attentions need to be given to user satisfaction when adopting new technology
- Perceived Ease of use –basically making users believe that they will not require much effort in using a new technology
- Management Support – This is a key factor for consideration when adoption new technology since the top management need to understand the benefits and advantage of adoption a new technology for them to have goodwill in driving the agenda
- Industry Pressure – Basically is the social push to adopt new technology
- External Support – This is the support you get from external vendor when adopting new technology thus cut down on operational expenditure like hiring new staff

Environmental factors affecting the adoption of cloud computing

The key environmental determinant affecting the adoption of cloud computing were listed as follows:

- External Pressure – This determinant has the highest weight and therefore should be given key attention because the adoption of technology is basically driven by outsiders especially for an industry like the NGO's
- External Support – This is support from regulatory and third party in adopting technology and therefore it should be perceived as driving force
- Government support – This is basically support from the government in adoption technology which has the lowest ranking and therefore should be given low priority

Cloud computing adoption drivers

The key determinant from the adoption drivers analyzed for this determinant included:

- Trial ability - This means that when considering adoption of cloud technology, the organization should focus on getting trial software and creating a test environment in order to allow for full testing and piloting before the final decision is made
- Compatibility – How compatible is the new technology with the organization strategy , processes ,existing systems etc. this are some of the key factors to consider
- Perceived ease of use - basically making users believe that they will not require much effort in using a new technology
- Awareness - The level of knowledge about the new technology e.g. experience from people who have adopted the new technology or from information on which vendors are good at delivering what? Though it an important driver but it should not hinder the adoption of new technology and therefore given a low priority.

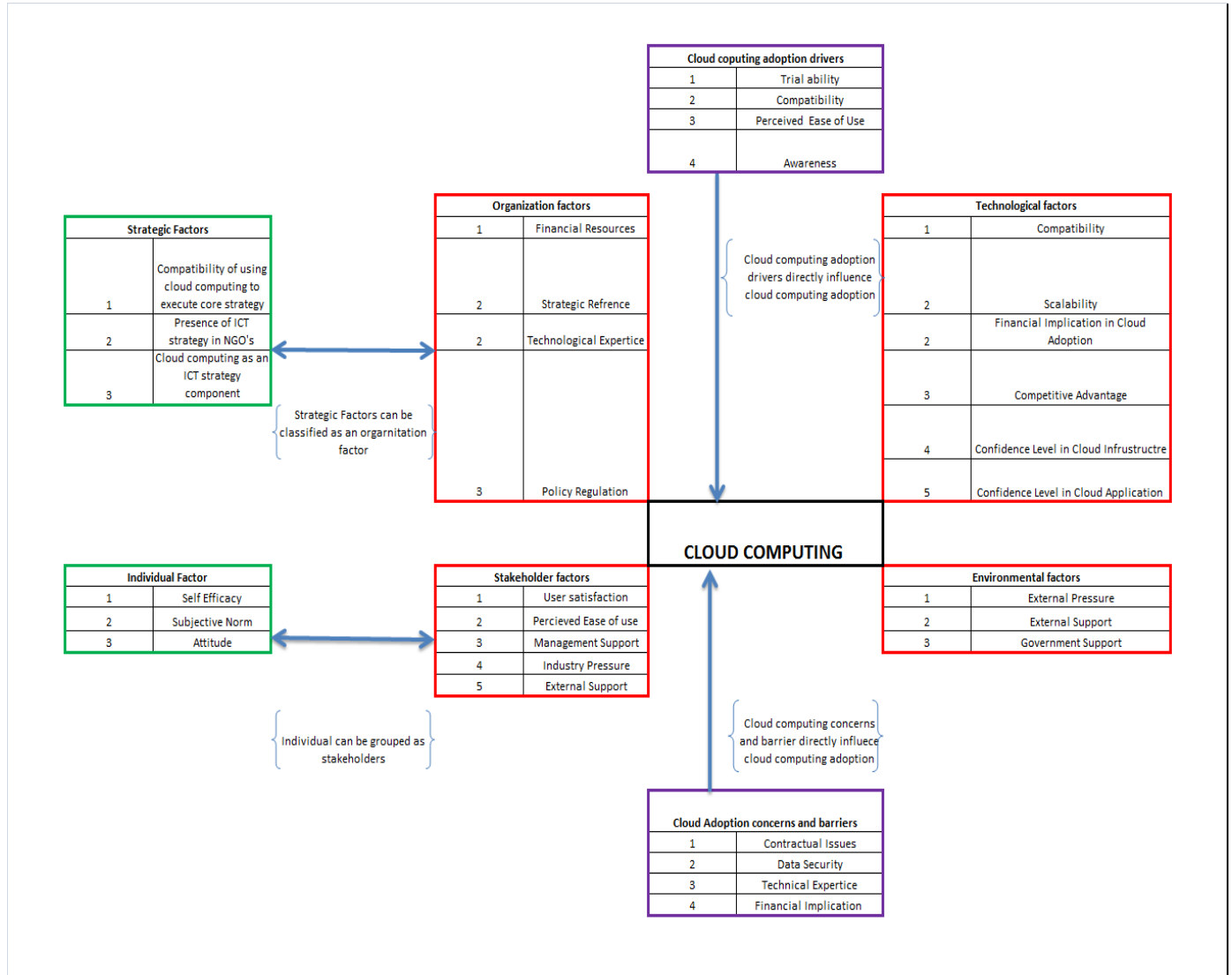
Cloud computing adoption barriers and concerns:

The following key determinants were highlighted as contributing factors to rejection of new technology:

- Contractual Issues-Lack of clarity , vendor locking ,unclear industry regulation is a major consideration which may block adoption of cloud technology its ranked first and therefore should be given high priority
- Data security – Data security is a key issue especially when it comes to cloud adoption and a user don't have control which rises issues like privacy , loss of data and integrity and should have medium priority since the technology has matured with security loopholes being patched
- Technical expertise - Availability of skilled human resource in this area since this is a new computing paradigm in the country though level of skilled resources are coming up.
- Financial Implications-Cost is a barrier especially when it comes to investing in ICT which is considered a support function in most NGO's and the move to go into cloud from existing onsite computing.

