



**UNIVERSITY OF NAIROBI  
COLLEGE OF BIOLOGICAL & PHYSICAL SCIENCES  
SCHOOL OF COMPUTING AND INFORMATICS**

**ASSESSING THE EFFECT OF CLOUD COMPUTING  
ADOPTION ON MICRO-FINANCE INSTITUTIONS  
OPERATIONS WITHIN NAIROBI COUNTY**

**By**

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

July, 2017

**DECLARATION**

This research project is my own original work and has not been presented for the award of degree in any other university

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**SUPERVISOR APPROVAL:**

This research project has been submitted for examination towards fulfillment for the award of Masters of Science in Information Technology Management with my approval as the university

Supervisor.

Signature.....

Date .....

**Prof. Elijah I. Omwenga.**

## **DEDICATION**

This project is dedicated to my family for the unending support they have always given me.

## **ACKNOWLEDGEMENT**

First and foremost I would like to thank the almighty God for helping me complete this research project successfully. I would also like to sincerely acknowledge and thank my supervisor for the support and dedication he provided throughout. To all my lectures I say thank you for quenching my thirst for knowledge.

To all my family members I thank you for the support.

## **ABSTRACT**

The use of computers and related technologies has become imperative in the daily operations of most organizations in Kenya. Cloud computing provides many attractive services to users of the services such as usage-based pricing, ubiquitous network access, transferring of risk to the service provider and provision of on demand self-service. However, it is not known whether these attractive services have resulted to positive gains in the operations of the organizations using these cloud services .The study aims at assessing the effect of cloud computing adoption on the operations of microfinance institutions (MFIs) within Nairobi County .The objective of the study was achieved, where this study revealed that the cloud adoption is at 92% and most of the MFIs have adopted SaaS model. Questionnaires were administered to the selected population and multiple regression used to test the effect of the independent variable on MFI operations which had a positive correlation. The study revealed that cloud usage and cloud user satisfaction have positive effect on MFIs operations. Security and data loss was cited as the biggest concern by most MFI.

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## Key terms and Abbreviations

**MFIS** - Micro Finance Institutions. This represent financial institutions registered by Sacco Societies Regulatory Authority of Kenya

**Cloud** – Cloud Computing Technology.

**PaaS** - Platform as a Service

**IaaS** - Infrastructure as a Service

**SaaS** - Software as a Service

**ICT** - Information and Communication Technology

**CC** - Cloud computing

**LAMP** - List of Apache–MySQL–PHP

**Sacco** - Savings and Credit Cooperative Organization

**IS** -Information System

Cloud computing system – These are the applications and related hardware involved in the cloud computing operation both on the user side and on the hosted server.

# CHAPTER ONE

## Introduction

Most of the organizations in Kenya today have computerized their daily activities. As a result, there have been rapidity in operations, efficiency and improvement in day-to-day business transactions. Computerization of activities comes at a cost where larger data centers are required, more servers, temperature control systems, expensive software and human resource among others. Linthicum (2009) argues that organizations will incur substantial budgets in acquiring and maintaining information technology infrastructure. Startup and small businesses may find it hard to acquire all computing infrastructure due to budget constraint, a better solution would be to adopt a cloud computing architecture in order to reduce capital investment required to purchase and configure the cloud. Cloud computing service will then be offered by a service provider at a fee which is less compared to purchasing of required equipment including associated software.

The National Institute of Standards Technology (NIST) defines Cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (such as networks, servers, storage applications, and services) that can be rapidly provisioned and released with minimal management effort. These resources may include either hardware or software in terms of network, servers, applications and storage. Cloud computing adoption comes with many benefits, Omwasa et al., (2013) observed that developing markets have opportunities to leap frog by adopting modern technologies that result in many benefits such as cost cutting.

Many ICT experts have envisioned cloud as a technological breakthrough, this is because it has had significant impact in all sectors of the economy. Cloud computing as a technology is developing quickly due to the emergence of new technologies for example the capability of mass storage and the development of superfast computers which can process information rapidly. Cloud computing involve sharing of infrastructure hence has greatly brought down the capital investment on critical infrastructure. Wyld (2010) envision significant growth in cloud computing technology where there will be creation of new organizations to cater for the large demand of cloud computing services by the public and private sector.

Cloud computing offers three types of services according to Buyya et al., (2011) which include infrastructure-as-a-service abbreviated as (IaaS), platform-as-a-service abbreviated as (PaaS) and software-as-a- Service abbreviated as (SaaS).The services are charged according to pay-per-use mode which comforts organizations in making strategic decisions, this is because organizations pays for the service required as compared to buying equipment and using a small percentage of the resource.

### **Scope of the Study**

The study will focus on Nairobi County where only the deposit taking microfinance institutions within Nairobi County will be involved in the study. Nairobi is the capital city of Kenya, the county is named after the capital city. The counties were created after the promulgation of the new constitution on 27th August 2010 which saw the birth of forty seven counties across Kenya.

### **Problem statement**

Cloud computing is a new technology which is an alternative way of service delivery. According to Omwasa et al., (2013) there exists many cloud service provider in Kenya who are willing to offer the cloud services but very few organizations are using cloud services. Cloud services in Kenya have been adopted by organizations in private and in the public sector, very few institutions in the public sector have adopted cloud technology.

Micro finance institutions have not been left behind, they have adopted some of the cloud services to facilitate their service delivery in order to gain competitive advantage over and above their rivals. The problem however, it is not known whether this cloud computing adoption have had a positive effect on the operations of these micro finance institution.

This study is therefore conducted to assess the effect of cloud computing adoption by micro finance institutions (MFIs) on their operations within Nairobi County.

## **Research objectives**

### General Objective

To study and analyze effect of cloud computing adoption on MFIs operations and recommend a framework that can be used to determine effect of cloud computing adoption.

### **Specific Objectives of the Study**

1. To evaluate the effect of cloud usage on MFIs operations.
2. To evaluate the effect of cloud user satisfaction on MFIs operations.
3. To evaluate the challenges and opportunities in using cloud computing service by MFIs within Nairobi county.
4. To develop and recommend a framework that can be adopted to inform policy.

### Research Questions

The research will answer the following questions.

- What is the status of cloud computing in Nairobi County in terms of adoption?
- Which framework can be used to assess the effects of cloud computing adoption on microfinance institutions operations?
- Which are the challenges facing Microfinance Institutions in using Cloud computing technology?

### **Significance of the research**

The study will be useful to future researchers and scholars as a point of reference and as a source of secondary data. The study will be useful to MFIs with plans to lay down infrastructures for cloud computing. The government of Kenya is also likely to benefit from the study reason being this study will inform policies which affect the use of cloud computing within Kenya. This research will help understand cloud computing better including its adoption, challenges including how to mitigate these challenges, it will also help create awareness and attitude change toward cloud computing.

# LITERATURE REVIEW

## Introduction

Cloud computing or simply cloud doesn't have one definition that summarizes all other definitions. Many researchers view cloud computing differently. One of the reason why there is no universal definition is because cloud computing is evolving rapidly with time, the devices used to access the services are also changing rapidly. The scope of cloud computing technology has also changed and has taken a new shape (Katrina et al., 2013).

National Institute of Standards and Technology (NIST) define 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. Cloud computing is characterized by two important characteristics; experience unlimited resources and pay per use. The service that is offered by the cloud is called utility computing, it can be related to resource usage of electricity or water. When a cloud service is available to the public, it is called a public cloud. A cloud that is not made available to the public is called a private cloud. A cloud service that cannot offer unlimited supply and pay per use is not offering cloud computing. Cloud computing can therefore include both utility computing and software as a service

From the definitions above , we can derive that cloud computing is a model of computing where computing resources are shared and used remotely which include software resources and hardware resources while the pay as you go architecture is applied .

## History of cloud computing

Cloud computing is a technology that has evolved over time taking different shapes and using different technologies. The earliest forms of cloud computing was grid which allowed multiple users to access a central computer using dumb terminals (Thomas Wozniak & Santi Ristol, 2009). Cloud computing evolution includes utility computing which involves offering computing resources as a metered service. SaaS is a network-based subscriptions to applications which is anytime anywhere access to IT resources delivered dynamically as a service.

## State of cloud computing in Kenya.

As cloud computing continues to be adopted in other countries, Kenya has not been left behind. According to Cisco cloud index (2013), South Africa leads in cloud computing adoption in Africa followed by Nigeria and Kenya. The report indicates that Africa's cloud computing infrastructure is expected to grow at the rate of 42% per year outpacing the global average. This will be facilitated by enhancement of communication infrastructure, for example the implementation of fiber optic backbone, fixed internet connections will also see modest growth between 2014-2019 this is according to the Cisco report.

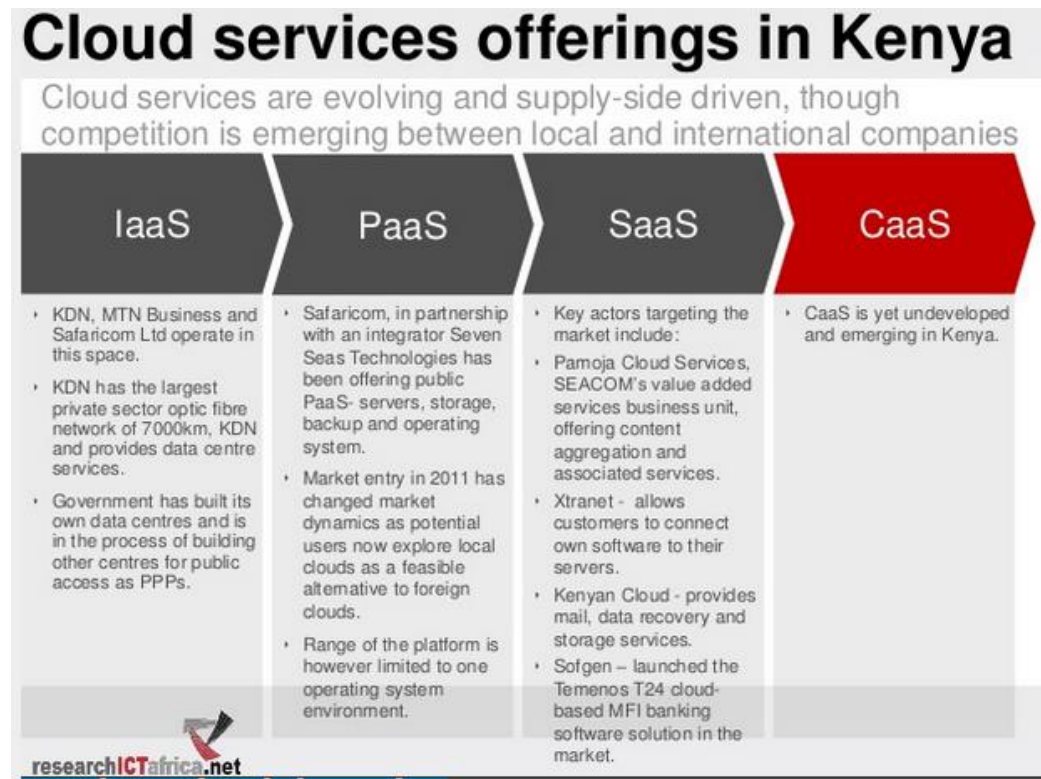


Figure 1: Cloud services offering in Kenya

Source: researchICTAfrica.net

According to Frost & Sullivan (2014), cloud computing in South Africa and Kenya alone earned revenues of \$114.6 million in 2013, the revenue is expected to rise to \$288 million by the year 2018.

Cloud computing adoption in Kenya is at 48% as compared to South Africa which is at 50%, this is according to Cisco report of 2014-2018. Cloud computing adoption is expected to grow in Kenya due to: the implementation of high speed infrastructure, implementation of 4G network by

telecommunication companies and cloud computing training in universities including colleges are all likely to accelerate this adoption. Competition is also forcing organizations to adopt cloud computing in order to have an upper hand in the market and compete on a level ground with their competitors. Organizations today are also forced by circumstances to implementing cloud in order to attract and retain as many customers as they can.

