OPEN SOURCE SOFTWARE IN CYBER CAFÉS IN KENYA: A SURVEY OF CYBER CAFÉS IN NAIROBI.

SUBMITTED BY

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D61/70554/2009

A Management Research Project Submitted in Partial Fulfilment of the Requirements of the Master of Business Administration Degree, School of Business, University Of Nairobi

OCTOBER 2011

DECLARATION

This management research proposal is my own original work and has not been submitted for a degree in any other university.

Signed: _____ Date: 10/11/2011

FREDRICK MBUGUA KAMAU

SUPERVISOR'S DECLARATION

This research proposal has been submitted for examination with my approval as the candidate's University Supervisor.

Signed: _____ Date: 10/11/2011

DR. KATE LITONDO

DEDICATION

This study is dedicated to my Family especially my late dad, for their encouragement and belief in me during my entire academic life. May Jehovah`s blessings shine upon you.

ACKNOWLEDGEMENT

I thank Jehovah for his guidance and blessings that he has bestowed upon me, enabling me reach this point in my life.

I wish to thank my mum for always encouraging me and for her advice that nothing is impossible to a willing heart, your guidance and wisdom has guided me through life, Thank you Mum.

I wish to thank my family for their unwavering support in enabling me pursue this course and for always being there for me and for your understanding and help always, May Jehovah bless you dear brothers and sisters.

I would like to thank my supervisor for her guidance and commitment during the course of this research paper without which none of this would be possible, Thanks doctor.

I also would like to thank my work colleagues and classmates for the personal sacrifices they have made to enable me pursue this course. I thank you all for being flexible and understanding to enable me fit in a demanding schedule. Thanks all

ABSTRACT

Open source is a concept that encourages access to a producer's source or raw materials. In the Information Technology field it means allowing software users to access the programming code and empowering them alter this code to improve on the performance of the software. The main benefits that arise from adopting the open source concept in software development include: cost effectiveness, enhanced system stability, security and flexibility. In Kenya cyber cafés provide access to internet services to a majority of the population. The purpose of this study was to evaluate whether cyber café s in Nairobi have adopted open source software, and the benefits as well as the challenges that have resulted from open source software. The study incorporated the Technology Acceptance Model (TAM) framework in evaluating the adoption of open source, with perceived ease of use being one of the variables in the study.

This was a case study covering cyber café s within the Nairobi CBD; with the population data set comprising of 47 cyber cafés that are listed in Mocality and the Yellow Pages online directory websites. The data collection was through structured questionnaires administered using the drop and pick approach. The data was analysed using means and standard deviation as a measure of variation in responses.

A majority of cyber cafés have adopted open source software especially the browsing applications and operating systems such as Linux. Price, security and availability were cited by the respondents as the major benefits resulting from using open source software. The study recommends that the government develops an open source policy framework to govern its use, and also advocates for open source to be incorporated in the Information Technology curriculum especially in public institutions. This will enable users and organisations to fully exploit the potential of open source software.

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Open source is a concept in production and development that encourages access to the end products source or raw materials. In the case of software this entails access to the programmer's source code that enables a diversification, alterations and improvements to be done on particular software from within. A user who has knowledge in programming is allowed to alter the software in order to meet his system requirements and at the same time distribute the modified software without risking legal prosecution (Perens, 1999). E.g. a person using a word processor like Microsoft word, can be allowed to reprogram it to better edit pictures in order to come up with an enhanced desktop publishing application and redistribute it under his own trade mark. Before the adoption of the term open source, developers and producers used a variety of phrases such as free software to describe the concept. However, opening the source code enabled a self-enhancing diversity of development models and interactive communities. Subsequently, a new, three-word phrase "open source software" was born to describe the environment that the new copyright, licensing, domain, and consumer issues created (Stallman, 2007).

It is important not to perceive open source software as being the same as free software. according to (Stallman, 2007) open source is a development methodology whereas free software is a social movement, Even though most open source software are available for free, it should be noted that not all open source software are freeware, and neither can all freeware software be described as open source software. The main fundamental characteristic of open source software lies not with the acquisition but on accessibility and freedom to alter the source code to suite a need. In terms of the economic aspect there are two perspectives to the software industry the supply (vendors; the people or organisations that create and distribute the software) and the demand (customers; the people and organisations that acquire and use the software). To the customers open source products which are available at little or no cost are useful for building their businesses whereas for vendors these have been viewed as threats since they compete with their products in the market. However, looking at the bigger picture, the total benefits or revenues from the businesses that benefit as consumers to these open source

software far exceed the revenues of the vendors who make money by selling software (DiBona, 2005).

The major characteristics of open source software can be summarised to include the following: high stability in that the software benefit from a large pool of developers hence low number of errors in the software; proven security since open source software are less susceptible to viruses as compared to proprietary software; end user input in development and evolution hence the software suites the user's needs; software is very cost effective with little or no license fee, and no vendor lock in since the user can incorporate components of different software producers into one (Munro, Negrette, & Aitken, 2003).

The main benefits that open source software offer over their proprietary counterparts include: low cost in maintenance and acquisition of the software mostly free of cost; they are readily available usually require access to the internet to access both the software and updates; they are more reliable the suffer less downtimes since they have less bugs due to more programmers and developers; they are robust and secure in nature i.e. they are less affected by viruses; and come with little copyright liability if any there by offering a gateway to innovation thereby improving on efficiency of the software (Nordling, 2010).

There also challenges that have restricted use of opens source by businesses such as cyber cafés this include: unstructured system support in some cases getting technical help on the use of software may be difficult; scarcity of human resource with knowledge and skills on open source systems; underdeveloped laws governing the use; and development of open source make many organisations shy away from adopting open source software and lack of awareness on open source solutions by users.

1.1.2 Cyber cafés in Kenya

A cyber café is a place where one can use a computer with Internet access for a fee, usually per hour or minute; sometimes one can have unmeasured access with a pass for a day or month (Wordiq.com, 2010). The concept of cyber cafés begun in 1991 in san Francisco, USA with the ideal of popularising the access to computers and media in general. Since computers were normally associated with workplace environment, the café a social place where people went to escape the pressures of work it seemed as an

ideal location promote portray computers as with a humane face since most people at the time associated computers with the workplace as they were viewed as work tools (Stewart, 1999). In Kenya the internet first became available to a small group of technical enthusiasts in 1993 through Gopher a text based service which only offered access to text based information. The African Regional Centre for Computing (ARCC), a Non Governmental Organisation (NGO) based in Nairobi, Kenya, became the first provider of web-based Internet service. They did this by providing their subscribers with the first-ever web browser software-Mosaic (Mweu, 2000). The first commercial internet service provider (ISP) Form net, was established in 1995 followed shortly by other providers such as Africa online and Inter-connect.

In July 1999 the Kenyan government liberalised the telecommunications sector and the regulatory body the Communication Commission of Kenya was formed. At the time there were about 30000 users of the internet in Kenya with multinational corporations and NGO's making up more than 50% of the subscriber base (Mweu, 2000). At the time the high cost of computers deterred most households from subscribing directly to the internet, cyber cafés provided a relief providing access to emails and internet to those who could not afford phone lines and computers at the time. By the year 2000 the estimated growth of the internet users in Kenya was at 300 additional users per month while the number of cyber cafés in the country had surpassed a hundred. According to the world internet statistics, by June 2010 Kenya had 3,995,500 Internet users (Argaez, 2010). This number has since nearly doubled to 7.5 million users as stated by Kenya's permanent secretary in the Information Ministry of Bitange Ndemo (Ombok, 2011). With the ready access to the internet, information flow became easier and people were able to access more information and software. Freeware (free software) that could easily be downloaded via the internet and shared with other users such as games became increasingly more popular.

In a market where a majority of consumers are highly price conscious, the Kenyan ICT sector is characterised by high price elasticity. For instance the average cost of browsing services in Nairobi is currently lower than 1 shilling per minute as compared to a few years ago when it was at around 5 shillings per minute. This cost has mainly been driven by competition both in terms of internet gateway availability and increased number of backbone service providers. E.g. the cost of accessing a 300 MB data bundle for

communication, service provider Safaricom LTD has reduced from 38$ one year ago to about 12$ currently (ADERO, 2010).

1.2 STATEMENT OF THE PROBLEM.

In line with our country's development vision 2030 where Kenya aims to become a middle income economy, technology is indeed touted as a means to achieving this aim. This goal is dependent on small scale firms including cyber cafés participation in building the economy (Republic Of Kenya, 2007). With increased competition and ready access to information services through alternative medium such as mobile phones, cyber café s like other businesses in Kenya have to engage in cost cutting measures. According to (Dedrick, 2004) the most important driver for technology adoption was found to be cost with businesses opting to adopt open source based software in order to reduce their operational costs.

The diversification by mobile service providers into internet service provision has resulted in many people today being able to access internet at home either via the mobile phone or computer universal serial bus (USB) modems and hence less and less have the need to visit cyber cafés. This has resulted to increased competition and reduced profitability to cyber cafés businesses as the prices for internet access have fallen sharply over the past few years (ADERO, 2010). In addition computer viruses and data security have impacted cyber cafés negatively leading to the loss of customer loyalty and loss of business.