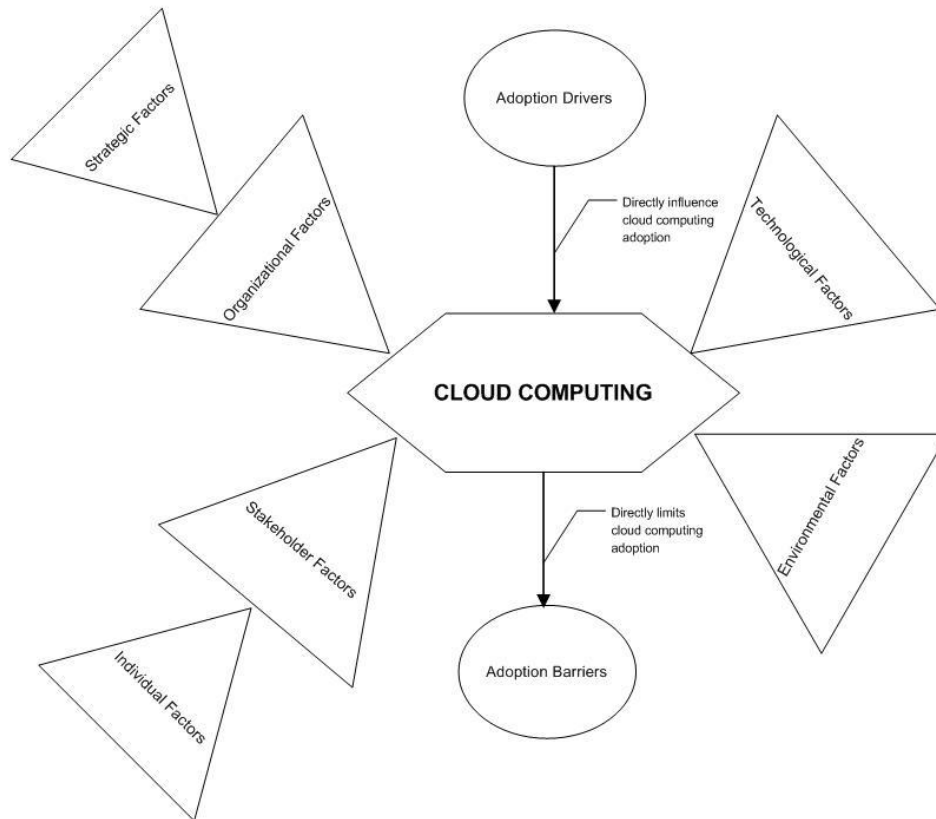
Proposed cloud computing Adoption Framework

In the analysis and ranking of key determinant that directly affect the adoption of cloud computing, each sub-factor was ranked against the core factors and the study proposed the below adoption framework.



Cloud computing Adoption Framework for NGO Summery

Cloud Computing Adoption Framework for NGO's



Proposed cloud adoption processes

In order to adopt cloud computing within the organization the following procedures were proposed to guide the adoption processes.

Step 1 Consideration of High Priority Factors

In the adoption of cloud computing framework Organizational and Stakeholder factors will be the first to be considered. This is because the factors are considered to be internal and can be controlled by the organization. The two factors have a key relationship with individual factors and strategic factors. During this initial consideration from the mentioned key factor the determinants with high priority classification are to be considered this determinant include Financial resources, strategic reference among other as listed in the proposed adoption model. A major key determinant to be considered at this level as well and all through is the cloud adoption drivers which include determinants as Trial ability since it has a direct correlation with the core technology to be adopted.

The next consideration factors with high priority will be technological factors and at this stage determinants such as compatibility, scalability among others as listed on the proposed adoption framework will be considered.

Its desirable as well to considered key major challenges in the adoption of cloud technology with high determinant factors such as contractual issues, data security which should and continue to be monitored all through the adoption of the framework.

Environmental factors are the least since the highest priority consideration is external pressure.

Step 2 Consideration of Medium Priority Factors

In this stage the key medium determinant factor in order of consideration are stakeholders, strategic factor and individual factor some of the determinant factors for consideration include: If NGO's have an ICT strategy , Subjective Norm and industry pressure.

The next consideration are the technological factors which basically is to look at the confidence level by which organization can deploy infrastructure on the cloud and if the organization is willing to take up the risk .The environmental factor plays a key role at the medium level since external support consideration determinant are to be considered.

Step 3 Consideration of Low Priority Factors

Even though not determinant factors have a low priority, it is important to also look at the low priority factors. This includes Policy regulator External support and government support. At the technological factors influence to build confidence level of deploying application on the cloud should be then considered.

Testing and evaluating the proposed cloud computing adoption framework

In concluding the realization of the key objectives of the study, two main objectives of this study was to test and evaluate the proposed cloud computing adoption framework. The study used a questionnaire to gather data and information on the proposed cloud computing framework. Below is a summery and analysis of the data gathered as per proposed cloud computing adoption framework.

Demographic

From a total of 22 questionnaire issued 21 responders responded within the given stipulated time which was 95% response rate. Out of the 20 responders 1 questionnaire was not completed which was 5% and therefore the questionnaires could not be used for analysis and only 20 questionnaires were usable for the analysis.

Evaluating key drivers in the proposed cloud computing adoption framework

In order to test and evaluate the key drives of cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% margin of error +5	Confidence Level of 95% - margin of	Confidence Level of 99%- margin of error +5	Total Avarage
Fct 1	Trial ability	19	20	18	19	19	18.66666667
Fct 2	Compatibility	20	20	19	20	20	19.66666667
Fct 3	Perceived Ease of Use	17	20	17	17	17	17
Fct 4	Awareness	19	20	18	19	19	18.66666667
	calculating the location of the mean	18.75	20	18	18.75	18.75	18.5

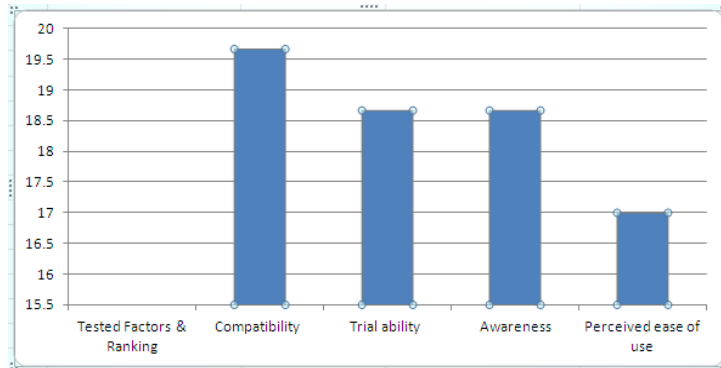
Fct - Factor Influencing cloud computing adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Compatibility	19.66666667
Trial ability	18.66666667
Awareness	18.66666667
Perceived ease of use	17

In conclusion the drives were graphed as indicated below according to priority consideration



Evaluating organizational factors in the proposed cloud computing adoption framework

In order to test and evaluate the organizational factors in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error +5	Confidence Level of 99%- margin of error +5	Total Avarage
Org Fct 1	Financial resource	18	20	17	18	18	17.66666667
Org Fct 2	Strategic References	19	20	18	19	19	18.66666667
Org Fct 3	Technological Expertise	18	20	17	18	18	17.66666667
Org Fct 4	Policy Regulation	17	20	17	17	17	17
	calculating the location of the mean	18	20	17.25	18	18	17.75

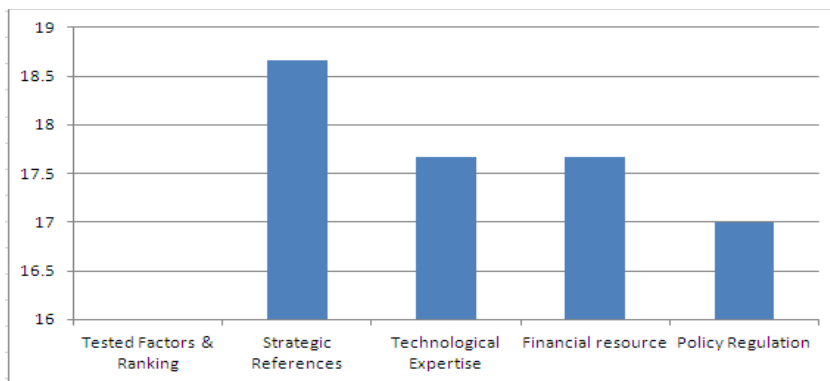
Orgarnizational Factors Influencing cloud computing adoption

