An enhanced model for adoption of local software: A case of Kenya

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A thesis submitted in partial fulfillment for the degree of Master of Science in Computer Systems in the Jomo Kenyatta University of Agriculture and Technology

2015

DECLARATION

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

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DEDICATION

I dedicate this work to the Almighty God for this would not have been possible without your wisdom and inspiration. I also dedicate it to my beautiful family, my husband and three wonderful kids for their moral support, their constant encouragement and demonstrating great concern during my study. To all my siblings God bless you for making this a success.

ACKNOWLEDGEMENT

I thank the Almighty God for the guidance throughout the research. For His profound love, good health and knowledge. Thank you Lord. Seconly, I sincerely thank my supervisors Dr. Kimwele Michael and Dr. Cheruiyot Wilson for their support, guidance and supervision. I would also want to appreciate the support and encouragement from family and friends during the tough times that I had to balance between the demands of a rigorous academic program. Lastly, I dearly thank JKUAT management for offering me sponsorship and study leave to undertake this master's degree, without their financial support I would not have made it through.

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LIST OF ABBREVIATIONS / ACRONYMS

DOI	**-** Diffusion of Innovation
ICT	- Information Communication Technology
TOE	- Technology-Organization-Environment
IT	- Information Technology
UTAUT	-Unified Theory of Acceptance and Use of Technology Model
TAM	- Technology Adoption model
OECD	- Organization for Economic Co-operation and Development
GSD	- Global Software Development
CMM	- Capability Maturity Model
NASSCOM	- National Association of Software and Services Companies
TOIE Model	- Technological Organizational Individual and Environmental model
IFI	-Incremental Fit Index
TLI	-Tucker-Lewis Coefficient
NFI	-Normed Fit Index
CFI	-Comparative Fit Index
RFI	-Relative Fit Index
RMSEA	-Root Mean Squared Error of Approximation
LOCAL SOFTWARE	-Software developed and packaged by the Kenyan industries and then marketed and sold in Kenya, Africa or other developed countries.
ADOPTION OF LOCAL SOFTWARE	- Reflects the desire to use local software now and in the future.

ABSTRACT

The share of developing countries in the global software market has risen and now accounts for around 5 percent of sales. A small number of developing countries have successfully developed their own software industries and have continued to strengthen the sector even after 2000. However, many customers in Kenya frequently opt for better packaged and marketed software from India, US or UK, even when these have to be overhauled to suit the Kenyan market. In doing so, the customers deny the local products the much needed breathe of life that is required to enable them to survive in the competitive software marketplace. Relatively little research has examined a framework for the adoption of local software, either as a unique task or in the context of Local software in Kenya. This study attempted to explain how adoption of Local software is affected by the individual, technological, environmental and organizational determinants in Kenya. In this model, explanatory research design was used. The population for this study was the 347 IT and ICT companies which provide ICT services including software services in Kenya. The list was obtained from members of Kenya ICT Providers Association. A sample of 35 managers from firms was taken and also 70 users. Purposive sampling was applied to select the product managers while random sampling was used to select customers. In this study, primary data was collected using a structured questionnaire. Descriptive statistics and inferential results were generated. The model was then validated by checking the values of model goodness of fit using AMOS (Analysis of Moment Structures) module which is an add-on module for SPSS.AMOS module was used to perform Structural Equation Modeling (SEM). It is designed primarily for structural equation modeling, path analysis, and covariance structure modeling. Further the model was tested using a simulation tool used to model, simulate and make predictions about uncertain environments. The expected results include a model that can be used to enhance adoption of local software. The research results indicated that individual factors, technological factors, organizational factors and environmental factors were positively correlated with adoption of local software adoption. The model is generic and therefore can be implemented in other developing countries so as to boost the economy of the developing countries.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Software is critical in today's markets. The importance of information and communication technologies, and thus the software that makes them function, is growing rapidly in both industrial and consumer markets. E-commerce, the Internet, enterprise-integration systems, and wireless networking are just some of the high-profile systems and applications dependent on effective software development.

The report by United Nations Conference on Trade and Development (UNCTD) 2013 revealed that local software production and development can spur economic growth in Africa and other developing economies. On the other hand, Information Economy Report (2012), shows that ICT software and services are dominated by developed world. African countries, Kenya included must look onto ways of increasing the adoption and diffusion of innovation and to solve the problems they are experiencing.

According to Kumar, Mukerji, Butt, and Persaud (2007), overall adoption of e-government services is low in many countries, such as in Ireland, Poland, and Kuwait at less than 30 percent, and in Australia, Canada, and Finland at around 50 percent. On the other hand, in the USA, Singapore, and Korea the proportion of citizens adopting e-government services is slightly higher as compared to other developed countries this is by report UN (2012). Even though governments are improving e-services, citizens are still more likely to use traditional ways of communication as noted by Bélanger and Carter (2008); Kumar *et al.*, (2007). Moreover, UN (2012) and Kumar *et al.* (2007) have emphasized on the dilemma of the low adoption of the e-services, finding that the rate of adoption of e-government is low around the world, although some countries are doing better than others.

The research by Kannabiran and Dharmalingam (2012) in India confirms that 100 per cent of all respondents have adopted their developed PCs, internet and e-mail, but only 17 per cent of

respondents have adopted advanced IT such as Customer Relationship Management (CRM) systems and Extranet Technology for B2B business systems.

The research by Lule, Omwansa, and Waema (2012) where they were looking at theApplication of Technology Acceptance Model (TAM) in M-Banking Adoption in Kenya, indicates that in Kenya Mobile phones with Mobile Commerce technology are becoming more readily available in Kenya. Similarly many financial institutions and mobile phone service providers are teaming up to provide banking services to customers via the mobile phone. However the number of people who choose to adopt or use such technologies is still relatively low. Therefore there is need to assess the acceptance of such technologies to establish factors that hinder or promote their acceptance. This was also supported by Bosire Judith (2012) in her study on the adoption of Mpesa in Kenya and Tanzania.

The Global Software Development (GSD) industry emerged in the wake of the first computers over 60 years ago, Cusick, Prasad and Tepfenhart (2008). Currently, there are maturity models, standards, methodologies, process improvement models and guidelines that can help an organization improve the way it does business (SEI, 2006).

The share of developing countries in the global software market has risen and now accounts for around 5 percent of sales as noted by Simon Commander (2003). A small number of developing countries have successfully developed their own software industries and have, in some cases, continued to strengthen the sector even past 2000. This growth in software activity has in part been attributable to the relatively low entry barriers operating in the industry, relatively high local human capital and strong cost advantages favoring developing countries.

According to Mohammad Abukhzam and Angela Lee (2010), majority of studies relating to technology diffusion and adoption have been conducted in the United States, Canada and the United Kingdom and, therefore, critics Khalfan, A. and Alshawaf, A. (2003); Kamel and Hassan (2006) argue that the results of these studies are less generalizable in developing countries. These critics argue that IT adoption studies to date have not established clear determinants of technology adoption in developing countries. It is accepted that technology adoption differs from one culture to another. On this theme, Cooper (1994) argues that IT is perceived and valued differently by different cultures, since each culture has its own way of

adopting, valuing, and using the technology. This is also supported by Juhanilivari and MadgaHuisman (2007) in their study which found out that deployment of methodologies by IS developers is associated with a hierarchical culture that is oriented towards security, order and routinization.

Several Information Technology adoption and diffusion models have been used to explain how Information Technology is adopted, this as per Mehdi Khosrowpour (2006.). These models focus on individual adoption behaviors and decisions. They do not necessarily lend themselves to studying organizational adoption of technology, King and Gribbins (2002). There should be a model that considers both the individual aspects and also the organization level of adoption.

1.2 Software adoption in Developing and Developed countries

1.2.1 Local Software adoption in Developing Countries

Studies by Florence Tushabe, Venansius Baryamureeba Paul Bagyenda, Cyprian Ogwang and Peter Jehopio (2008) have shown that the local software-industries in most low income developing countries are dominated by subsidiaries of large multi-national computer/consultancy companies. The developers consist of mostly one- and two-person software firms with low turnover. Microenterprises play an important role in socio-economic development and in bridging the gap in the segments of the economy of South Africa. The study findings confirm that ICT use and support of institutions and organisations have a positive impact on the livelihoods of microenterprises. However, ICT use in microenterprises is curtailed by challenges beyond access and ownership of ICTs. Chief among these problems is lack of awareness of application of ICT in business activities and awareness of support services provided by business development organisations as illustrated by Makoza, Frank, and Wallace Chigona (2011).

Local software has been identified as a facilitator for small enterprises in emerging markets, however, Chigona, Ngqokelela, and Mpofu (2009) noted that diffusion of Information Systems in South Africa has been rather slow. South Africa have problems related to infrastructure which threaten the wide spread adoption of Local software. Unreliable electricity supplies, lack of international network bandwidth and the fact that only a small portion of the population has

access to computers and the Internet, are among the factors which negatively influence the adoption of Local software in SA.

In recognition of the importance of software, Nigerian government has recognized that Nigeria's local software industry needs to grow and be involved to make the required impact, Ajayi (2002). Local developers are losing out to foreign software providers. Most Nigerian businesses, especially the small businesses, don't invest in specialized software, for them the packaged / office applications are as far as it goes. Awareness is low about the benefits of software. And for most of the large corporate organizations that invest in niche software, regard foreign software as the better option. Tax incentives should be provided for local software developers. And just like the made-in-Nigeria PCs, government should patronize and give preference to locally developed software. The study by Ajayi (2002) , also found that most System software and packaged applications in use are those manufactured by global industry leaders, e.g. Oracle, Microsoft, etc for reasons of support, manufacturer's Research & Development (R&D) and compatibility.

In Uganda, Local developers have the benefit of producing mass-off-the-shelf software for sale with high chances of it being bought. They are however presented with a challenge of out-competing imported services. Local developers must prove that their products are equal or even better than others, if they are to enjoy a decent cut of the market share. Another issue which has to be tackled is how to increase user knowledge of the complete functionalities of given software.

A study carried out by Florence Tushabe et.al (2010) on the in Uganda found out that software users need software that is lighter and compatible with other platforms or applications. They say that software should be made more user-friendly by reducing the menu items /options and increasing the icons and prompts and not complicated.

1.2.2 Factors for Successful Growth of Computer Software development in developed Countries

During the United Nations Conference on Trade and Development (2013), it was noted that countries around the globe have become more information and knowledge-intensive, giving rise to the phenomenon of the knowledge-based economy. Knowledge-based industries are not

only growing faster but also account for an increasing proportion of trade in most developed economies.

India software and services exports have been rising rapidly. Annual growth rate is between 20-22%, in IT services and 55% in IT –enabled services like Call centers, Mathur (2006). Indian software industry has been able to catch up. There is success in access, learning and developing of technological standards of global market while other developing countries lag behind. Indian software firms quickly moved up value chain from performing low cost programming abroad to providing comprehensive software development services for overseas clients as noted by Bhatnagar and Subhash (2006). This growth has been possible because of several reasons including, foreign technology licensing by government, market competition, venture capital, quality education and research scientists, ICT promotion and prioritization by government, quality of business schools where the students are taught on the benefits of entrepreneurial capabilities and trade, high quality standards and certifications, good infrastructure, good connections with countries like USA. Indian professional entrepreneurs were working at Silicon Valley and were able to use the skills to develop their software industries.

NASSCOM (2009) report showed that the quality standards for the Indian organizations were very high. Indian CMM-5 certified companies were 60 as compared to 2 and 3 for China and Russia respectively. The growth of software and related services in Unites States has outpaced the rest of the economy in each year since 2003, OECD, STAN Database for structural Analysis (2008) revealed. In 2008, the USA share of packaged software (Corel draw, Autocad, Microsoft.net Apple OS X etc) market was 45.9 % of the world market.

In the Global Information Technology Report 2005-2006, published by Palgrave Macmillan (2006) ranked USA top maintaining its eminent position in area of innovation usage. USA has been successful in software development for many reasons which includes available ICT physical infrastructure that are compatible with other applications, broadly supportive market environment, high level of business and government usage of latest technology, technological sophistication, quality education and cooperation with research bodies, availability of venture capital and resources, cooperation between public sector and the private sectors. Private sector is seen to be having the entrepreneurial capability than public sector. The other factors are good

pay for the workers, government policies which promoted diversity and innovation and also quality standards by Tessler and Barr (1997).Quality standards for software development are very high in USA as compared to other countries like India, Singapore, and Australia. For level 4 organizations there were 39 high maturity organizations from USA while India had 27, Australia had only 2 organizations as per NASSCOM Strategic Review (2009).

In The global information technology report 2005-2006 , which was published by Palgrave Macmillan (2006), indicated that Singapore had maintained its third position. This was possible due to excellent Regulatory Environment and developing environment which maintains the standards required, government commitment which enhance the use of new technologies in all sectors, high level of education, excellent macroeconomic management and improved institutional environment.

United Kingdom also tops the list of ICT indicators. The factors that makes it possible to grow in the field of local software development includes: sophistication of financial markets, availability of venture capital, good laws related to ICT, the standards, market competition, good quality research, local market available, and quality scientific research. This was published in the global information technology report 2005-2006, by Palgrave Macmillan (2006).