A study carried out on cloud computing adoption in the insurance industry in Kenya revealed that most of the companies (94%) have data security concerns which greatly affect the rate of adoption (Akhusama, P. M., & Moturi, C., 2016).

There are many cloud computing service providers in Kenya providing different services which include:

1. Cloud-hosted Corporate Email Solutions such as Safaricom LTD
2. Cloud data backup : Extranet Limited
3. Virtual hosting : Safaricom Limited
4. Dedicated servers : Services Access Kenya
5. Software as a service: Safaricom's M-ledger.

### **Characteristics of cloud computing**

In the past, there have been discussions on the benefits of cloud computing and the opportunities it provides to organizations that incorporates cloud technology in their daily operations. Thomas Wozniak & Santi Ristol (2009), clearly discusses the benefits and characteristics of cloud computing. Some of the cloud computing characteristics are discussed below.





Figure 1a Cloud computing Characteristics

Source: NBS System www.Omniretail-experts.com

1. **Elasticity.** This is the ability of a cloud service to automatically scale depending on the demand of a particular service. For example when the demand of a particular service is high the system might add more memory resource to aid in rapid processing of requests. This is one of the best feature of cloud service because the customer pays for what he/she uses, for example the customer only pays for storage space allocated as compared to paying for the entire disk or the entire server.

2. **Multi Tenancy.** This involves pooling computing resources and sharing them. This feature greatly reduces the cost of cloud services. The resources are reallocated on demand which includes processing power, memory and storage among other resources.

3. **Duplicity and broad access.** This feature allows access of cloud services using different platforms including; smart phones, laptops, pads etc. This feature ensures that the service can be accessed from any location and using any device that can support internet connectivity. This

feature removes the need to be at your work station to be able to use a cloud service as compared to traditional architecture where you have to be in the office to attend to an email.

4. **Automation.** Automation is critical in any system, it ensures the system continues to operate without human intervention. Cloud services are accessed throughout (24 hours a day) it is therefore important to ensure that there is automatic fail over in case one system fails.

### Cloud computing service models

According to Ronald (2010), cloud computing can take several models depending on the service being offered by the service provider. The cost of the cloud services differs depending on the service provider and the proximity to the client also determines the cost of the cloud service.

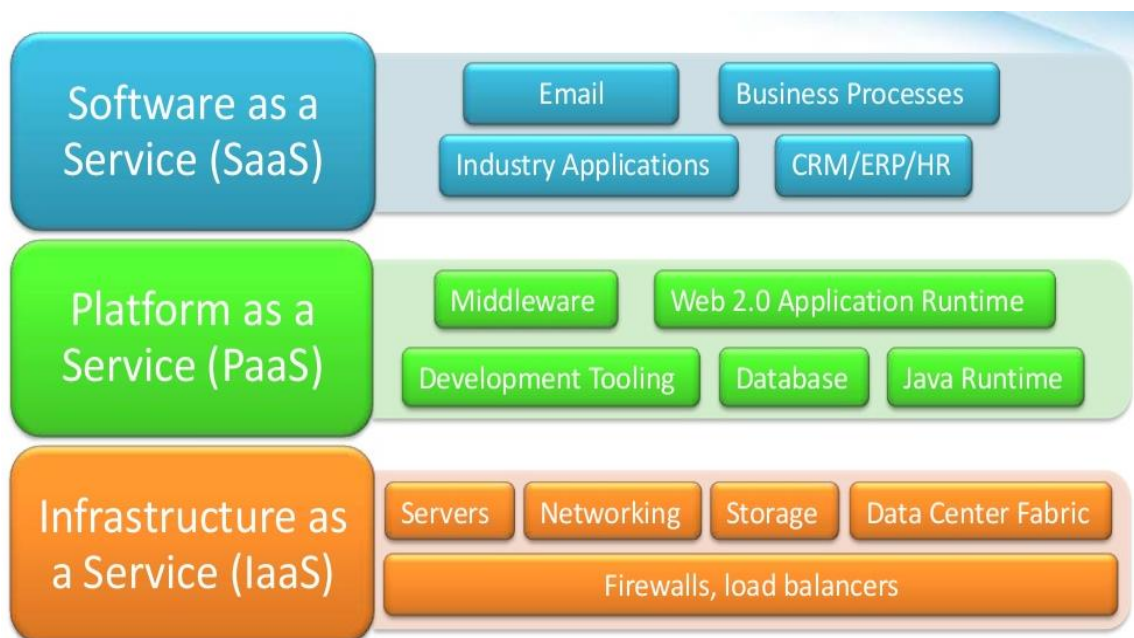


Figure 2 Cloud computing Service models

Source <http://www.barkatconsulting.com>

### Software as a service (SaaS)

Software as a service is abbreviated as SaaS. This is a cloud model where a service provider hosts computer applications and makes them available to the customer via the internet. This model ensures the customer avoids additional hardware cost, licensing and related software fees.

This model frees the customer from complex management of hardware and software which requires skilled professional to effectively manage cloud applications. This model may include; email hosting, application hosting among others.

### **Infrastructure as a service. (IaaS)**

This cloud service model involves virtualization of hardware where pool of servers are brought together and virtualized. Virtualization is the process of creating a virtual version of a resource e.g. creating virtual storage .In IaaS the customer can do self-provisioning of server space, memory, bandwidth etc. This model help reduce the budget of buying and maintaining computer hardware including the data center accessories.

### **Platform as a service (PaaS)**

This computing model involves the cloud service provider managing and controlling the infrastructure on behalf of the customer.

PaaS is mostly used for developing and deploying application. Developers are able to develop and test applications quickly and at cost effective rate. This cloud computing model frees the developer from having to install development software in-house. The service provider manages Operating system, database, and storage among other key infrastructure.

## **Cloud computing deployment models**

Cloud computing can be deployed in several models according to Oredo et al.,(2014). Cloud deployment model include:

1. Public deployment model. This model provides cloud services that are available to the members of public and can be accessed through private networks or the internet.
2. Private deployment model. As the name suggests this service is privately owned and is accessible within an organization.
3. Community deployment model. A community cloud is similar to a public cloud except that its access is limited to a specific community of cloud consumers.
4. Hybrid deployment model. A hybrid cloud is comprised of two or more different cloud deployment models such as community model and private combined.

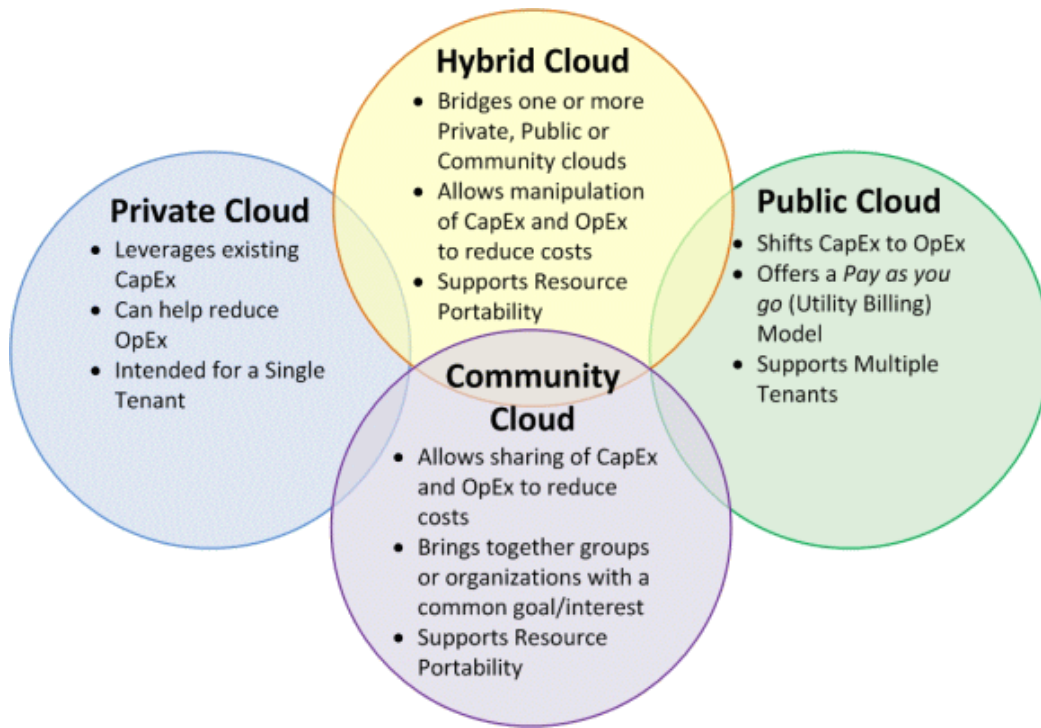


Figure 3 Cloud Deployment model

Source : [www.ibm.com](http://www.ibm.com)

### Benefits, challenges and risks of cloud computing adoption

Cloud computing comes with many benefits and challenges. Some of the benefits includes: Increased availability and reliability (Akhusama, P. M. , & Moturi, C. , 2016). Cloud services can be accessed from any location and using any device which has the capability of connecting to the internet. Ronald (2010) says that Cloud computing allows for both large and small organizations to have the opportunity to use internet-based services so that they can reduce start-up costs, lower capital expenditures, use services on a pay-as-you-use basis, access applications only as needed, and quickly increase capacities.

Ronald (2010) puts across data ownership, privacy protections, data mobility, quality of service and service levels, bandwidth costs, data protection, and support as some of the challenges facing cloud computing today. Data security has also been a concern of many organizations where data can be intercepted on transit through “man in the middle” attack. The data hosted by the service provider can be disclosed to competitors for example email details, organizational strategy among others. Considering the above threats it is therefore advisable organizations to vet the service provider before signing the contract. Vetting can be done through review of previous

work, number of customers, user support, complying with statutes and regulations among others. This background check minimizes the above threats.

### **Cloud computing adoption**

Cloud computing adoption is just like any other system change over, it involves migrating organization's operations to the cloud. It is important that organizations use frameworks which have been test for a smooth change over.

An organization must carry out internal analysis to determine if the adoption of a particular model will translate to value addition in the operations of the organization. Availability of professionals to manage the cloud should also be considered before adoption of any cloud service.

Some of the frameworks that can be used in cloud computing adoption include:

1. Cloud Computing Adoption Framework. This framework was initially developed by IBM Chang (2015) clearly discusses the components. The Cloud Computing Adoption Framework (CCAF) is designed to deal with the challenges of portability, linkage and sustainability by assisting organizations to realize decent Cloud designs, deployment and services.
2. Cloud adoption framework by (Nabeel Khan and Adil Al-Yasiri, 2015). This framework streamlines the cloud adoption process by removing uncertainty in the fundamentals associated with the organization and cloud adoption process. The framework addresses most of the challenges which are likely to be experienced during the adoption process.

### **Gaps observed in Literature Review based on this study**

Many researchers have researched on cloud computing but very few have recommended frameworks or models which would be applicable to micro finances institution in order to reap all the benefits of cloud computing. Most of the researchers have recommended general frameworks furthermore available literature shows that minimal cloud computing study have been conducted on MFIs in Kenya. Lack of information on cloud computing in Kenya makes adoption of this

technology hard because organizations do not want to venture into unclear technologies and risk hard earned capital.