In Kenya studies have been done in relation to operational costs associated to ICT however, though a lot of studies have been conducted on software in general the open source initiative still remains largely unexplored especially in the Kenyan ICT context yet more and more firms are turning to the open source as the try and seek refuge from the escalating costs in the industry, studies done in the past on software use offer solutions that are short term in nature and the normally don't address the underlying factors such the ability of organisations to adopt lower cost platforms such as open source and the total unsuitability of the application in meeting the user needs. According to Macharia (2008) the major problems associated with proprietary software include high cost of acquisition and maintenance as well as weaknesses in security in some systems

mainly windows based. In this studies the solution to bugs or errors that lead to system instability upgrade is normally the preferred solution, but in many an occasion this is normally a fix rather than a solution. This paper will try to provide another dimension of solutions to these problems. Another study established that the main strategy adopted by small scale ICT firms including cyber cafés involves giving customers more value by being low cost producers and selling differentiated products (Kimani, 2007) . With the advantages that open source offers to businesses there still remains a gap as to how best to exploit this initiative and hence my motivation to carry out this study.

1.3 OBJECTIVE OF THE STUDY

The main objective of this study is to evaluate the usage of open source software among cyber cafés in Nairobi. Specifically to

a. Determine the extent to which cyber café businesses in Nairobi have adopted open source software.

b. Analyse the benefits that open source software offers.

c. Establish the software challenges faced by cyber café businesses in relation to open source software.

1.4 IMPORTANCE OF THE STUDY

Many firms in the ICT sector are finding it hard to keep up with the dynamic nature of the Information technology world be it in terms of upgrades, service packs, or the renewal of licences. All this come at great cost that goes a long way in reducing their returns. In most cases they may opt to compromise by using cheaper but outdated version, this in return has a negative effect in that the level of competitiveness is reduced. This study will try and provide a solution to the small scale ICT service provides in particular cyber cafés who are most affected by this situation. Kenya lacks an open source ICT policy by evaluating the use of open source solutions this study will offer an insight as to whether the need for such a policy actually exists or whether the existing ICT policy suffices. Lastly it's my hope that this study shall also serve to increase on the knowledge that exists on the open source movement and encourage as well as provide an insight to other students who might pursue this subject further maybe even into the corporate sector.

CHAPTER TWO: LITERATURE REVIEW

2.1 OPEN SOURCE SOFTWARE.

Open source is a concept in production and development that encourages access to the end products source or raw materials. Although in this study the concept of open source shall be applied in the information systems field it's important to note that the open source concept is not restricted to this particular field only. The same was applied in other fields such as the electronics industry through the open standards concept where firms share standards of technology and complete on the implementation stage (Simcoe, 2005).

In the information technology field the open source initiative was led by users of main stream software who were idealist who sought for universal access to software by all since most software at the time was highly controlled by organisations that owned this software. In order to promote the values of free software, Richard Stallman a software freedom activist created the General Public License (GPL) and founded the Free Software Foundation (FSF) (West, 2001). With the ideology that any software created with free software must also be free software. Stallman termed this as "copyleft" because it preserved the rights of the user not the programmer. Copyleft was developed from the term copy right which implied that only the owner of the software had the right to modify, make copies and distribute this software for copyleft it provided a leeway for other users to modify and distribute software, no one could claim exclusive right of ownership (West, 2001).

Stallman wanted all users to have true ownership of their computer through free software. He wanted to create a free open source operating system and for this he started the GNU project. Stallman was afraid software companies would subvert his cause by copying and selling community-created software. The modern open source model permits this, but free software ideally should be free. Stallman observed how software companies used restrictive end user licenses to control their products. To protect the idea and practice of free software, Stallman created GPL with the concept of "copyleft" which is the opposite of copyright whereas most licenses restrict a user from copying or changing software, the GPL (DiBona, 2005). The idea of a communal, infectious

software was too radical for most software companies most companies couldn't imagine how to build a business model on free software. The success of Linux and the growth of the Internet focused more attention on free software. Some proponents redefined a more moderate view to appeal to the business world. This became open source (West, 2001).

2.2 OPEN SOURCE APPLICATIONS

With the emergence of the internet the open source movement has grown from strength to strength the dot com boom experienced from 1998 – 2000 can be partially attributed to the open source initiative. The same period also saw the popularity of open source programs increase especially for Linux operating systems. With the commercialisation of open source software, there was an increased attraction to open source by investors as characterised by the IPO offerings of open source organisations in the late 1990's this led to a development boom with many open source based applications emerging (West, 2001).

Linux is the most popular open source operating system brand. It can be compared to what the Microsoft windows platform is to proprietary software. Linux operating system developed by a Finnish student Linus Torvalds in 1991 works under the general public license and it is an open source system. For Linux and its assorted distributions it doesn't mean that they are freeware, companies and developers may charge money so long as the source code remains available (Ralph & Reynolds, 2008). Linux is only a kernel of an operating system i.e. the part that controls the hardware, manages files and separates processes. Various sets of capabilities and applications are available that forms a complete operating system. This combination is called a distribution of Linux. Linux is available on the internet and some of its distributions are readily available on the internet, these include Red hat Linux, Ubuntu and Caldera open Linux.

Linux is supported by various large computer corporations including IBM, HP and Intel who support the Operating system through resources such as personnel. Many Chief Information Officers are considering making a switch to Linux due to its security strengths (Ralph & Reynolds, 2008). Red hat Linux is a Linux network operating system that taps the talent of tens of thousands of programmers who took part in its development. It's very efficient as a web server operating system and can manage a cluster of up to 8 servers e.g. the film Lord of the Rings utilised red hat Linux in its

production and to manage hundreds of servers that were required to deliver the many special effects (Ralph & Reynolds, 2008).

Vyatta: is an open-source routing software approach to networking that is changing the way networks are being deployed. Using Vyatta has created a routing and security solution that is more flexible, affordable and scalable than other proprietary solutions such as Cisco. Vyatta supports most commonly used network interfaces and networking protocols. It doesn't require standardised hardware but in reality a standard x86-based computer can be installed with Vyatta routing software and will provide the same firewall and routing solutions a CISCO router at half the price or less (Vyatta Inc, 2007).

By eliminating the reliance on specialized hardware, Vyatta has opened up new possibilities on how networking technologies are being used for instance with the emergence of virtual operating environments / platforms where a sub computer can be created virtually within another PC. An organisation requiring routing solutions needs not acquire new hardware but can have their existing computer server acting as their router and firewall thus saving on costs or alternatively can make use of outdate computers which they could have disposed off to act as there routers. This aspect is making consumers of networking technology to rethink their allegiance to proprietary networking vendors like Cisco (Vyatta Inc, 2007).

Netscape navigator; is a web browser developed by American online (AOL) though it started as a proprietary software, it was changed to an open source software in January 1998 eventually leading to development of the Mozilla Firefox browser. The main aim of the Netscape project was to initialise a broad based browser development effort within the programmer's society that would result in future browsing applications (DiBona, 2005).

Mozilla Firefox; is a free web browser application that is open source based, it is a part of the Mozilla application suites that resulted from the Mozilla project started in march 1998. The project resulted from the source code of Netscape communicator a previous browser suite, being made public under the open source licence. The first version of Mozilla Firefox browser was Mozilla 1.0 developed by the Mozilla org in June 2002, then followed by Mozilla Firefox browser developed in November 2004. The Mozilla org was formed by a group of Netscape communication corporation employees who had

a vision for an open source browser project. At the time the Netscape Corporation was engaged in a browser battle with Microsoft's internet explorer (DiBona, 2005).

Open office; is an open source full office suite that includes word processing, spreadsheet, presentation and database applications that are compatible with various operating systems (Suárez-Potts., 2011). This suite today normally comes as an accessory feature incorporated in most operating systems including Microsoft windows and various Linux distributions such as Ubuntu and Mephis Linux. Though it plays a similar role to Microsoft Office suite it is incorporated in windows free of charge hence for users who don't rely heavily on office applications they don't need to purchase the Microsoft office suite.

Apache HTTP server software; a web server software that's open source based (Munro, Negrette, & Aitken, 2003). It is developed and maintained by Apache software foundation which is an open community of developers. It played a significant role in the initial growth of the internet and by 2009 it was being used in hosting more than 100 million websites worldwide. It can be supported by various operating systems including Windows, Linux and Macintosh operating System X.

Vuze it is an online application that enables a user to watch, publish and download high quality video files that are available on the internet. Its open source based and it also enables a user upload video files (Jeroen Verhoeckx, 2010).

KTorrent is a bit-torrent client designed for Linux operating environment that enables download of complete files broken down into bits for faster downloads. Unlike other torrent client it provides for bandwidth management to ensure the torrent application doesn't clog your bandwidth (Fleming, 2007). *Gnome Office* this are open source office applications that accompany Linux operating systems that have the graphical user interface (Jeroen Verhoeckx, 2010). *Android* this is an open source based operating system developed by Google and The open handset alliance. Its common on mobile phone as well as handheld devices such as palm tops, tablets though there are developments for the personal computer version (Open source Project, 2007). *MySQL;* it is an open source database management software that is characterised by high reliability and ease of use. It is ideal for applications developed on PHP, Perl and Python programming languages (Oracle Corp, 2010). It runs in different operating systems

including windows, Linux and Mac OS hence providing flexibility when developing a centralised database.

2.3 BENEFITS OF OPEN SOURCE SOFTWARE

Economical: Since most software is protected by laws underlining copyright or licensing provisions. These provisions can vary though in some cases you are allowed unlimited use of software on one or two computers (common with applications for personal computers), in some cases you are required to pay as per usage (this is popular with software placed on networks or large mainframes). Some software requires registration and activation before they can be fully used. This can prove to be quite expensive to a small scale organisation. For example the auditor of the state of Massachusetts estimates that the cost that could be saved by the state adopting open source could be as high as ten million dollars, as compared to developing software in house when legal and protection delays are included (George & Ralph, 2008). Open source software such as Linux which can be downloaded for free provides a relief from such costs of acquisitions and licensing (Dedrick, 2004).