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Strategic References	18.66666667
Technological Expertise	17.66666667
Financial resource	17.66666667
Policy Regulation	17

In conclusion the organizational factors were graphed as indicated below according to priority consideration:



Evaluating Strategic factors in the proposed cloud computing adoption framework

In order to test and evaluate the strategic factors influencing adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

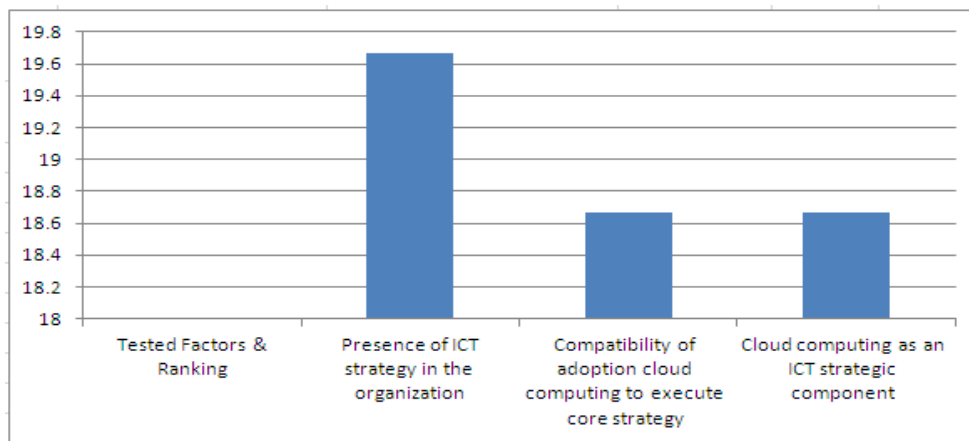
Ref	Test Parameters	Number Responders(YE)	Total Number	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error +5	Confidence Level of 99% - margin of error +5	Total Average
Str Fct 1	cloud computing to execute core strategy	19	20	18	19	19	18.66666667
Str Fct 2	Presence of ICT strategy in the organization	18	20	17	18	18	17.66666667
Str Fct 3	Cloud computing as an ICT strategic component	19	20	18	19	19	18.66666667
	calculating the location of the mean	18.66666667	20	17.66666667	18.66666667	18.66666667	18.33333333
strategic factors Influencing cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Presence of ICT strategy in the organization	19.66666667
Compatibility of adoption cloud computing to execute core strategy	18.66666667
Cloud computing as an ICT strategic component	18.66666667

In conclusion the strategic factors were graphed as indicated below according to priority consideration:



Evaluating Technological factors in the proposed cloud computing adoption framework

In order to test and evaluate the technological factors influencing adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to YES, NO and I don't know, being a descriptive statistic the following was the analysis and response

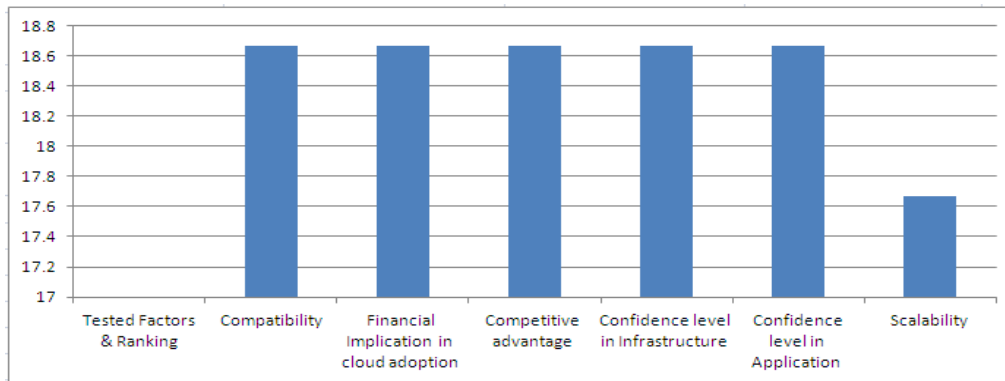
Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% - margin of error +5	Confidence Level of 95% - margin of error +5	Confidence Level of 99% - margin of error +5	Total Average
Tec Fct 1	Compatibility	19	20	18	19	19	18.66666667
Tec Fct 2	Scalability	18	20	17	18	18	17.66666667
Tec Fct 3	Financial Implication in cloud adoption	19	20	18	19	19	18.66666667
Tec Fct 4	Competitive advantage	19	20	18	19	19	18.66666667
Tec Fct 5	Confidence level in Infrastructure	19	20	18	19	19	18.66666667
Tec Fct 6	Confidence level in Application	19	20	18	19	19	18.66666667
	calculating the location of the mean	18.83333333	20	17.83333333	18.83333333	18.83333333	18.5
Technological factors Influencing cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Compatibility	18.66666667
Financial Implication in cloud adoption	18.66666667
Competitive advantage	18.66666667
Confidence level in Infrastructure	18.66666667
Confidence level in Application	18.66666667
Scalability	17.66666667

In conclusion the Technological factors were graphed as indicated below according to priority consideration:



Evaluating Stakeholder factors in the proposed cloud computing adoption framework

In order to test and evaluate the stakeholder factors influencing adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

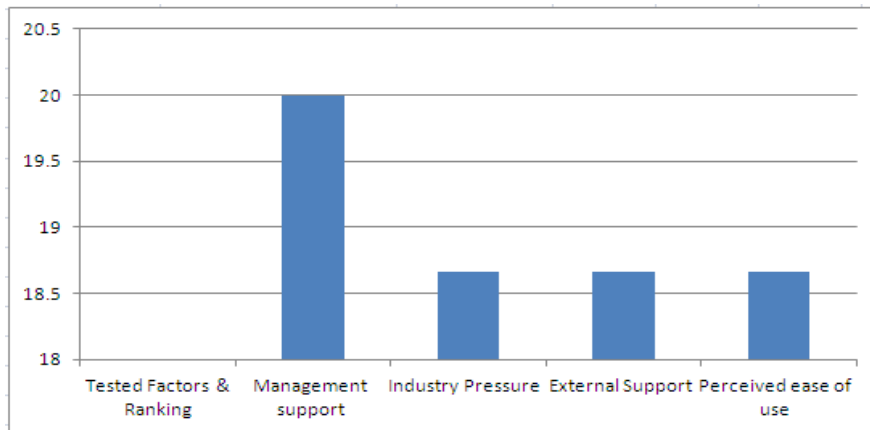
Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum N)	Confidence Level of 90% -	Confidence Level of 95% -	Confidence Level of 99%- margin of error +	Total Avarage
Str Fct 1	Perceived ease of use	19	20	18	19	19	18.66666667
Str Fct 2	Management support	20	20	20	20	20	20
Str Fct 3	Industry Pressure	19	20	18	19	19	18.66666667
Str Fct 4	External Support	19	20	18	19	19	18.66666667
	calculating the location of the mean	19.25	20	18.5	19.25	19.25	19
Stakeholder factors Influencing cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Management support	20
Industry Pressure	18.66666667
External Support	18.66666667
Perceived ease of use	18.66666667

