

# Infrastructure A Major Barrier to Ecommerce Development and Adoption

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## Abstract

**Ecommerce (e-commerce)** or **electronic commerce** is the purchasing, selling, and exchanging of goods and services over computer networks (such as the Internet) through which transactions or terms of sale are performed electronically. Ecommerce can be placed in several categories based on the parties involved in the transaction such as business to business or consumer to business. Use of technology enables buyers to purchase or sellers to access business market globally by use of internet though areas with no ICT infrastructure are faced with a lot of challenges ranging from lack of equipment, power connection and access to internet. Lack of ICT knowledge and skill, policies and laws to security concern are factors contributing to barriers to ecommerce development and adoption. The study in this research concentrated on lack of ICT infrastructure that denies most people universal access to internet that promotes use of ecommerce. The objective of the study was to; establish how lack of infrastructure affects adoption of ecommerce in rural areas and how lack of universal access to internet affects both buyer and seller. The study adopted a mixed methods paradigm with both quantitative and qualitative approaches (triangulation). Within the quantitative approach, the descriptive survey design was used, while within the qualitative approach, the exploratory design was used. Questionnaires and in-depth interviews were used for data collection. Quantitative data has been analyzed using basic descriptive statistics and inferential statistics such as independent - sample test and Analysis of Variance. Qualitative data from interviews has been analyzed by using the thematic analysis. The study finding will be useful to customer to business(C2B),business to customer (B2C) and business to business(B2B) in variety of business activities. Significance of the study is that it highlights on; why many people engaged in various business activities have not embraced use of ecommerce due to lack of ICT infrastructure.

## INTRODUCTION

Electronic commerce is a set of technologies, applications, and business processes that link business, consumers, communities, Governments, Private and public institutions for buying, selling, and delivering products and services over the internet. Ecommerce has advantages offered by technology that enables purchasers and sellers to reach their vendors at any part of the world without barrier. Those who enjoy the use of technology to transact over the internet basically require computers, knowledge, skills in ICT and access connection to internet. Involvement of Government participation contributes to faster growth of infrastructure for telecommunications as witnessed in telecommunication sector in Nigeria in 2000 (Sadiq et al, 2011). The study aimed to assess various business activities at the centre and the surrounding and to find out how lack of ICT infrastructure in the area affects development and adoption of ecommerce. Research established that poverty denies most people an opportunity to be educated, to be trained and to benefit from the use of technology. Lack of infrastructure in some urban areas and rural areas, people being unable to afford computers and the cost to connect to internet are attributed to high poverty level in the country and especially in yimbo that results with many going to the lake to do fishing. Nyamonye Shopping Centre where case study was done is in Nyamonye sub location in Yimbo North Location, Usigu Division of Bondo sub-county. Yimbo is about seventy seven kilometers away from Kisumu City using Kisumu Usenge Road and about fifteen kilometers from Bondo town. Yimbo is sandwiched between river Yala and lake Victoria and from lake Vitoria somebody can sail to Kisumu,Tanzania and Uganda. From Yimbo one can sail to Mageta Island where our founding father the late Mzee Jomo Kenyatta was taken at one time during the struggle for Kenyas independence in late 1950's. From Yimbo one can sail to the famous island Mingingo which is known for high production of tilapia fish, the reason for struggle for ownership between Kenya and Uganda Government.

The economic activities in the 1970's was cotton farming, fishing and maize farming along river yala swamp. These have since changed with no more farming of cotton since the Rivertex factory in Kisumu was closed down several years ago. Currently a larger percentage of farming along river Yala is done by Dominion that uses the swamp for maize, rice and other crops for economic activities with a smaller percentage done by individuals for a living. Sugar cane is also grown by individuals for local consumption in Yimbo and other areas such as Alego and Sakwa.

Research established that the main economic activity in Yimbo and other areas along lake Victoria is fishing. Fish from Lake Victoria is used for local consumption in the area and export to other areas including City of Kisumu and Nairobi City the Capital of Kenya. Lack of ICT infrastructure is a major barrier to use of technology

and people in the area still stick to old traditional methods of doing business. That means they are not benefiting from innovation and advancement in technology that has diversified and simplified ways of doing business including use of internet to buy and purchase goods globally regard less of where one may be. People involved in the business are consumer to consumer (C2C), individuals buying from individuals, Business to Consumers (B2C) business buying from individuals or Consumer to Business (C2B), Individuals selling to business, Business to Business (B2B) Habibi.F et,al (2015). The research established that there are societies, individuals who would have benefited from the use of technology to market and to sell their products over the internet but there is no infrastructure to make this possible, no universal access to internet for communities in rural and remote areas, Adediran Y.A. (2005).