In 2001 India was the leading exporter of IT services at 7.2 %, Ireland 6.5%, USA 5.1%, and UK 4.2%. In the ranking there was no African Country between positions1-10.This report clearly shows that developing countries still lag behind in diffusion and adoption of Local software. This ranking is available on the CEPII CHELEM Database. There are some weaknesses like lack of ICT promotion by government, administrative burden, low speed in registration of business, poor electricity and telecommunication infrastructure, but the strengths outdo the weaknesses making developed countries to grow their software industries.

India's software and services exports have been rising rapidly. The annual growth rate ranges between 20 -22% in IT services and nearly 55 % in IT-enabled services (ITES), such as call centres, Business Process Outsourcing (BPO) and other administrative support operations. Together they are predicted to grow at 25% pa till 2010. The IT industry is highly export oriented and the exporters are predominantly Indian .

The report by world economic forum (2009-2010) showed that the players in ICT services were dominated by the developed countries. USA ranked 1st in 2005 which was an improvement as compared to 2004, Singapore 2nd position , dropped one place, UK moved two places compared to 2004, South Africa was in position 37, dropped 3 places, Uganda position 79, down 2 places, Nigeria position 90 from 86 in 2004 and Kenya was position 91 from 75 in 2004. Another report by Global Information Technoloffy 2013 ranked Kenya number 92, this thowed a decrease in the adoption of ICT services. This clearly shows that the adoption of ICT services and software development is dropping in Kenya. African countries, Kenya included have problems to do with limited access to venture capital, poor infrastructure, piracy, inadequate protection of intellectual property rights, poor legal model.

1. 3 Statement of the Problem

Adoption rate of Local software in Kenya is very low. The biggest challenges facing software innovators in Kenya are the skill to package the software products, and the capital for marketing. Many Kenyans build software that never grow beyond a few customers. Many customers frequently opt for better packaged and marketed software from India, US or UK, even when these have to be overhauled to suit the Kenyan market. In doing so, the customers deny the local products the much needed breathe of life required to enable them survive in the competitive software marketplace (Kabugi, 2013).

The majority of studies relating to technology diffusion and adoption have been conducted in developed countries. Most of the studies focus on individual adoption behaviors and decisions. They do not necessarily lend themselves to studying organizational adoption of technology. Therefore, there is need for a research to come up with adoption model that suits the developing countries like Kenya and also a model that looks at the individual level of adoption and also the organization level.

In addressing the factors influencing software adoption there is the need for a model that specifically highlights on the individual adoption and organization adoption of software. Relatively little research has examined a model for the adoption of local software, either as a unique task or in the context of Local software in Kenya. This study attempts to explain how

adoption of Local software is affected by the individual behavours, technological, environmental and organizational determinants in Kenya.

1.4 Justification

It is argued in this study that individual characteristics, technological, organizational and environmental factors in software development affect adoption. Hence, Results of this study may be of use to the IT and ICT firms and other professionals providing software services. They may use the recommendations aimed at improving on delivery of such services in local adoption measures.

Results can also be used by the users of the local software to improve on their perceptions and attitude towards the locally developed softwares.

1.5 Objectives

1.5.1 General Objective

To determine an enhanced model for adoption of Local software in Kenya.

1.5.2 Specific Objectives

i. To establish the effect of individual, technological, organizational and environmental factors on the adoption of Local software.
ii. To analyze the effect of individual, technological, organizational and environmental factors on the adoption of Local software.
iii. To formulate a model for adoption of Local software.
iv. To evaluate the model for adoption of Local software.

1.6 Research questions

i. What is the effect of individual, technological, organizational and environmental factors on the adoption of Local software?
ii. To what extent do individual, technological, organizational and environmental factors influence the adoption of Local software?

iii. What is the most suitable model for adoption of Local software?

iv. How to test the suitability of the model for software development?

1.7 Scope of the Study

The study comprised of the 347 IT and ICT companies which provide software services in Kenya in the year 2013 and their customers. The study covered the individual characteristics, technological, organizational and environmental factors influencing the adoption of local software in Kenya. The reseach will borrow from ealier models, TAM, DOI and TOE to come up with an anhanced model.

1.8 Assumptions and Limitations

T-O-E is the closest fit to explain institutional behavior in technology adoption. Only a high level descriptive analysis of some common models has been done to justify this statement and can therefore be challenged by others. The basis and applicability of the statement was for this research only. The population did not include those individuals who are developing and selling local softwares without registering their companies with the ICT board. It would not be possible to get data from such individuals due to legal issues. The total sample size of about 105 respondents limits the generalizability of the proposed model.. It also limits the effectiveness of the data analysis method used. The very technical nature of software development limits its awareness outside, and to a good extent within, IT professionals. This limited the number of competent respondents and increase error in measurement.

1.9 Significance of the Study

Practitioners and policy makers can find value in the knowledge presented in this research for secondary use. It may impact existing policies and practices in adoption of Local software. The proposed model can assist developers in selection and cost effective implementation of the right adoption environment aligned with both business and technology objectives/roadmaps. The model can be further adapted for use in impact assessment of deployed systems against the desired technical and business objectives. It can also be adapted and applied to institutions in other sectors of the economy as well as other developing countries.

This research has implications on the wholesomeness of T-O-E , TAM and DOI model in explaining and predicting adoption behavior in institutions and proposes crucial additions.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter discussed theories relevant to the research. Literature related to the study was also reviewed with the aim of identifying literature gaps. The literature review also guided the relevance of the research findings.

2.2 Theoretical Review

This research was guided by the adoption theories.

2.2.1 Adoption Theories

There are theories that inspired many adoption models over the last 2 decades or so. Only a few that are closely related to the research subject are listed. The origins of the theories span multiple disciplines in sociology and psychology detailing human behaviors in a social system when faced with adopting innovation. They are widely used by innovators and marketers alike in predicting adoption and use of innovation by a target society. They form an invaluable source of information towards understanding, explaining and predicting organizational behavior in technology adoption.

Diffusion of innovations (DOI) (Rogers 2003) looks at the stages that a new technological innovation takes for acceptance in the market over a period of time and specific cultures. It seeks to explain how, why and the rate at which new technology spreads over time through cultures. The DOI found that individual characteristics, internal characteristics of organizational structure, and external characteristics of the organization are important antecedents to organizational innovativeness, Rogers (2003). These factors will affect the adoption rate of software and systems at the firm level.

Unified Theory of Acceptance and Use of Technology (UTAUT) is among the models accepted to predict and explain usage intention. Since its inception in the year 2003, the UTAUT is the most leading and widespread theory available in the IS literature to date as noted by Schaupp,

L.C., Carter, L. and McBride, M.E. (2010), asestimated by the number of citations received by the originating article of the UTAUT by Venkatesh*et al.* (2003), which has now reached close to 5,000. This model has been implemented to the various new technological adoptions (e.g. picture archiving and communication systems, information kiosk, Wireless LAN technology, internet banking, and mobile internet, etc.).

The majority of IT adoption studies use UTAUT theory because of the fact that this is a unified model which has been developed by the mapping of eight competing theories of IT adoption and can be used as an alternative for the eight constituent theories to a larger extent. Muhammad and Jouni (2013), findings show that performance expectancy, effort expectancy, facilitating conditions and social influence are the factors that affect the user's adoption of e-government services in Pakistan.

Technology Acceptance Model is about the first and the foremost traditional adoption theory in the field of IT (Awa, Eze, Urieto & Inyang 2011). Technology Acceptance Model (TAM) by Davis (1989) which is at the individual level has been the only one which has captured the most attention of the Information Systems community. TAM looked at the perceived ease of use, perceived usefulness and attitude of the users. These are individual characteristics which will affect the adoption of software.

The Technology-Organization-Environment- TOE model was developed by Tornatzky and Fleischer (1990).identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation. The theory suggests that adoption is influenced by technology development, organizational conditions, business and organizational reconfiguration as noted by Chatterjee, Grewal, & Sambamurthy (2002), and industry environment Kowath and Choon (2001).

2.3 Adoption Models

2.3.1 Technology Acceptance Model (TAM 1)

Davis' (1989) TAM is widely used to study user acceptance of technology. TAM model which deals with perceptions as opposed to real usage, suggests that when users are presented with a new technology, two important factors influence their decision about how and when they will

use it Davis (1989). According to TAM, perceived usefulness (PU) and perceived ease of use (PEOU) influence one's attitude towards system usage, which influences one's behavioural intention to use a system, which, in turn, determines actual system usage.

Davis defines PU as 'the degree to which a person believes that using a particular system would enhance his or her job performance Davis (1989) and PEOU as 'the degree to which a person believes that using a particular system would be free of effort , Davis (1989). Perceived ease of use is predicted to influence perceived usefulness, because the easier a system is to use, the more useful it can be. These constructs reflect users' subjective assessments of a system, which may or may not be representative of objective reality. System acceptance will suffer if users do not perceive a system as useful and easy to use , Davis (1989).

Demographic variables such as environment are also the antecedent that induces perceived usefulness and perceived ease of use. Thus, TAM is based on both important perceptive factors as perceived usefulness and perceived ease of use. TAM is widely applied on the researches of information technology. This is seen on the research carried out by Mohammad (2009) in which he pointed out that TAM is very popular model for explaining and predicting system use. The figure 2.1 below shows the variables which are considered by TAM.

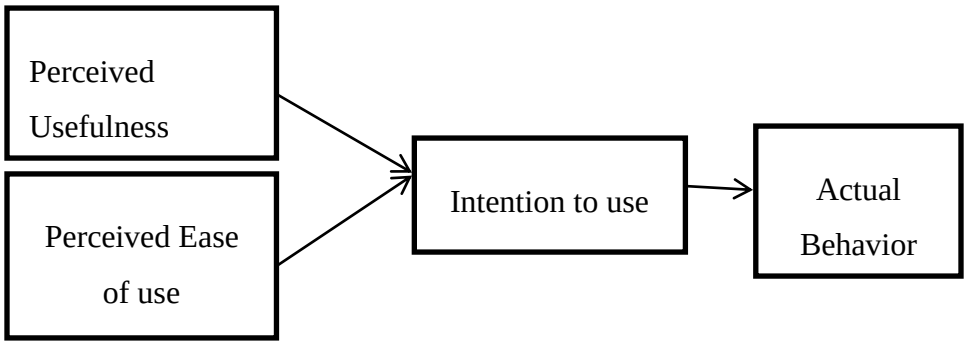


Figure 2.1: Technology Acceptance Model (TAM 1)

Source: Davis. (1989)

In general original TAM model focuses on the individual 'user' of a computer, with the concept of 'perceived usefulness', with extension to bring in more and more factors to explain how a user 'perceives' 'usefulness', and ignores the essentially social processes of IS development and

implementation, without question where more technology is actually better, and the social consequences of Information Systems use , Bagozzi (2007).

TAM was measured and tested by carrying field and laboratory studies. According to Adams et al. (1992) the variables perceived ease of use and perceived usefulness were tested to check on their validity and reliability. They used five different applications: email, voice mail, word perfect, lotus 123 and Harvard graphics. The participants were Master of Business Administration (IS) students and the self- reported use data of the applications were used as a measure for actual use. The result indicated that TAM model maintained its consistency in predicting and explaining system adoption.

2.3.3 Diffusion of Innovation (DOI)

Diffusion of Innovation (DOI) theory is another popular model used in information systems research to explain user adoption of new technologies. Rogers defines diffusion as 'the process by which an innovation is communicated through certain channels over time among the members of a social society', Rogers (2003). According to Tiago and Maria (2011), individual characteristics, internal characteristics of organizational structure, and external characteristics of the organization are important antecedents to organizational innovativeness. Figure 2.2 shows are the facors and variables which are considered by the DOI model.

According to Nripendra, Yogesh, Michael (2013), the rate of diffusion is affected by an innovation's relative advantage, complexity, compatibility, trialability and observability but only three of its constructs (i.e. compatibility, complexity, and relative advantage) were in use across various studies. Relative advantage is the degree to which an innovation is seen as being superior to its predecessor. Complexity is the degree to which an innovation is seen by the potential adopter as being relatively difficult to use and understand'. Compatibility is the degree to which an innovation is seen to be compatible with existing values, beliefs, experiences and needs of adopters. Trialability is the degree to which an idea can be experimented with on a limited basis. Finally, observability is the degree to which the results of an innovation are visible.