Increasing profitability; With the increase of input costs such as rent and electricity it is prudent that small scale businesses such as cyber cafés and bureaus adopt cost reduction strategies in order to remain competitive and profitable. Open source software provided a relief in terms of a reduction in operational costs and in return increasing profitability of these firms. With the emergence of additional open source software such as Vyatta routing software this has helped cyber cafés to be more reliable service providers. In the cyber business reliability can be termed as a tool for differentiation. According to (Macharia, 2008) software maintenance costs consume a major portion of a software lifecycle financial resource. The cost of software maintenance which includes upgrading costs, licence and support represent a large portion of budgets for IT departments in Kenyan firms including cyber cafés. Therefore by reducing costs and attracting more clients the cyber cafés in return increase their profit margin.

Availability; As a result of the Open Source Initiative being a non profit corporation dedicated to the development and promotion of open source software. Open source software is freely available to anyone and can be easily modified. Users can download

source code and build or improve on the software themselves. In addition developers can make executable version available along with the source code. (West, 2001) Open source development is a collaborative process where developers around the world keep in contact via email and internet sharing ideas and submitting software via the internet. Many open source software exist and are in use worldwide including here in Kenya they include Linux operating systems (e.g. Ubuntu, Red hat, Mephis), Apache web server, and Mozilla Firefox.

Efficiency; Open source is appealing to the enterprise level because it offers more flexibility than most commercial products. Businesses are able to incorporate the open source code with their existing business applications and improve on them. Robert Lefkowits a vice president of a research and executive education institution in Optaros outlines the amount of user control that open source offers in trouble shooting and maintenance of the system when you can " look under the hood yourself". (Kenneth & Jane, 2007). Since open source software like Linux use the evolutionary prototyping approach where by the developers use a build and fix approach (Dawson, 2005) as illustrated by the numerous daily releases that Linus torvalds had to make when he first launched Linux, whenever errors were discovered, fixes were channelled to him and he incorporated and released the better version.

As the Internet usage increased, the demand for new, cutting-edge solutions emerged. Linux, Apache, and other open source software could outperform costly proprietary UNIX or Microsoft software. This success puzzled people as people wondered how community developed software could become more powerful and efficient than proprietary software. To help explain this phenomenon, programmer Eric Raymond wrote an essay called "The Cathedral & the Bazaar." This paper eventually set out a chain of events that lead to the formation of the Open source Initiative with a presentation of the paper at the O'Reilly Perl Conference in September 1997 helping to trigger Netscape's announcement, on January 22nd 1998, that it planned to release the source code of its popular Web browser as free software. (Suárez-Potts)

They are more reliable than commercial software since, by having the source code of a program readily available users can fix a problem they discover and share the same solution online. This makes fixes be available online within hours of problem discovery. This also enhances the chance of a bug being discovered before any harm is done. Linux

open source software provides more system stability making them more suitable for running system tasks (Dedrick, 2004).

Higher security; Open source software are not prone to virus attacks as compared to their proprietary software, and viruses are a major concern for most businesses. A viral threat is multidimensional in that on one hand the cost of purchasing, installing and updating of the antivirus software and the cost that can result from the loss of data from viral attacks. the important point to consider is that the antivirus software are not a hundred percent effective against computer viruses new viruses are emerging every day and are often designed to circumvent the current antivirus realises.

2.4 CHALLENGES OF ADOPTING OPEN SOURCE SOFTWARE.

For ICT managers especially in small scale firms such as cyber cafés they need to weigh on the benefits of adopting open source based software against the drawbacks that accompany the open source based systems. Some of the drawbacks are discussed below.

Unstructured user support; The question of user support is the biggest obstacle in the adoption of open source software since many proprietary software come accompanied with guarantees and support services that most open source software don't. For open source software the support structure may be insufficient as compared to those provided by proprietary software firms or vendors such as Microsoft which are backed by large organisations coupled with a large number of support staff and structures. In case of system failures for open source the developer's community exists on the internet and through internet forums and blogs one can communicate with other users in the user group (A user group is comprised of users that use the same software) and might reach someone who helped in developing it. Users of popular open source software such as Ubuntu OS can get answers to their technical questions within hours of their posting them on the appropriate web forum. Another approach is to contact one of the many companies offering high quality support at a fee, such companies include; Red hat for Linux, C2Net for apache (George & Ralph, 2008).

Secondly *lack of trained human resource* presents a challenge, in small scale firms training on open source may be required since most of the current Information Technology curriculum is biased towards convectional applications which are proprietary based hence the need to perform a cost to benefits analysis e.g. Florian

Kainz a computer graphics principal engineer at industrial light and magic asserts that companies migrating from UNIX to Linux operating systems are more likely to get better results as compared to companies starting from windows since the technical support skills for UNIX and Linux are similar (Kenneth & Jane, 2007).

Lack of legislation; is another drawback on the open source application. The decentralised and unregulated communities that develop the software which in some cases can result in key tools or features in an application that the business or enterprise relies upon not being incorporated in future releases of the software since the developer does not deem them as essential. In such a case the business is faced with a dilemma of either retaining an outdated application or altering a business process both of which may not be options if the business is to remain competitive. Additionally the undefined structure of the development community exposes businesses to legal issues (e.g. intellectual property lawsuits) which they are not confronted with when using commercial applications. For some organisations such as yahoo, they rigorously evaluate and scrutinise the usage, rights and licenses of the open source software before deploying it to a particular project or initiative, since licence agreements for open source software don't always grant complete freedom for distributing and modifying source code (Kenneth & Jane, 2007).

Lack of governing policy; The absence of Free Open source Software (FOSS) policies in most developing countries also makes it difficult to decipher where the line can be drawn in such cases e.g. in Ghana the existing procurement policy does not clearly stipulate terms for procuring software. It is interesting to note that in the Public Procurement Act, 2003 (Act 663) a software is defined as "something you buy a license for" in such a case the open source software are not legally considered as actual software and hence no clear cut policy on the same. (Vota, 2010). In this case businesses such cyber cafés may shy away from using open source software for fear of legal implications. It is however prudent that nationally we develop a coherent ICT policy, according to (Kandiri, 2007) a lack of such a policy is likely to contribute to ineffective IT infrastructure and wastage of resources. Indeed he continues to add that should the government decide to promote the use of freeware such as advocated in this project we are likely to enjoy as a country the benefits of free software such better security and lower costs.

Lastly lack of awareness is another major challenge since there are still many who aren't aware of the existence of open source solutions e.g. in academic circles programs such as Sage programme for mathematics and Open Source Chemical Informatics programs exist. These programs are being put to use by universities in the west while in Africa where the universities can highly benefit from these applications as teaching aids very few academic institutions are aware of their existence. According to (Nordling, 2010) it is difficult to deduce if indeed academic institutions in Africa (with South Africa being the exception) actually use these free ware since they don't require user registration, but based on the questions reaching the support group they are all from South Africa. The main reasons touted as to why these open source software have yet to pick include lack of advocacy, poor internet connectivity and aggressive marketing by proprietary software companies.

When making the important decision as to whether to embrace the open source initiative many may opt to follow the majority, since the proprietary software are still dominating the software market they may use these application despite them not fully meeting their needs. According to (Arthus, 2004) the continuing conflict between open source and proprietary software producers has shown that just because a technology enjoys a larger market doesn't necessarily mean that its functionally better with a similar situation as in world politics just because a strong economy is able to occupy an oil producing region it doesn't necessarily mean its cultural system is better.

2.5 OPEN SOURCE SOFTWARE DEVELOPMENT MODEL

The key advantage in open source lies in its robust nature. Open source software are less prone to bugs and virus attacks and this can be attributed to the very structure of its development model. The strength of this model emanates from the fact that it's supported through a wider support base than other existing software development models.

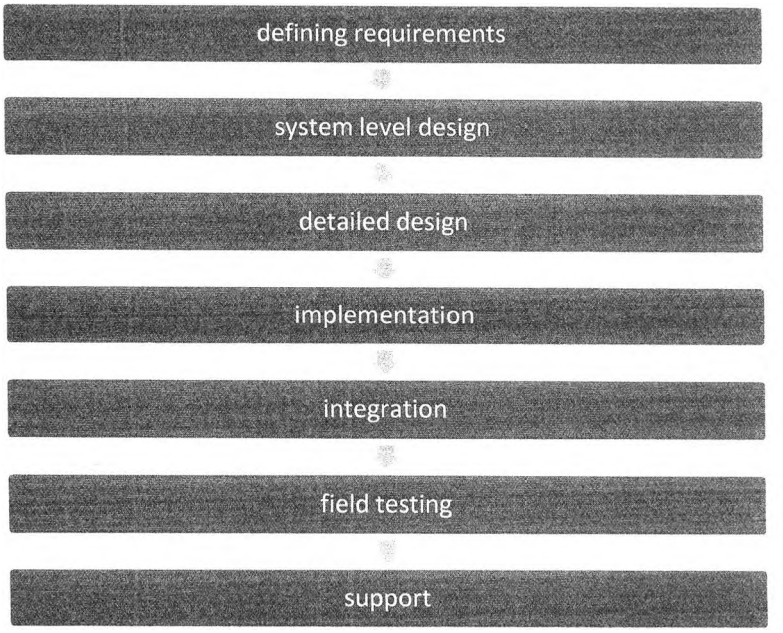


Figure 1 Open source development model (Gilliam, 2001)

The model improves upon existing software development models by allowing for sharing of ideas with other major open source software developers. In the development process through the use of Computer Aided Software Engineering tools (CASE) the project management develops the application using a Unified Modelling Language (UML) (Gilliam, 2001). This concept is then registered with the Open Source Development Surge Force which is like a centralised database of open source projects. From here the project attracts the developers who test and add new features application under the guidance of a maintainer. Once complete the project manger incorporates the changes to the application then identifies a user who tests the application and point out errors and areas of improvement such as additional features. The feedback is submitted to the developers who incorporate the changes and this cycle continues till the application is ready for realise.