Dominion farms in Yimbo has a lot of business activities meant to uplift the living standard of the locals and to benefit others in the country as a whole but, is not known by many in the country because of lack of infrastructure that denies them a chance to link to internet to market products and sell in a wider market country wide. They have a basic website for their Headquarters in United States of America but nothing dedicated for Dominion Farms in Kenya. Dominion farms in Kenya are also involved in fish farming but has challenges in marketing their products. Use of technology has made it possible for fishermen in some developed countries to use devices such as sensors in fishing but this involves proper training and availability of required infrastructure. It is reported that sensors technology has reached a peak in development and it is doubted whether any increased benefits will be found in the future (Banks, 2001). Lack of infrastructure affects businesses in various areas. The study on book publishing industry established that most of their clients such as booksellers, libraries and even learning institutions (secondary and primary schools) are not connected to internet because of lack of infrastructure. This study established further that in the area there are no good access roads, electricity installations in schools, business premises, computers, and internet connections, cyber cafes where people can browse or check emails and in some parts there are no mobile phone boosters for reliable mobile phone network signals.

One would think that it is the high poverty level only that denies most people a chance to use ecommerce in various business activities but the research indicated Infrastructure as the major barrier to ecommerce development and adoption. Infrastructure such as poor roads for transport, fiber cable networks, power supply, credit or debit cards, computing equipment such as computer hardware and physical goods delivery challenges are major contributors to ecommerce development barriers in the area which is a reflection of the problem in Kenya as a whole compared to rural areas in developed nations such as EU and northern Europe (Adisa, 2012). Nyamonye Shopping Centre in Nyamonye Sub location, Usigu Division in Yimbo of Bondo Sub-county was selected for study because it is in between lake Victoria where there is a lot of small business activities including fishing and other business activities at River Yala swamp where the Dominion carries a lot of business activities such as, fish farming and other food crops farming whose products would be marketed and sold in a wider market area by use of ecommerce. The research established that in Yimbo, there are three major centres where we have various business activities. At the far end toward the border of Kenya and Uganda is Usenge with several beaches and a big shopping centre and market place, it is the main terminus for the main road from Kisumu to Usenge. The other centre is Usigu from Usenge with Nyamonye at the eastern part toward Kisumu. Nyamonye is a unique centre with several road connections to Usenge, Dominion at Yala connecting to Siaya, Bondo Teachers Training College and Jaramogi Oginga Odinga University along Bondo Usenge road. Research further established that in Nyamonye there are only two cyber cafes that hardly offer the basic internet services. An attempt to check email would take between ten to twenty minutes or fail completely and there is no internet connection to surf. The connection through a modem that is only fixed on one personal computer is frustrating. The other two cyber cafes near Jaramogi Oginga Odinga University about fifteen Kilometers away from Yimbo are equally poor for internet connection, what they reliably offer are printing and binding services. The only place where internet services are reliable is within Jaramogi Oginga Odinga University but this is not for general public. The cause for these are lack of linking ICT cables, poor network signals, no ISP network boosters and no power supply in most places.

The study also established that people in these areas are engaged in promoting some ecommerce activities and services by increased use of mobile phone technology as stated by Barrett, M and Kim, HSA and Prince, K (2011), "M-PESA Power: Leveraging service innovation in emerging economies". Most of these people especially motor cycle operators commonly known as bodaboda have no Bank Accounts but, use mobile phones for money banking and money transfer through the services offered by Safaricom M-Pesa. They reason out that banks are not available for them and even if they were there, they would not use them since they can not afford. The problem is that there is no infrastructure to make it possible for them to participate in other ecommerce activities. There are no cyber cafes for internet and email within their reach. Lack of infrastructure denies Shopkeepers, bodaboda and the general public at the centre a chance to participate and benefit from full range of ecommerce services other than money banking and money transfer on mobile phones.