In conclusion the stakeholder factors were graphed as indicated below according to priority consideration:



Evaluating Individual factors in the proposed cloud computing adoption framework

In order to test and evaluate the Individual factors influencing adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

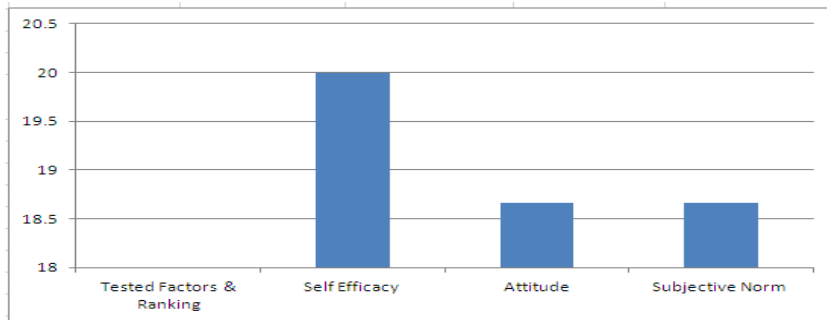
Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum)	Confidence Level of 90% -	Confidence Level of 95% -	Confidence Level of 99%-	Total Avarage
Ind Fct 1	Self Efficacy	19	20	18	19	19	18.66666667
Ind Fct 2	Subjective Norm	18	20	17	18	18	17.66666667
Ind Fct 3	Attitude	19	20	18	19	19	18.66666667
	calculating the location of the mean	18.66666667	20	17.66666667	18.66666667	18.66666667	18.33333333
Individual factors influences cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Self Efficacy	20
Attitude	18.66666667
Subjective Norm	18.66666667

In conclusion the Individual factors were graphed as indicated below according to priority consideration:



Evaluating Environmental factors in the proposed cloud computing adoption framework

In order to test and evaluate the Environmental factors influencing adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to YES, NO and I don't know, being a descriptive statistic the following was the analysis and response

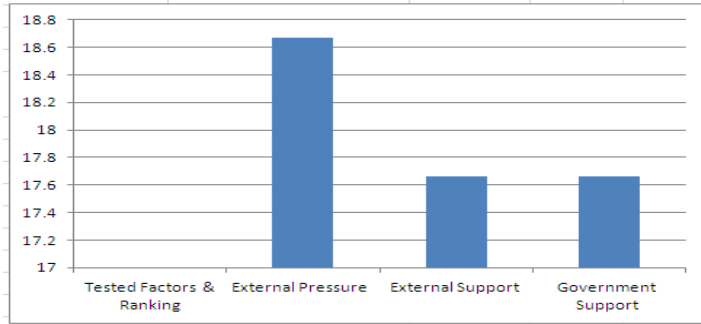
Ref	Test Parameters	Number Responders(YES)	Total Number Responders	Confidence Level of 90% - margin of error +	Confidence Level of 95% - margin of error +5	Confidence Level of 99% - margin of error +5	Total Avarage
Env Fct 1	External Pressure	19	20	18	19	19	18.66666667
Env Fct 2	External Support	18	20	17	18	18	17.66666667
Env Fct 3	Government Support	18	20	17	18	18	17.66666667
	calculating the location of the mean	18.33333333	20	17.33333333	18.33333333	18.33333333	18
Environmental factors influences cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
External Pressure	18.66666667
External Support	17.66666667
Government Support	17.66666667

In conclusion the Environmental factors were graphed as indicated below according to priority consideration:



Evaluating Barriers that hinder adoption of cloud computing in the proposed framework

In order to test and evaluate the barriers that hinder adoption in the proposed cloud computing adoption framework responders were asked a set of questions which had a close end response to **YES, NO and I don't know**, being a descriptive statistic the following was the analysis and response

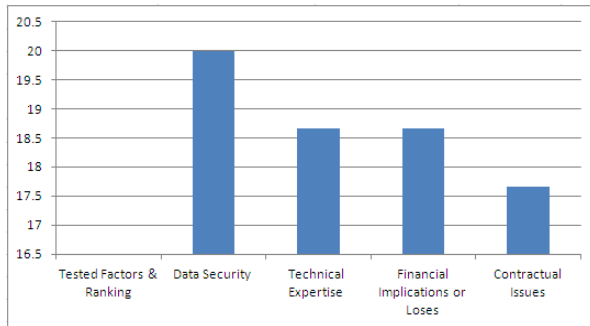
Ref	Test Parameters	Number Responders(YES)	Total Number Reponders (Sum)	Confidence Level of 90% - margin of error	Confidence Level of 95% - margin of error	Confidence Level of 99%- margin of error	Total Avarage
Ad_B Fct 1	Contractual Issues	18	20	17	18	18	17.66666667
Ad_B Fct 2	Data Security	20	20	20	20	20	20
Ad_B Fct 3	Technical Expertise	19	20	18	19	19	18.66666667
Ad_B Fct 4	Financial Implications or Loses	19	20	18	19	19	18.66666667
	calculating the location of the mean	19	20	18.25	19	19	18.75
adoption barriers Influencing cloud computing adoption							

In the above statistic test to located the mean we used Low confidence level of 90% and High confidence level 99%. Other parameter applied were a margin error of + or -5 (accepted or tolerated error) and a response distribution of 50% (expected result).

We concluded that the mean is located at a confidence level of 95% and cannot be higher than HCL or lower than the LCL. The factors that were tested and ranked were highlighted below as follows:

Tested Factors & Ranking	
Data Security	20
Technical Expertise	18.66666667
Financial Implications or Loses	18.66666667
Contractual Issues	17.66666667

In conclusion the Environmental factors were graphed as indicated below according to priority consideration:



Conclusion

The key objectives of the study were achieved in line with the research design applied for this study. Data gathering, analysis, conclusions and recommendations were the highlights and purpose of the study by proposing a cloud computing adoption framework, testing and continuous evaluating the framework.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATION

Summery

The purpose of this study was to undertake a research project on adoption of cloud computing in NGO's within Nairobi and develop a framework that will guide the adoption of cloud computing. In order to understand cloud computing adoption framework, preliminary studies were undertaken to understand the research area on previous technology adoption framework which guided the coining of the problem statement .The problem statement defined the gap between cloud computing as a paradigm and adoption of the paradigm through a better adoption framework which will drive the uptake of cloud computing by addressing various challenges and mitigate risks that are associated with cloud computing within the NGO sector in Nairobi Kenya.

Once the problem statement was defined we then developed an approach to resolve the identified problem through objectives of the study and came up with four objectives and research questions to guide the purpose and structural content of the study.