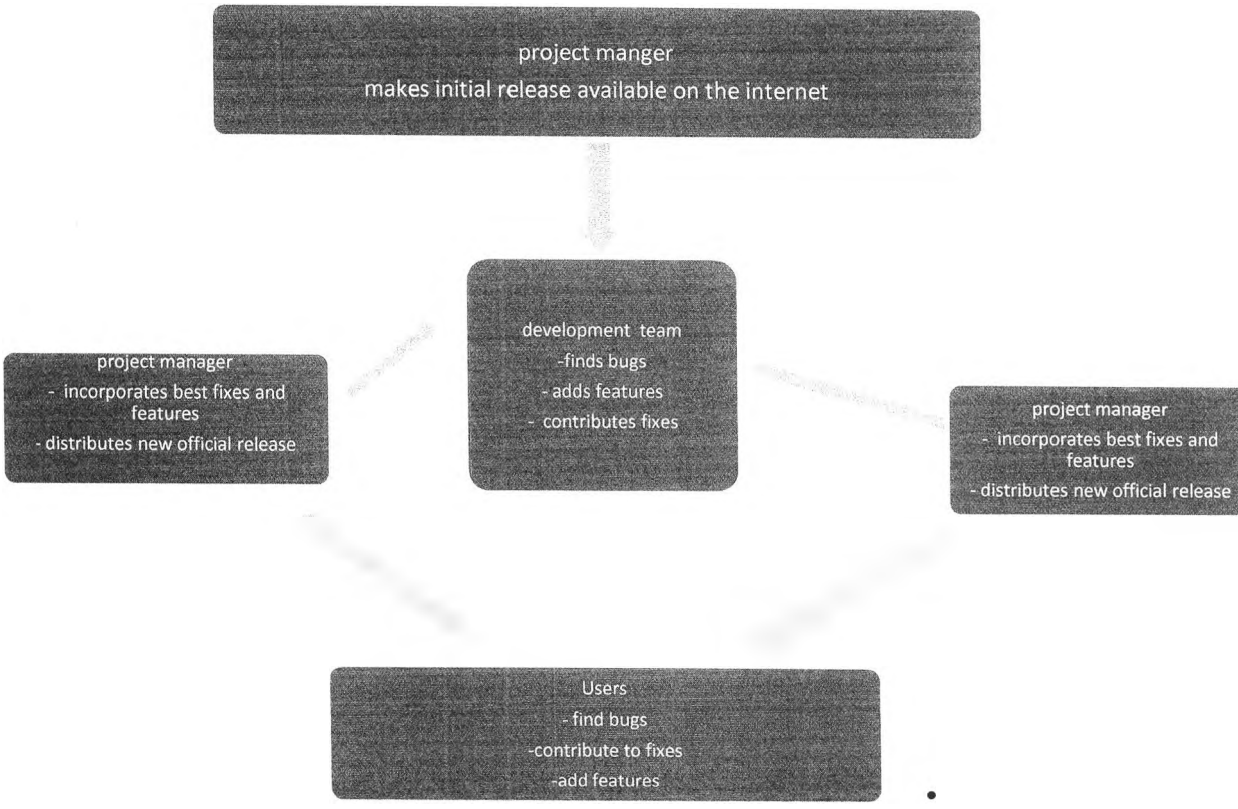


Figure 2 Open source development cycle (Gilliam, 2001)

By having a development structure that incorporates the user right from the beginning users looking for customised solutions and stable service would opt for open source solutions and with cyber cafés system stability directly affects the ability to retain customers loyalty and as a result its long term going concern.

2.6 OPEN SOURCE IN KENYA

For developing economies such as Kenya, open source software provide a means to spread benefits of software to a wider array of users while at the same time promoting innovations and self reliance. Due to its open and unlegislated nature it is hard to determine when exactly the open source movement began in Kenya however in Africa the Free Software and Open Source Foundation for Africa (FOSSFA) was the first legally recognised body that advocates for the use of open source applications and systems (Edward, 2008).

In Kenya the open source movement is fast growing, this is evident with the emergence of open source based organisations and bodies such as the Linux professional association

of Kenya. Further evidence to the popularity of the open source movement in the country is the first ever Kenyan open source awards held in may 2009 with the permanent secretary in the ministry of information and communication Dr. Bitange Ndemo in attendance (Otter A. , 2009). Also small scale ICT businesses in Kenyan urban areas especially the cyber cafés are adopting to use the Linux based operating systems as well as open source browsers such as Mozilla Firefox.

There have been further developments in the Kenya where entrepreneurs are using Linux to cut costs and maximise profits as they look for new ways to bring computing to users. E.g. Patrick Mathenge, CEO of Mullard Electronic Limited, a firm trading in hardware and software from its Mombasa Road offices. The company is distributing open source software that can turn a single computer into up to 10 workstations. The software divides the CPU resources to the number of the workstations in an office. The CPU resources are shared equally amongst the workstations. Users can't access information, if it is not his or her workstation. Information stored on the hard disk is labelled per monitor. Different users need to have secret password to access information. A user cannot access a colleague's work Mullard offers a choice of two systems: the Desktop Multiplier, which is suitable for normal office and general use and Discover station for public computing. With the Discover station software, administrators can control access, enforce usage limits and even apply charges directly to the user's account. (Otter A. , 2008).

Currently in Kenya there is a lot of enthusiasm in the corporate sector in regards to the adoption of Information Technology, while this is a positive development many businesses are not taking time in accessing their information requirements in relation to available technology. For instance in the case of micro financial institutions there is a tendency to emphasise more on technology rather than the value of information and as such make unnecessary investments in Information Technology which don't complement the business needs (Gachiri, 2008). This can be mitigated by adopting low cost open source solutions.

2.7 TECHNOLOGY ACCEPTANCE MODEL FRAMEWORK IN RELATION TO OPEN SOURCE SOFTWARE.

The Technology Acceptance Model describes the determining factors that defines a user's acceptance of technology in general and follows the impact external variables such as beliefs attitudes and intentions have on acceptance of these resources. It consists of system usage, attitude toward using, perceived usefulness, behavioural intention to use, Perceived ease of use, and external variables with system usage being the primary indicator of technology acceptance (Kim, Mannino, & Nieschwietz, 2009).

Perceived usefulness and perceived ease of use determines ones intention to use a given technology and this drives someone to choose which computer system to opt for (Wahid, 2007). The major objective of this study is to determine the why different cyber café s opt to use open source software while others shy away from using them. Perceived usefulness shall be captured by the ability of open source to meet the objective of the cyber café which in the real sense is to increase profitability and customer satisfaction. Some of the measurement variables for profitability is cost saving e.g. in terms of the price of software, reduction of maintenance costs, ability to modified the software easily hence saving on programming cost, reduced opportunity cost due to downtimes resulting from virus attacks. Customer satisfaction can be measured by system stability and availability hence creating a sense of reliability. Perceived ease of use shall be reflected by the user's familiarity with the open source software and shall be measured based on customers and employees preference towards using open source. Availability of technical support also determines the perceived ease of user since the customer can always find a helping hand in case of any challenges (Kim, Mannino, & Nieschwietz, 2009). Perceived ease of use has an indirect effect on perceived usefulness, the easier to use a user finds a system to be the more useful he will perceive it to be.

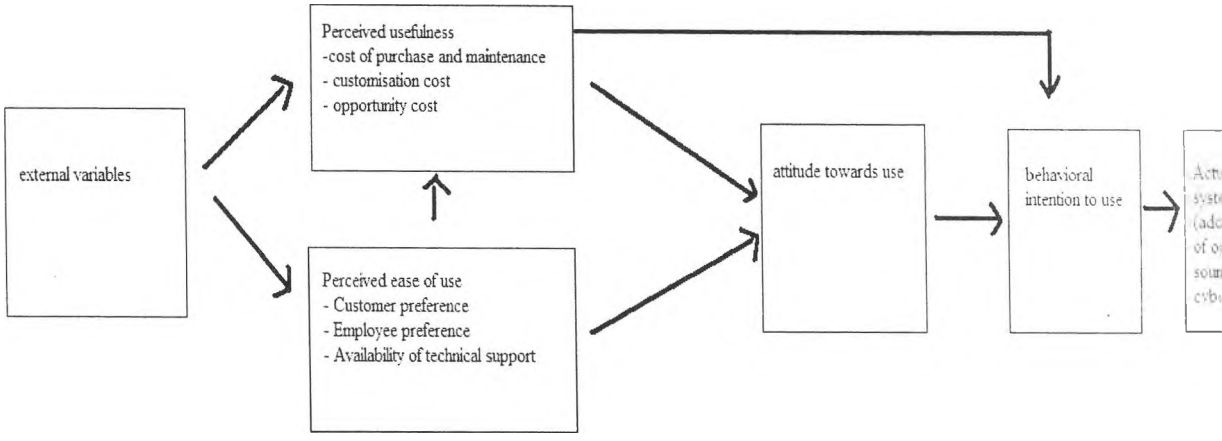


Figure 3 Technology adoption model for open source.