Infrastructure and the level of usage indicate that very few people have main power installed in their premises; none have computers while the use of mobile phones for communication and money banking is high as shown on Fig.1

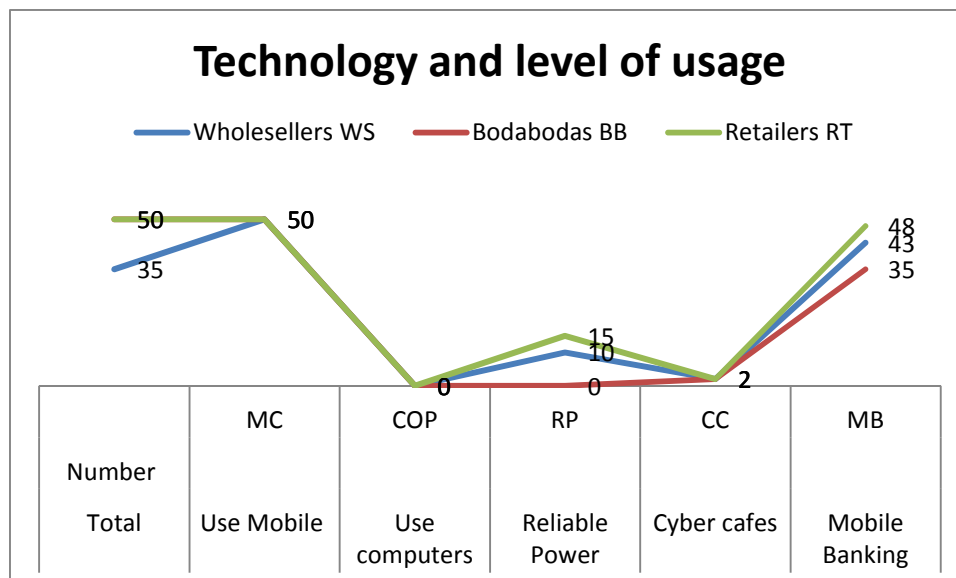


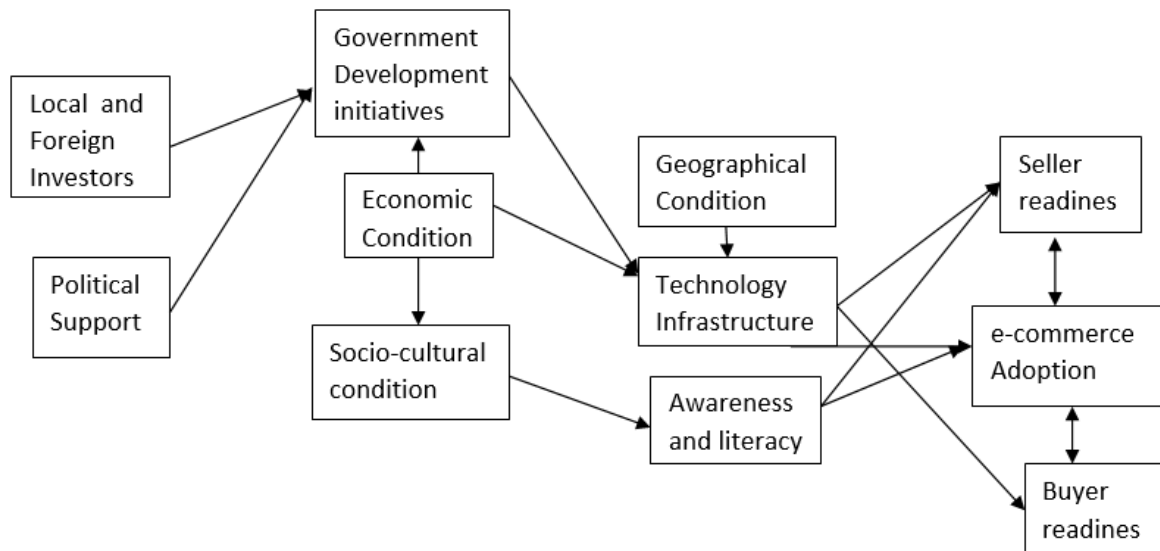
Figure 1: Technology and level of usage

#### ACRONYMS

- **B2B (Business-to-Business)**  
Companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers.
- **B2C (Business-to-Consumer)**  
Businesses selling to the general public typically through catalogs utilizing shopping cart software
- **C2B (Consumer-to-Business)**  
A consumer posts his project with a set budget online and within hours companies review the consumer's requirements and bid on the project. The consumer reviews the bids and selects the company that will complete the project.
- **C2C (Consumer-to-Consumer)**  
There are many sites offering free classifieds, auctions, and forums where individuals can buy and sell thanks to online payment systems like PayPal where people can send and receive money online with ease. eBay's auction service is a great example of where person-to-person transactions take place every day since 1995.
- **GPO- General Post Office**
- Huduma Centres – One stop shop where huduma programmes are offered
- Huduma Kenya - (**Huduma Kenya**) is a network of public government offices (**Huduma Centres**), in which Kenyans can transact business such as driving licence renewals, duplicate identity cards and seasonal parking tickets.
- **ICT** -Information and Communication Technologies
- **ISP** –Internet Service Provider
- **M-Pesa** - A mobile banking service that allows users to store and transfer money through their mobile phones.