### **Theoretical framework Analysis**

The study reviewed two frameworks to enable generation of conceptual framework. The models reviewed includes

1. DeLone and McLean Information System Success Model (D&M).
2. Seddon's Model.

#### **DeLone and McLean Information System Success Model (D&M)**

Delone and Mclean conducted a comprehensive review on any information system success and came up with a model which evaluates six interrelated dimensions of IS success. Which includes:

1. System Quality
2. Information Quality
3. Use
4. User Satisfaction
5. Individual Impact
6. Organizational Impact

In the year 2003 DeLone and McLean updated their model and made minor changes to it. They defined their new model dimension as:

1. Systems quality
2. Information quality
3. Service quality
4. Use
5. User satisfaction
6. Net benefits

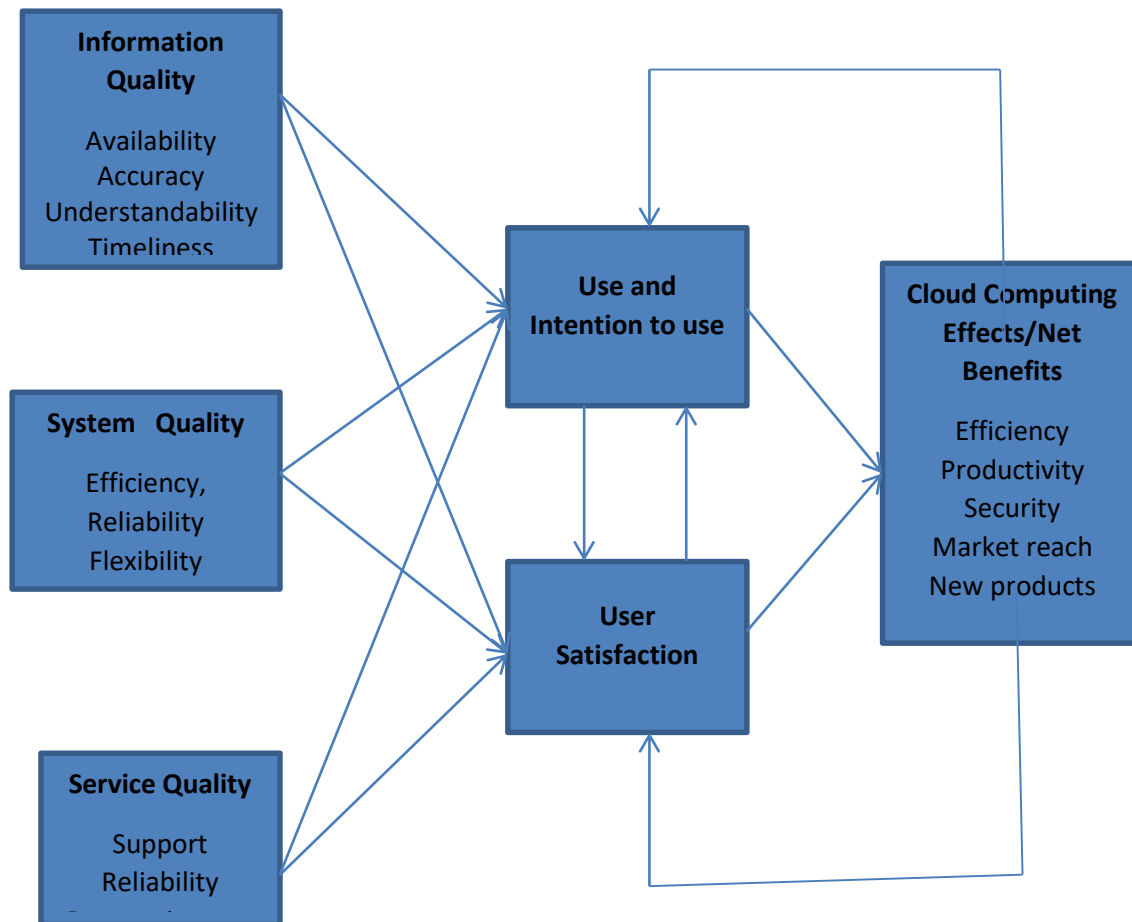


Figure 4 DeLone and McLean Information System Success Model (2003)

### **Information quality.**

This variable evaluates the quality of information in the information system. This aspect also evaluates the characteristics of fitness for use. The aspect evaluates information completeness, relevancy, easy to understand and security.

### **System Quality**

This is a very important aspect, it evaluates the characteristics of usability, availability, reliability and adoptability including the response time.

### **Service Quality**

Service quality compares the user expectation vs the user satisfaction. Quality evaluates how well a service delivered to a customer both internal customer and external customer meets his or her expectations.

## **Usage**

This aspect of the model assess the level of interaction with the system or a particular service.

## **User Satisfaction**

This is the user's opinion on the service provided in terms of his or her general experience.

## **Net Benefits**

This aspect evaluates the balance between positive and negative impacts/successes of a particular service adoption. The aspect assesses if the market reach have expanded, if the sales have increased, if the productivity has increased or there have been development of new products and services.

## **Seddon's Model**

Seddon used Delone and Mclain (2003) model to develop his model. This model evaluates two aspects of an information system i.e. IS use and IS success. The Use aspect evaluates expectations about the net benefits of future IS use. The success model Evaluates:

1. Measure of information & system Quality (System Quality and Information Quality).
2. General perceptual measures of net benefits of IS use (Perceived Usefulness and User satisfaction).
3. Other Measures of Net benefits of IS Use. These includes Individual benefits ,societal benefits and overly organizational benefits

Under the first aspect, Seddon lists information quality as being relevant, timeliness and the accuracy of the output. System quality evaluates the bugs, ease of use, user interface and maintainability aspects.

The usefulness aspect of the model evaluates whether there have been enhanced performance and increased user satisfaction. The net benefits aspects looks at the outcome of the whole process i.e. have the adoption / implementation of a particular service translated to any benefits to the organization, society or to an individual.



Individual impact may include user satisfaction, individual productivity and ease of use. Organizational impact may include aspects such as cost reduction, development of new products or extension of the organization's market reach.

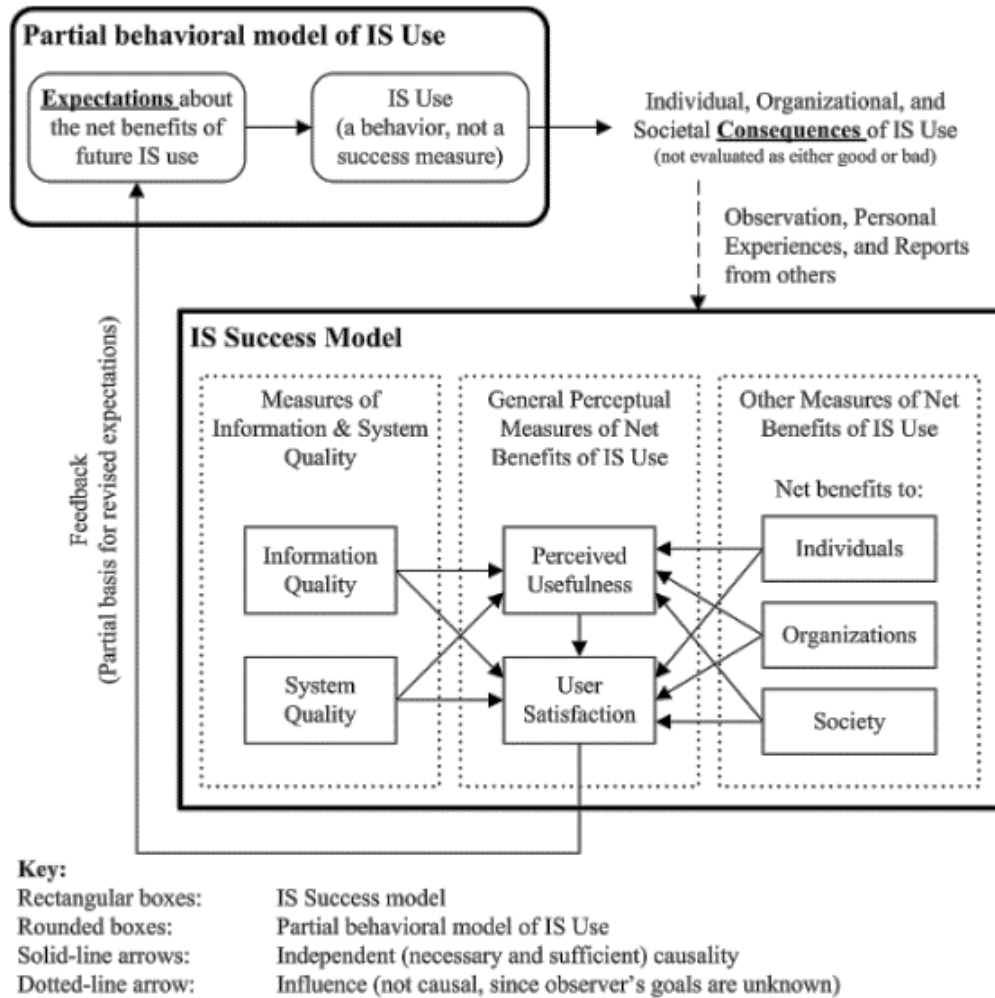


Figure 5 Seddon's model of IS success (Seddon, 1997).

## Conceptual framework for assessing the Effect of cloud computing adoption on operations

In accordance with D&M updated framework and Saddon (1997) framework, this study proposes an integrated model for assessing the effect of cloud computing adoption on micro-finance operations. A total of three dimensions were proposed which include: Cloud Usage, Cloud service user satisfaction and Microfinance Operations. The model evaluates the effect of cloud computing adoption on MFIs operations by relating the three variables.

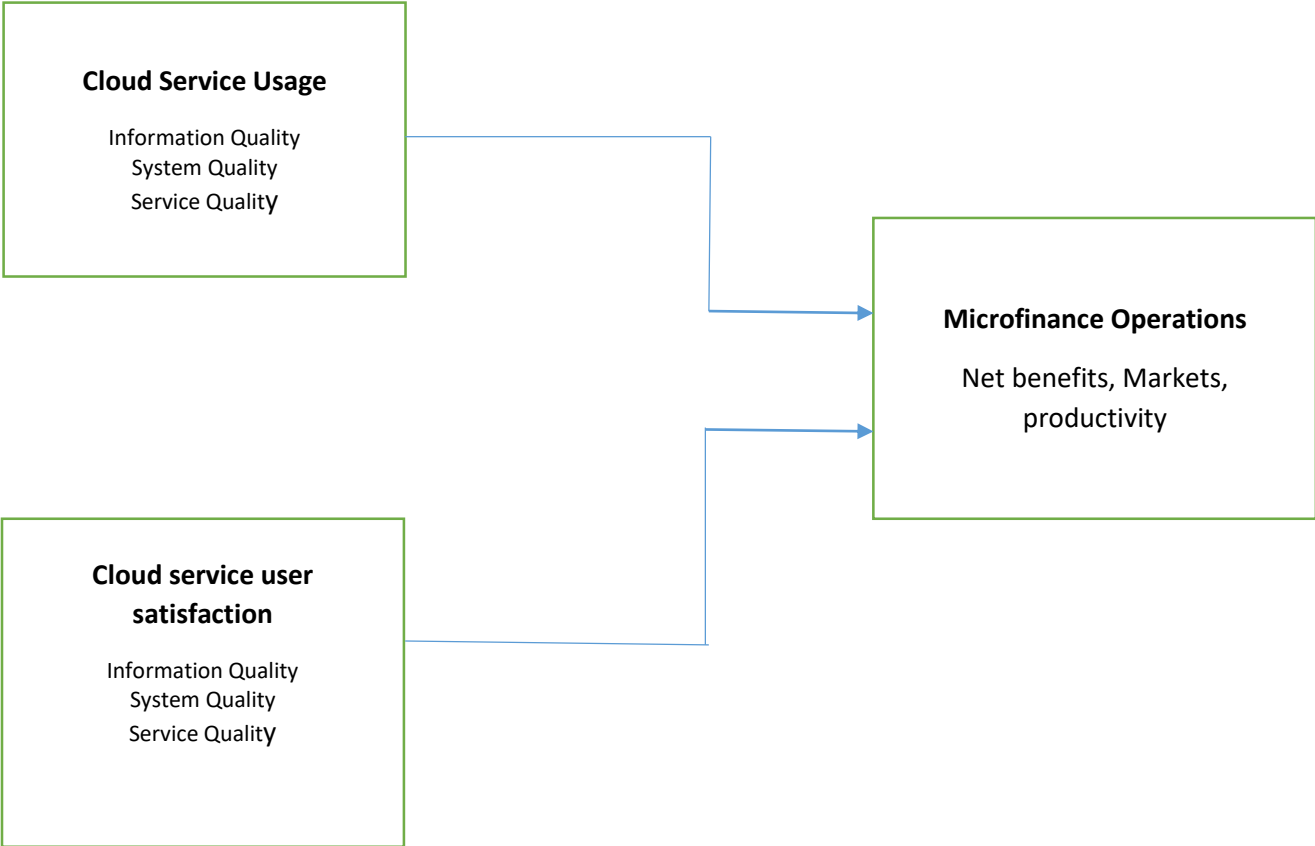


Figure 6 Conceptual framework for assessing the Effects of cloud computing on operations