In this study we appreciated previous work done by other scholars and existing cloud adoption framework and further analyzed and even critiqued existing cloud adoption framework. The analysis and match between existing adoption framework and the objective of the study was the base for the conceptual model. We adoption action research methodology which was the overall plan, structure and strategy that integrated the different components of the study in a coherent and logical way which ensured we effectively address the research problem; it constituted the blueprint for the collection, measurement, and analysis of data in order to come up with a conclusive suggestion and recommendation.

The study then proceeded to collect data from NGO's in Nairobi, analyze and discuss the finding whose key output was a proposed framework for cloud computing adoption for NGO in Kenya.

The proposed cloud adoption framework for NGO was further evaluated and a step by step approach was designed to guide the adoption of cloud computing.

Conclusion

The study fulfilled the objectives of the research and answered the research questions that were outlined in the introductory part of the study below is a conclusive response to the objectives of the study:

Investigate the adoption drivers and significance of cloud computing in NGO's in Nairobi-Kenya.

The introductory and pre-amble of this study gave a general layout of cloud computing adoption in NGO's and further reason were investigated in the literature review by looking on previous research done by various scholar on the drivers and significance of cloud computing adoption in NGO's .The data collection, analysis and discussions concluded that the key drivers in cloud computing adoption in NGO's were:

- Trial ability - This means that when considering adoption of cloud technology, the organization should focus on getting trial software and creating a test environment in order to allow for full testing and piloting before the final decision is made
- Compatibility – How compatible is the new technology with the organization strategy , processes ,existing systems etc. this are some of the key factors to consider
- Perceived ease of use - basically making users believe that they will not require much effort in using a new technology
- Awareness - The level of knowledge about the new technology e.g. experience from people who have adopted the new technology or from information on which vendors are good at delivering what.

Investigate the relationship between cloud computing and ICT strategy as a contributing factor to the NGO's core strategy.

This was a significant objective for this study, since it held the underlying base for adoption of cloud computing by aligning cloud computing as a technology and ICT strategy as a plan to achieve a bigger organization objective or mission. The research concluded that the key determinant factors for this objective were:

- Compatibility of cloud computing in executing core strategy – In the introductory section on the background of NGO's we defined NGO as non-profit making organization which relied heavily on donor to fund their mission, In the research we observed that NGO's execute their work mainly in the fields and the nature, architecture, pay-per-use model and other characteristics of cloud computing fitted well with NGOs mission. The factor was highly rated and therefore it should be highly prioritized when NGO's are executing their core strategy.
- Presence of ICT strategy is NGO's – The purpose of this factor was to evaluate if NGO's have an ICT strategy which basically forms the master plan of driving ICT agenda's.

- Cloud computing as an ICT strategy component –The purpose of this factor was to establish the importance of cloud computing being part of the ICT strategy and thus becomes key tool in the execution of ICT strategy, this factor should be as well given priority.

Investigate previous cloud computing adoption frameworks

The following cloud computing adoption framework were investigated as listed ;Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Diffusion of Innovation (DOI),The Technology Acceptance Model (TAM),The Unified Theory of Acceptance and Use of Technology (UTAUT),Social Cognitive Theory (SCT) ,Motivational model (MM)and Model of PC utilization (MPCU) .In conclusion the previous cloud computing adoption framework was the baseline for the conceptual framework which had four component as Listed below:

- Organizational Factors
- Stakeholder factor
- Technological Factors
- Environmental Factors

Formulate and test a framework that will drive the adoption of cloud computing in NGO's in Nairobi-Kenya.

In our data analysis and discussion a cloud computing adoption framework customized to the NGO's sector was designed with specific determinant factors unique to NGOs. The determinant factors were tested using statistical techniques and ranked according to their level of importance under each factor, as outlined on the proposed cloud computing adoption framework. The proposed adoption framework has been captured under the title proposed cloud computing adoption framework with the key determinant and their relationship.

Evaluate the adoption framework of cloud computing within the NGO-in Nairobi – Kenya

In the study the evaluation of the framework will be a continuous process will be a continuous process as the framework has been proposed to an NGO to evaluate whether they can adopt the framework or need to be customized further. This is in line with the action research methodology which was adopted for this research undertaking.

The finding of the evaluation will further be assessed to customize the proposed cloud computing adoption framework and give a final solution to the problem statement of the research.

Limitation and Recommendation

In concluding the research the following limitation and recommendations were made:

1. Scope of the study

In this study the research was undertaken within NGO based in Nairobi; with almost half of the total number of NGO who are located outside Nairobi not participating thus reducing the level of confidence in scope sampling and sample spread and final conclusion on a better adoption framework for NGO's.

2. The mode of data collection

In the study only Questionnaire were used to collect data which posse's difficulties especially when collecting qualitative data; a mixture of data collection methods and tools should be used in future in order to capture both qualitative and quantitative data.

Suggestions for further research

The finding of this research was limited to adoption framework of cloud computing in the NGO's; further research and investigation need to be conducted on the following areas

- Cloud computing implementation framework
- Cloud computing evaluation framework

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APPENDIX

NGO Participant in the survey

Ref No	Name of Organization	Organization criteria
R1	International Centre for Research in Livestock (ILRI)	Agriculture
R2	International Centre for Research in Livestock (ILRI)	Agriculture
R3	World Agroforestry Center (ICRAF)	Agriculture
R4	World Agroforestry Center (ICRAF)	Agriculture
R5	World Agroforestry Center (ICRAF)	Agriculture
R6	Pathfinder International	Health & HIV and Aids
R7	Pathfinder International	Health & HIV and Aids
R8	AMREF	Health & HIV and Aids
R9	AMREF	Health & HIV and Aids
R10	AMREF	Health & HIV and Aids
R11	AMREF	Health & HIV and Aids
R12	PSI	Health & HIV and Aids
R13	PSI	Health & HIV and Aids
R14	PSI	Health & HIV and Aids
R15	Action Against climate change	Environment and Conservation
R16	USAID-HIV AIDS	Health & HIV and Aids
R17	KEMRI	Health & HIV and Aids
R18	KEMRI	Health & HIV and Aids
R19	Catholic Relief Services	Relief
R20	Catholic Relief Services	Relief
R21	Catholic Relief Services	Relief
R22	Red Cross	Relief
R23	Red Cross	Relief
R24	Christian Mission Aid	Relief
R25	African Network for Animal Welfare	Environment and Conservation
R26	David Shedrick Wildlife trust	Environment and Conservation
R27	Action Aid Kenya	Relief
R28	Institute of Policy Analysis and Research	Information
R29	African Economic Research Consortium (AERC)	Economic
R30	African Economic Research Consortium (AERC)	Economic
R31	African Economic Research Consortium (AERC)	Economic
R32	Disability people International	Disabilities
R33	UNHCR	Refugees
R34	UNHCR	Refugees
R35	UNHCR	Refugees
R36	UNHCR	Refugees
R37	Computers for School Kenya	Education