#### FACTORS INFLUENCING E-COMMERCE ADOPTION

To understand the relevance of e-commerce and the factors that contributes to its growth with sellers and buyers at the receiving end. A number of e-commerce adoption factors have been identified from the literature as summarized in Figure 2 The figure also demonstrates the influence of each factor on other factors.



**Figure 2. Factors Affecting e-commerce Adoption**

**Government Initiatives**

Government initiatives are important in the adoption of e-commerce and other ICT in general (Molla 2005). They can be in terms of promotion of ICT usage, education and the establishment of adequate regulatory framework for e-commerce including taxation and tariff for revenue generated through e-commerce. Government of Kenya has introduced Huduma Centres to facilitate delivery of Government services to the people. Established Huduma Centres are spread across the country as shown on the table 1

Huduma Centre	Location
Nairobi,	GPO, City Square
Nakuru,	GPO
Kakamega,	GPO Kakamega
Nyeri,	Provincial Headquarters
Mombasa,	GPO Mombasa
Kisii,	GPO Kisii
Wajir,	GPO Wajir
Bungoma,	GPO Bungoma
Kitui,	GPO Kitui
Machakos,	GPO Machakos
Eldoret,	GPO Eldoret
Kisumu,	Former PC Office
Embu,	GPO Embu
Kajiado,	GPO Kajiado
Meru,	GPO Meru
Siaya,	GPO Siaya
Isiolo,	GPO Isiolo

**Table 1: Huduma Centres**

**Huduma Centres**

The following are services offered at Huduma Centers.

1. Renewal of Drivers licenses and Status check
2. Duplicate National Identity Card
3. NHIF Registration and Claims
4. NHIF Member Statements and accredited Institutions
5. Assessment and Payment of Stamp Duty – Lands
6. Nairobi City Single Business Permit
7. Issuance of Seasonal NCC tickets
8. Search and Registration of Business Names

9. Registration of Welfare Groups
10. PPOA Filing reviews and /or addressing complaints in procurement and disposal
11. Student Loan Application – HELB
12. Student Loan Repayment Services – HELB
13. NSSF Registration
14. NSSF Member Statements and Benefits
15. Reporting Corruption – EACC
16. EACC Clearance Certificate
17. Status of Pension Claims
18. Kenya Police Abstract
19. Community Policing- NyumbaKumi
20. Public Complaints through the Commission on Administrative Justice – Ombudsman

### ***Political Support***

Political situation is a key factor for e-commerce growth. In a country with an unstable political condition, it is less likely that government will give enough attention, if any, on e-commerce development (Dedrick et al. 1995). Political leaders would concentrate on development programmes only if there is peace. Countries where leaders are majorly concerned with development of economy pay more attention to development of infrastructure including roads, electricity and telecommunication networks that enable e-commerce development and adoption.

### ***Economic Condition***

Economic condition is a major driver for e-commerce adoption. If the level of poverty is high then people may not be able to participate in developing infrastructure for e-commerce because of low economic activities. Buyers may not be able to acquire necessary equipment such as computer hardware, software and access to internet. Since e-commerce relies on some technology infrastructures which are relatively expensive for many developing countries, counties with high level of poverty are not likely to be involved in e-commerce (Dedrick et al. 1995).

### ***Buyers and Sellers***

Sellers and Buyers form a part of factors affecting development and adoption of e-commerce since set up and access to internet must be ready at both ends. This is really so because publishers need to be e-commerce ready as well as their clients, buyers such as booksellers, schools, and libraries. Both seller and buyer must be ready to make electronic transactions a reality if they have ICT infrastructure in place.

### ***Technology Infrastructure***

Telecommunication infrastructures are required to connect various regions within a county and across countries (Molla 2005). E-commerce relies on efficient logistic infrastructures within a country. Its growth further requires the establishment of reliable and secure payment infrastructures to avoid frauds and other illegal actions (Boerhanoeddin 2000). Government, political wills, economic and geographical conditions of the county contribute to fast development of infrastructure required for e-commerce.

### ***Geographical Condition***

Geographical condition of a place can be a motivation or barrier to technology infrastructure development. Technology infrastructures can be difficult to develop in remote rural areas that consist of many small islands. Example are Oyamo Island, Ndeda Island and Mageta Island in lake victoria among others.