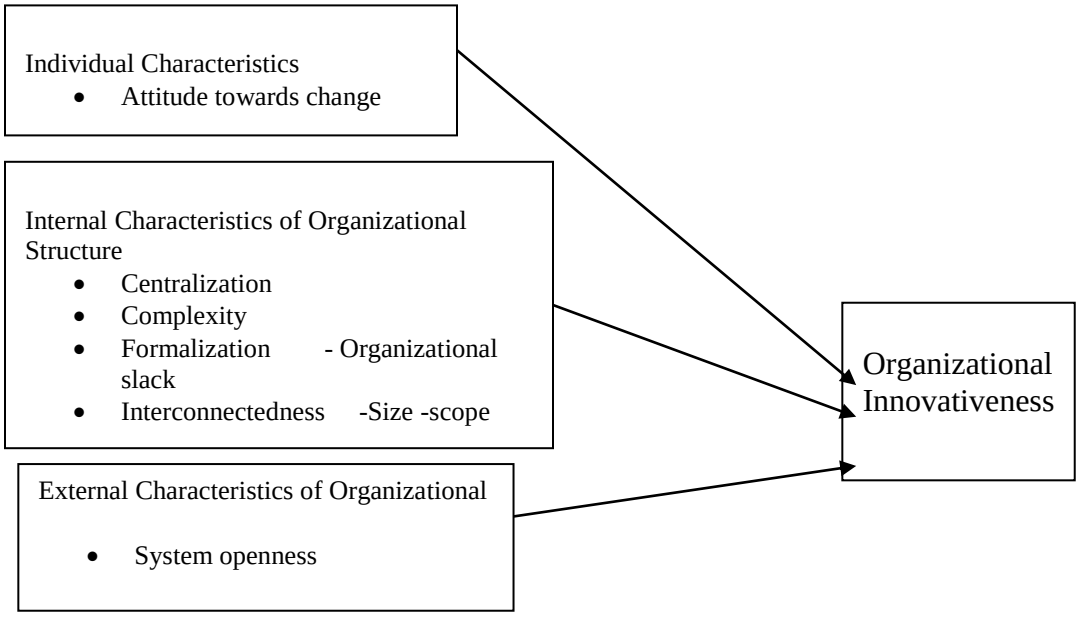


Figure 2.2: DOI theory as applied by Rogers, 2003 to organization level

2.3.4 Technology-Organization-Environment (TOE) Model

The TOE model was developed by Tornatzky and Fleischer, (1990). It identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context.

TOE model is consistent with the DOI theory, Tiago and Maria (2011). DOI model emphasized on individual characteristics, and both the internal and external characteristics of the organization, as drivers for organizational innovativeness. But the TOE model also includes a new and important component, environment context. The environment context presents both constraints and opportunities for technological innovation.

Technological context describes both the internal and external technologies relevant to the firm.

Organizational context captures firm's business scope, organizational culture, complexity of managerial structure measured in terms of centralization, formalization, and vertical differentiation, the quality of human resource, size related issues such as internal slack resources and specialization as shown by Jeyaraj, Rottman & Lacity*(* 2006). Environmental

context is the arena in which a firm conducts its business—its industry, competitors, and dealings with the government, Tornatzky and Fleischer (1990). It has been used widely in IT adoption studies at the organizational level as stated by Hart (2012). In study by Susan K. Lippert and Chittibabu Govindarajulu (2006) on TOE antecedents to web services adoption, he noted that many empirical studies have used the TOE model as a theoretical foundation for investigating organizational adoption of new technologies.

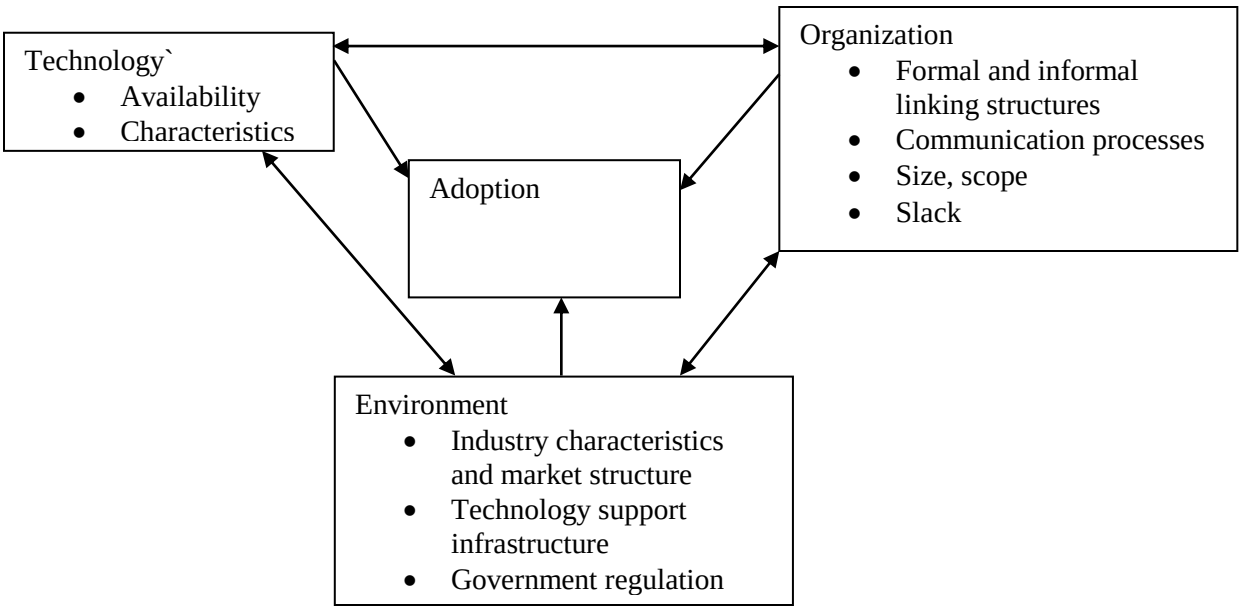


Figure 2.3: Technology, organization, and environment Model , Tornatzky and Fleischer (1990).

2.4 Comparison of the Theoretical Models

Diffusion of innovation theory (DOI) is the second highly used model, but only three of its constructs (i.e. compatibility, complexity, and relative advantage) were in use across various studies , Nripendra et al. (2013). Considerable amount of IT acceptance and adoption works have been performed on the outcome of Rogers' work ,Dwivedi and Irani (2009).

According to Fichman (2000), Rogers' innovation diffusion model has had a profound role in shaping the basic concepts, terminology, and scope of the field, but does not apply equally well to all kinds of innovations in all adoption contexts. Whereas banks in general are perceived as early adopters, some cases have shown them to be laggards as is evident where banks choose to retain legacy systems.

There are several limitations of Diffusion of Innovation Theory, which include the following: it does not foster a participatory approach to adoption of learning program. It works better with adoption of behaviors rather than cessation or prevention of behaviors and also, it doesn't take into account an individual's resources or social support to adopt the new behavior or innovation as shown by Davis (2009).

The technology acceptance model (TAM) has come to be one of the most widely used models within this paradigm as elaborated by King and He, (2006) ; Porter & Donthu (2006). The IS community has also considered TAM as a prudent and powerful theory from the last two decades as indicated by Dwivedi, Y.K. and Irani, Z. (2009); Lucas and Spitler, (1999); Venkatesh and Davis, (2000). Since its origin, TAM and its revisions have been applied to a variety of technologies. Yousafzai, Foxall, and Pallister (2007)," conducted meta-analysis studies in this area and confirmed that TAM explains the adoption of numerous technologies, ranging from software packages to various online services.

The measures presented in Davis' study target employee acceptance of organizational software, but these measures have been tested and validated for various users, experienced and inexperienced, types of systems, word processing, spreadsheet, email, voicemail and gender. Studies have also used TAM in USA, UK, Canada, Nigeria, Japan and many more other countries to evaluate user adoption of e-commerce, presentation software, case tools, decision support tools and many other systems.

TAM has been found as the most frequently used theoretical model even in e-government adoption research. According to S. E. Colesca, l. Dobrica (2008).; Lee JinKyu ' H. Raghav Rao (2009); Murali Sambasivan, George Patrick Wemyss , Raduan Che Rose (2010) , some of the e-government adoption research studieswere even limited to the TAM as a guiding model. According to averweg, Udo (2008), few studies have been carried out to test the applicability of TAM outside the North America.

According to Timothy J. Willis (2008) in his study, TAM model has been studied with a variety of populations and technologies and has proven to be one of the most robust theories of behavior at work. Over the past fifteen years the model has effectively predicted or explained the acceptance of workplace innovations but it sometimes does not predict acceptance as well for special populations or very specialized technology.

The main strength of TAM is the intentions to use a technology influence usage behavior, and perceived usefulness (PU) and perceived ease of use (PEU) determine intentions to use. Significantly, TAM has consistently outperformed the Theory of Reasoned Action (TRA)

model and Therory of Planned Behaviour (TPB) model in terms of explained variance across many studies those by Davis et al. (2009); Venkatesh et al. (2003).

TAM lacks sound theory and method for identifying the determinants of PU and PEU, as well as other bases for decision making, the neglect of group, social, and cultural aspects of decision making, the reliance on naïve and over-simplified notions of affect or emotions, and finally the over dependence on a purely deterministic model without consideration of self-regulation processes , Venkatesh et al. (2003).

TAM models have questionable heuristic value, limited explanatory and predictive power, triviality, and lack of any practical value noted by Chuttu (2009). Benbasat and Barki (2007) posited that the independent attempts by several researchers to expand TAM in order to adapt it to the constantly changing IT environments have lead to a state of theoretical chaos and confusion.

Chien-Hsin Lin, Hsin-Yu Shih and Peter (2007) included technology readiness as an antecedent of perceived usefulness and perceived ease of use in TAM. The TAM has received considerable support over the years. It has been validated over a wide range of systems, and perceived usefulness and perceived ease of use have proven to be reliable and valid cognitive dimensions as noted by King and He (2006).

The proponents of TAM posit that perceived usefulness is influenced by perceived ease of use and both predict attitudes , Davis (1993). Although TAM has received empirical validation, application, and replication shown by Gounaris and Kori-tos (2008), the model provides less meaningful information on user's opinions about adopting specific systems by narrowing its constructs to only PU and PEOU. Hence, the need to expand the factors or integrate with other IT acceptance models to improve TAM's explanatory and pre- Integrating TAM and TOE model.

Both the UTAUT and TAM were primarily designed to be used in an organization environment where the mechanism for technology adoption is management driven. There is a significant difference in the implementation environments between software and software

development, Conklin (2007). It is this difference that plays a central role in the approaches to be used to increase adoption of software development services.

Technology-Organization-Environment (TOE) model by Tornatzky and Fleischer (1990) groups factors influencing technology adoption and use at the organizational level into 3 broad areas of; Technology; internal and external technologies relevant to the firm, Organization; factors such as strategy, structure, size etc, Environment; firm's placement in its industry, competition, regulations, development environments etc.

Zhu *et al.* (2003) posisted that TOE model has been a popular foundational model in examining issues such as Ecommerce adoption, implementation, and usage. Similarly, TOE model was found to provide consistent empirical support in a number of IS domains including electronic funds transfer (EFT), electronic data interchange (EDI), open systems, material requirement planning, and enterprise resource planning noted by Zhu and Kraemer (2005).The TOE model has a solid theoretical basis, consistent empirical support and the potential of application to IS innovation domains, though specific factors identified within the three contexts may vary across different studies.

TOE model has been used widely in IT adoption studies at the organizational level , Hart (2012). Many empirical studies have used the TOE model as a theoretical foundation for investigating organizational adoption of new technologies, Susanet al. (2006). The TOE model has a solid theoretical basis, consistent empirical support and the potential of application to IS innovation domains, though specific factors identified within the three contexts may vary across different studies.

Critics of TOE, Dedrick and West (2004) posit that this model as originally proposed and later adapted in IT adoption studies, offers little more than taxonomy for categorizing variables and does not represent an integrated conceptual model or a well-developed theory . Nevertheless it considers most factors relevant at the firm level where innovation adoption is concerned.

Some studies have incorporated TAM determinants with TOE e.g. Hart et al, in their research, "Integrating TAM and TOE Models for E-Commerce Adoption by SMEs." Hart proposed combining constructs from both models and included additional ones in order to adequately

explain the SME scenario. Integrating T-O-E with other models such as TAM, with each adoption predictor offering larger number of constructs than the original provides richer theoretical lenses to the understanding of adoption behavior

TOE failed to address the individual characteristics; this is the basis of extending T-O-E with constructs most relevant to the local software in light of software development in order to derive the proposed model. TAM lacks sufficient rigor and relevance that would make it a well-established theory for the IS community.

It can be deduced from the review of current theories and models around technology adoption that there is no one model that fits all scenarios of individual and/or organizational contexts of adoption. New models are mostly improvements on earlier models addressing shortcomings to fit specific scenarios. Rui (2007) noted that deeper understanding of IS adoption behavior in organizations remains relatively underdeveloped and the existing models have been limited in their ability to provide a core set of constructs to help IS researchers to build a parsimonious yet powerful model for IS innovation adoption. Most of the existing theories/models are generic and were developed over 2 decades. Institutional behaviors towards technology adoption have changed over this period. The Technology-Organization-Environment (TOE) model offers a good starting point for institutional based adoption model.