R38	Computers for School Kenya	Education
R39	Computers for School Kenya	Education
R40	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R41	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R42	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R43	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R44	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R45	International Centre of Insect Physiology and Ecology (icipe)	Agriculture
R46	AFRICAN OLD AGE NETWORK KENYA	Old Age
R47	Islamic Relief	Relief
R48	Islamic Relief	Relief
R49	Kenya Human Rights	Human Rights
R50	Child Fund	Children
R51	Child Fund	Children
R52	Child Fund	Children
R53	ECONOMIC GOVERNANCE INITIATIVE	Governance
R54	ECONOMIC GOVERNANCE INITIATIVE	Governance
R55	MERCYCORPS	Youth
R56	MERCYCORPS	Youth
R57	URBAN SETTLEMENT IMPROVEMENT PROGRAMME	Housing & Human Settlement
R58	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation
R59	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation
R60	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation
R61	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation
R62	Agrochemicals Association of Kenya	Agriculture
R63	Agrochemicals Association of Kenya	Agriculture
R64	Agrochemicals Association of Kenya	Agriculture
R65	Agrochemicals Association of Kenya	Agriculture
R66	Agrochemicals Association of Kenya	Agriculture
R67	Agrochemicals Association of Kenya	Agriculture
R68	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation

R69	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation
R70	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation
R71	Children Homes of Africa Network (CHAN)	Children
R72	Children Homes of Africa Network (CHAN)	Children
R73	Children Homes of Africa Network (CHAN)	Children
R74	Children Homes of Africa Network (CHAN)	Children
R75	Children Homes of Africa Network (CHAN)	Children
R76	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation
R77	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation
R78	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation
R79	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation
R80	GREEN WORLD	Environment and Conservation
R81	GREEN WORLD	Environment and Conservation
R82	GREEN WORLD	Environment and Conservation
R83	GREEN WORLD	Environment and Conservation
R84	Greenbelt Movement	Environment and Conservation
R85	Greenbelt Movement	Environment and Conservation
R86	Greenbelt Movement	Environment and Conservation
R87	Intermediate Technology Development Group (ITDG) - Practical Action	Information
R88	Intermediate Technology Development Group (ITDG) - Practical Action	Information
R89	Intermediate Technology Development Group (ITDG) - Practical Action	Information
R90	Intermediate Technology Development Group (ITDG) - Practical Action	Information
R91	Intermediate Technology Development Group (ITDG) - Practical Action	Information
R92	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic
R93	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic
R94	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic
R95	Community Training Research and Development	Peace & Culture
R96	Community Training Research and Development	Peace & Culture

Email Introductory to Responders

Dear Sir/Madam

I would like to invite you to kindly participate in this survey questionnaire: “A FRAMEWORK FOR ADOPTION OF CLOUD COMPUTING IN NON-GOVERMENTAL ORGANIZATION IN NAIROBI – KENYA “.

The survey forms part of my MSc ITM study requirements and all the information that you provide will be used for purposes of this research only.

The questionnaire will take you only a few minutes to complete.

Kindly see attached, fill and complete the questions.

Thank you in Advance for your participation.

Regards,

Tonny Kiprotich Rop

Questionnaire

A survey questionnaire on a framework for adoption of cloud computing in non-governmental organization in Nairobi Kenya

Purpose: The purpose of this questionnaire is to collect data which will be used to develop a framework for adoption of cloud computing in non-governmental organization in Nairobi-Kenya.

Instructions: Respond to all questions as accurate and precise as possible; your response is important in the undertaking of this research and its accuracy.

Caution: Data collected for this undertaking shall be strictly and only used for this research and will be kept privately and treated with outmost confidentiality.

Section 1: Demographic Information:

- a) Name of your Organization
- b) Purpose/mission of your organization
- c) Respondent Designation

d) Respondent Age

e) Period worked at the organization

f) Respondent Department /unit/Section

g) Respondent Experience in ICT	2 years and below	2 years to 4 years	4years to 6years	6 years and above
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h) Respondent ICT Qualification	Diploma	Bachelor's Degree	Master's Degree	Doctorate Degree
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Section 2: Current ICT Setup:

a) Does your organization have an ICT strategy?

YES	NO	I don't Know
-----	----	--------------

b) How has your ICT been deployed?

ON SITE/PREMISE	IN THE CLOUD	I don't Know
-----------------	--------------	--------------

c) Does Cloud computing form part of the ICT strategy?

YES	NO	I don't Know
-----	----	--------------

d) Can cloud computing align to your ICT strategy?

YES	NO	I don't Know
-----	----	--------------

e) Does your organization host any applications in the Cloud?

YES	NO	I don't Know
-----	----	--------------

f) How many organizational applications are hosted in the cloud out of all applications?

1	2	3	4	5	All	None
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g) Select the adoption model that the organization has adopted?

Infrastructure as a service (IaaS)	
Platform as a service (PaaS)	
Software as a Service (SaaS)	
None	

h) Based on the above Question, why was the adoption model adopted?

.....

i) Select the implementation model that the organization has adopted?

Private cloud	Public cloud	Hybrid cloud	Community cloud	None
---------------	--------------	--------------	-----------------	------

j) Based on the above Question, why was the implementation model adopted?

.....

k) Who managed and handled migration to the cloud in your organization?

Internal ICT staff	
Internal ICT staff with help of consultants /outsourced	
Consultants/ outsourced	

Section 3: Technological Factors:

a) Does your current Infrastructure support cloud computing?

YES	NO
-----	----

b) Please indicate to what extent you agree with the listed statements by using the following scale

Slightly disagree	Strongly disagree	Neutral	Slightly Agree	Strongly Agree
-------------------	-------------------	---------	----------------	----------------

c) The organization is more likely to be deployed the below critical application services on the cloud?

- i. ERP Application
- ii. Payroll
- iii. Human Resources
- iv. Procurement
- v. Accounting and finance
- vi. Project management
- vii. Application development in the cloud
- viii. Web hosting
- ix. Email
- x. Data backup
- xi. Other (please specify and rate).....

d) The organization is more likely to be deployed the below critical Infrastructure services on the cloud?

- i. Virtual machine
- ii. Security service
- iii. WAN infrastructure
- iv. Data center /colocation
- v. Other (please specifies and rate)

Section 4: Stakeholder Factors:

a) Does the management support ICT as a driving factor of achieving organization goal?

YES	NO
-----	----

b) Please indicate to what extent you agree with the listed statements by using the following scale

Slightly disagree	Strongly disagree	Neutral	Slightly Agree	Strongly Agree
-------------------	-------------------	---------	----------------	----------------

- i. Users can access services easily (minimal or non-complexity) if they are hosted on the cloud.....
- ii. Users can access services anywhere in they are hosted on the cloud.....
- iii. Users are content with the availability of services if they are hosted on the cloud.....
- iv. Users are not concerned where the applications are hosted

Section 5: Organization Factors:

a) Is cloud computing part of the organization core strategy?

YES	NO	I don't Know
-----	----	--------------

b) Does the overall practice in ICT industry drive the organization to deploy cloud computing in the organization?

YES	NO	I don't Know
-----	----	--------------

c) Is it a strategic necessity to deploy cloud computing to achieve organization objective?