### ***Socio-cultural Condition***

cultural and social environment may also affect adoption of e-commerce. In some countries, people consider shopping as a good opportunity to meet with friends, make better choice of goods required and get good time to socialize and therefore, B2C e-commerce is difficult to nurture (Boerhanoeddin 2000). Likewise, the level of education, digital literacy, affordability of personal computers and internet universal access within the society affect the growth of e-commerce (Raffa et al. 2002). Lack of infrastructure and awareness about the benefits of e-commerce influences businesses to retain traditional method of business transactions, Samanta, I. (2011).

### ***Awareness and Literacy***

Lack of awareness of the use, the knowledge and potential benefits of ICT can also hinder the growth of e-commerce (Molla 2005). In Kenya, many people are only aware of limited e-commerce applications and use of some e-commerce components such as chat, email and browsing websites (Minges 2002). The most commonly used component is money banking and cash transfer offered by Safaricom known as mpesa.

### ***Local and Foreign Investors***

Local and foreign investors may also influence the growth of e-commerce in a country. Investors help in development of infrastructure to facilitate smooth operation of their businesses. For example, some big investors may install communication boosters or fiber optic cables in their premises thus making them accessible to premises in the area.

### **OBJECTIVES**

Investigate factors that contribute to slow development and adoption of ecommerce in rural areas  
Investigate and understand the role of good ICT infrastructure in ecommerce development and adoption

### **CHAPTER THREE: METHODOLOGY**

In this study we conducted an empirical study of people doing business at the centre including shopkeepers, Motor Cycle Bodaboda operators and general public at random. The study covered preferred mode of communication, availability and affordability of power supply, use of computers, email communication, use of any technology such as mobile phones, internet and business transaction mode of payment.

#### **Research Method**

Exploratory research was found to be suitable for research design, data collection, and selection method. An explorative investigation is appropriate when a research problem is unstructured and difficult to delimit according to (Eriksson & Wiedersheim, 1997).

The research purpose and question applied here can be described as both exploratory and confirmatory but largely confirmatory, since we aimed to find out effects of lack of ICT infrastructure on ecommerce development.

#### **Research Approach**

##### **Triangulation approach**

Data was collected and analyzed by means of survey questionnaires, semi-structured interview, (triangulation approach). Triangulation was chosen because it offers the use of different research techniques giving many advantages. Denzin (1970), for example, suggested that the use of triangulation approach offers greater validity and reliability than a single methodological approach. Dixon et al. (1988) state that most hypotheses and research objectives can be researched using more than one technique of data collection; providing detailed data about the phenomenon being investigated.

#### **Data collection and procedures**

People involved in whole sales and retail at the centre, motor cycle operators and individuals at the centre were approached individually and asked to participate in the research.

Data was collected by means of survey questionnaires and semi-structured interview.

#### **Questionnaire preparation**

The questionnaire was prepared in stages. First, an initial pool of items was generated following the method of Molla & Licker (2005), the items were reviewed and edited to capture the essence of the concepts and constructs and a preliminary questionnaire was obtained.

#### **Survey questionnaires**

Questionnaires are appropriate for gathering the views of a large number of people about a particular phenomenon (Stroh, 2000). Questionnaires were used to gain general picture of effects of infrastructure on ecommerce development at the centre. A general list was generated at first for general interview conducted. The questionnaires consisted of questions that were related to possible factors affecting ecommerce development resulting from lack of ICT infrastructure. Like five point scales ranging from 'strongly agree' to 'strongly disagree' are used as a basis of questions. This scale has been used in previous ecommerce adoption research according to (Molla & Licker, 2005). The questions were categorized according to the factors expected to be the major contributors of challenges and problems facing ecommerce development caused by lack of ICT infrastructure.

Benefits were assessed on a five-item scale based on the survey questionnaire of Thong (1999) who investigated IS adoption in small businesses. The questions measured understanding of the benefits and application of ecommerce by user of technology as shown on Table 2

### **QUESTIONNAIRE**

Sample questionnaire is shown here below

**E-commerce evaluation**

	Please evaluate the following statements by placing a tick where appropriate	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	<input checked="" type="checkbox"/>					
1	I use mobile phone for most of my communication					
2	I contact my customers through mobile phones and email					
3	I have a fixed landline phone					
4	I use computer to send email					
	I have never heard about a website					
5	I prepare my business documents on the computer					
	Mobile networks receive strong network signals in the area					
	Use of mobile for Money banking and transfer is common					
	Power supply is available and connected to most business premises					
	Cyber cafes use fiber cables					
	Most people do not understand benefit of using computers to buy and sell products					
	I have never heard about Internet Service Provider( ISP)					
	We have never heard about Credit Or Debit card					
	Delivery of physical Goods a challenge for ecommerce use					