The Technology-Organization-Environment (TOE) model, Technology Acceptance Model (TAM) and DOI model will form the basis of the research. The new integrated model will also add two more construct which the researcher believes is very important. The new variables to be added are developer's entrepreneurial capability and developing environment. Mostly during the startup phase of a new business, lack of entrepreneurial skills in an owner can cause a business to fail. A small firm's performance outcome is a function of many variables, including individual owner characteristics, owner behaviors, and environmental influences. Entrepreneurs generally have a high need for achievement and social awareness, and they are high risk takers. Consequently, the personal and personality characteristics of an owner can be a cause of business failure. Copyright 2011, Attard Communications, Inc.

When entrepreneurs appropriate too little rents from innovation, too few resources are allocated to entrepreneurship and returns to Research & Development are low because of this lack of

entrepreneurial skills. When so, innovation should be promoted by encouraging entrepreneurship rather than research. Jarkko Pyysiäinen, Alistair Anderson, Gerard McElwee, Kari Vesala, (2006)

Developer's Entrepreneurial capability is the overall user's satisfaction with local software services in terms of content, interface, speed, quality and security elaborated by Colesca & Dobrica (2008). Development environment are the development process, development philosophy and workflow management by which the development team proposes to satisfy the customer's requirements, that is the sequence of steps leading from the initial requirements gathering and specification to the final delivered software product. Are they standardized, regulated, or meet minimum international standards, Jonasson (2012). The development system is another development environment factor that relates to the choices of hardware and software tools used in software development and or to facilitate software development and in some cases to reduce performance risk ,Stern and Arias (2011).

If an idea about a software is formed in Kenya but the software is developed in UK people will tend to trust and believe in that software than one which is developed wholey in Kenya. A case of Mpesa explains this fact. The idea of coming up with the Mpesa software for money transaction was born in Kenya but the development was done in UK.

The new constructs will upgrade original TAM and T-O-E models to a more comprehensive level to promote and facilitate improved explanatory and predictive lenses of IT adoption. This is the basis of extending T-O-E and TAM with constructs most relevant to the local software in light of software development in order to derive the proposed model.

2.4.1 Studies that used the TOE, TAM and DOI model

Several authors used only the TOE model to understand different IT adoptions as described by Tiago Oliveira and Maria Fraga Martins (2011). They include electronic data interchange, open systems, web site; e-commerce; enterprise resource planning; business to business (B2B) e-commerce; e-business as shown by Zhu *et al.,(* 2006); Zhu and Kraemer, (2005; and knowledge management systems (KMS) studied by Lee *et al., (*2009).

There are also studies which combined the TOE model and DOI theories which includes, Thong (1999) joins CEO characteristics from DOI to the TOE model, Chong,Richard, and Alastrair (2009) add innovation attributes (relative advantage, compatibility, and complexity) from DOI and an additional new factor in the adoption study called information sharing culture characteristics to the TOE model, Zhu *et al*. (2006) combined relative advantage, compatibility, cost, and security concern from DOI with the TOE model.

Table:2.1 Factors and Variables for the Models

Models	**Constructs**	**Used in developing Technological-Organization-Individual-Environmental (TOIE)Model**	**Not used**	**Added factors from Literature Review and Case study**
DOI	**Individual Characteristics** Attitude towards change Internal Characteristics of Organizational Structure Centralization Complexity Formalization Organizational slack Interconnectedness -Size **External Characteristics of Organizational** System openness	Individual Characteristics Attitude towards change Internal Characteristics of Organizational Culture Size Resources	Internal Characteristics of Organizational Structure Centralization Complexity Formalization	
TAM	Perceived	Perceived Usefulness		

	Usefulness Perceived Ease of Use	Perceived Ease of Use		
TOE	**Organizational factors** • Formal and informal linking structures • Communication processes • Size • Slack **Technological** • -Availability • Characteristics **Environmental factors** • Industry characteristics and market structure • Technology support infrastructure • Government regulation	**Individual factors** -Developer's entrepreneurial capability -Perceived Usefulness -Perceived Ease of Use **Organizational factors** -Organization culture -Organization size Organization Resources **Technological** -Compatibility -Security -Privacy **Environmental factors** -Industry competition -Regulatory Environment - Developing Environment	• Formal and informal linking structures • Communication processes	-Developer's entrepreneurial capability. -Developing Environment

Table 2.1 shows the factors which are found in each of the models and also the variables which were incooperated to form the new model in the study. The research adopted only the factors considered more important as per the literature review and case studies. The research work incooperated two new variables which are not found in any of the models discussed. They include Developer's entrepreneurial capability and Developing Environment.

When entrepreneurs appropriate too little rents from innovation, too few resources are allocated to entrepreneurship and returns to Research & Development are low because of this lack of entrepreneurial skills. When so, innovation should be promoted by encouraging entrepreneurship rather than research. Jarkko Pyysiäinen, Alistair Anderson, Gerard McElwee, Kari Vesala, (2006).

Developer's Entrepreneurial capability is the overall user's satisfaction with local software services in terms of content, interface, speed, quality and security as noted by Colesca & Dobrica (2008). Development environment are the development process, development philosophy and workflow management by which the development team proposes to satisfy the customer's requirements, that is the sequence of steps leading from the initial requirements gathering and specification to the final delivered software product. Are they standardized, regulated, or meet minimum international standards (Jonasson, 2012).

The researchers left out the factors which were repeated in some models so as to avoid repetition.

2.5 Research Model

The research model for this study borrowed from existing models and examined citizens' demand on different levels on software adoption in addition to testing different variables that might affect citizens' utilization of Local software. The research model proposed is an integration of TOE, TAM and DOI model. The research model will also add two new construct "Developer's Entrepreneurial capability" and "developing environment". Developing environment is important because it looks at the tools, choices of hardware and software tools used in software development and also the worjflow which is very important during development. Developer's Entrepreneurial capability is important because this will make the

developers be ready to take the risks in this copmetative industries. In India , the developers were having the Entrepreneurial skills to enable them maintain the industry. The new model is called Technological-Organisational-Technological- Environmental (TOIE) Model, which will look at the effects of Technological factors, organizational characteristics, individual behaviors and environmental factors to adoption of local software.

2.5.1 Individual Factors

The addition of Individual characteristics (consisting of entrepreneurial capabilities and perceptions of developer and users) is important since it extends the TOE model which concerns itself with Technological, Organizational and Environmental Factors only.

Perceived usefulness is one of the strongest predictor and remains significant at all point of measurement shown by Venkatesh et al. (2003).

Usage of software is connected to the way customers perceive the software to be useful in a way that, if the customers regard the local software as useless then it cannot be used effectively. The inclusion of Perceived Ease of Use (PEOU) and Perceived Usefulness as individual factors is because they are constructs which are dependent on perceptions of the individual. One individual may find a technology easy to use while another one may not because of the individual unique capabilities.

In addition, it is important to capture the developer's entrepreneurial capabilities since they may affect the rate of adoption. The risk taking nature of a developer implies that he/she participates in research design and is likely to introduce as many variants of local software as he/she can. In addition, the competitive aggressiveness of a developer implies that he/she markets aggressively and this has an effect on the adoption of innovations.

With the globalization of the world economy, interest in international entrepreneurship has increased rapidly over the past decade. One of the most important features of today's global economy is the growing role of young entrepreneurial. Changes in the competitive environment and the interdependence of the global economy make internationalization attractive to entrepreneurial firms posists John A Mathews and Ivo Zander(2007).

This study adopted perceived usefulness, perceived ease of use and developer's entrepreneurial capability as the constructs of individual factors.

2.5.2 Technological Factors

The Technology context refers to the internal and external technologies available to the organization which has a bearing on its productivity Susan et al (2006) encompasses the existing technologies in use within the organization and the relevant technologies the organization can draw on externally, Zhu, Kraemer, Gurbaxani& Xu, (2006). Dedrick and West (2004) cite DOI theory and include Compatibility, relative advantage, complexity ,Trialability and observability as technological factors influencing linked to technology adoption.

The Software Cost and Risk model determines the cost and the risks of using open source services, Guliani and Woods (2005). Failure to optimally manage the potential risks and rewards of software will put IT organizations at an increasingly serious risk in the coming years.Studies suggest that risk involved in a technology increase customers' concerns with security and thus slow down the adoption of the technology. Firms attempt to increase technology adoption by assuring them of various safety features that reduce risk in technology adoption Xu et al., (2009) posisted . For example, encryption and authentication are some approaches that reduce the chances of failure due to risks in electronic commerce. Similarly, firms alleviate risks by adopting proper legal model as well as obtaining certification from various agencies (such as eTrust) that certify the site to be secure / trustworthy.

Suh and Han (2003) assert that security is one of the most challenging problems faced by customers who wish to trade online because of the inherent vulnerabilities of the Internet. They argue that when a customer trades through the Internet, anyone from anywhere can access the information being transmitted. Bouwman, Carlsson, Molina-Castillo and Walden (2007) categories these barriers into physical (whether or not risky technology is physically accessible), cognitive (effort required in mastering the use of risky technology), affective (attitudes and motivation with regard to the use of systems, such as confidence, efficacy, and trust), economic (benefits and cost), social (cultural norms) and political (related to power and knowledge gaps)

This study adopted compatibility, security and privacy as the constructs of technological factors.

2.5.3 Organizational Factors

The Organizational context is characterized by a few descriptive measures e.g. scope, culture, size of the organization, the slack resources available internally. Organizational factors are comprised of different elements. Organisations have different competitive positions and roles for IT, and a high level of IT intensity is proportional to open source adoption. The innovation orientation of an organization is related to the timing of adoption and the prompts pertinent to adoption decision. The centrality of IT to the business strategy is core to the willingness of the organization to adopt software , Dedrick et al.(2004).

Choice set and Selection occurs as a response to software adoption, but more importantly occurs within the application context which exhibits the strategic significance of the specified system and consequently the equivalent weighted value for features, risk, cost and available products where the predilection of the buyer is restricted by a limited number of available choices said Kwan and West (2004). This study adopted organizational culture, organization size and resources as the constructs of organizational factors.

2.5.4 Environmental Factors

The Environmental context refers to the arena in which the organization operates and conducts its business, Zhu et al. (2003). Susan et al. (2006) contends that the organization is influenced by the industry itself and its competitors. Environmental factors encompass factors such as rivalry, industry competition, regulatory Compliance, customer influence and relations with buyers and suppliers notes Zhu et al. (2006). The Software Skills and Risk Tolerance model ascertains the propensity of the organization to handle the risks intrinsic in software adoption and produces a risk tolerance plan and profile. The relationship between skill and experience with value is directly proportional, where the higher the skill proficiency and the greater the experience a company has with local software, the higher the prospective value of local software illustrated by Guliani and Woods (2005).

According to Guliani and Woods (2005) a higher skill set further reduces the time investment and the cost of using local software. The developer skills may be improved by the intellectual challenge of contributing to software development when they are granted access to source code, this is noted by Comino, Manenti and Parisi (2007). This study adopted industry competition, Regulatory Environment and developing environment as the constructs of environmental factors.

2.6 Definition of Constructs

Below is a brief description of the constructs that formed the conceptual model.

Table 2.2 Definition of the Research Model Constructs

Construct	Definition	Reference
Perceived Usefulness (PU.	The extent to which a person believes that the technology, under investigation, will enhance his/her productivity or job performance In the software development context, it is perceived as the likelihood that the technology will benefit the user in the performance of some task. A significant body of TAM research has provided evidence that PU is a strong determinant of user acceptance, adoption behavior.	Davis et al.(2009)
Perceived Ease of Use (PEOU)	The extent to which a person believes that using a technology will be simple and easier to use. This construct is linked to a potential software developer's estimation of the effort he or she will put to understand and utilize the technology. This describes the interactions between a number of entities in a software. As the number of entities increases, the number of interactions between them would increase exponentially, and it would get to a	Davis et al. (2009) Rogers (2005)

	point where it would be impossible to know and understand all of them.	
Developer's entrepreneurial capability	This refers to the entrepreneurial orientation of the developer in terms of risk taking, competitive aggressiveness, proactivenes among other indicators	Colesca and Dobrica (2008)
Compatibility	This is a characteristic of software components or systems which cannot operate satisfactorily together on the same computer, or on different computers linked by a computer network. They may be components or systems which are intended to operate cooperatively or independently.	McKnight et. al. (2002)
Security and Privacy	Risk involved in a technology increase customers' concerns with security and thus slow down the adoption of the technology. Firms attempt to increase technology adoption by assuring them of various safety features that reduce risk in technology adoption For example, encryption and authentication are some approaches that reduce the chances of failure due to risks in electronic commerce. Similarly, firms alleviate risks by adopting proper legal model as well as obtaining certification from various agencies (such as eTrust) that certify the site to be secure / trustworthy	Suh and Han (2003) Bouwman et al. (2007) Xu et al.(2009). Guliani & Woods, (2005)
Organizational culture	The values and behaviors that contribute to the unique social and psychological environment of an organization. Organizational culture includes an organization's	Colesca and Dobrica (2007),

	expectations, experiences, philosophy, and values that hold it together, and is expressed in its self-image, inner workings, interactions with the outside world, and future expectations.	
Organization size and Resources	Size can be defined as a structural property (like degree of formalization) or a contextual variable (like demand). It's a property at the interface between internal structures and the environment. Developer's perception of whether the resources' cost benefit pattern of using local software services is acceptable.	Rogers (2005)
Industry competition	It is a contest between companies for a niche, or a location of customers. People's knowledge of local software project or services, and the availability of its services.	Roca et. al (2008),Choudrie and Dwivedi (2005)
Regulatory Environment and developing environment	The incorporation of standards that conform to specific requirements, regulatory compliance is the regulations a company must follow to meet specific requirements.	Colesca and Dobrica (2007), Roca et. al (2008),
Adoption of Local software	Reflects the desire to use local software now and in the future. This includes the Willingness to use Local software services and actual use	Davis et al. (2009)

2.7 Conceptualization of the Variables

According to Cooper and Schindler (2011), "There is nothing very tricky about the notion of independence and dependence. But there is something tricky about the fact that the relationship of independence and dependence is a figment of the researcher's imagination until demonstrated convincingly. Researchers hypothesize relationships of independence and dependence. They invent them and then they try by reality testing to see if the relationships actually work out that way". Cooper and Schindler (2011) defines dependent variable as a "variable that is measured, predicted, or otherwise monitored and is expected to be affected by

manipulation of an independent variable". They also defined Independent variable as a "variable that is manipulated by the researcher, and the manipulation causes an effect on the dependent variable".