2.8 SUMMARY OF LITERATURE REVIEW.

With the increasing cost of doing business i.e. operating cost, businesses are looking at ways of reducing their operating cost and cyber cafés are no different. The cost of software consumes a major part of organisations IT budget and open source software provide a relief to these costs. They cater not only for normal business applications but also for communication and networking solutions with products such as Vyatta.

In addition to cost savings, flexibility of applications to meet user needs; open source software are normally more reliable and robust. This is from fact that they enjoy a pool of human resources who have access to the source code and in turn any bugs or errors are normally eliminated within a very short time period as compared to proprietary software which relies on a specific group of personnel to fix. Nowadays it isn't odd to find the proprietary software developing firms adopting technology long in use in the open source domain. With the increasing success of open source more proprietary software developers are adopting open source mode of operations including one of the biggest critics Microsoft Inc. Technology Acceptance Models indicate that internal belief, attitudes and intention shape an individual's choice of system, this study will capture the factor that make cyber café s choose open source software over others as their tool of trade.

This study will be able to open up the idea of open source to more Kenyans and Kenyan small scale ICT firms. This study will try to highlight the benefits that can be enjoyed and are being enjoyed by firms that have already adopted the use of open source

software. In addition it will try to establish whether firms using the open source software actually benefit from lower costs and higher system stability. Furthermore the study in a larger perspective will in a way determine whether proprietary application developers should adopt the approach of the open source movement development and hopefully establish the role played by both within the Kenyan contexts and who may eventually emerge the victor in the battle between proprietary software and open source software.

CHAPTER THREE: METHODOLOGY

3.1 RESEARCH DESIGN

This study involved a survey on cyber cafés in Nairobi, with specific emphasis on the extent to which they have adopted open source software and the reason for and against their current choice of software. A survey design was used since no documentation has been done in relation to the use of open source software by cyber cafés in Nairobi.

3.2 POPULATION.

The population of this study consisted of cyber cafés located within the Nairobi city square. The list of cyber cafés consisted of the 47 cyber cafés within Nairobi city square listed in the Mocality online business directory (Mocality, 2010) and the yellow pages online directory (Kenya postel Directories, 2011). No sampling was undertaken since entire population of cyber cafés listed formed the data set of the study (see appendix A). For the purposes of this study the Nairobi city square refers to the area within the Nairobi central business district surrounded by the following major streets Moi Avenue to the north, university way to the west, Uhuru highway to the south and Haile Selassie street to the east.

3.3 DATA COLLECTION

Primary data was collected using structured questionnaires with four main sections A, B, C, and D. Section A captured demographic data that assisted in identifying the age and level of education of the respondent in this case part of the cyber cafés management. Section B covered the extent to which the organisation uses open source software it assisted in determining the level of awareness and application of open source software within the cyber in terms of the type of software in use at present. Section C covers benefits of using the open source software as compared to other proprietary software. It helped define why cyber cafés opt to use their current software both at the application and operating system level. Section D covers the challenges experienced from using the current software and assisted in determining if open source can offer a reprieve. For section C and D likert scale was used for data capture. The drop and pick approach was used in administering the questionnaires.

3.4 DATA ANALYSIS

The information collected was coded and entered into a spreadsheet format for analysis. Information collected from section A was analysed using frequencies and percentages

and classified in charts and graphs. This assisted in determination of who the respondents are and also provided information about the cyber they represent.

Data collected in section B was analysed using frequencies and means, and represented in tables. This assisted in determining the extent to which various categories of open source software have been adopted in relation to other proprietary software as well as determine the level of awareness in relation to open source solutions.

Data collected in section was analysed using frequencies and means, and represented in tables the level of importance tied to particular benefits in relation to adopting of open source software. This assisted in determining the benefits enjoyed by cyber café s that are currently using open source in comparison to other proprietary software.

Data collected in section D was analysed using frequencies and means, and represented in tables the level of importance tied to particular challenges in relation to discouraging adopting of open source software. This assisted in determining the challenges that make cyber café s shy away from using open source.

SPSS version 11.5 was used in the analysis.

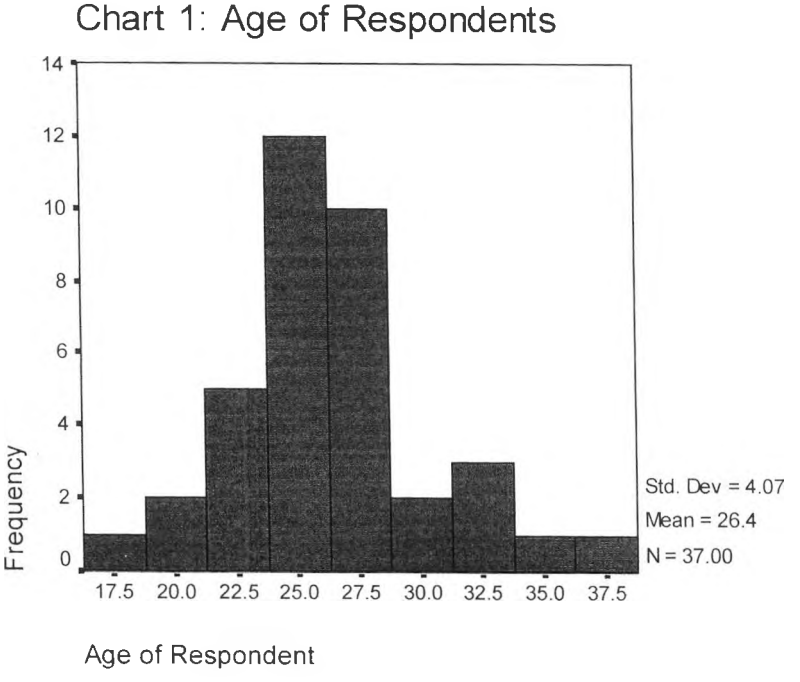
CHAPTER FOUR: FINDINGS AND DISCUSSIONS

4.1 INTRODUCTION

This chapter will discuss the research findings on the study conducted to evaluate the adoption of open source software by cyber café s within Nairobi. In order to attain the objectives set a survey was conducted. Data collection was done through questionnaires administered using the drop and pick approach .The response rate was 79% with most of the 37 collected questionnaires being well filled albeit with some errors such as leaving some questions blank as well as misinterpretation of the likert scale queries. A response rate of 50% and above is considered adequate for purposes of statistical analysis (Mugenda & A.G.Mugenda, 1999).

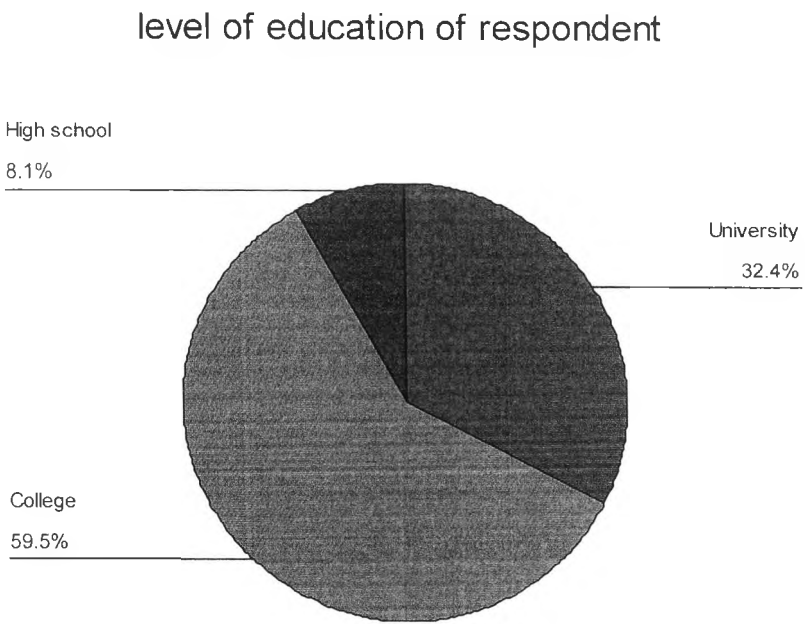
4.2 PROFILE OF RESPONDENTS

Figure 4: The Age Distribution of Respondents



The average age of the respondents was found to be at 26 years old. This age group is expected to have completed their education recently and be in touch with recent trends on the ICT world such as open source.

Figure 5: Education Level of Respondent



Over 80 % of the respondents have undergone some tertiary training it is expected that they should be up to date with the recent developments in the ICT sector being that most of the have only recently left school. Though the questionnaire did not cover the course studied it is expected the respondents have undertaken some information technology courses to enable them manage these cyber cafes.

Size of organisation

Table 1: Size of Organisation in Terms of Number of Employees.

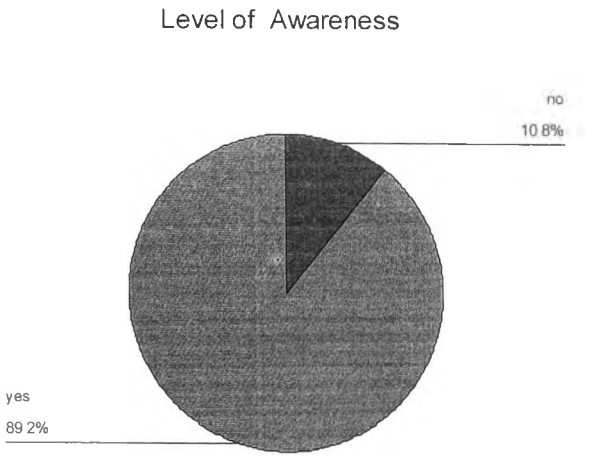
		Frequency	Percent
Valid	0	1	2.7
	Less than 3 employees	15	40.5
	Between 3-5 employees	18	48.6
	Between 5-10 employees	1	2.7
	More than 10 employees	2	5.4
	Total	37	100.0

Majority of the respondents work in small scale cyber cafés which employ less than five employees. The organisations are expected to be cost efficient and flexible in terms of

adapting to changes in the market due to having leaner organisation structures hence lower bureaucracy.