Table 2: Ecommerce evaluation

**ANALYSIS**

**Data Analysis**

Discriminant function analysis and Independent samples test were used where applicable to analyze data in this research. Analysis details were coded as shown below on Table 3:

ITEM DETAILS

		Whole sellers	Retailers	Motor cycle operators
MC	Common communication is by mobile phone	50	46	50
CU	I use computers to prepare business documents and send emails	0	0	0
RP	We have reliable power supply for business activities	0	0	0
RC	We have reliable and cheap cyber cafes for email and browsing	0	0	0
FC	Reliable cyber cafes at the centre are connected by fiber cables	0	0	0
MT	M-Pesa easier for banking and money transfer than banks	40	45	50
CT	Never heard about credit and Debit Cards	45	50	50

Fig 3. Effects of lack of infrastructure analysis

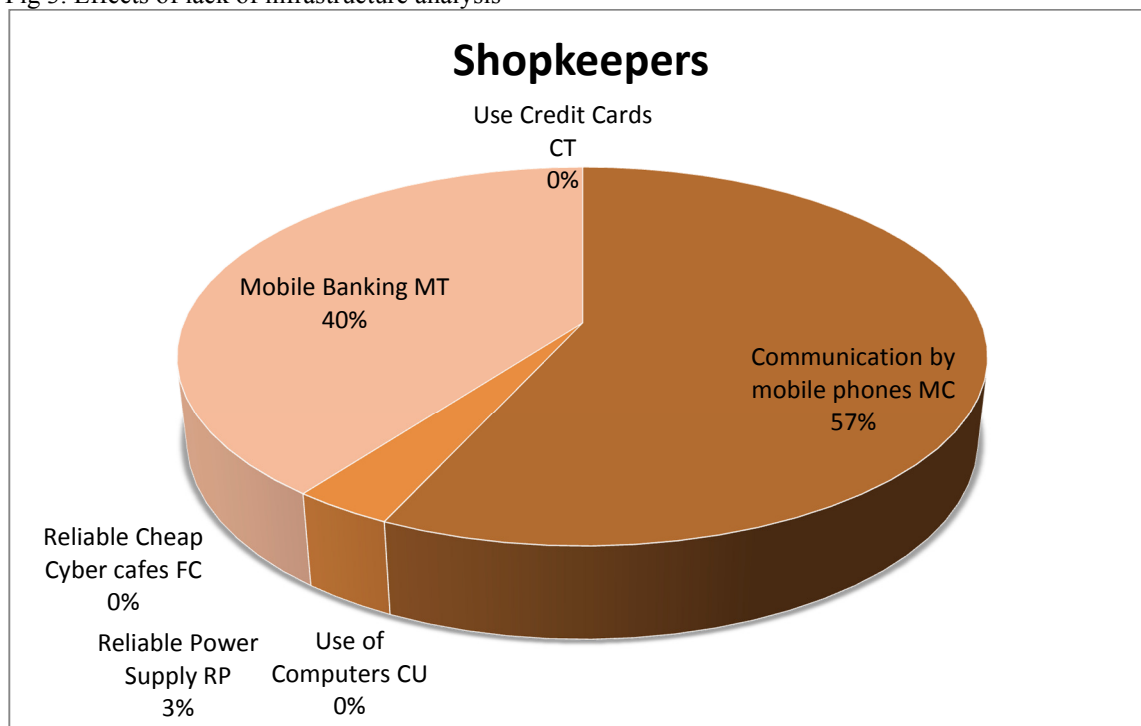


Fig.3 Infrastructure a major barrier to ecommerce

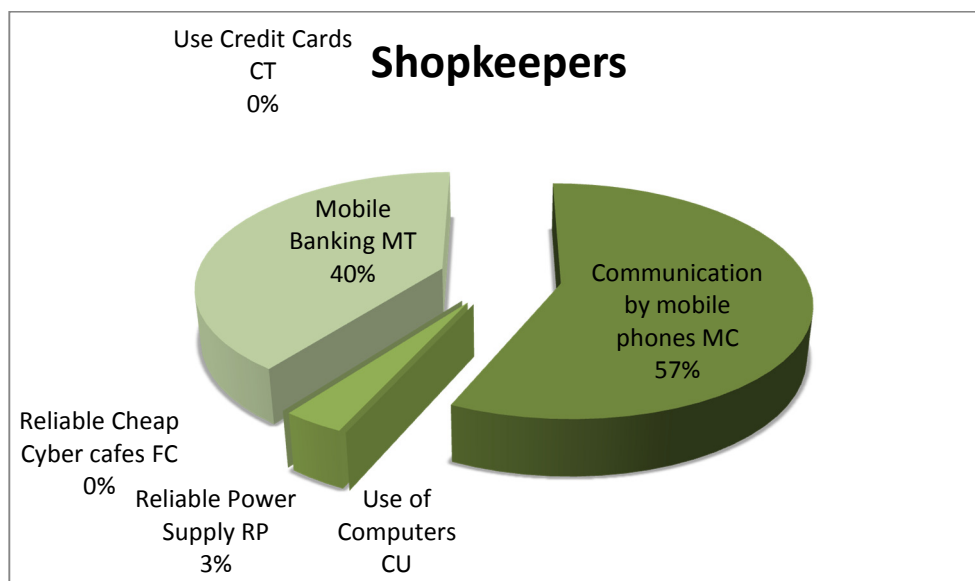
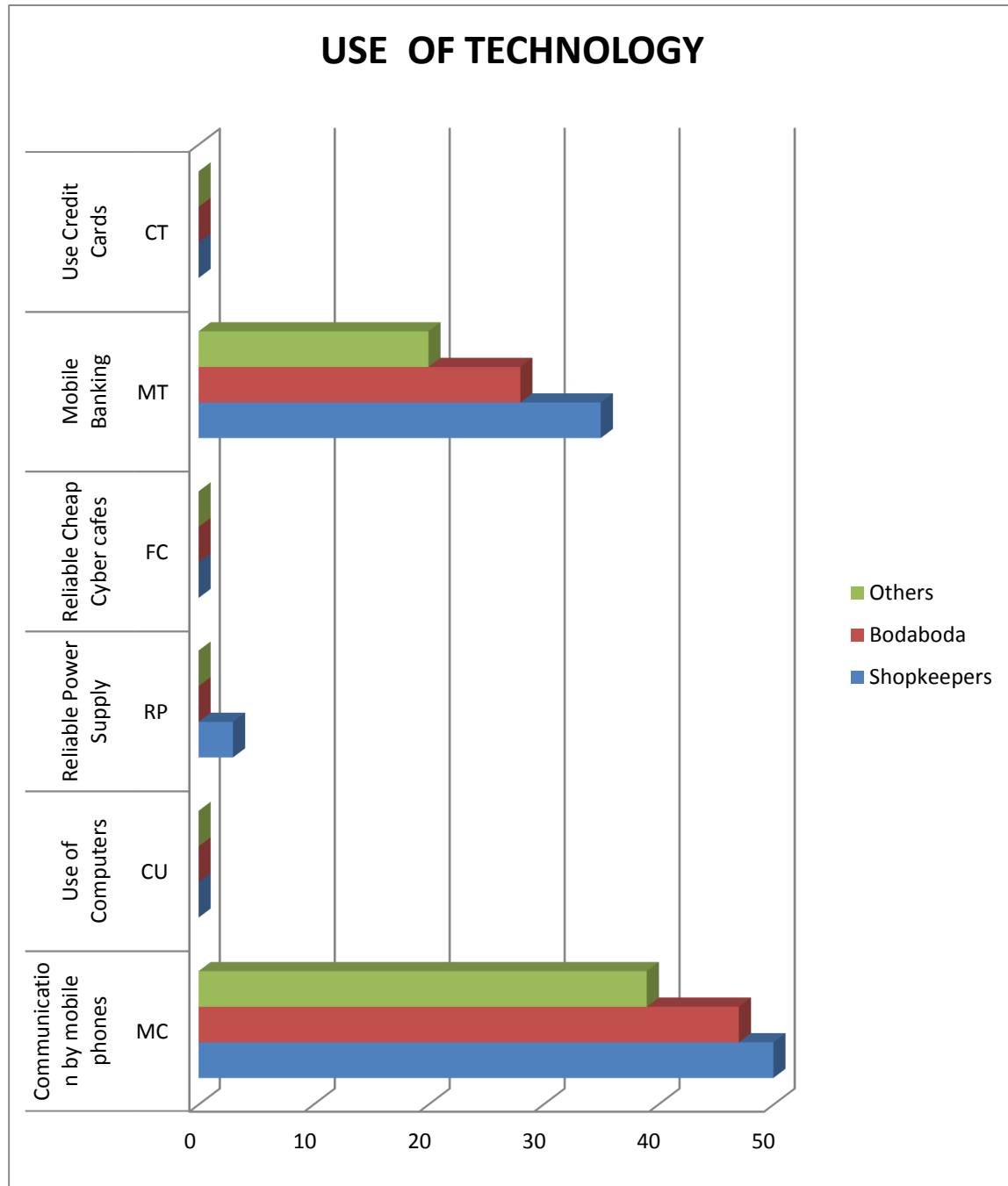