Source: Author

## Details of the conceptual framework variable Operationalization

*Table 1 conceptual framework variable Operationalization*

Cloud Usage Factors	Indicator	Description
Information quality	Availability	That the cloud service is available when needed.
	Accuracy	That the cloud system in use will give the same result given the same parameters.
	Understandability	The output from the system is easy to understand.
	Timeliness	That the information is sufficiently up-to-date for the task at hand.
System quality	Reliability	Extent to which information generated from the system is correct and reliable.
	Relevance	That the information provided by the system can aids in decision making.
	Flexibility	Refers to the ability to adopt to new changes.
	Usability	That the information is clear and easily used.
	Security	How secure is the system and the information contained in the system. Is the information/data encrypted?
Service quality	User Support	Does the service cloud service provider offer support to the user?
	Support Reliability/ Responsiveness	How reliable is the support from the service provider.
	Internet Availability	How regular is the internet downtime?
Usage	Cloud service adopted	Which cloud service have been adopted?
	Number of Employee using cloud service	The number of successful procurement transactions in a day.
	Years	How long your organization have used cloud computing services.
	Future adoption	Do you plan to adopt cloud computing / adopt additional features.

User satisfaction	Repeated use	The frequency a user uses the cloud service.
Information Quality	Efficiency and effectiveness	Number of transactions processed.
System Quality	Reliability	Are the users requirements are met?
Service Quality	Flexibility availability	User satisfaction on system access speed.
MFI Operations This factor represents the net benefits from the use of cloud computing service.	Cost savings Extended markets reach Operation Efficiency and flexibility Reduced search costs Time savings Development of new products.	Have cloud computing saved organization time and money? Have the benefits such as new markets, and customer responsiveness yielded positive net benefits for the organization Have the adoption of cloud computing brought about development of new products and services? Has the organizational profit increased from use of cloud service?

Source: Author

**Hypotheses**

H1. Cloud computing Usage has significant effect on MFI operations.

H2. Cloud computing user satisfaction will have significant effect on MFI operations.

## CHAPTER THREE

### RESEARCH METHODOLOGY

Research method is a key aspect of any research, it acts as an architectural plan when building a house. This section of the research involves a detailed plan for collecting, measuring and analyzing data. A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Claire Selltiz et al., 2002).

This section of the research analyses all aspects involved in the design and development of research methodologies used in this study. The following subsections are included in the research method; research design, population sample, sampling, data collection, data analysis and operationalization of the research variables. The research approach will also be included in this section of the study.

#### **Research Philosophy**

In the recent past, cloud computing seems to have drastically evolved and now has become the backbone of many organizations in the developed world. In other countries most organizations are using cloud computing technology to deliver services to their clientele faster and reliably and at minimized expense hence increasing their profit at the long run.

The research philosophy helps the researcher in identifying what is being investigated (Johnson and Clark, 2006). In analyzing the objectives of the project, the researcher has opted to consider himself in the shoes of a positivist throughout the research process. The philosophy of positivism is an epistemological position that relates to the philosophical stance of the natural scientist (Saunders et al., 2009). Research can either be represented qualitatively or quantitatively where research findings are usually represented in numerical forms which speak for themselves (Mutch et al., 2011). This approach is in line with this research which will contribute to a growing body of knowledge as it pertains cloud computing, this will be achieved by using the conceptual framework for designing questionnaire to be used in the study.

Nairobi has one of the best infrastructure in Africa for provision of cloud service, but looking at previous research, cloud computing adoption has been very low. The ultimate goal of this research is to apply technological principles, frameworks and methods to understanding how to best design, implement, and evaluate cloud computing technology in the workplace to encourage user acceptance, learning, and productivity.

## **Research design**

Research designs can be explained as organizing research activity, including the collection of data in ways that are most likely to achieve the research objectives (Ronald, 2010).

This research intends to evaluate cloud computing effect on operations of MFIs within Nairobi County by collecting and analyzing collected data. Data was collected using questionnaire and document review. The questions in the questionnaire were generated from the conceptual framework components. The questionnaire included additional questions that aided in this study. All research questions were appraised with three purposes as explanatory, descriptive or exploratory.

Research design is important because it shows whether the researcher will be able to get solutions to the problem he/she is researching on.

A descriptive research approach was used to investigate the effect of cloud computing in Nairobi County by MFIs and the outcome represented through numbers/percentages.

According Kshetri (2010) descriptive research is designed to obtain pertinent and precise information status of the phenomena. Creswell (2003) emphasize that descriptive designs are used in preliminary and exploratory studies to allow the researcher gather information, summarize, present and interpret for the purpose of classification.

## **Population Sample**

Johnson et al. (2006) views population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. In this research the population will be the micro finance institutions both private and those owned by the government.

In Kenya we have one hundred and sixty nine (169) Microfinance institutions which are licensed to undertake deposit according to Sacco Societies Regulatory Authority (SASRA, 2016). This research will concentrate on all the deposit taking microfinance institutions within Nairobi County.

## **Sampling**

A sample is a subset of a population selected to participate in the study, it is a fraction selected to participate in the research project (Johnson, P. and Clark, M. , 2006).

Sampling therefore means selecting a portion of the population that will represent the entire population where the findings of the sample can be used to represent the entire population. Sampling help quicken the research process and reduce cost, taking the entire population may consume a lot of time and money.

A total of 35 microfinance institutions within Nairobi County were selected. Deposit taking microfinance institutions were selected in the study, this is because they were well established and have better structures. At least two respondents were interviewed from every organization. The list of licensed microfinance institutions was generated from Sacco Societies Regulatory Authority website ([www.sasra.go.ke](http://www.sasra.go.ke) , 2016).

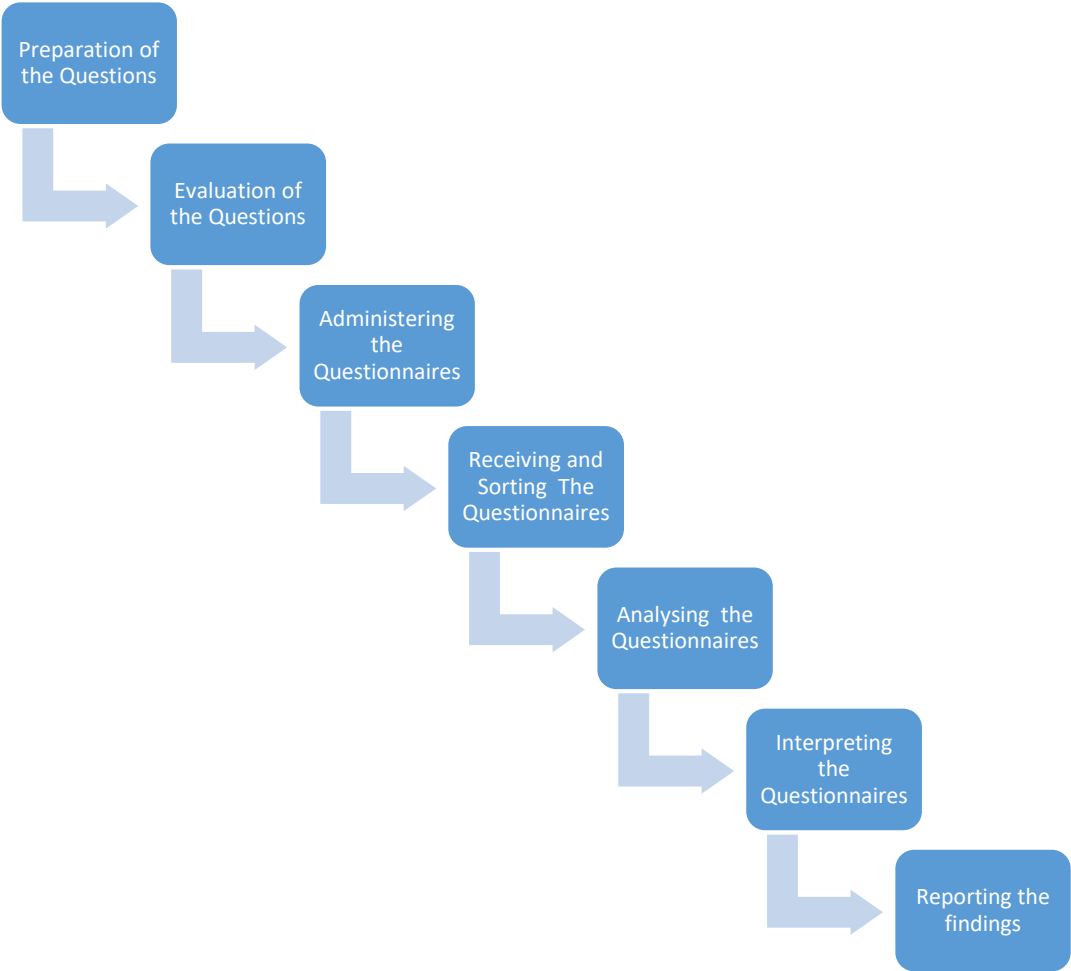
## **Data Collection**

For a research project to be successful the researcher must come up with resourceful way of collecting data which will later be analyzed. Data for this study was collected using closed-ended questionnaire, face to face interview and document reviews. Data was collected from the consumer of the service.

Data for collection is critical to any research project and there are many sources of data. According to Kumar (2005) there are two main types of data to be collected in a research study, namely: Primary data and Secondary data.

**Data Collection procedure**

The sample was drawn from ICT departmental heads, Finance directors and cloud system users from the selected microfinance institutions within Nairobi County. The procedure below was followed during data collection process.



*Figure 7 Data Collection*

Source: Author



In this study, data collection utilized both quantitative and qualitative approach. Where interviews were conducted, questionnaires circulated to the selected sample and review of available literature. Interview was conducted to the senior managers and staff members who were involved in policy making in their respective organizations. Staff members in senior positions were better placed to discuss the status, benefits and challenges of cloud computing.

## Data Analysis

Data analysis can be challenging given that qualitative data analysis methods are not as well established as quantitative methods and the volume and variety of data collected may make analysis time-consuming that is according to (Cavaye, 1996).

Collected data was entered in to the computer system and analyzed using SPSS software (version 20). Statistical analysis of the data is represented in the analysis chapter. Data was represented in terms of percentages, average, mean and standard deviation

Some of the tasks involved in data analysis included

- Data editing ,which involved making corrections and adjustments where necessary
- Handling of blank responses. Blank responses were also analyzed to assist in identifying the response rate
- Data categorization which involved categorizing data in several subsets or categories.
- Data coding, which involved giving data some codes for quick reference.

## Ethical Issue identified

It is always prudent to use data collected from the respondent for the purpose it was collected for. Using collected data for other purposes e.g. sharing the data with a rival organization is considered unethical .The information collected during this study was used for research purposes only.