2.7.1 Dependent variable

The dependent variable, adoption of local software will determine the adoption levels of Local software. It was measured as the number of local software modules bought or sold by users and developers.

2.7.2 Independent variables

Independent variables are: developer's entrepreneurial ability, perceived usefulness, perceived ease of use, Security and Privacy, compatibility, Regulatory Environment and developing environment, organization culture, size and resources.

Figure 2.4 depicts the relationship between the generic model factors (individual, technological, organization, and environmental factors) and variables and their impact on local software adoption.

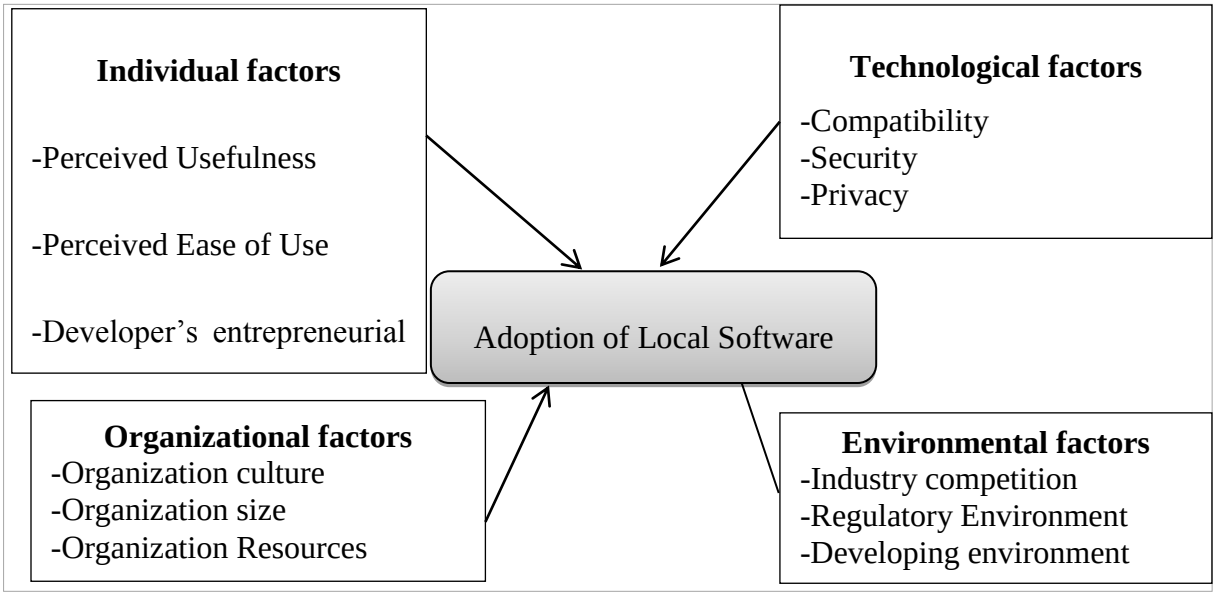


Figure 2.4: Proposed Research Model for adoption of local software

Source: Researcher

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This research intended to empirically validate the proposed theoretical model (and hypotheses) of Local software in Kenya. It was a descriptive study of the causal relationship between factors that support or deter adoption. Data from software developers includes those that adopted and succeeded and those that attempted but failed were obtained touching on their perceptions, plans, success/fail factors, challenges, extents of adoption, actual gains etc. The questionnaire will address all areas of software development.

3.2 Conceptual Model

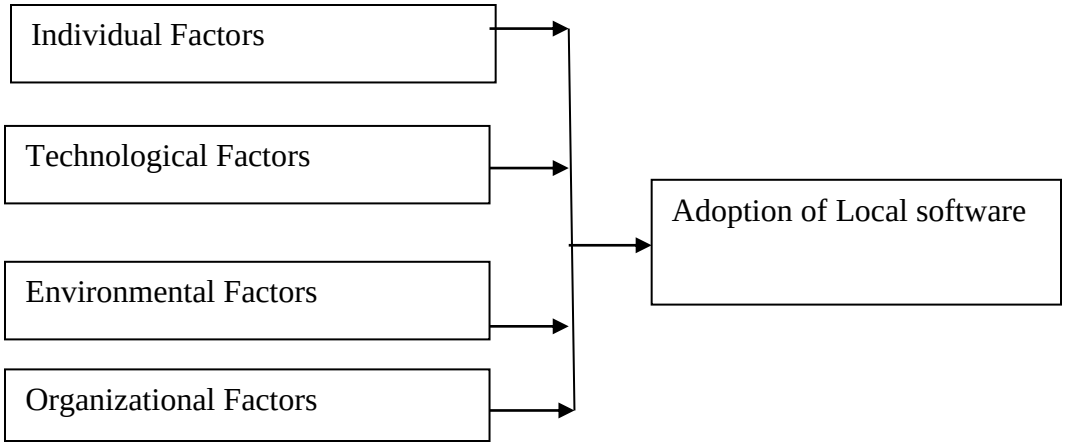


Figure 3.1: The conceptual model for adoption of local software

3.3 Research Design

In this model, explanatory research design was used. Studies that establish causal relationships between variables are termed as explanatory studies. The emphasis here is on studying a situation or a problem in order to explain the relationship between variables , Lewis et al. (2003). Explanatory studies are designed to test whether one event causes another. In general, an explanatory design was appropriate because the study intended to establish if there was a causal relationship between individual related constructs, environment related constructs,

organization related constructs, and technology related constructs and adoption of Local software.

3.4 Population and Sample

According to Mugenda and Mugenda (2003) a population without a sampling frame is an undefined population. It may also be referred to as large population. Therefore this study had a target as well as accessible population of an undefined population. Mugenda and Mugenda (2003) recommend a formula for determining a final population for a large population which was assumed to be normally distributed at a confidence interval of 95% and a margin of error 5%. The population for this study was the 347 IT and ICT companies which provide ICT services including software services in Kenya and are listed as members of Kenya ICT Providers Association and also their users/customers.

According Mugenda and Mugenda, (2003) a sample of 10-30% is deemed adequate for this study. A sample of 10% which is 35 firms was taken. In the firms ,the developers were to be given the questionnares . However, simple random sampling was used to select the two users from the 35 firms. In total the research had a sample of 105 (users and developers) to give the questionnaires.

3.5 Data Collection Tools

The measurement instrument was a structured questionnaire in hardcopy and also in softcopy sent through email to suit respondents' choice. Each determinant of adoption was an independent variable and had items (questions), attributes and nominal values to operationalize it. The respondents responded to each question on a Likert-type scale of 1 to 5 apart from areas where the questions are dichotomous (e.g. 'yes/no' type). The framing of the questions was such that issues of confidentiality are minimal to the extent that participants do not have to seek management consent to respond. Anonymous responses were allowed.

3.6 Data Validity and Reliability

Golafshani, (2003) posists that validity relates to whether the measuring instrument used in a particular study measures what it intends to measure. A test's validity therefore indicates whether the test items used reflect the variables in the theoretical model.

Construct validity refers to the process of examining whether or not a test actually measures a theoretical construct or trait. Hence, studies should continue to provide evidence of construct validity and only when studies of a test consistently lead to negative outcomes should the test be rejected.

Reliability refers to the consistency of measurement as cited by Harrington, Donna (2008). A measuring instrument is therefore reliable when the same results are produced when the instrument is used in a different situation and administered to different groups at different times. An important reliability estimate to evaluate the reliability of scales is internal consistency.

Both validity and reliability of the questionnaire was enhanced by piloting and item analysis. The pilot data was analyzed by Cronbach's alpha tool so as to ascertain the reliability of the questionnaire. The most popular reliability statistics in use today is Cronbach's alpha by Cronbach (1951). Cronbach's alpha determines the internal consistency or average correlation of items in a survey instrument to gauge its reliability. It states that 0.70 is the cutoff value for being acceptable when checking on the reliability of the instrument to be used for collecting data.

3.7 Data Collection

In this study, primary data on adoption was collected using a structured questionnaire, since it can be used to collect data about phenomena that is not directly observable (e.g. inner experiences, opinions, values, interests, etc.), easier to administer, analyze and economical in terms of time and money. The questionnaires were issued to the respondents through informal self-introduction. The questionnaires were sent to the respondents under an introduction letter from the researcher. Follow ups were made and the fully completed questionnaires picked from the respondents later by use of a research assistant.

3.8 Data Analysis

Burns and Grove (2003) define data analysis as a mechanism for reducing and organizing data to produce findings that require interpretation by the researcher. The researcher used frequencies, averages and percentages in this study. The researcher used Statistical Package for Social Sciences Version 20 (SPSS) to generate the descriptive statistics and also to generate inferential results. The individual hypotheses were tested using correlation analysis. Regression analysis was used to demonstrate the relationship between adoption of Local software and the determining factors. According to Mugenda and Mugenda (2003), the regression technique used to analyze the degree of relationship between two variables.

The multiple linear regression models adopted for the study was as follows:

$Y=\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$ ……(i)

Where: Y = Adoption of Local software

X_1 = Individual related constructs

X_2 = Technology related constructs

X_3 = Organizational related constructs

X_4 =Environmental related constructs

In the model α was the constant term while the coefficients β_1 to β_4 was used to measure the sensitivity of the dependent variable (Y) to unit change in the explanatory variables (X_1, X_2, $X_3$and X_4). $\varepsilon$is the error term which captures the unexplained variations in the model.

The regression results were evaluated and interpreted as follows; the coefficient of determination (r squared) was evaluated to determine the explanatory power of the model. The f statistic was evaluated to determine the overall significance of the models. A reported p value less than the critical value of 0.05 was construed to mean that the overall model was significant.

The sign of the beta coefficient was used to determine whether the relationship between the dependent and independent variables was positive or negative. The significance of the independent variable was determined by the t statistics and the associated p values. A reported p value less than the critical value of 0.05 was construed to mean that the independent variable has a significance relationship with the dependent variable. Tables, Pie charts and other graphs were used as appropriate to present the data collected for ease of understanding and analysis.
Moderating factors such as age, gender, experiences and voluntariness are not tested. Depending on the environment in which the system or technology is implemented, these moderating factors may or may not have direct influence on user intention to use technology.

3.9 Model modification and Testing

The first stage was analysis of the model which was by running regression and correlations among the various variables. This was done to help in formulating the model, coming up with the correct questionnaire and then data collection.

The second stage was to identify which hypothesis was rejected and which ones were accepted. The hypothesis being the model .

According to Lule et al, (2012), to modify the model and see which variables are the best at explaining the variance in adoption, factors analysis and structural equation modeling will be used. Specifically, SPSS 20 and AMOS module was used to perform Structural Equation Modeling (SEM). It is designed primarily for structural equation modeling, path analysis, and covariance structure modeling, though it may be used to perform linear regression analysis and ANOVA and ANCOVA.This is Structural Equation Modeling (SEM) software that uses Confirmatory Factor Analysis (CFA) to align the tested measures to the specific constructs and constraining the variances of each measure to the latent construct it should represent. In addition to assessing the degree to which each measure contributes to its latent construct, CFA also tests the separation between constructs by evaluating the fit in the overall model.

There are four groups of fit measures and among the many measures of fit; four popular measures are used in this study. $\chi 2$ /df, CFI, TLI and RMSEA.

The model was again tested using AgenaRisk tool to ascertain the results. AgenaRisk is a commercial application used to model, simulate and make predictions about uncertain and risky environments. Its algorithms allow for formulation and construction of hybrid models containing discrete and continuous variables and dynamic modeling of time based or evolving systems. The organization and environmental factors are considered first; this provides a general criteria for selection of software for adoption. Individual factors are then used to assess the software, this could be done mostly by end users or IT proffessionals. After this the technical aspects of the software(s) intended for adoption are then assessed.