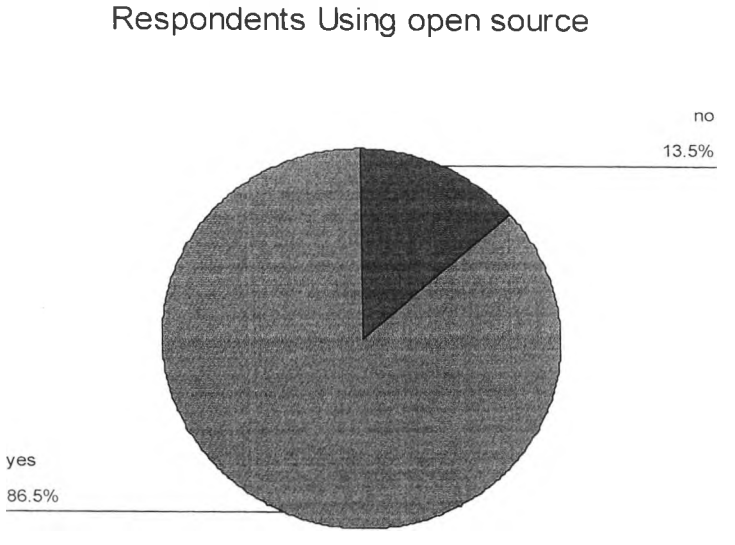
4.3 EXTENT OF ADOPTION OF OPEN SOURCE SOFTWARES

Figure 6: Level of awareness by respondents towards open source.



89% of the respondents were aware of the existence of open source software hence a majority of cyber café s are aware of the option to use open source.

Figure 7: Level of Adoption of Open Source Software by Respondents.



86% of the respondents are using some form of open source software in their cyber café. This indicates that most cyber café s have adopted open source software at some level. According to (Riehle, 2010) it was estimated that by 2008 the total market share of open

source software in relation to proprietary software stood at 1% globally though this statistic only considered open source software that's paid for with the majority of open source software in use being the free ware open source. In this case this study concurs with the report since for a majority of the respondents are using open source software in one aspect of their business.

During analysis the higher the mean value the higher the adoption of particular software and a low mean value indicates low use or adoption of particular software. For the purposes of this study standard deviation was used as a measure of variability recording the extent to which respondents were in agreement in terms of level of adoption of particular software and the corresponding benefits and challenges experienced in the adoption. A variable recording a standard deviation of greater than 1 indicates a high degree of variation meaning respondents differed widely on how they rated a given aspect, while a standard deviation score of less than 1 indicates a low variation in responses meaning respondents differed slightly in their ratings.

This section will also analyse the findings in relation to the main objective of the study that is to determine the extent to which cyber café s have adopted open source software. The study employed a 5 point likert scale where 1 is mainly used, 2 frequently used, 3 commonly used, 4 rarely used and 5 not used at all or not applicable. For the purpose of the study during data entry blanks were coded as not applicable. The scale was used to gauge the various software`s according to their usage in different cyber café s.

Operating system use

Table 2: Level of Usage of Operating Systems by Cyber Cafés.

Operating System	Mean	Std. Deviation
Windows OS	2.22	1.766
Linux OS	3.27	1.694
Android based OS	4.84	0.501
Mac OS	4.76	0.83

This table shows that windows operating systems has the lowest mean at 2.22 hence it is frequently used operating system among respondents but with a high deviation meaning

most of the respondents responses differed highly. Linux an open source operating system has the second lowest mean of 3 meaning it is commonly used with the respondents also differing highly but with fewer deviations in responses. Both android and Mac operating systems have means of above 5 meaning they are not used and with deviations of less than 1 meaning the respondents are mostly in agreement in this regard.

Browsers and download applications use

Table 3: Level of Usage of Browsers and Download Applications by Cyber Café S.

Application or browser	Mean	Std. Deviation
Internet Explorer	3.38	1.738
Google Chrome	3.03	1.848
Opera mini	4.27	1.407
Mozilla firefox	1.57	1.237
Netscape Navigator	4.95	0.329
Vuze	4.89	0.393
Sea monkey	4.95	0.329
Ktorrent	4.76	0.83
other type of browser or download App	4.78	0.787

Mozilla Firefox an open source browser has the lowest mean of 1.5 indicating it's mainly used with a lower deviation indicating most respondents were in agreement with this analysis, other browsers like internet explorer and Google chrome have means of 3 indicating they are commonly used though with high deviation in responses hence most respondents aren't in agreement while the rest of the browsers and application software have a mean of 5 indicating they are not used and most respondents are in agreement with this assessment. This is clear indication that for browsing purposes open source applications are highly adopted.

Adoption of office suites

Table 4: Level of Usage of Office Suites by Cyber Café S.

Office suite	Mean	Std. Deviation
MS office	1.81	1.543
open office	3.24	1.786
corel office	4.49	1.216
Gnome office	4.86	0.585
Other type of office	4.89	0.658

Microsoft office is the suite that's frequently used though there is a high degree of deviation meaning many respondents did not concur with this assessment. Open office an open source solution is also commonly used but similarly respondents differed highly with this aspect, while the rest of the open suites are either rarely used or not used at all with most respondents in agreement with this aspect.

Routing systems usage

Table 5: Level of Usage of Routing/Firewall Systems by Cyber Café S.

Routing OS	Mean	Std. Deviation
Cisco routing OS	2.84	1.922
Vyatta routing OS	5	0
Other Routing OS	4.46	1.386

In terms of the routing systems the proprietary solutions such as Cisco are still dominant within this field though with high deviation indicating differing opinions within the responses, open source applications such Vyatta are not in use.

4.4 BENEFITS INFLUENCING CHOICE OF SOFTWARE.

This section will analyse the findings in relation to the objective of the study that is to analyse the benefits offered by open source software. The study employed a 5 point likert scale where 1 is highly important, 2 quite important, 3 important, 4 not very important and 5 of least importance or not applicable. For the purpose of the study during data

entry blanks were coded as not applicable. The scale was used to gauge the benefits that would influence a cyber café to adopt open source software.

Benefits influencing choice of software

Table 6: showing benefits that influence choice of software by cyber café s.

	Mean	Std. Deviation
Price of software	2.27	1.661
Affordability in maintenance	2.41	1.624
flexibility of software	3.03	1.833
customer Preference	2.49	1.789
Security e.g. not virus prone	2.35	1.798
System Stability	2.16	1.625
Employee Preference	2.78	2.136
Availability of system	2.14	1.549
copyright terms	2.54	1.757
Technical support offered by s/ware company	3.08	1.738
Vendor lock in	3.51	1.726

Respondents rated price, availability, security and system stability as the main factors that would make them opt to adopt particular software. Since some of the characteristics of open source software include low cost, availability and stability (Nordling, 2010) it's not a surprise that a high percentage of cyber café s have adopted open source software. Characteristics such as customer and employee preferences, technical support offered, flexibility and copyright terms were considered to be important but not very important though for employee preference there was very high variation in responses. This indicates these are secondary factors in terms of influencing choice of software and since open source software fall short in terms of aspects such as technical support and copyright terms this factors would not highly influence choice of software. Vendor lock

in was not considered important by most respondents though with high variation in responses hence indicating that most respondents preferred independence in supply.

4.5 CHALLENGES RESULTING FROM CHOICE OF SOFTWARE.

This section will analyse the findings in relation to the objective of the study that is to establish the software challenges cyber café s face and how open source can resolve this challenges. The study employed a 5 point likert scale where 1 is highly important, 2 quite important, 3 important, 4 not very important and 5 of least importance or not applicable. For the purpose of the study during data entry blanks were coded as not applicable. The scale was used to gauge the challenges that would influence a cyber café not to adopt open source software.

Software challenges that discourage use of software

Table 7: Software Challenges That Discourage Use of Software by Cyber Cafes.

	Mean	Std. Deviation
lack of Skilled personnel	3.86	1.549
High cost of Software	3.59	1.771
Inability to modify System	3.51	1.726
System Insecurity	3.51	1.660
Lack of copyright	3.84	1.537
Instability of system	3.27	1.677
Lack of technical support	3.97	1.500
unavailability of system	3.59	1.674
Lack of Governing Laws	3.95	1.471
Perceived ease of use	3.30	1.793
Lack of experience in using software	4.11	1.487

The table shows that perceived ease of use and instability of the system are deemed important factors by respondents that can discourage them from using particular type of software though with high variability of responses as indicated by the high standard deviation of greater than 1. This means for most cyber café s the perceived ease of use determines their intention to use particular software and this drives them to choose particular software. This is in line with the technology acceptance model framework (Wahid, 2007). Since for open source software are increasing in popularity with a majority of users adopting their more users are becoming familiar with open source and as a result opting for open source. System stability which is also a key strength for open source and as per the respondents this is an important factor that influences their choice of software and hence influencing more cyber to adopt open source. Factors such as high cost, unavailability and insecurity were also deemed important factors that would discourage the use of particular software and hence favouring open source even further. Lack of skilled personnel, technical support, personal experience in using particular software, copyright and governing laws were not considered as being important enough to discourage the use of open source software by respondents as indicated by the high means of 4.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter summarises the findings of this research and draws conclusions relevant to this research and puts forward recommendations on the same. The study had three objectives i.e.: To evaluate the extent to which cyber café s in Nairobi have adopted open source software, To analyse the benefits that open source software offers and, Establish the software challenges faced by cyber café businesses today in relation to open source software.