## Project Schedule

<b>Task Name</b>	<b>Duration</b>	<b>Start</b>	<b>Finish</b>	<b>Task Status</b>
Finding a topic	5d	01/11/16	01/15/16	Complete
Research on topics	7d	01/18/16	01/26/16	Complete

<b>Task Name</b>	<b>Duration</b>	<b>Start</b>	<b>Finish</b>	<b>Task Status</b>
Draft project title	2d	02/01/16	02/02/16	Complete
Discuss with the supervisor	1d	02/02/16	02/02/16	Complete
Finalize research questions	2d	02/04/16	02/05/16	Complete
Literature Review	14d	02/08/16	02/25/16	Complete
Discuss with the supervisor	1d	02/26/16	02/26/16	Complete
Include recommendations	17d	02/29/16	03/22/16	Complete
Research Methodology	14d	03/24/16	04/12/16	Complete
Discuss with the supervisor	1d	04/14/16	04/14/16	Complete
Include recommendations	2d	04/15/16	04/18/16	Complete
Milestone one: Proposal	12w			Complete
Present Proposal to panel	1d	06/10/16	06/10/16	Complete
Include recommendations from the panel	1d	06/11/16	06/11/16	Complete
Milestone Two: Data Collection	4w	08/08/2016	08/19/2016	Complete
Present to Panel		09/16/2016	09/23/2016	Complete
Include recommendations from the panel				Complete
Milestone Three: Analysis	4w	5/04/2017	5/04/2017	Complete
Present to Panel		5/04/2017	5/04/2017	Complete
Milestone Four: Conclusion		5/04/2017	5/04/2017	Complete
Present to Panel	1d	5/04/2017	5/04/2017	Complete

Key d= Day, w=Week.

*Table 2 Project Schedule*

Source: Author

## **CHAPTER FOUR**

### **DATA ANALYSIS AND PRESENTATION**

#### **4.1 Introduction**

This section presents the data analysis and findings of the study as set out in the research methodology. The data that was collected during the study, was summarized in form of graphs and tables for simplicity.

The data collection process was conducted within Nairobi County for analysis purposes, the collected data was used to examine the status of cloud computing in MFIs within Nairobi County. This chapter shall discuss the findings obtained from the primary instrument used in this study. SPSS version 20.1 was used to carry out analysis of the collected data and presented the analyzed data inform of graphs and tables.

#### **4.2 Response Rate**

A total of eighty seven (87) questionnaires were issued to different Micro finance institutions within Nairobi County, of the 87 questionnaires issued seventy four (74) questionnaires were returned. The completed questionnaires were edited and relevant corrections made.

The returned questionnaire represented 85% response rate. The data was adequate for the study to continue to the next stage.

#### **4.3 Questionnaire analysis**

This section analyzes all the questions in the questionnaire to determine the outcome. The first section of the questionnaire comprises of questions to obtain basic information about the respondent and the organization he is representing. The second section contains questions to examine the status of cloud computing including questions to assess the effect of cloud computing on MFI operations. The questionnaire used in this study was developed in line with the set research objective.

### 4.3.1 Demographics Information.

This section of the questionnaire contains general information about the respondent and their respective organizations. The bio data pointed out at the appropriateness of the respondent in responding to the questionnaire and participating in the research process.

#### The number of years the respondent had worked for the organization

Number of years worked in the organization					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1	9	12.2	14.5	14.5
	1	2	2.7	3.2	17.7
	2	22	29.7	35.5	53.2
	3	11	14.9	17.7	71.0
	4	8	10.8	12.9	83.9
	6	3	4.1	4.8	88.7
	10	3	4.1	4.8	93.5
	11	3	4.1	4.8	98.4
	21	1	1.4	1.6	100.0
	Total	62	83.8	100.0	
Missing	System	12	16.2		
Total		74	100.0		

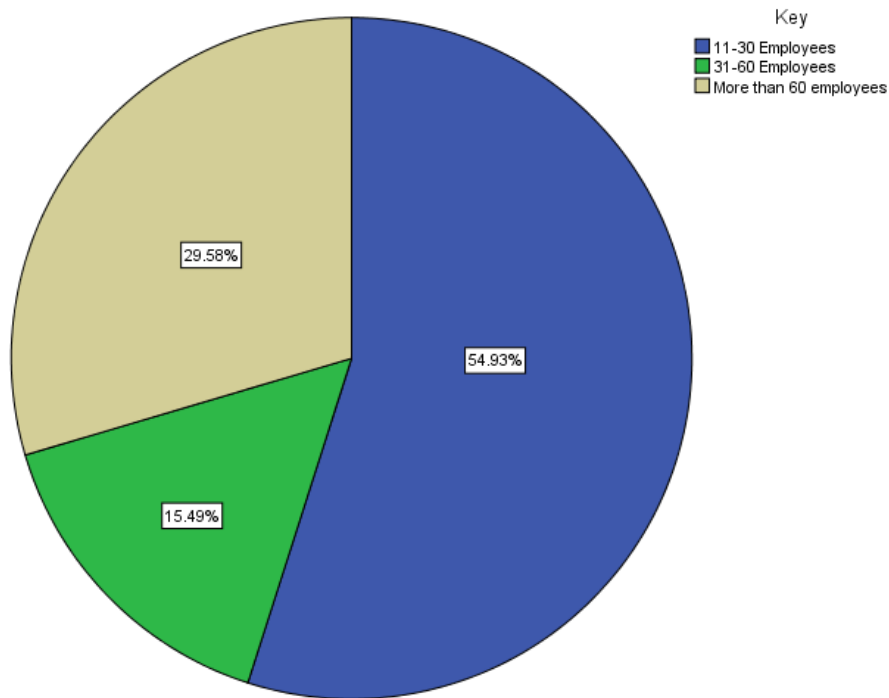
Table 3 Number of years worked in the organization

Source: Research Data

Table 3 above shows that, majority of the respondents had more than two years in their respective organizations therefore information provided had high level of accuracy. A total of twelve respondents didn't give information on the number of years they had worked for their respective organizations. The more years a respondent has worked for an organization the better he/she understands the organization's process and policies.

#### Size of the organization

Respondents were asked the size of the organization by stating the number of employees in their respective organization. This was to determine the number of users utilizing the cloud systems in their respective organizations.



*Figure 8 Analysis on size of the organization (Source: Research data)*

From the analysis we can see that majority of the microfinance institutions had number of employees ranging between 11-30 employees which represented 54.93% of the respondents. MFIs with more than sixty employees were 29.58% of the total population.

### **1.3.2 Cloud service Information.**

The study sort to find out the number of years MFIs had used the cloud service. This question was to find out which organizations had not adopted any cloud service.

### How long has your organization used cloud computing services and solutions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Adopted	6	8.1	8.1	8.1
	Less than 2 years	45	60.8	60.8	68.9
	Between 3 and 5 years	23	31.1	31.1	100.0
	Total	74	100.0	100.0	

Table 4 How long has your organization used cloud computing services and solutions

Source: Research data

From table 4 above, we can see that 91.9% have adopted cloud computing service. This indicates that the adoption rate of cloud computing technology in micro-finance institutions is at 91.9%. Only 8.2% of the respondents have not adopted any form of cloud computing service.

From the analysis we can see that majority of the organizations i.e. 60.8% have used cloud service for less than two years.

### Cloud service Model

Cloud service model adopted Summary

Model		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PaaS	3	4.1	4.4	4.4
	SaaS	65	87.8	95.6	100.0
	Total	68	91.9	100.0	
Missing	System	6	8.1		
Total		74	100.0		

Table 5 cloud service model adopted

Source: Research data

Table 5 shows that majority of the respondents 95.6% have adopted Software as a service model. None of the organization interviewed have adopted IaaS (Infrastructure as a service).

Only 4.4% have adopted Platform as a service (PaaS). In the next table we will see the services adopted by different microfinance institutions.

**Services received from the cloud service provider**

**Which services do you receive from CC provider**

Services	Frequency	Percent	Valid Percent	Cumulative Percent
Web services	20	27.0	29.4	41.2
Email hosting	28	37.8	41.2	70.6
Database hosting	6	8.1	8.8	79.4
Online storage	6	8.1	8.8	88.2
Application hosting	8	10.8	11.8	100.0
Total	68	91.9	100.0	
Missing System	6	8.1		
Total	74	100.0		

*Table 6 Services received from the cloud service provider*

*Source: Research data*

Most of the respondents were utilizing web services, email services, data backup services and application hosting from their service providers. The analysis shows that 41% of the respondents were utilizing email hosting services.

**Micro-Finance Institutions drivers to cloud computing**

The study evaluated the key drivers to micro finance institutions adopting cloud computing the results were as follows. All items were measured on a five point Likert scale as below.

1 = strongly disagree. 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Economies of scale as a driver to CC adoption	68	4.56	.720	2	5
Flexibility and scalability as a driver for CC adoption	68	4.00	1.051	1	5
Security benefits as a driver for CC adoption	68	4.19	.935	2	5
Diversification as a driver for CC adoption	68	4.12	.783	2	5
IT resource optimization as a driver for CC adoption	68	4.00	.872	3	5
Valid N (listwise)	68				
<b>Average</b>		<b>4.17</b>	<b>0.87</b>	<b>2.00</b>	<b>5.00</b>

*Table 7 Micro-Finance Institutions drivers to cloud computing*

*Source: Research data*

From the table 7 above, economies of scale play a big role in MFIs adopting cloud service where the cumulative mean was 4.56 out of the possible 5.0. This findings indicates that most of the respondents strongly agreed that economies of scale was a key driver in adopting a particular cloud computing service.

Flexibility and IT optimization both had a mean of 4.00 which shows that respondents agreed that both were also key drivers to cloud service adoption.

Security had a mean of 4.19, which mean that security was a key driver to cloud adoption.



## Barriers/ Challenges which hinder adoption and full utilization of cloud computing services

The study sought to find out which were the hindrances to cloud adoption, the table below shows the analysis from the questionnaire.

**1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.**

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
lack of enough budgetary allocations hinder CC adoption	68	4.46	.854	2	5
Provision of unreliable services hinder CC adoption	68	3.79	1.073	1	5
Inadequate internal skills hinder CC adoption	68	3.07	1.150	1	5
Negative attitude towards CC hinder CC adoption	68	3.44	1.042	2	5
Organisational culture hinders adoption	68	3.54	1.057	1	5
Valid N (listwise)	68				
Average		3.66	1.04	1.40	5.00

*Table 8 Barriers/ Challenges which hinder cloud adoption*

*Source: Research data*

Lack of adequate budget was a hindrance to most of the MFIs adopting cloud computing service. Inadequate skills and attitude toward cloud was not a major hindrance to most of the MFIs the two aspects had a mean score of 3.07 and 3.44 respectively. Organizational culture also plays a big role in cloud computing adoption, most of respondents agreed that organizational culture was a hindrance. Organizational culture had a mean of 3.54.

Unreliable service from the service providers was also a hindrance in cloud service adoption this aspect had a mean of 3.76 out of the possible five on the likert scale.

### 1.3.3 Cloud Usage

This section was divided into three sections where description analysis of the system was carried out. This was borrowed from the conceptual framework. The three sections evaluated the three aspects of cloud usage which included.

1. Descriptive analysis of system quality

2. Descriptive analysis of information quality
3. Descriptive analysis of service Quality

### Descriptive analysis of system Quality

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
It is easy to use CC services	68	4.01	1.029	2	5
Use of CC services is user friendly	68	4.13	.420	3	5
CC systems generate accurate information	68	4.22	.666	3	5
CC systems takes less time to respond to user requests	68	4.60	.577	3	5
CC systems are customisable	68	4.40	.577	3	5
Valid N (listwise)	68				
Average		4.27	0.65	2.80	5.00

*Table 9 Descriptive analysis of system Quality*

*Source: research data*

A good system should be easy to use, should be user friendly, generate accurate information and should be customizable. From the analysis in table 9 above, most respondents indicated that it was easy to use the adopted cloud systems. Most of the respondent agreed that requests made via cloud systems are responded to quickly which is a good characteristic of any system.