CHAPTER FOUR

4.0 DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The chapter presents the empirical findings and results of the application of the variables using techniques mentioned in chapter three. Specifically, the data analysis was based on specific objectives where patterns were investigated, interpreted and implications drawn on them. The chapter starts with a preliminary analysis of the data before analyzing the study variables.

4.2 Response Rate

The number of questionnaires that were administered were 105, out of these, 35 were administered to developers and 70 were administered to users of local software. A total of 84 questionnaires were properly filled and returned, which included 26 questionnaires from the developers and 58 questionnaires from the users. This represented an overall successful response rate of 80%. According to Mugenda and Mugenda (2003), a response rate of 50% or more is adequate.

Table 4.1: Response Rate

	Successful	Unsuccessful	Total
Developers	26	9	35
Users	58	12	70
Total	84	21	105

4.3 Demographic Characteristics of Users of Local Software

4.3.1 Gender

The respondents who are users of local software were asked to indicate their gender. Results in Figure 4.1 revealed that 40% of the respondents who are users of local software were male and 60% of the respondents who are users of local software were female.

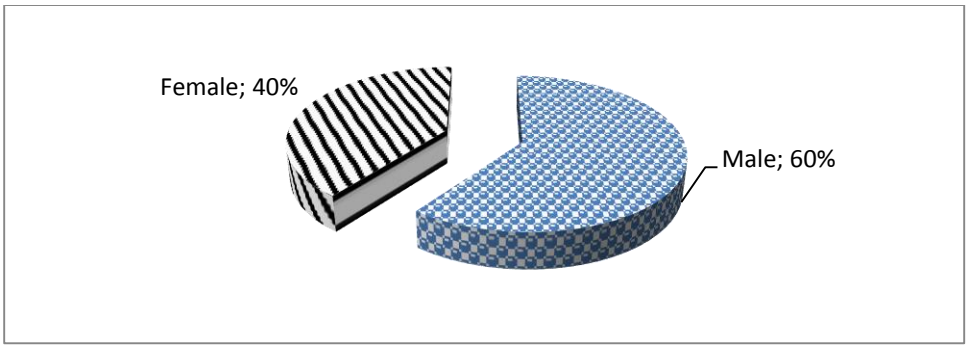


Figure 4.1: Gender of the Users of Local Software

4.3.2 Age of the Respondents

The respondents who are users of local software were asked to indicate their age brackets. Results in Figure 4.2 revealed that 78% of the respondents were aged between 21 and 40 years, while 15% indicated between 41-60 years of age and 7% were below 20 years of age.

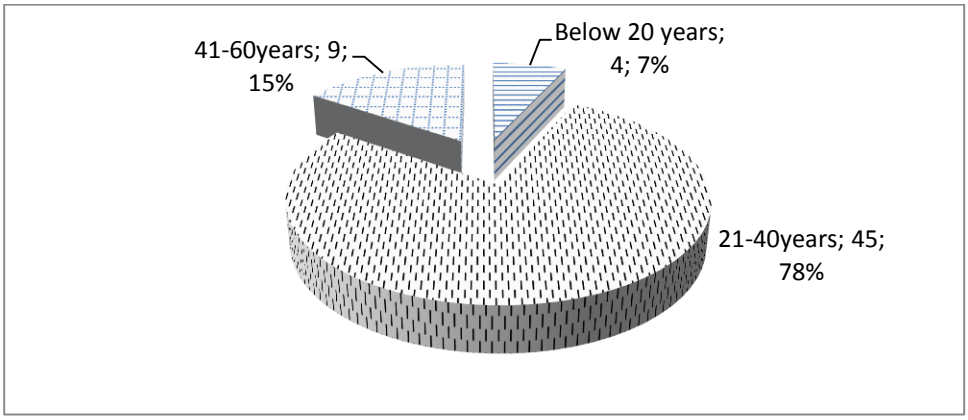


Figure 4.2: Age of Users of Local Software

4.3.3 Level of Education

The study further sought to establish the highest academic qualifications attained by the respondents. The level of education was important in that it helped the researcher to determine the expertise and specialization of most of the users of local software. The responses on this question are depicted in figure 4.3. Majority (74%) of the respondents who are user had undergraduate degrees and 19% had post graduate degrees.

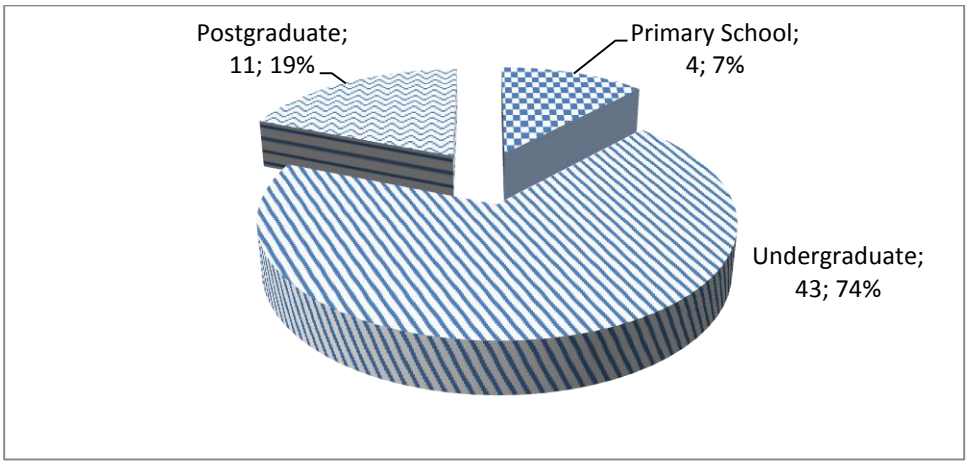


Figure 4.3: Users' Level of Education

4.3.4 Years of Experience in Local Software Usage

The respondents were asked to indicate the years of experience in the usage of local software. Figure 4.4 illustrates that 52% of the respondents had less than three year experience in usage of local software, 27% of the respondents had no experience and 21% of the respondents had between three and ten years of experience in local software usage.

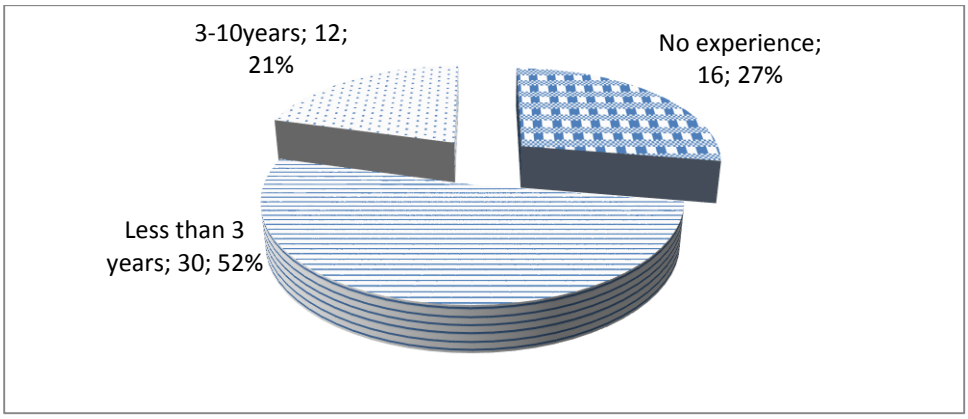


Figure 4.4: Users` Years of Experience in Local Software Usage

4.4 Frequencies and Descriptive Analysis for Users of Local Software

This section is arranged based on the objectives of the study.

4.4.1 Perceived Ease of Use

This section tested the views of the users of local software regarding their perceived ease of use of the local software. Table 4.2 shows that 20.6% of the respondents disagreed that local software are easy to use compared to international software while 46.6% agreed that local software are easy to use compared to international software, Fifty percent of the respondents agreed that local software require less ICT knowledge to understand compared to international software while 10.3% disagreed that local software require less ICT knowledge to understand compared to international software, 56.9% disagreed that local software come in more than one language and this improves understandability and 29.3% agreed that that local softwarecome in more than one language and this improves understandability. In addition, 39.6% disagreed that local software come with manuals which are well illustrated, 46.6% agreed that Local software come with manuals which are well illustrated. The mean score for the responses was 3.10 which indicate that many respondents who are users of local software did not know whether or not the local software are easy to use.

Table 4.2: Users` Perceived Ease of Use of Local Software

Perceived ease of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software are easy to use compared to international software.	3.4%	17.20%	32.8%	46.6%	0.0%	3.22
Local software require less ICT knowledge to understand compared to international software	0.0%	10.30%	39.7%	43.1%	6.9%	3.47
Local software come in more than one language and this improves understandability	6.9%	50.0%	13.8%	29.3%	0.0%	2.66
Local software come with manuals which are well illustrated	3.4%	36.20%	13.8%	46.6%	0.0%	3.03
Average	3.4%	28.4%	25.0%	41.4%	1.7%	3.10

4.4.2 Perceived Usefulness

This section tested the views of the users of local software regarding their perceived usefulnessof the local software. Table 4.3 shows that 34.5% of the respondents disagreed that local software has more benefits compared to the international software while 58.6% agreed that local software have more benefits compared to the international software. Seventy point seven percent of the respondents agreed that local software enable them to save money compared to other software and 19% disagreed that local software enable them to save money compared to other software, 41.8% disagreed that local software have more customised modules compared to other software and 41.4% agreed that that local software have more customised modules compared to other software. In addition, 20.7% disagreed that local software take less time to understand and use while 79.3% agreed that local software take less time to understand and use. The mean score for the responses was 3.29 which indicate that many respondents who are users of local software disagreed that local software are useful.

Table 4.3: Users` Perceived Usefulness of Local Software

Perceived usefulness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software has more benefits compared to the international software	0.0%	34.5%	6.9%	58.6%	0.0%	3.24
Local software enable us to save money compared to other software	0.0%	19.0%	10.3%	70.7%	0.0%	3.52
Local software have more customised modules compared to other software	6.9%	37.9%	13.8%	20.7%	20.7%	3.10
Local software take less time to understand and use	6.9%	13.8%	0.0%	62.1%	17.2%	3.69
Average	3.5%	26.3%	7.8%	53.0%	9.5%	3.29

4.4.3 Compatibility

This section tested the views of the users of local software regarding the compatibility of the local software with the other software. Table 4.4 shows that 8.6% of the respondents disagreed that local software are easily compatible with existing applications, 72.4% agreed that local software are easily compatible with existing applications, and 29.3% disagreed that local software are compatible with other international software. Fourty three point one percent of the respondents agreed that local software are compatible with other international software, 17.2% disagreed that local software have been added with interfaces which increase compatibility to existing software and 56.9% agreed that local software have been added with interfaces which increase compatibility to existing software. In addition, 74.1% of the respondents agreed that local software can be linked together with other networks. The mean score for the responses was 3.64 which indicate that many respondents who are users of local software agreed that local software are compatible to other software.

Table 4.4: Compatibility

Compatibility	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software is easily compatible with existing applications	0.0%	8.6%	19.0%	72.4%	0.0%	3.64
Local software is compatible with other international software	6.9%	22.4%	27.6%	43.1%	0.0%	3.07
Local software has been added with interfaces which increase compatibility to existing software	6.9%	10.3%	25.9%	56.9%	0.0%	3.33
Local software can be linked together with other networks	0.0%	0.0%	25.9%	74.1%	0.0%	3.74
Average	3.5%	10.3%	24.6%	61.6%	0.0%	3.64

4.4.4 Security and Privacy

This section tested the views of the users of local software regarding the security and safety of the local software. Table 4.5 shows that 81% of the respondents disagreed that local software are less prone to virus attack, 12.1% agreed that local software are less prone to virus attack, and 67.3% disagreed that local software are less prone to programming bugs. Twelve point one percent of the respondents agreed that local softwareareless prone to programming bugs, 81% disagreed that local software are less prone to hacking by software hackers and 19% agreed that that local software are less prone to hacking by software hackers. In addition, 39.6% disagreed that local software ensures that the private information is kept confidential and 32.8% agreed that local software ensures that the private information is kept confidential. The mean score for the responses was 2.21 which indicate that many respondents who are users of local software disagreed that local software are secure and confidential.

Table 4.5: Security and Privacy

Security and privacy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software is less prone to virus attack	10.3%	70.7%	6.9%	12.1%	0.0%	2.21
Local software is less prone to programming bugs	27.6%	39.7%	20.7%	12.1%	0.0%	2.17
Local software is less prone to hacking by software hackers	20.7%	60.3%	0.0%	19.0%	0.0%	2.17
Local software ensures that the private information is kept confidential	3.4%	36.2%	27.6%	32.8%	0.0%	2.9
Average	15.5%	51.7%	13.8%	19.0%	0.0%	2.21

4.4.5 Regulatory Environment and developing environment

This section tested the views of the users of local software regarding the Regulatory Environment and developing environment that the local software operate. Table 4.6 shows that 20.7% of the respondents disagreed that the current legal requirements in Local software effectively accommodates the local software adoption, 75.9% agreed that the current legal requirements in Local software effectively accommodates the local software adoption, and 5.2% disagreed that there are minimal requirements in adoption of local software relative to other adopted software. Forty eight point three percent of the respondents agreed that there are minimal requirements in adoption of local software relative to other adopted software, 12.1% disagreed that recent local lT regulations have been modified to encourage more local software use and 74.1% agreed that that recent local lT regulations have been modified to encourage more local software use. In addition, 51.7% disagreed that the government has put laws that effectively deal with software piracy and 37.9% agreed that local software the government has put laws that effectively deal with software piracy. The mean score for the responses was 3.36 which indicate that many respondents who are users of local software agreed that there are regulations that a local software company must follow to meet specific requirements.