YES	NO	I don't Know
-----	----	--------------

d) Is availability of support from cloud computing vendors a factor in organization decision to adopt Cloud computing?

YES	NO	I don't Know
-----	----	--------------

e) Does the organization have the technical and management resource capability to adopt cloud computing?

YES	NO	I don't Know
-----	----	--------------

f) Does the organization have the capability to access consultancy services from vendors in adopting cloud computing?

YES	NO	I don't Know
-----	----	--------------

Section 6: Environmental Factors:

Please indicate to what extent you agree with the listed statements by using the following scale

Slightly disagree	Strongly disagree	Neutral	Slightly Agree	Strongly Agree
-------------------	-------------------	---------	----------------	----------------

- a) Are you aware that there are policies by the government that regulate the adoption of cloud computing?
.....
- b) Are you aware of any adoption framework for cloud computing in NGO's?
- c) Are you aware of any industry regulations in cloud computing?

Section 7: Cloud Computing Concerns/Barriers:

Please indicate to what extent you agree with the listed statements by using the following scale

Slightly disagree	Strongly disagree	Neutral	Slightly Agree	Strongly Agree
-------------------	-------------------	---------	----------------	----------------

- a) The organization main concern in adopting cloud computing are:
 - i. Data Security
 - ii. Availability of services and/or data
 - iii. Integrity of services and/or data
 - iv. Confidentiality of corporate data
 - v. Privacy
 - vi. Loss of control of services and / or data
 - vii. Lack of knowledge in the subject area
 - viii. Losing current investments
 - ix. Lack of liability of providers in case of security incidents
 - x. Unclear government regulations
 - xi. Unclear industry regulations
 - xii. Unclear scheme in the pay per use approach
 - xiii. Difficulty of migration to the Cloud (legacy software)
 - xiv. No guaranteed Service Level Agreement (SLA) and Quality of Service (QoS) by Cloud providers
.....
 - xv. Cost of migrating services to the Cloud
 - xvi. Intra-clouds (vendor lock-in) migration
 - xvii. Other (please specify and rate)

List of Participant in the survey Questionnaire

Ref No	Name of Organization	Organization criteria	Gender	Age	Respondent designation	Respondent department	Respondent ICT Qualification	Respondent Qualification
R1	International Centre for Research in Livestock (ILRI)	Agriculture	Male	46	Head of ICT	ICT	6 years and Above	Bachelor
R2	International Centre for Research in Livestock (ILRI)	Agriculture	Male	30	Research Associate	Support	Non-ICT	Non-ICT
R3	World Agroforestry Center (ICRAF)	Agriculture	Male	31	MIS Officer	ICT	4 to 6 Years	Bachelor
R4	World Agroforestry Center (ICRAF)	Agriculture	Female	30	Operations Officer	Operations	Non-ICT	Non-ICT
R5	World Agroforestry Center (ICRAF)	Agriculture	Male	40	Research Associate	Operations	Non-ICT	Non-ICT
R6	Pathfinder International	Health & HIV and Aids	Male	35	Head of ICT	ICT	6 years and Above	Bachelor
R7	Pathfinder International	Health & HIV and Aids	Female	39	Support Officer	Administration	Non-ICT	Non-ICT
R8	AMREF	Health & HIV and Aids	Male	37	Head of ICT	ICT	6 years and Above	Masters
R9	AMREF	Health & HIV and Aids	Male	32	Systems Administrator	ICT	6 years and Above	Bachelor
R10	AMREF	Health & HIV and Aids	Male	35	Network Administrator	ICT	6 years and Above	Bachelor
R11	AMREF	Health & HIV and Aids	Female	34	ICT Support Officer	ICT	6 years and Above	Bachelor
R12	PSI	Health & HIV and Aids	Male	40	ICT coordinator	ICT	6 years and Above	Bachelor
R13	PSI	Health & HIV and Aids	Female	33	Finance and Admin Officer	Finance and Administration	Non-ICT	Non-ICT
R14	PSI	Health & HIV and Aids	Male	30	Data Analyst	Research and Information	Non-ICT	Non-ICT
R15	Action Against climate change	Environment and Conservation	Female	33	ICT Officer	ICT	4 to 6 Years	Bachelor
R16	USAID-HIV AIDS	Health & HIV and Aids	Male	31	Systems Administrator	ICT	6 years and Above	Bachelor
R17	KEMRI	Health & HIV and Aids	Male	41	Infrastructure Head	ICT	6 years and Above	Bachelor
R18	KEMRI	Health & HIV and Aids	Male	36	Procurement officer	Procurement	Non-ICT	Non-ICT
R19	Catholic Relief Services	Relief	Male	35	Snr ICT Officer	ICT	6 years and Above	Masters
R20	Catholic Relief Services	Relief	Female	29	Finance officer	Finance	Non-ICT	Non-ICT
R21	Catholic Relief Services	Relief	Female	31	Finance officer	Finance	Non-ICT	Non-ICT
R22	Red Cross	Relief	Male	37	Head of Systems	ICT	6 years and Above	Bachelor
R23	Red Cross	Relief	Male	32	HR Personnel	Administration	Non-ICT	Non-ICT
R24	Christian Mission Aid	Relief	Male	35	Regional ICT	ICT	6 years and Above	Bachelor
R25	African Network for Animal Welfare	Environment and Conservation	Male	28	ICT Officer	ICT	4 to 6 Years	Diploma

R26	David Shedrick Wildlife trust	Environment and Conservation	Male	30	ICT Officer	ICT	4 to 6 Years	Bachelor
R27	Action Aid Kenya	Relief	Male	38	ICT Manager	ICT	6 years and Above	Masters
R28	Institute of Policy Analysis and Research	Information	Female	31	Network Administrator	ICT	4 to 6 Years	Bachelor
R29	African Economic Research Consortium (AERC)	Economic	Male	38	Head of ICT	ICT	6 years and Above	Masters
R30	African Economic Research Consortium (AERC)	Economic	Male	30	Human Resources	Administration	Non-ICT	Non-ICT
R31	African Economic Research Consortium (AERC)	Economic	Female	40	Communications officer	Communication	Non-ICT	Non-ICT
R32	Disability people International	Disabilities	Female	26	ICT Officer	ICT	4 to 6 Years	Bachelor
R33	UNHCR	Refugees	Male	42	ICT Manager	ICT	6 years and Above	Bachelor
R34	UNHCR	Refugees	Male	29	HR Officer	Administration	Non-ICT	Non-ICT
R35	UNHCR	Refugees	Female	31	Programme Support	Administration	Non-ICT	Non-ICT
R36	UNHCR	Refugees	Male	37	Programme Support	Administration	Non-ICT	Non-ICT
R37	Computers for School Kenya	Education	Male	33	Network Administrator	ICT	6 years and Above	Bachelor
R38	Computers for School Kenya	Education	Female	28	Data Analyst	Support	Non-ICT	Non-ICT
R39	Computers for School Kenya	Education	Female	31	Finance Officer	Finance	Non-ICT	Non-ICT
R40	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Male	41	Head of Systems	ICT	6 years and Above	Bachelor
R41	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Male	33	Programme Support	Programmes	Non-ICT	Non-ICT
R42	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Male	30	Programme Support	Programmes	Non-ICT	Non-ICT
R43	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Male	33	Programme Support	Programmes	Non-ICT	Non-ICT
R44	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Female	31	Programme Support	Programmes	Non-ICT	Non-ICT
R45	International Centre of Insect Physiology and Ecology (icipe)	Agriculture	Female	36	ICT Support	ICT	6 years and Above	Bachelor
R46	AFRICAN OLD AGE NETWORK KENYA	Old Age	Male	35	Operations and ICT Officer	ICT	6 years and Above	Bachelor
R47	Islamic Relief	Relief	Male	32	Programme coordinator	Programmes	Non-ICT	Non-ICT