On average we can see that most of the respondents indicated that they agreed that the system quality was good hence they would continue using the cloud service, this is clearly seen in the average mean of 4.27 on the Likert. When a system quality is good, it is very likely that users will continue using the system and consequently the system will have positive effect on the organization's operations.

## Descriptive analysis of information quality

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
CC systems provide up-to date information	68	4.40	.794	3	5
CC systems generate clear information	68	4.18	.690	3	5
CC systems generate reliable reports	68	4.29	.754	2	5
CC systems provide required information	68	4.46	.656	3	5
CC systems provide timely information	68	4.28	.750	3	5
CC systems generate sufficient information	68	4.22	.844	2	5
Valid N (listwise)	68				
<b>Average</b>		<b>4.30</b>	<b>0.75</b>	<b>2.67</b>	<b>5.00</b>

*Table 10 Descriptive analysis of information quality*

*Source: Research data*

The quality of information generated from any system will determine its usage (Ronald L, 2010). Some of the characteristics that make quality information include updateness, clarity among others. The analysis in the above table shows that information from cloud systems was of good quality this is seen in the mean score of 4.18 out of the possible 5.0. Sufficiency, up datedness and reliability all had a mean above 4.0 which had an agree score in the Likert scale.

Overall information generated from the cloud system was of good quality, the average score from the respondents was 4.30 which is an agree score in the Likert scale.

The thumb rule is that standard deviations greater than one implies that there was greater disparity in respondents' response while the standard deviations which is less than one indicates that respondents' opinions were almost the same.

## Descriptive analysis of service Quality

The quality of service received from the cloud system and service provider will most likely determine the usage of a service. Good service and support will encourage usage and vice vasa.

The table below shows the outcome of the interview on service quality.

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
CC systems and services gives reliable service	68	4.56	.761	2	5
Connections to CC services is fast	68	4.0000	.77267	2.00	5
CC systems and services is adequate	68	4.49	.763	3	5
CC systems and services is responsive	68	4.51	.635	3	5
Valid N (listwise)	68				
<b>Average</b>		<b>4.39</b>	<b>0.73</b>	<b>2.50</b>	<b>5.00</b>

*Table 11 Descriptive analysis of service Quality*

*Source: Research Data*

From the table 11 above, we can see that most of the respondents agreed that the service provided by the system and the service provider was appropriate, fast and reliable. The mean score for service quality reliability was 4.56 which indicates that most of the respondent agreed that the services quality by their respective service providers were very reliable.

The average score was at 4.39 which on the Likert scale was agree, this indicated that most respondents agreed that service quality from both the system and the service provider was good or made them happy. This impacted greatly in their usage of the cloud services.

#### 1.3.4 Cloud Satisfaction

This was the second independent variable. The study relates how usage and satisfaction of cloud computing services affect MFI operations.

Satisfaction also evaluated the three aspects of

1. Information quality on user satisfaction.
2. System quality and user satisfaction.
3. Service Quality on user satisfaction.

## Information quality on user satisfaction

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Efficiency of CC systems and services brings user satisfaction	68	4.38	.713	3	5
Information quality of CC systems and services brings user satisfaction	68	4.34	.765	2	5
Information accuracy of CC systems and services brings user satisfaction	68	4.18	.809	2	5
Valid N (listwise)	68				
<b>Average</b>		<b>4.30</b>	<b>0.76</b>	<b>2.33</b>	<b>5.00</b>

*Table 12 Information quality on user satisfaction*

*Source: Research Data*

This aspect evaluated the level of user satisfaction on the parameters of efficiency, quality and accuracy.

From the analysis we can deduce that cloud efficiency brought about user satisfaction from the mean score of 4.38 out of the possible 5.00. Information quality and information accuracy brought about user satisfaction this was agreed by most of the respondent with the two parameters scoring a mean of 4.34 and 4.18 respectively.

Over all, respondents agreed that information quality is likely to affect user satisfaction. The average mean on Likert scale was 4.30 out of the possible 5.00.

### **System quality and user satisfaction.**

This section evaluated whether the system quality will affect user satisfaction. The outcome was as below.

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
user friendliness of CC systems and services brings user satisfaction	68	4.34	.725	3	5
Ease of use of CC systems and services brings user satisfaction	68	4.00	.573	3	5
Service reliability of CC systems and services brings user satisfaction	68	4.32	.679	3	5
service quality of CC systems and services brings user satisfaction	68	4.46	.633	3	5
Valid N (listwise)	68				
<b>Average</b>		4.28	0.65	3.00	5.00

*Table 13 System quality and user satisfaction.*

*Source: Research Data*

Respondents agreed that they were satisfied with the user-friendliness of their systems this parameter has a mean of 4.34.

Ease of use and service reliability both had a mean score of 4.00 and 4.32 respectively, this meant that they were satisfied with the user friendliness and service reliability of their respective cloud systems.

The average score of user satisfaction on system quality was at 4.28, this meant that most organizations were satisfied with the quality of their cloud systems.

### **Service Quality on user satisfaction.**

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Support service of CC systems and services brings user satisfaction	68	4.40	.979	1	5
Response time of CC systems and services brings user satisfaction	68	4.19	.553	3	5
Valid N (listwise)	68				
<b>Average</b>		4.29	0.77	2.00	5.00

*Table 14 Service Quality on user satisfaction*

Source: Research data

Respondents agreed that support service and quick response time brings about user satisfaction, this can be confirmed from the mean score of 4.40 and 4.19 respectively.

The overall score of the service quality was 4.29 which is a good score according to the likert scale. Therefore most respondents agreed that the service quality from the cloud was generally good.

### 1.3.5 Micro-Finance Institutions Operations

This study identified two independent variables and one dependent variable. The independent variables were: cloud service usage and cloud service satisfaction. The two independent variables have positive effect on the dependent variable though the effect is of different propositions. Meaning the outcome of the other two variables will affect the dependent variable.

The data collected was analyzed as below.

#### Descriptive analysis for the dependent variable (MFI operations)

##### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
CC adoption has increased organisations market	68	4.57	.698	3	5
CC adoption has increased organisational efficiency	68	4.28	.730	3	5
CC adoption has increased organisations flexibility	68	4.16	.857	2	5
CC adoption has increased organisations productivity	68	4.43	.581	3	5
Valid N (listwise)	68				
<b>Average</b>		<b>4.36</b>	<b>0.72</b>	<b>2.75</b>	<b>5.00</b>

Table 14b

(Source: Author)

Table 14b shows the effect of adopting cloud service. Respondents who agreed that cloud computing had increased their market reach had a mean of 4.57. Those who agreed that cloud computing services had improved their organizational efficiency had a mean of 4.28.

Majority of the respondents agreed that cloud computing had increased organizational productivity this can be derived from the 4.43 mean score.

On average a mean of 4.36 out of the possible 5.00 was achieved from the analysis. This means that majority of the respondents felt that cloud computing had a positive impact on their organization's operations.

The figure below shows that 88% of the respondents agreed that cloud computing adoption had increased their market reach. This is because they have implemented online banking portal, mobile apps among others.

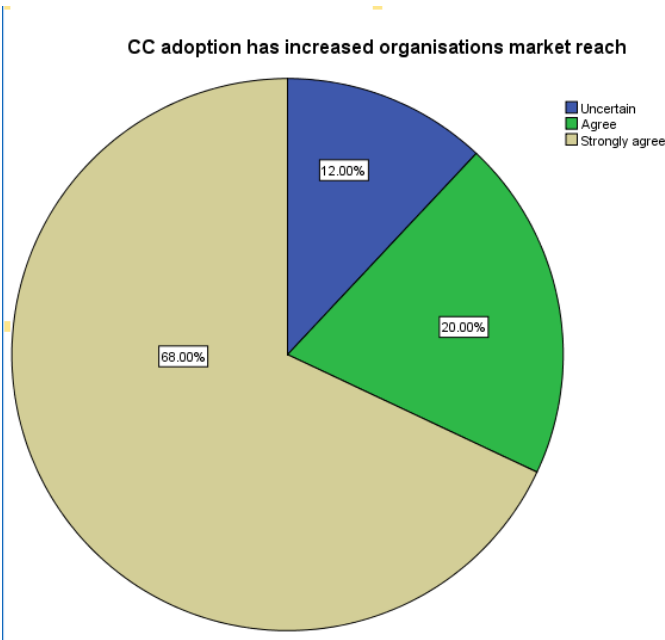


Figure 9 Cloud computing adoption and market reach



### 1.3.6 Correlations table: Cloud Usage, Cloud user Satisfaction and MFI operations

Table 15 Correlations table: Cloud Usage, Cloud user Satisfaction and MFI operations

(Source : Research data)

		Correlations		
		Cloud Usage	CC user satisfaction	MFI Operations
Cloud Usage	Pearson Correlation	1	.173	.363**
	Sig. (2-tailed)		.158	.002
	N	68	68	68
CC user satisfaction	Pearson Correlation	.173	1	.357**
	Sig. (2-tailed)	.158		.003
	N	68	68	68
MFI Operations	Pearson Correlation	.363**	.357**	1
	Sig. (2-tailed)	.002	.003	
	N	68	68	68

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The numbers in the correlation table measures the strength and direction of linear relationship between the dependent and independent variables.

From the analysis we can see that cloud usage has a positive correlation of 0.363 with MFI operation. The relationship is significant, the significance is less than 0.05, and we can also see that Cloud satisfaction also have a positive correlation of 0.357. A positive correlation indicates that when one variable increases in value the other variable also increases in value and vice versa. In this study if cloud usage increases there is a likelihood of MFI operations improving. We also deduced that the correlation between user satisfaction and MFIs operations is also statistically significant, the significance is less than 0.05, the significance is at 0.003.

### Regression Analysis

#### Combined

Model Summary					
Model	R	R	Adjusted R	Std. Error of	Change Statistics

		Square	Square	the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.470 <sup>a</sup>	.221	.197	.38592	.221	9.205	2	65	.000

a. Predictors: (Constant), CC user satisfaction, Cloud Usage

*Table 16 Regression Analysis model summary (Source: Author)*

Table 16 above indicates that the regression model predicts the dependent variable (MFI Operations) significantly well. The significance of 0.000 indicates that the statistical significance is statistically significant therefore predicts the outcome variable well.

In summary table above shows that both cloud user satisfaction and cloud usage contributes 22.1% variance of MFI operations which can be explained by the two independent variables.

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.742	2	1.371	9.205	.000 <sup>b</sup>
	Residual	9.681	65	.149		
	Total	12.423	67			

a. Dependent Variable: MFI Operations

b. Predictors: (Constant), CC user satisfaction, Cloud Usage

*Table 17 regression ANOVA summary (Source: research data)*

Table 17 indicates the statistical significance of the regression model that was run. The regression model is significant given the level of significance at 0.000(p = .000) which is below 0.05, therefore there is statistical correlation between the means of the dependent and explanatory variables. The significance of 0.000 indicates that the statistical significance is statistically significant and predicts the outcome variable well.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
	(Constant)	.049	1.012		.049	.961
1	Cloud Usage	.557	.200	.310	2.789	.007
	CC user satisfaction	.445	.163	.303	2.728	.008

a. Dependent Variable: MFI Operations

*Table 18 Coefficients table (Source: Research data)*

Table 18 shows that the two independent variables obtained a positive correlation hence both have positive effect on MFI operations .From the coefficients table above we can see that cloud usage has a greater contribution on MFI operations compared to cloud user satisfaction (Cloud user satisfaction Beta=.303 and Cloud Usage Beta =.310).