5.2 SUMMARY OF FINDINGS

This study captured four main areas with the first gathering demographic data of respondents. The respondents were found to have an average age of 26 years old and a 80% of whom had college education or above. This reflects a population that is at its most productive stage and with fresh knowledge in their field of education. Even though the study did not capture the particular course studied by the respondents it's expected that they would be having the most current knowledge in the field they are working in and since the majority of the organisations studied are small scale in nature this would be characterised by highly flexible organisations sensitive to change and keeping up with changes within their industry.

The second part of the study looked into the extent to which cyber café s have adopted open source software. The findings suggest that majority of cyber café s are aware of open source and over 86% have adopted open source software at some level. In the operating system level Linux operating system open source software was rated as commonly used by most of the respondents though windows operating system had a higher rating. In terms of browsers and download applications Mozilla Firefox open source browser is the dominant browser in use by cyber café s preferred over proprietary applications such as internet explorer. For office application suites Microsoft office was found to be the most used suite followed by open office, while for routing solutions proprietary routing solutions Cisco were the most preferred with open source having almost zero penetration in this aspect.

The third part of the study analysed the benefits that make cyber café s prefer certain software over others. It was found that respondents rated price, availability, security and system stability as the main factors that guide their choice of software.

The fourth part of the study established the challenges that discouraged cyber café s from using particular software. From the findings respondents rated perceived difficulty of use and system instability as the main factors that would discourage adoption of particular software by cyber cafés.

5.3 CONCLUSIONS

Based on the findings stated above the following conclusions are derived.

Majority of the cyber café s are aware and have adopted open source software in their key areas of operation i.e. the browsers, operating system and office suite. By having almost 90% of the total respondents aware of open source it is clear that the open source software is increasing in popularity. And with over 86% of cyber cafes having adopted open source it is clear that there is need to have a policy touching on open source to cover the challenges that may result from the adoption of open source.

With the average age of respondents pegged at 26years and over 91% of the having cleared tertiary education it would be prudent to incorporate open source within the core curriculum of tertiary IT courses to further enhance the skills of the students on open source to better equip them in the work environment.

Cyber café s prefer software that are cost effective, readily available, secure and reliable, all this are benefits that are offered by open source software (Nordling, 2010) and as a result a majority of cyber café s are using open source software in order to enjoy this benefits.

The major software challenges that cyber café s try and avoid while making their choice of software include perceived difficulty to use software and software that are unstable. This may explain why cyber café s haven't adopted Linux operating system wholly but rather tend to incorporate open source solutions such a Mozilla Firefox within windows operating system which is perceived to be easier to use by most users.

5.4 RECOMMENDATIONS

In accordance to the finding that more and more cyber cafés are adopting open source software, this study recommends that there should be a concerted effort to enhance the knowledge on open source software. This can be accomplished by having open source

incorporated within the education curriculum of public tertiary and secondary institutions and enhanced where it already exists. In addition there exists a need to incorporate open source within the ICT policy framework in order to nurture and guide its growth in Kenya.

The study also recommends that established open source distribution companies such as Linux Redhat, Ubuntu etc should play a leading role in further popularising open source in Nairobi and in Kenya as a whole. This can be done by opening agencies and outlets within the country and also holding workshops to further enhance open source knowledge in the country. This can be organised in conjunction with the local open source organisations such as the Linux professional association of Kenya.

For software developers the study found that the open source development cycle offers more benefits such as coming up with a more robust and efficient system and therefore it offers an alternative development approach which developers can use. Lastly the study has highlighted the benefits that open source has to offer to cyber café s and recommends the adoption of open source software not just by cyber café s but also by other organisations and individual users.

5.5 AREAS OF FURTHER RESEARCH

The study found that few studies have been done relating to open source in Kenya and therefore there exists further gaps which other studies can fill. This study geographically concentrated within the Nairobi CBD other studies can be on open source in regards to other areas in the country. Also the study focused on small scale enterprises in this case cyber café s, further studies can be conducted touching on individual and corporate adoption of open source solutions. Lastly open source is not a concept restricted only to the software industry investigations can be done in regards to open source in other fields such as manufacturing.

5.6 LIMITATIONS OF THE STUDY

Out of the 47 listed cyber café s 10 declined to fill the questionnaire with the main reason being previous experiences with previous research studies that resulted enforcement of dormant copyright software laws. They declined despite reassurances that the study was for academic purposes. Secondly some of the respondents didn't understand the term open source though they were already using the same within their cyber this would lead

to some inaccurate results. Also some questions were left blank in this case the questions were coded as not applicable and this may result in generalisation problems.

Lack of previous studies touching on open source software in Kenya resulted in inadequate literature. In addition time and budget limitations were also experience during the course of the study.

QUESTIONNAIRE

The following questionnaire is for research purposes only. Please answer the questions below as honestly as possible. Tick where appropriate.

SECTION A

i.) Age _____

ii.) Education level of respondent □ University □ college □ High school □ primary

iii.) Duration since organisation started

□ Less than a year □ between 1 and 3 years

□ Between 3 and 5 years □ More than 5 years

iv.) Size of organisation in terms of number of employees

□ Less than 3 employees □ between 3 and 5 employees

□ Between 5 and 10 employees □ More than 10 employees

SECTION B (EXTENT)

1. Are you aware of open source software?

   □ Yes □ no

2. If yes in (2) above do you use any open source software in your cyber café business

   □ Yes □ No

Please rate your answer where 1 is mainly used, 2 frequently used, 3 commonly used, 4 rarely used and 5 not used at all.

3. What type of operating system are you using in your cyber café?

Level of usage (most - least)	**1**	**2**	**3**	**4**	**5**

a) Windows OS					
b) Linux (e.g. Ubuntu, Mephis, Redhat,					
c) Android					
d) Mackintosh OS					

4. What type of browser or download application do you mainly use in you cyber café?

Level of usage (most - least)	**1**	**2**	**3**	**4**	**5**
a) Microsoft Internet Explorer					
b) Google chrome					
c) Opera					
d) Mozilla Firefox					
e) Netscape Navigator					
f) Vuze					
g) sea monkey					
h) KTorrent					
i) Other _____					

5. What type of office suite application do you use in your cyber café?

Level of usage (most - least)	**1**	**2**	**3**	**4**	**5**
a) Microsoft office					
b) Open office					
c) Corel office					
d) Gnome Office					
e) Other _____					

6. What type of routing /firewall system do you currently use in you cyber café?

Level of usage (most - least)	1	2	3	4	5
a) Cisco routing system					
b) Vyatta routing system					
c) Other _____					

SECTION C (BENEFITS)

Please rate your answer where 1 is highly important, 2 quite important, 3 important, 4 not very important and 5 of least importance.

7. How would you rate these factors in terms of their importance in making you opt for open source system and application software (Browser and office suite) in your organisation?

Level of importance (high - least)	1	2	3	4	5
a) Price of software					
b) Affordability in maintenance					
c) Flexibility of software (e.g. can be modified					
d) Customer preference					
e) Security (e.g. it's no affected by viruses)					
f) Stability of the system e.g. doesn't hang					
g) User/employee preference					
h) Availability of the system					
i) Copyright terms					
j) Technical Support offered by software					
k) No vendor lock in (independent from					

SECTION D (CHALLENGES)

8. How would you rate these challenges in terms of them making you not to choose open source system and application software (i.e. Browser and office suite) in terms of how they are currently affecting your business

Level of importance (high - least)	1	2	3	4	5
a. Lack of skilled personnel					
b. High Cost of software in relation to others					
c. Flexibility of software (e.g. can't be modified					
d. System insecurity (in terms of supply)					
e. Lack of copyright laws					
f. Frequent system downtimes (e.g. hanging)					
g. Lack of Technical Support by software company					
h. Unavailability of the system					
i. Lack of laws governing software use					
j. Difficulty of using the system by users					
k. Lack of personal experience in using the					

Thank you

APPENDIX A

LIST OF CYBBER CAFÉ S IN NAIROBI CITY CENTER LISTED IN MOCALITY AND YELLOW PAGES ONLINE DIRECTORY.