Table 4.6: Regulatory Environment and developing environment

Regulatory Environment and developing environment	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
	6.9%	13.8%	3.4%	75.9%	0.0%	3.48
The current legal requirements in Local software effectively accommodates the local software adoption.						
Same software developed in USA and Kenya regarded differently	0.00%	1.00%	0.00%	0.2%	0.00%	1.0
There are minimal requirements in adoption of local software relative to other adopted software	0.0%	5.2%	46.6%	48.3%	0.0%	3.43
Recent local lT regulations have been modified to encourage more local software use	0.0%	12.1%	13.8%	74.1%	0.0%	3.62
Software developing environment	0.00%					
Government has put laws that effectively deal with software piracy	46.2%	0.0%		30.8%	15.4%	7.7% 2.38
Government has put laws that effectively deals with TAX incentives	42.3%	7.7%		38.5%	11.5%	0.0% 2.19
Government has put laws that effectively deal with software piracy	0.0%	51.7%	10.3%	34.5%	3.4%	2.9
Average	1.7%	20.7%	18.5%	58.2%	0.9%	3.36

4.4.6 Use of Local Software

This section tested the views of the users of local software regarding their use of the local software. Table 4.7 shows that 96.6% of the respondents said that they use the local software to gather information, 67.2% said that they use the local software to pay for service charges online, and 63.8% said that they use the local software to schedule daily activities.Sixty five point one percent of the respondents said that they use the local software to do business internationally. The mean score for the responses was 1.3 which indicates that many

respondents who are users of local software use them to gather information, pay service charges online, to schedule daily activities and to do business internationally.

Table 4.7: Use of Local Software

Use of local software	Yes	No	Likert Mean
Gather information	96.6%	3.4%	1.0
Pay service charges online	67.2%	32.8%	1.3
To schedule daily activities	63.8%	36.2%	1.4
Do business internationally	32.8%	67.2%	1.7
Average	65.1%	34.9%	1.3

4.4.6 Number of Software Bought

This section sought to find out the number of local software that the users of local software have bought within the last one year. Figure 4.5 shows that 83% of the respondents said that they bought between 1-5 software, 10% said that they bought between 6-10 software, and 7% said that they bought over 10 local software within the last one year.

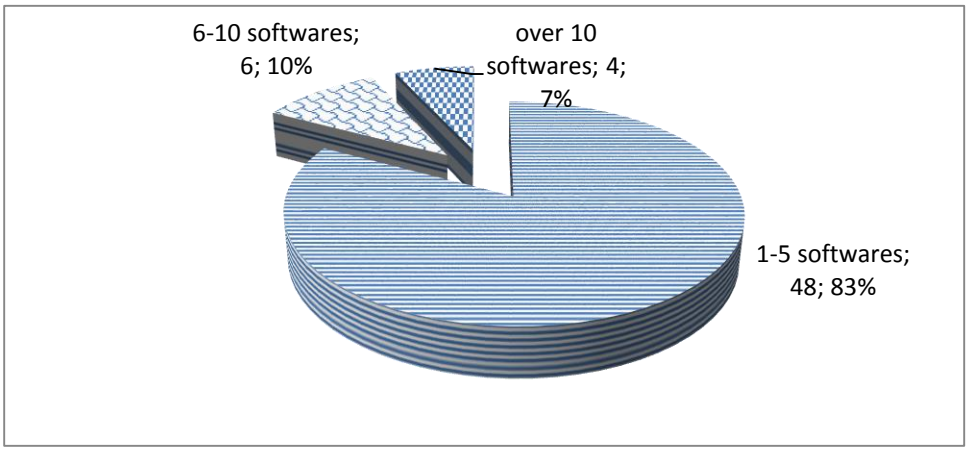


Figure 4.5: Number of Software Bought

4.4.7 Satisfaction with Local Software

This section sought to find out if the users of local software were satisfied with the service they get after adopting the local software. Figure 4.6 shows that 67% of the respondents agreed that they are satisfied with the service they get after adopting the local software while 26%

moderately agreed and 7% strongly disagreed that they were satisfied with the service they get after adopting the local software.

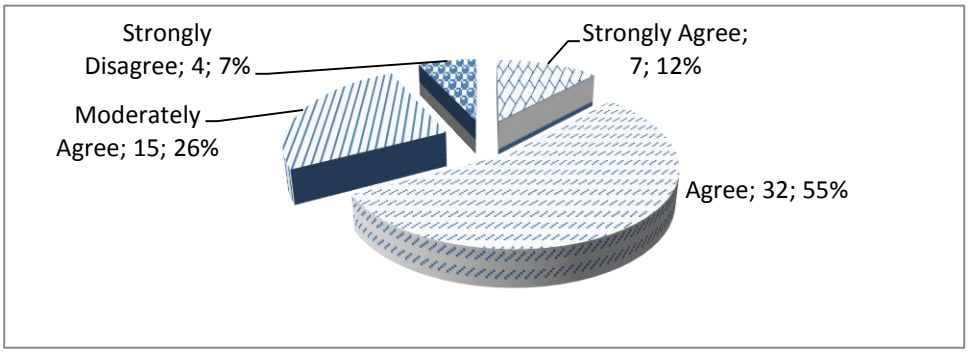


Figure 4.6: Satisfaction with Local Software

4.5 Inferential Statistical Analysis for Users of Local Software

This section presents the correlation and regression analysis.

4.5.1 Bivariate Correlation

Table 4.8 displays the results of correlation test analysis between the dependent variable (adoption of local software) and independent variables and also correlation among the independent variables themselves. Results on Table 4.8 show that adoption of local software is positively correlated with all the independent variables. This reveals that any positive change in perceived ease of use, perceived usefulness, compatibility, Security and privacy and Regulatory Environment and developing environment can lead to increased adoption of local software.

Table 4.8: Bivariate Correlation for Users of Local Software

Variable		Adoption of local software	Perceived ease of use	Perceived usefulness	compatibility	Security and privacy	Regulatory Environment and developing environment
Adoption of local software	Pearson Correlation	1					
	Sig. (2-tailed)						
Perceived ease of use	Pearson Correlation	0.359	1				
	Sig. (2-tailed)	0.006					
Perceived usefulness	Pearson Correlation	0.229	-0.165	1			
	Sig. (2-tailed)	0.084	0.216				
compatibility	Pearson Correlation	0.740	0.270	0.448	1		
	Sig. (2-tailed)	0.000	0.041	0.000			
Security and privacy	Pearson Correlation	0.528	0.438	-0.522	0.316	1	
	Sig. (2-tailed)	0.000	0.001	0.000	0.016		
Regulatory Environment and developing environment		0.413	0.06	0.181	0.206	0.103	1
	Pearson Correlation						
	Sig. (2-tailed)	0.001	0.654	0.174	0.122	0.44	

4.5.2 Regression Analysis

In order to establish the statistical significance of the independent variables on the dependent variable (adoption of local software) regression analysis was employed. The regression equation took the following form.

$$Y=\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Adoption of Local software

X_1 = Individual related constructs

X_2 = Technology related constructs

X_3 = Organizational related constructs

X_4 = Environmental related constructs

In the model, α = the constant term while the coefficient $\beta_i i= 1\ldots.4$ was used to measure the sensitivity of the dependent variables (Y) to unit change in the predictor variables. μ is the error term which captures the unexplained variations in the model. Table 4.9 shows that the coefficient of determination also called the R square is 73.6%. This means that the combined effect of the predictor variables (perceived ease of use, perceived usefulness, compatibility, security and privacy and Regulatory Environment and developing environment) explains 73.6% of the variations in adoption of local software. The correlation coefficient or R of 85.8% indicates that the combined effect of the predictor variables has a strong and positive correlation with adoption of local software. This also meant that a change in the drivers of adoption of local software has a strong and a positive effect on adoption of local software.

Table 4.9: Regression Model Fitness for Users

Indicator	Coefficient
R	0.858
R Square	0.736
Std. Error of the Estimate	0.24065

Analysis of variance (ANOVA) on Table 4.10 shows that the combined effect of perceived ease of use, perceived usefulness, compatibility, security and privacy and Regulatory Environment and developing environment was statistically significant in explaining adoption of local software. This is demonstrated by a p value of 0.000 which is less that the acceptance critical value of 0.05.

Table 4.10: Analysis of Variance (ANOVA) for Users

Indicator	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.399	5	1.680	29.006	0.000
Residual	3.011	52	0.058		
Total	11.411	57			

Table 4.11 displays the regression coefficients of the independent variables. The results reveal that perceived ease of use was not statistically significant in explaining adoption of local software while perceived usefulness, compatibility, Regulatory Environment and developing environment, security and privacy are statistically significant in explaining adoption of local software. The findings imply that there is a negative and insignificant relationship between perceived ease of use and adoption of local software while there is a positive and significant relationship between perceived usefulness, compatibility, Regulatory Environment and developing environment and security and privacy and adoption of local software.

Table 4.11: Regression Coefficients for Users

Variable	Beta	Std. Error	t	Sig.
Constant	4.862	0.326	14.903	0.000
Perceived ease of use	-0.057	0.066	-0.852	0.398
perceived usefulness	0.187	0.085	-2.190	0.033
compatibility	0.309	0.093	-3.337	0.002
Security and privacy	0.312	0.078	-3.993	0.000
Regulatory Environment and developing environment	0.182	0.060	-3.026	0.004

The regression output above was represented in form of a graphical model below. The model consists of only significant variables as shown by the p values.

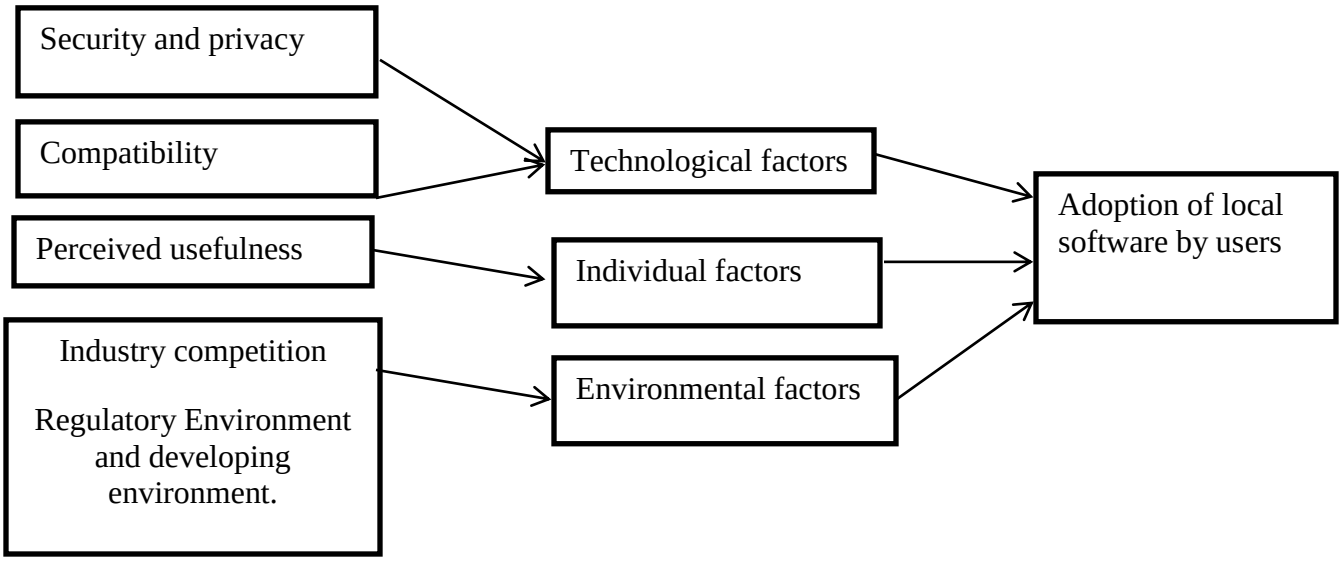


Figure 4.7: Model validation for Users (Validated by P values)

4.5.3 Optimal Model for Users

Table 4.12 shows that the coefficient of determination also called the R square is 72.2%. This means that the combined effect of the predictor variables (individual factors, technological factors and environmental factors) explains 72.2% of the variations in adoption of local software. The correlation coefficient or R of 85% indicates that the combined effect of the predictor variables has a strong and positive correlation with adoption of local software. This also meant that a change in the drivers of adoption of local software has a strong and a positive effect on adoption of local software.

Table 4.12: Optimal Model Fitness for Users

Indicator	Coefficient
R	0.85
R Square	0.722
Std. Error of the Estimate	0.24245

Analysis of variance (ANOVA) on Table 4.13 shows that the combined effect of individual factors, technological factors and environmental factors was statistically significant in explaining adoption of local software. This is demonstrated by a p value of 0.000 which is less that the acceptance critical value of 0.05.