### **Individual independent variable**

#### **Cloud Usage**

*Table 19 Regression analysis Cloud Usage (Source: Research data)*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.363 <sup>a</sup>	.131	.118	.22515	.131	9.991	1	66	.002

a. Predictors: (Constant), MFI Operations

The regression table above shows that the significance is 0.002 which is less than 0.05 this indicates that the regression model statistically and significantly predicts the outcome variable .Table 19 above also shows that cloud usage can explain 13.1% of the variance on the overall MFI operations of 22.1% as seen in table 15.

### **Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.436	.280		12.278	.000
MFI Operations	.202	.064	.363	3.161	.002

a. Dependent Variable: Cloud Usage

*Table 20 Cloud Usage ANOVAa (Source: Research data)*

Table 20 shows that cloud usage has a positive correlation of 0.363 on Micro-finance institutions operations. The relationship is statistically significant since 0.002 is less than 0.050 ( $p < 0.05$ ).

## User Satisfaction Analysis regression Analysis

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.357 <sup>a</sup>	.127	.114	.27646	.127	9.639	1	66	.003

a. Predictors: (Constant), MFI Operations

*Table 21 User Satisfaction Analysis regression Analysis (Source: research data)*

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.227	.344		9.391	.000
	MFI Operations	.244	.078	.357	3.105	.003

a. Dependent Variable: CC user satisfaction

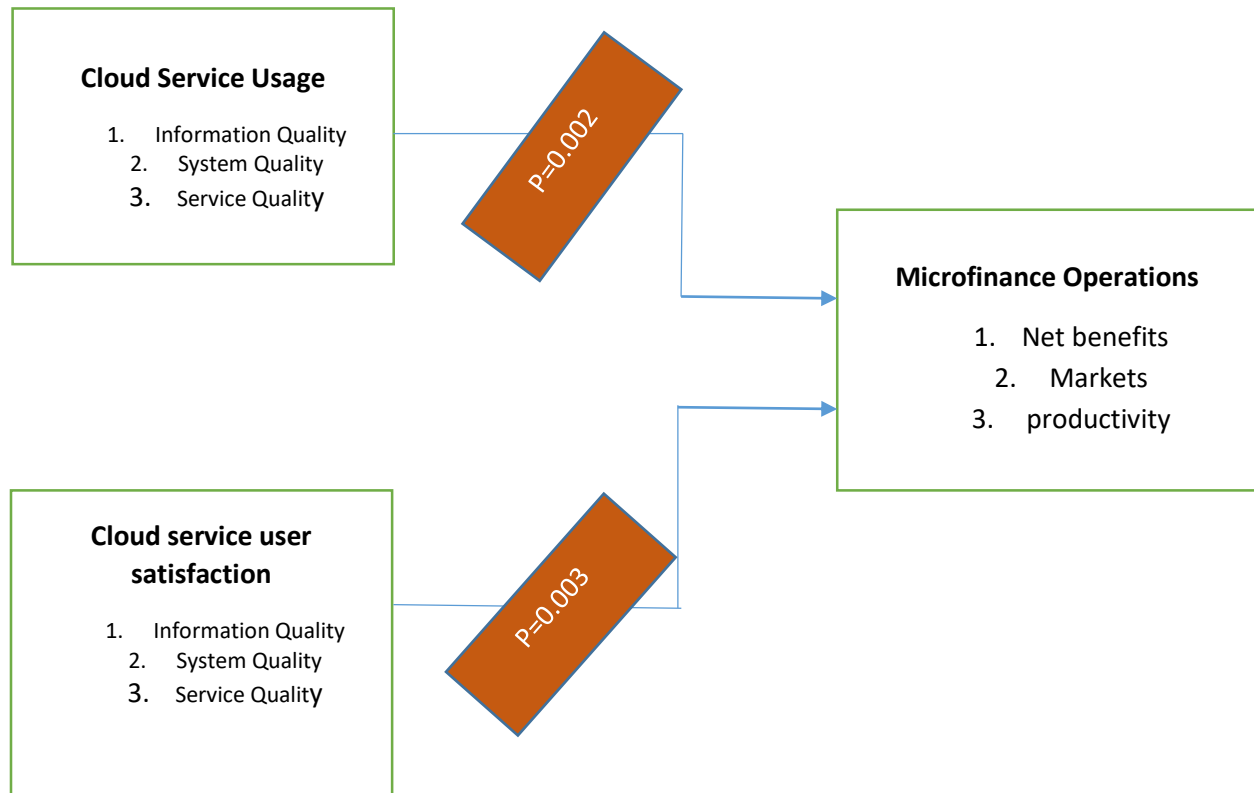
*Table 22 User Satisfaction Coefficients (Source: Research data)*

The regression table above shows that the significance is 0.003 which is less than 0.05 this means that the regression model statistically significantly predicts the dependent variable well. Table 21 above also shows that cloud usage can explain 12.7% of the variance on the overall MFI operations of 22.1% as seen in table 15.

### Conceptual framework Validation

The framework had two independent variables and one dependent variable which included Usage, satisfaction and MFI operations respectively. The framework was tested to assess how the MFI operations were affected by the other two variables this was done by generating questions from the proposed framework based on both the dependent and independent variables.

The figure below represents the significance of every variable in relation to MFI operations.



\*\* $P < 0.05$

### Conceptual framework after validation

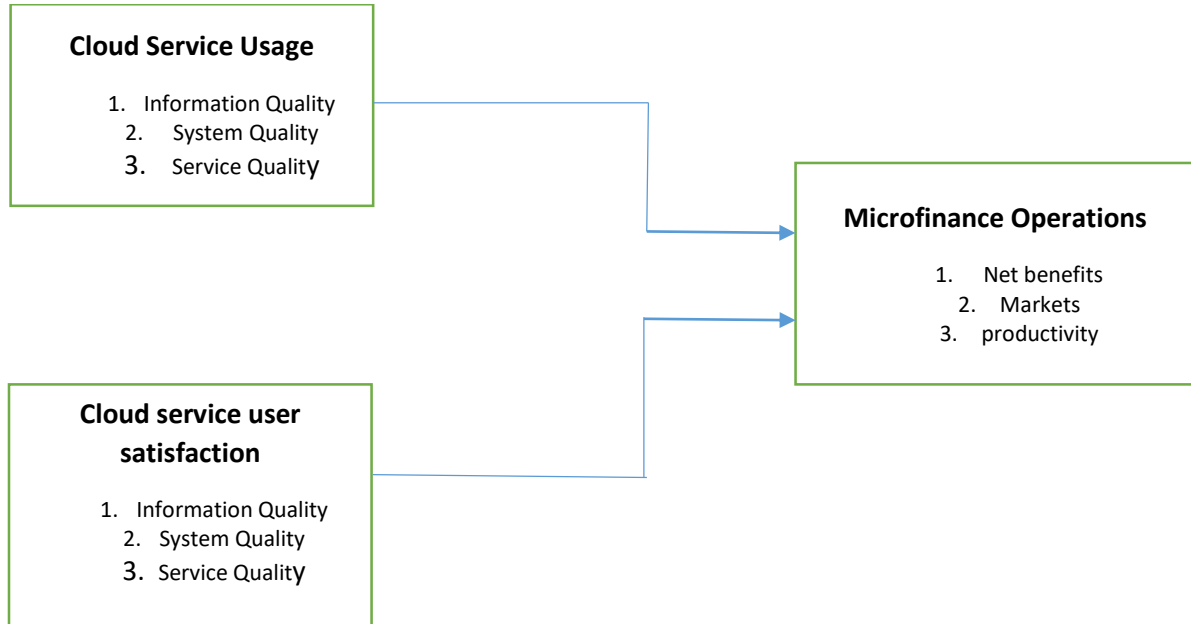
The framework was validated and supported by the regression outcome in this chapter. From the above figure the model predicts the outcome pretty well since all the significance (p) were less than 0.05.

The results of the regression indicated that:

1. There was a positive correlation between cloud computing service usage and MFI operations.
2. From the regression analysis we can see that there is also a positive relationship between cloud computing user satisfaction and Micro-finance institution operations. Where the significance is below 0.05
3. We can identify that there is statistically significance relationship between cloud computing service usage and cloud service user satisfaction.

## Validated Framework

Figure 11 Conceptual framework after validation (Source : Author)



## Hypothesis

H1a. Cloud computing Usage has significant effect on MFI operations.

The results indicates that there is significant effect on MFI operations. The regression table above shows that the significance is 0.002 which is less than 0.05 this means that the regression model is statistically significant and predicts the outcome variable. The hypothesis is therefore supported.

H2a. Cloud computing user satisfaction will have significant effect on MFI operations.

From the findings in the analysis we identified that there is significant relationship between cloud service user satisfaction and MFI operations. Essentially the relationship is statistically significant at 0.003.

## **CHAPTER 5:**

### **CONCLUSION AND RECOMMENDATION**

#### **Introduction**

This chapter includes recommendations and conclusion of the study including limitations of this study and suggestions for further work.

#### **Contributions of this study**

Contribution of this study were generated from the objectives in Chapter one.

##### **1. To examine the status of cloud computing in MFIs in Nairobi county**

This study was to establish the effect of adopting cloud computing on MFI operations. The questionnaire was used to evaluate the status of cloud adoption in microfinance within Nairobi County.

From the study we identified that the adoption rate was at 91.9%, only four micro-finance institutions out of the 29 interviewed had not adopted cloud service.

The study also revealed that majority of the MFI utilizes Software as a service model of cloud computing technology i.e. 95.6% of the MFI interviewed are using SaaS. None of the MFI interviewed were using IaaS, while majority of the MFIs had used cloud service for a period of one to two years.

##### **2. To determine Challenges and opportunities in using cloud computing by MFIs in Nairobi County.**

From the study we identified that the challenge cited by most of the MFIs interviewed was budget challenges which was cited by 84% of the respondents. The other challenge cited by MFIs was unreliable service from the service provider. Attitude toward cloud



and organizational culture were also cited as challenges toward cloud computing adoption and use.

Other challenges from the literature reviewed includes privacy issues, security issues, availability of data, data loss and vendor lock. Existing infrastructure was also a hindrance to cloud adoption because organizations were not ready to do away with their expensive hardware in order to adopt cloud technology.

Flexibility, ICT optimization and economies of scale were cited as some of the opportunities identified in the study.

**3. To evaluate effect of cloud usage on MFI operations**

From the study we can conclude that usage of cloud service have some effect on MFI operations. We identified that the relationship between the two variables is statistically significant hence the model can predict the outcome i.e. the dependent variable. The correlation is positive, an increase in cloud usage will definitely lead to improved MFI operations. It was noted that cloud usage reduced expenses of maintaining data centers in the organization, this is because there was less power consumption and less staff members were needed to support and manage the infrastructure.

**4. To evaluate effect of cloud user satisfaction on MFI operations**

The regression table (table 21) above shows that the significance is 0.003 which is less than 0.05 this means that the regression model statistically significantly predicts the dependent variable well. The correlation between user satisfaction and MFI operation is also positive hence an increase in user satisfaction will lead to improvement in MFI operations. It was also noted that the more a user got satisfied with a cloud service the more he/she used the service including other cloud services.

**5. To validate and recommend a framework that can be used to assess the effects of cloud computing adoption on microfinance operations**

In the previous chapter, the analysis was able to validate the proposed framework where we identified that the two independent variables had positive correlation which means that when the independent variable increases the dependent variable also increases.

From data analysis above, the two independent variables (cloud usage and cloud user satisfaction) we confirmed to influence the MFI operations outcome.

The significance between the two independent variables and the dependent variable was also less than 0.05.

The validated framework was therefore recommended for evaluating the effect of cloud adoption on organizational operations.

### **Recommendations**

The study shows that cloud usage and cloud service user satisfaction plays a great role in most MFI. It is therefore recommended that organizations train their users properly and ensure they are trained regularly so that they are up-to-date with the current trend on cloud computing. This will help them appreciate how cloud technology can transform business processes.