1. Appollga Cyber Café ,Kenyatta Avenue,
2. Horizon cyber café Koinange Street.
3. Hannibal cyber, Moi Avenue.
4. Wings Cyber Café , Hakati Road.
5. Wanmac cyber café , watalii street
6. Link net Computer systems, Moi Avenue.
7. Exchange Communication Cyber, Moi Avenue.
8. Sam Cyber Mall University Way.
9. Petcom Cyber, Loita Street.
10. Danjim Communication Ltd, Moi Avenue.
11. Park Cyber Bureau Services, Moktar Daddar, City Square ,Located Close To Jevanjee Gardens
12. Alpha source LTD, Tubman road.
13. Mumbu Cyber, Moi Avenue.
14. Geos Digital bureau, Monrovia Street.
15. Options investments, Koinange Street.
16. Samax Limited, Haile selassie lane.
17. Speed Surf cyber, Moi Avenue.
18. Cyber City Watalii St.
19. Webs Hotspot, Moi Avenue,
20. Light wave Cyber café , Moi Avenue.
21. Kawa cyber café , Moi Avenue.
22. Jafame Cyber , Kenyatta avenue
23. Tiffs Enterprise, Tom Mboya, City Square

24. Zobo Solutions, Kimathi, City Square

25. Gid Co. Ltd, Moi Avenue, City Square

26. Hagen Cyber , Moi avenue

27. Titan impex, Wabera St.

28. Perm enterprises, Standard Street.

29. Wavetek Communications Solutions Ltd, Kenyatta Avenue,

30. Cyber city, Standard Street.

31. Betsy Business Services, University Way, Nairobi

32. Studio Plaza Ltd, Reinsurance Plaza Aga Khan Walk, Nairobi

33. Fes Cyber, Watalii St.

34. Leck Cyber Cage Ltd, Chai Hse, Nairobi

35. University cyber University way

36. Cyber tray café moktah daddah St.

37. Friends Cyber dome, Haile Selassie Ave.

38. Geolya cyber café , Moi Avenue.

39. Space net cyber, muindi Mbigu Street.

40. Blisswa systems Koinange Street near teleposta towers.

41. Millennium Cyber café , Koinange street.

42. Webtouch Ltd Cyber Café , Queensway Hse, 2nd Flr Kaunda St, Nairobi

43. By grace cyber koinange street.

44. Born designs Cyber. Watalii Street.

45. Checha Cyber Café , koinange street

46. Internet Surf point Ltd, Kenya Cinema Plaza, 2nd Flr Moi Ave, Nairobi

47. Njokamu cyber café , Moi Avenue.

REFERENCES

ADERO, B. (2010, october 11). *Kenya's service providers insist internet costs are falling*. Retrieved november 27, 2010, from www.itnewsafrica.com: http://www.itnewsafrica.com/?p=9153

Argaez, E. D. (2010, june). *internetworldstats*. Retrieved january 22, 2011, from www.internetworldstats.com: http://www.internetworldstats.com/africa.htm

Arthus, G. (2004). open source software as an agent for technological innovation. *first international confrence in public finance and fiscal policies in transitional economies* (p. 4). bishkek: long island library.

Dawson, C. w. (2005). *projects in computing and information systems*. Essex: pearson education LTD.

Dedrick, J. (2004). *An Exploratory Study into Open Source Platform Adoption*. Retrieved August 3, 2011, from origin-www.computer.org: http://origin-www.computer.org/plugins/dl/pdf/proceedings/hicss/2004/2056/08/205680265b.pdf?template=1&loginState=1&userData=anonymous-IP%253A%253AAddress%253A%2B%2B92.122.50.175%252C%2B%255B140.98.196.191%252C%2B196.201.214.17%252C%2B%2B92.122.50.175%252

DiBona, C. (2005). *Open Sources 2.0 : the continuing evolution*. Sebastopol, CA: O Reilly Media, Inc.

Edward. (2008, july 4). *History of FOSSFA*. Retrieved october 12, 2010, from FOSSA website: http://www.fossfa.net/node/5

Fleming, E. (2007, april 24). *KTorrent - a Bittorrent Client for Linux*. Retrieved august 08, 2011, from http://www.associatedcontent.com: http://www.associatedcontent.com/article/211617/ktorrent_a_bittorrent_client_for_linux.html

Gachiri, C. W. (2008). *extent and challanges of application of Information and communication technology in commercial banks in kenya*. nairobi: Unppublished MBA project UON.

George, R., & Ralph, S. (2008). *Principles of Information Syatems.* new york: thompson course technology Inc.

Gilliam, J. O. (2001, june). *Improving the Open Source Software Model with UML Case Tools.* Retrieved august 8, 2011, from www.tldp.org: http://tldp.org/LDP/LGNET/67/gilliam.html

Jeroen Verhoeckx. (2010). Retrieved august 08, 2011, from www.opensourcesoftwaredirectory.com: http://www.opensourcesoftwaredirectory.com/

Kandiri, J. M. (2007). *ICT POLICY IN KENYA AND WAYS OF IMPROVING THE EXISTING ICT POLICY.* nairobi: unpublished paper to UON.

Kenneth, C. L., & Jane, P. L. (2007). *Essentials of business information systems.* new york: pearson education LTD.

Kenya postel Directories. (2011). *www.yellowpageskenya.com.* Retrieved may 10, 2011, from www.yellowpageskenya.com: http://www.yellowpageskenya.com/av.php?go=Cyber+Cafes&locality=&category=Cyber+Cafes&start=90&page=4

Kim, H.-J., Mannino, M., & Nieschwietz, R. J. (2009). Information technology acceptance in the internal audit profession: Impact of technology features and complexity. *International Journal of Accounting Information Systems* , 214-228.

Kimani, f. N. (2007). *competitive strategies used by information telecommunications firms in nairobi.* nairobi: Unpublished MBA project: UON.

Macharia, r. W. (2008). *A survey on software maintenance practises in kenya.* nairobi: Unpublished MBA project: UON.

Mocality. (2010). *www.mocality.co.ke.* Retrieved may 10, 2011, from www.mocality.co.ke: http://www.mocality.co.ke/search?skw=cyber%20cafe&nav=1_City-Centre&scity=Nairobi&rcnt=10

Mugenda, O., & A.G.Mugenda. (1999). *Reaserch methods : Quantitative and Qualitative approaches.* Nairobi: Acts press.

Munro, R., Negrette, J., & Aitken, A. (2003, june). *Engaging with the Open Source Community (Part One).* Retrieved march 11, 2011, from

http://www.theinquirer.net/inquirer/news/1031976/engaging-with-the-open-source-community-part-one: http://www.theinquirer.net/inquirer/news/1031976/engaging-with-the-open-source-community-part-one

Mweu, F. (2000, june 9). *OVERVIEW OF THE INTERNET IN KENYA.* Retrieved january 22, 2011, from www.itu.int: http://www.itu.int/africainternet2000/countryreports/ken_e.htm

Nordling, L. (2010, november 5). *Africa Analysis: The benefits of open source software.* Retrieved november 20, 2010, from www.scidev.net: http://www.scidev.net/en/opinions/africa-analysis-the-benefits-of-open-source-software.html

Ombok, E. (2011, january 19). *Kenyan Internet Usage Doubles Over 2010, Ministry Says.* Retrieved january 22, 2011, from www.bloomberg.com: http://www.bloomberg.com/news/2011-01-19/kenyan-internet-usage-doubles-over-2010-ministry-says-update1-.html

Open source Project. (2007). *Welcome to Android.* Retrieved August 8, 2011, from http://source.android.com: http://source.android.com/index.html

Oracle Corp. (2010). *www.mysql.com/why-mysql/.* Retrieved august 7, 2011, from Why MySQL?: http://www.mysql.com/why-mysql/

Otter, A. (2009, may 20). *Kenya to host first open source software awards.* Retrieved october 12, 2010, from tectonic.co.za: http://www.tectonic.co.za/2009/05/kenya-to-host-first-open-source-awards/

Otter, A. (2008, may 05). *Linux cutting software costs in kenya.* Retrieved november 20, 2010, from www.tectonic.co.za: www.tectonic.co.za/2008/05/linux-cutting-software-costs-in-kenya/

Perens, B. (1999, january). *Open Sources: Voices from the Open Source Revolution .* Retrieved august 13, 2011, from www.oreilly.com: http://oreilly.com/catalog/opensources/book/perens.html

Peter, M. N., & Kumssa, A. (2004). *Research design, Data collection and analysis: A training manual.* UNON printshop.

Ralph, S., & Reynolds, G. (2008). *fundamentals of Information Systems.* New york: thompson course technology Inc.

Republic Of Kenya. (2007). *kenya vision 2030.* nairobi.

Riehle, D. (2010, november 09). *The Single-Vendor Commercial Open Source Business Model.* Retrieved October 22, 2011, from Software Research and the Industry: http://dirkriehle.com/publications/2009-2/the-commercial-open-source-business-model/

Simcoe, T. (2005). *Open Standards and Intellectual Property Rights.* Toronto: Oxford University Press.

Stallman, R. (2007, july 13). *Why Open Source misses the point of Free Software.* Retrieved august 13, 2011, from www.gnu.org/: http://www.gnu.org/philosophy/open-source-misses-the-point.html

Stewart, J. (1999, june 12). *Cafematics ©: the cybercafe and the community.* Retrieved August 14, 2011, from homepages.ed.ac.uk: http://homepages.ed.ac.uk/jkstew/work/Cafematics.pdf

Suárez-Potts, L. (n.d.). *History of the OSI.* Retrieved november 13, 2010, from www.opensource.org: http://www.opensource.org/history

Suárez-Potts., L. (2011, february 26). *www.openoffice.org.* Retrieved march 11, 2011, from why open office: http://why.openoffice.org/

Vota, W. (2010, october 27). *usage of open source and proprietary software in Ghana.* Retrieved november 04, 2010, from www.ictworks.org: http://www.ictworks.org/news/2010/05/03/sms-gov-local-government-via-frontlinesms

Vyatta Inc. (2007). *Why vyatta is better than Cisco.* Retrieved november 20, 2010, from http://www.vyatta.com: http://www.vyatta.com/Why vyatta is better than Cisco

Wahid, F. (2007). *http://www.ejisdc.org.* Retrieved August 14, 2011, from Using Technology adoption Model to Analyse internet adopting and use amoung men and women in Indonesia: http://www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/467/223

West, J. (2001, november 1). *Open Source Standardization: The Rise of Linux in the Network Era.* Retrieved August 1, 2011, from www.joelwest.org: http://www.joelwest.org/Papers/WestDedrick2001b-WP.pdf

Wordiq.com. (2010). *Internet cafe - Definition.* Retrieved january 22, 2011, from www.wordiq.com: http://www.wordiq.com/definition/Internet_cafe