Fig. 4 M-commerce common among the users





**Figure 5: Use of Technology**

#### FINDINGS

Infrastructure is the backbone of ecommerce development. Research established that most of the shopkeepers at the centre have no electricity and the cost of installation is far beyond what they can afford. Business activities are done manually with the aid of hand calculators for simple mathematical calculations. Communication is through traditional mails and mobile phones. There is no landline telephone connection but the use of mobile phones is common to almost all categories of people at the centre. We found out that the use of mobile phones is most preferred method of communication and is the only technology that is used by the group that is financially stable and the low income group. This is not comparable with use of computers that requires electricity supply, computer hardware and computer software with some basic skills. There are no cyber cafes for browsing and sending emails at the centre. Motor cycle operators commonly known as bodaboda use mobile phones mainly for communication, money banking and cash transfer. There are two cyber cafés at the centre with only one having one computer connected to a single user modem but to be connected to access email account is not easy because of poor network.

This takes 10 or more minutes to connect or fails completely. Motor cycle operators and the general public interviewed said that mobile phones offer simple and cheap most preferred option for money banking and money transfer. All the people who participated in this research survey said they had never used credit or debit cards and they did not understand how use of these would help them in business. In ecommerce delivery of physical goods remains a major challenge among other necessary infrastructure. Services and products in digital form such as music, software or books in softcopies can be transacted easily but physical goods pose some delivery challenges. Research further confirmed that poverty denies people many things in life but lack of good ICT infrastructure contributes to low ecommerce development and adoption.

### **Low income Group**

Research identified high poverty level as one of the major contributing factors that affects ecommerce development and adoption at almost all levels. The people in this category that includes whole sellers, retailers, motor cycle operators (bodaboda) can not afford to buy computer equipment, install electricity, pay for fiber cable for reliable and fast internet connection or use credit and debit cards for easier transaction. They cannot afford to use banks even if they were available but, most of them can afford to own mobile phones. They use mobile phones for communication, sending and receiving short messages, money banking and money transfer activities.

The study also established that this group is engaged in promoting some ecommerce activities and services without knowing. Most of these people have no Bank Accounts but, use mobile phones for money banking and money transfer through the services offered by Safaricom M-Pesa. They reason out that banks are not available for them and even if they were there, they would not use them since they can not afford. The problem is that there is no infrastructure to make it possible for them to participate in other ecommerce activities. There are no cyber cafes for internet and email within their reach.

### **INTERPRETATION AND RECOMMENDATION**

Lack of infrastructure is a major barrier to development and adoption of e-commerce. High cost of installing electricity, cost of computers, and cost of installing fiber cables for cheap and faster internet access, lack of knowledge on the benefit of using credit cards, concentration of ISPs only in the capital city of Kenya, Nairobi, physical goods delivery challenges are the major barriers that leaves most people with the option of using mobile phones thus the increase of m-commerce. M-commerce also faces one major challenge concerning lack of network boosters that makes mobile phone use difficult at some places.

### **CONCLUSION**

The research established that people who can not afford to use Bank services can easily use money banking and money transfer through mobile phones but this is far from achieving all benefits of ecommerce. Low income group are the main users of these services especially in Kenya since the financially stable category use both banks and mobile but, their concentration is on banks.

In this way low income group also facilitate adoption of some ecommerce services such as money transfer and money banking by use of mobile phones. It has also been established that boarder boarder operators now use mobile phones to reach their clients and on the other hand their clients also reach them to book and make payment through M-Pesa.

Ecommerce relies on some technology infrastructures which are relatively expensive for many developing countries. They have unfavorable economic conditions that deprive them an opportunity to be involved in fast ecommerce development. Among the most pressing are economic conditions, educational systems, payment systems for enabling transfer of funds, and distribution systems for physical transfer of goods.

Kenya Government is making commendable effort in use of technology but is far from achieving its goals unless the infrastructure problems are solved both in towns and rural areas. The greatest achievement of the Huduma Centres is their operating model of Integrated Service Delivery. It provides the citizen with multiple-channel, single-window access to government services at one-stop Citizen Service Centres, complete with call centres, mobile phone platforms and web portals. Currently the National Government is setting up only one Huduma Centre per county making it impossible for most people to benefit from the services offered. The issue of power supply and installation of fiber optic cable to other places other than county headquarters must be addressed by the National Government to speed up development. National Government need put adequate ICT infrastructure in place to facilitate setting up of digital villages with the reach of common citizen

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