With the current cyber security setup there are many risks facing the customer's data stored on the service provider's premises including data on transit. The study recommends that cloud service providers should use the latest security technology to help protect this data e.g. encrypting data. This will consequently build customer trust in cloud service.

The study also recommends that the government should come up with laws and legislations to help protect the consumer of the cloud service from cartels and rouge business men. To ensure there is data privacy, security and related issues .There is need to ratify and enforce regulations governing cloud computing. This can be done through development of new laws or amending existing laws which will govern cloud computing technology. The law will also guide parties in case of any dispute or disagreement. National ICT policy and framework should also help in making the environment for cloud computing conducive by being flexible.

The study also recommends that organizations should allocate more fund to ICT department this will help build their technological capability and their human capacity to support cloud service effectively.

### **Challenges experienced during the study**

Though the study was completed successfully it was not without some challenges, the study had initial challenges where most of the microfinance staff members were not willing to share information due to their busy schedule. The aspect of time and budget constraint was also a challenge, the accuracy of the study was limited to respondents giving their honest opinion during the interview.

Availability of vast information on cloud computing in Kenyan context was limited. The study had to rely on the limited information available.

The study also considered only two dependent variables which affect MFI operations while there are many other factors which would have impact on MFI operations.

MFI operation is a broad term which was conceptualized in our study, however it would be important to evaluate the extent of cloud effect on a specific net benefit such as increase in profit.

### **Suggestions for further work**

It would be important in future if a study is carried out on other cloud computing variables which might affect the organization's operations the selected variables in this study contribute only 22.1%. i.e. % of variance that can be explained.

It would also be important for a similar study to be carried out outside Nairobi County where infrastructure and skills cannot match the ones within Nairobi County.

## References

- Akhusama, P. M., & Moturi, C. (2016). Cloud Computing Adoption in Insurance Companies in Kenya. *American Journal of Information Systems*, 4(1), 11-16
- Buyya, R. Broberg, J and Goscinski, A., (2011). *Cloud Computing Principles and Paradigms*. John Wiley & Sons. ISBN 9780470887998.
- Cavaye, A. L. M. (1996). "Case study research: a multi-faceted research approach for IS", *Information Systems Journal*, 6, pp227-242.
- Victor Chang (2015). *A Proposed Cloud Computing Business Framework*. New York: Nova Science Publishers, Inc., Commack.
- Claire Selltiz, C. (2002). *Research methods in social relations*. United Kingdom: Holt,Rinehart & Winston of Canada.
- Creswell, J. W. (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (2nd Ed.)*. Upper Saddle River, NJ: Pearson.
- Dornyei, Z. (2007). *Research methods in applied linguistics*. New York: Oxford University Press.
- Frost & Sullivan ., (2014). *Strategic Analysis of Cloud Computing Services in South Africa and Kenya*. (n.d.).
- Ford, D. (2007). Technologizing Africa: On the bumpy information highway. *Computers and Composition*, 24(3), pp.302-316.
- Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, 33(5), 861-874.

Johnson, P. and Clark, M. (2006), *Research Methods in Business and Management : Volume 2 Positivism: Deductive Research Methodologies*. London: Sage.

Katrina Stanoevska & Santi Ristol (2013). *IT Enabled Services*. Vol. 1,

Kaul-Lokesh (1984). *Methodology of Educational Research : Third edition*, New Delhi. Vikash Publishing House Pvt. Ltd.

Khan, B.H. (2005). *Managing e-learning: Design, delivery, implementation and evaluation*. Hershey, PA: Idea Group Publishing.

Kim, W., Kim, S. D., Lee, E., & Lee, S. (2009). Adoption issues for cloud computing. In *Proceedings of the 7th International Conference on Advances in Mobile Computing and Multimedia (2-5)*. ACM.

Kshetri, Nir (2010). *Cloud Computing In Developing Economies: Drivers, Effects And Policy Measures*.

Kumar, R. (2005). *Research methodology: A step-by-step guide for beginners (2nd ed.)*. Los Angeles: SAGE Publications.

Ledgerwood, J. (1999), *Microfinance handbook: An institutional and financial perspective*, the World Bank publications, USA By Fred M'mbololo Page 22 .

Linthicum, D.S. (2009). *Cloud Computing and SOA Convergence in Your Enterprise Step-by-Step Guide*.

Mugenda, O. M. and Mugenda, A. G. (2003). *Research Methods: quantitative and qualitative approaches*. Nairobi: ACTS press

Mather, T., Kumaraswamy, S., & Latif, S. (2009). *Cloud security and privacy: an enterprise perspective on risks and compliance*. O'Reilly Media, Inc.

Mutch, C. Lawrence Manion, Keith Morrison,(2005). *Doing Educational Research: A Practitioner's Guide to Getting Started*. Wellington: NZCER Press.

Nabeel Khan and Adil Al-Yasiri. (2015). *Framework for cloud computing adoption: a roadmap for smes to cloud migration*. School of Computing Science and Engineering, University of Salford, Manchester, United Kingdom

Omwansa, T. K., Waema, T. M., & Omwenga, M. B (2013). *Cloud Computing in Kenya A 2013 Baseline Survey*.

Oredo, JO, Njihia J.(2014).Challenges of Cloud Computing in Business: Towards New Organizational Competencies. *International Journal of Business and Social Science*.

Ronald L. Krutz, (2010). *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*. 1 Edition. Wiley.

Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research methods for business students*, 5th ed., Harlow, Pearson Education.

Selltiz, C., Wrightsman, L. S., & Cook, S. W. (1976). *Research methods in social relations*. New York: Holt, Rinehart and Winston.

SASRA. The Sacco Societies Regulatory Authority (SASRA) is a statutory state corporation. Available at:<http://www.sasra.go.ke/index.php/news-updates/speeches/87-list-of-sacco-societies-licensed-to-undertake-deposit-taking-sacco-business-in-kenya-for-the-financial-year-ending-december-2016>. Retrieved June 10, 2016

Thomas Wozniak, Santi Ristol .(2009). Grid and Cloud Computing: A Business Perspective on Technology and Applications. 2010 Edition.

Winkler, V. (2011). Securing the Cloud: Cloud Computer Security Techniques and Tactics . New York: Syngress.

Wyld, D.,(2009). The Utility Of Cloud Computing As A New Pricing, And Consumption – Model For Information Technology, International Journal of Database Management Systems, Vol. 1, No. 1, pp. 1—20.

## Appendix 1

### Introduction letter



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Nairobi  
Kenya

Our Ref: UON/CBPS/SCI/ITM/2015

2 August 2016

TO WHOM IT MAY CONCERN

Dear Sir/Madam

**RE: MUNYA ISAAC KARIUKI: REG. NO. P54/79830/2015**

This is to confirm that the above named is a bona fide student of the University of Nairobi, School of Computing and Informatics.

He is pursuing a M.Sc. course in Information Technology Management. He would like to collect data for his project entitled: ***"Impact of Adopting Cloud Computing by Micro-finance Institutions in Nairobi County."*** Under the supervision of Prof. Elijah I. Omwenga.

Any assistance accorded to him will be highly appreciated.

Yours faithfully

A handwritten signature in blue ink, appearing to be 'W. Okelo-Odongo'.

**PROF. W. OKELO-ODONGO  
DIRECTOR  
SCHOOL OF COMPUTING & INFORMATICS**

**School of Computing & Informatics  
University of NAIROBI  
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**UNIVERSITY OF NAIROBI**  
**COLLEGE OF BIOLOGICAL & PHYSICAL SCIENCES**  
**SCHOOL OF COMPUTING AND INFORMATICS**

**ASSESSING THE EFFECT OF CLOUD COMPUTING ADOPTION ON MICRO-FINANCE  
INSTITUTIONS OPERATIONS WITHIN NAIROBI COUNTY**

**By**

**Isaac K. Munya**

**Disclaimer**

The information collected will only be used for research purposes only. The information provided will be used to accomplish the listed objectives only and will be kept confidential

**To the Respondent**

Thank you for participating in this survey which is aimed at studying the impact of adopting cloud computing by microfinance institutions in Nairobi County

## Section One

### Demographics

Name of Organization (Optional).....

Physical Address

.....

Number of years you have worked for the organization.....

### Section Two

1. What is the size of your organization?
  - 1-10 Employees
  - 11-30 Employees
  - 31-60 Employees
  - More than 60 Employees
2. How long have your organization used cloud computing services?
  - 0
  - 1>2
  - 3>5
  - >5
3. Which cloud service model have your organization adopted? (select all that applies)
  - IAAS
  - PAAS
  - SAAS
  - Others.....
4. Which services does your organization receive from your cloud computing service provider? (Select all that applies).
  - Webhosting

- Email hosting
- Database hosting
- Online storage
- Application hosting
- Others .....

5. What are the key drivers to your organization adopting cloud computing services?

5 = Strongly Agree 4 = Generally Agree 3 = Neutral (acceptable) 2 = Generally Disagree 1 = Strongly Disagree

	<b>Key drivers</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
1	Economies of scale					
2	Flexibility and Scalability of IT resources					
3	Security benefits of cloud computing					
4	Diversification of IT systems and resources					
5	IT resource optimization					

- Other (please specify).....

6. Which are the barriers/ Challenges which hinder adoption and full utilization of cloud computing services (select all that applies)

5 = Strongly Agree 4 = Generally Agree 3 = Neutral (acceptable) 2 = Generally Disagree 1 = Strongly Disagree

	<b>Key drivers</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
1	Budget limitation					
2	Lack of reliable service from service provider					
3	Lack of skill to manage the service in-house					
4	Attitude towards cloud computing					
5	Organizational culture					

Other (please specify).....

**Section Three**

INSTRUCTIONS: Kindly consider each question separately and rate them independently of all others. Highlight the rating that indicates the extent to which you agree with each statement.

5 = Strongly Agree 4 = Generally Agree 3 = Neutral (acceptable) 2 = Generally Disagree 1 = Strongly Disagree

<b>A</b>	<b>Cloud Usage</b>					
	<b>System quality</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
1	Using Cloud computing service is easy					

2	The cloud computing system adopted are/is user friendly and attractive					
3	Information generated from cloud computing service is accurate .					
4	The response time by cloud computing system is acceptable(down time)					
5	The cloud computing system is customizable to suit my your preference(Flexibility)					
	<b>Cloud computing service, Information Quality.</b>					
6	The cloud computing service provides up-to date information					
7	Information generated from cloud computing service is clear					
8	Information / reports generated from cloud computing service is reliable					
9	The cloud service is always available when needed					
10	I get required information on time from the cloud service.(Timeliness)					
11	Information generated from the cloud service is sufficient					
	<b>Cloud Computing Service Quality</b>					
12	The cloud service provider gives reliable service.					
13	The Internet connection to the cloud service is fast					

14	The support from the service provider is adequate.					
15	Cloud service provider is always willing to help (responsiveness)					
<b>B Cloud computing User Satisfaction</b>						
	<b>Information Quality</b>					
16	I am satisfied with cloud computing service efficiency					
17	I am satisfied with cloud service information quality.					
18	I am satisfied with cloud service information accuracy.					
	<b>System Quality</b>					
19	I am satisfied with cloud service user-friendliness					
20	I am satisfied with cloud service ease of use					
21	I am satisfied with cloud service reliability					
22	service quality of CC systems and services brings user satisfaction					
	<b>Service Quality</b>					
23	I am satisfied with cloud support service provided by the cloud provider					
24	I am satisfied with service provider response time to requests.					
<b>C MFI operations</b>						
25	Cloud computing service have extended organization's market					

26	Cloud computing service have improved operational efficiency					
27	Adoption cloud computing has brought about flexibility. (Work anywhere )					
28	Cloud computing have increased my productivity					

**Thank you for participating.**