R48	Islamic Relief	Relief	Male	40	Head of missions	Operations	Non-ICT	Non-ICT
R49	Kenya Human Rights	Human Rights	Female	34	Administration Officer	Finance and Administration	Non-ICT	Non-ICT
R50	Child Fund	Children	Male	42	ICT Head	ICT	6 years and Above	Bachelor
R51	Child Fund	Children	Male	34	Programme office	Programmes	Non-ICT	Non-ICT
R52	Child Fund	Children	Male	36	Programme office	Programmes	Non-ICT	Non-ICT
R53	ECONOMIC GOVERNANCE INITIATIVE	Governance	Female	30	Finance Officer	Administration	Non-ICT	Non-ICT
R54	ECONOMIC GOVERNANCE INITIATIVE	Governance	Female	31	Administration Officer	Administration	Non-ICT	Non-ICT
R55	MERCYCORPS	Youth	Male	36	ICT Officer	ICT	4 to 6 Years	Bachelor
R56	MERCYCORPS	Youth	Female	32	HR Officer	Administration	Non-ICT	Non-ICT
R57	URBAN SETTLEMENT IMPROVEMENT PROGRAMME	Housing & Human Settlement	Female	35	Finance Officer	Administration	Non-ICT	Non-ICT
R58	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation	Female	32	Finance officer	Finance	Non-ICT	Non-ICT
R59	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation	Male	31	Finance officer	Finance	Non-ICT	Non-ICT
R60	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation	Male	32	Finance officer	Finance	Non-ICT	Non-ICT
R61	Environment & Sustainable Development Angaza Youth Works (AYW)	Environment and Conservation	Male	34	Project officer	Projects	Non-ICT	Non-ICT
R62	Agrochemicals Association of Kenya	Agriculture	Male	33	Network Administrator	ICT	4 to 6 Years	Non-ICT
R63	Agrochemicals Association of Kenya	Agriculture	Male	31	Systems Administrator	ICT	6 years and Above	Bachelor
R64	Agrochemicals Association of Kenya	Agriculture	Male	41	Project Manager	Support	Non-ICT	Non-ICT
R65	Agrochemicals Association of Kenya	Agriculture	Male	36	Finance Officer	Finance	Non-ICT	Non-ICT
R66	Agrochemicals Association of Kenya	Agriculture	Male	35	Finance Officer	Finance	Non-ICT	Non-ICT
R67	Agrochemicals Association of Kenya	Agriculture	Female	29	Finance Officer	Finance	Non-ICT	Non-ICT

R68	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation	Female	31	ICT Associate	ICT	4 to 6 Years	Bachelor
R69	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation	Female	37	Field Officer	Programmes	Non-ICT	Non-ICT
R70	Global Environmental Strategy Centre for Human Development (CHD)	Environment and Conservation	Male	32	Field Officer	Programmes	Non-ICT	Non-ICT
R71	Children Homes of Africa Network (CHAN)	Children	Male	35	Programme Manager	Programmes	Non-ICT	Non-ICT
R72	Children Homes of Africa Network (CHAN)	Children	Male	28	Programme office	Programmes	Non-ICT	Non-ICT
R73	Children Homes of Africa Network (CHAN)	Children	Male	30	Project officer	Programmes	Non-ICT	Non-ICT
R74	Children Homes of Africa Network (CHAN)	Children	Male	35	ICT Administrator	ICT	6 years and Above	Non-ICT
R75	Children Homes of Africa Network (CHAN)	Children	Female	31	Administratio n Officer	Finance	Non-ICT	Non-ICT
R76	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation	Female	34	Project officer	Support Services	Non-ICT	Non-ICT
R77	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation	Female	28	Project officer	Support Services	Non-ICT	Non-ICT
R78	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation	Female	25	Field Officer	Support Services	Non-ICT	Non-ICT
R79	Cohort for Research on Environment, Urban Management and Human Settlements	Environment and Conservation	Male	30	Field Officer	Support Services	Non-ICT	Non-ICT
R80	GREEN WORLD	Environment and Conservation	Male	37	ICT coordinator	ICT	6 years and Above	Masters
R81	GREEN WORLD	Environment	Male	41	Project	Prgrammes	Non-ICT	Non-ICT

		and Conservation			Specialist			
R82	GREEN WORLD	Environment and Conservation	Male	30	Programme officer	Prgrammes	Non-ICT	Non-ICT
R83	GREEN WORLD	Environment and Conservation	Male	29	Data Analyst	Prgrammes	Non-ICT	Non-ICT
R84	Greenbelt Movement	Environment and Conservation	Male	34	Front office Administrator	Administratio n	Non-ICT	Non-ICT
R85	Greenbelt Movement	Environment and Conservation	Male	32	Field Officer	Support	Non-ICT	Non-ICT
R86	Greenbelt Movement	Environment and Conservation	Male	32	Field Officer	Support	Non-ICT	Non-ICT
R87	Intermediate Technology Development Group (ITDG) - Practical Action	Information	Male	35	ICT cordinator	ICT	6 years and Above	Bachelor
R88	Intermediate Technology Development Group (ITDG) - Practical Action	Information	Male	27	Head of Data and Information	ICT	4 to 6 Years	Bachelor
R89	Intermediate Technology Development Group (ITDG) - Practical Action	Information	Female	31	Data Analyst	ICT	4 to 6 Years	Bachelor
R90	Intermediate Technology Development Group (ITDG) - Practical Action	Information	Male	30	Data Analyst	ICT	4 to 6 Years	Bachelor
R91	Intermediate Technology Development Group (ITDG) - Practical Action	Information	Male	34	Data Analyst	ICT	6 years and Above	Bachelor
R92	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic	Male	28	Programe Executive	Operations	Non-ICT	Non-ICT
R93	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic	Male	34	Administratio n Officer	Operations	Non-ICT	Non-ICT
R94	KENYA ASSOCIATION OF MANUFACTURERS (KAM)	Economic	Male	39	Administratio n Officer	Operations	Non-ICT	Non-ICT
R95	Community Training Research and Development	Peace & Culture	Male	36	Field Officer	Support Services	Non-ICT	Non-ICT
R96	Community Training Research and Development	Peace & Culture	Male	32	Field Officer	Support Services	Non-ICT	Non-ICT