Table 4.13: Analysis of Variance (ANOVA) for Users –Optimal Model

Indicator	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.236	3	2.745	46.708	0.000
Residual	3.174	54	0.059		
Total	11.411	57			

Table 4.14 displays the regression coefficients of the independent variables. The results reveal that individual factors, technological factors and environmental factors are statistically significant in explaining adoption of local software. The findings imply that there is a negative and significant relationship between perceived ease of use and adoption of local software while there is a positive and significant relationship between individual factors, technological factors and environmental factors and adoption of local software.

Table 4.14: Regression Coefficients for Users- Optimal Model

Variable	Beta	Std. Error	t	Sig.
Constant	4.888	0.318	15.353	0.000
Individual factors	0.288	0.083	-3.474	0.001
Technological factors	0.571	0.063	-9.006	0.000
Environmental factors	0.194	0.06	-3.265	0.002

The regression output above was represented in form of a graphical model below. The model consists of only significant variables as shown by the p values.

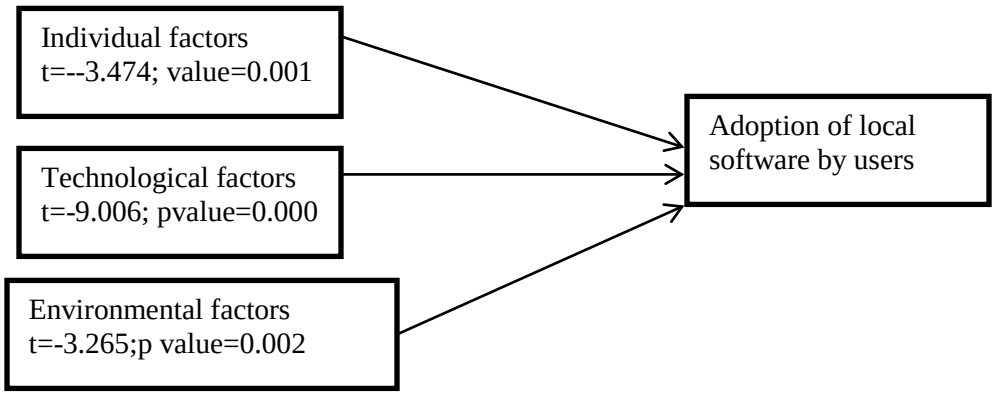


Figure 4.8: Optimal Model validation for Users (Validated by P values)

4.6 Demographic Characteristics of Developers of Local Software

4.6.1 Gender

The respondents who are developers of local software were asked to indicate their gender. Figure 4.9 revealed that 77% of the respondents who are developers of local software were male and 23% of the respondents were female. The findings imply that Local software sector is a male dominated field.

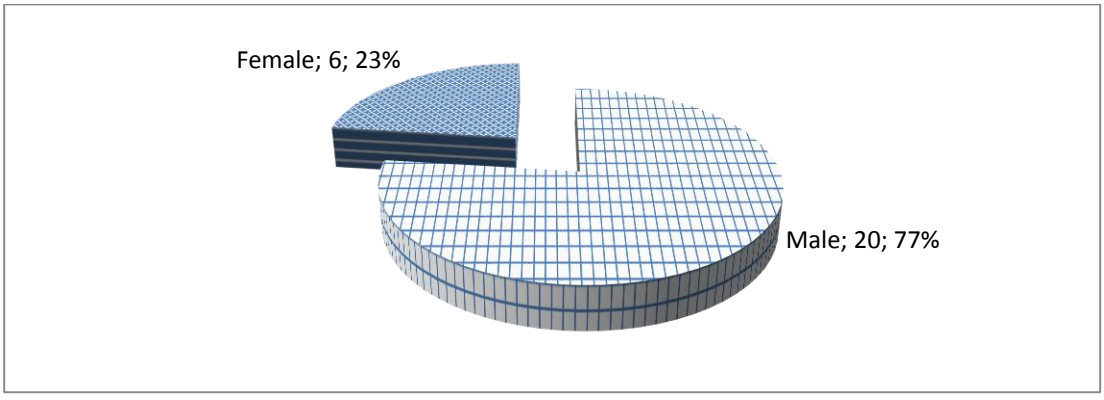


Figure 4.9: Gender of the Developers of Local Software

4.6.2 Age of the Respondents

The respondents who are developers of local software were asked to indicate their age brackets. Figure 4.10 revealed that 62% of the respondents were aged between 21 and 40 years and 38% were aged between 41-60 years of age. The findings imply that most of the respondents were at their career peak.

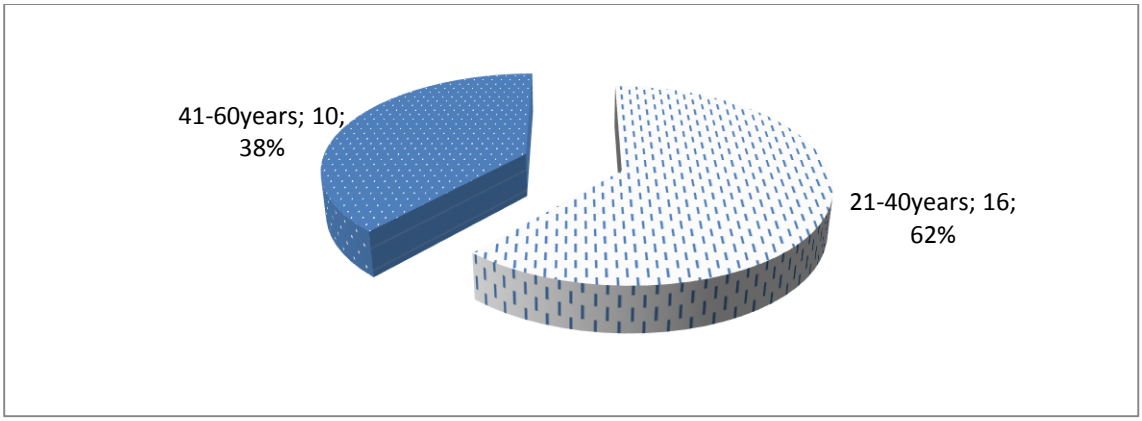


Figure 4.10: Age of Developers of Local Software

4.6.3 Level of Education

The study further sought to establish the highest academic qualifications attained by the respondents. The level of education was important in that it helped the researcher to determine the expertise and specialization of most of the developers of local software. The responses on this question are depicted in figure 4.11. Majority (85%) of the respondents had undergraduate degrees while only 15% of the respondents were holders of postgraduate degrees.

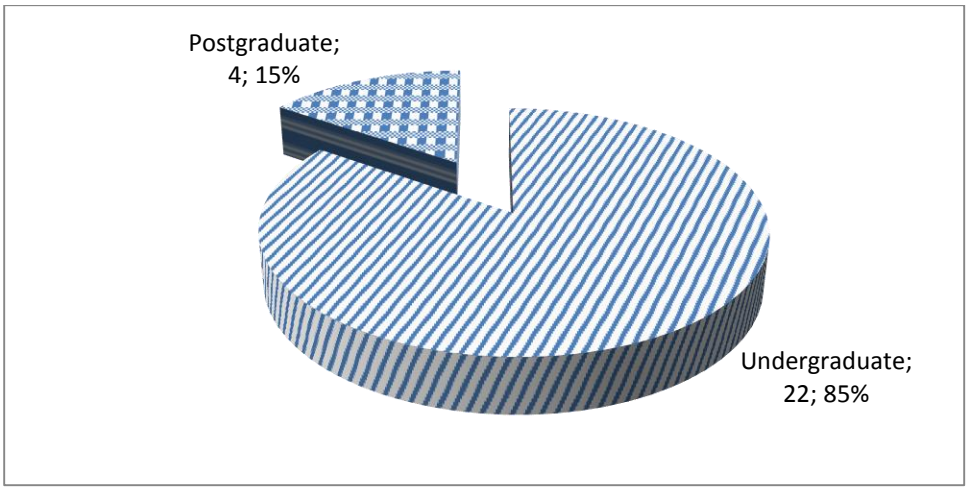


Figure 4.11: Developers` Level of Education

4.6.4 Years of Experience in Software Development

The respondents were asked to indicate the years of experience in software development. Figure 4.12 illustrates that 54% of the respondents who are developers of software development had between three to ten years experience in Local software and 27% had over ten years experience in Local software while 19% had less than 3 years experience in Local software.

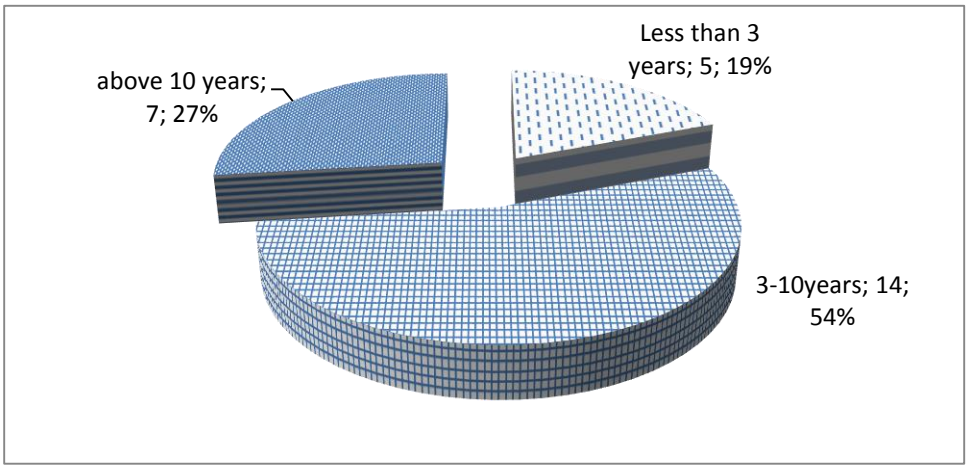


Figure 4.12: Developers` Years of Experience in Local software

4.7 Frequencies and Descriptive Analysis for Developers of Local Soft Wares

4.7.1: Developer`s Entrepreneurial Capability

This section tested the views of the developers of local software regarding their entrepreneurial capability. Table 4.15 shows that 26.9% of the respondents disagreed that they are comfortable with introducing new software in spite of low adoption, 57.7% agreed that they are comfortable with introducing new software in spite of low adoption, 7.7% disagreed that they frequently exploit all the opportunities for improving the software development, and 65.4% agreed they frequently exploit all the opportunities for improving the software development. Eleven point five percent of the respondents disagreed that their firm is well positioned and has a competitive advantage as a result of its capabilities, 65.4% agreed that their firm is well positioned and has a competitive advantage as a result of its capabilities and 7.7% disagreed that they frequently invest in researching on new programming software for improving my software products. In addition, 73.1% agreed that they frequently invest in researching on new programming software for improving my software products and 7.7% disagreed that they aggressively market their products by using above the line marketing approaches while 73.1% agreed that they aggressively market their products by using above the line marketing approaches. Seven point seven percent disagreed that they have sought strategic alliances with other software developers for developing synergies in software while 73.1% agreed that they have sought strategic alliances with other software developers for developing synergies in software. The mean score for the responses was 3.71 which indicate that many respondents who are developers of local software agreed that they posses substantial entrepreneurship capability.

Table 4.15: Developers` Entrepreneurial Capability

Developer`s entrepreneurial capability	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
I am comfortable with introducing new software in spite low adoption	26.9%	0.0%	15.4%	23.1%	34.6%	3.38
I frequently exploit all the opportunities for improving the software development	7.7%	0.0%	26.9%	34.6%	30.8%	3.81
Our firm is well positioned and has a competitive advantage as a result of its capabilities	11.5%	0.0%	23.1%	42.3%	23.1%	3.65
I frequently invest in researching on new programming software for improving my software products.	7.7%	0.0%	19.2%	42.3%	30.8%	3.88
I aggressively market my products by using above the line marketing approaches	0.0%	7.7%	19.2%	42.3%	30.8%	3.96
I have sought strategic alliances with other software developers for developing synergies in software development	7.7%	0.0%	38.5%	19.2%	34.6%	3.73
I frequently subject my software to industry and Quality reviews from customers and other developers	15.4%	7.7%	11.5%	38.5%	26.9%	3.54
Average	11.0%	2.2%	22.0%	34.6%	30.2%	3.71

4.7.2: Perceived Ease of Use

This section tested the views of the developers of local software regarding their perceived ease of use of the local software. Table 4.16 shows that 42.3% of the respondents disagreed that local software are easy to use compared to international software, 30.8% agreed that local software are easy to use compared to international software, 53.8% disagreed that local software require less ICT knowledge to understand compared to international software, and 46.2% agreed that local software require less ICT knowledge to understand compared to international software. Fifty three point eight percent of the respondents disagreed that local

software come in more than one language and this improves understandability, 7.7% agreed that local software come in more than one language and this improves understandability and 42.3% disagreed that local software come with manuals which are well illustrated. The mean score for the responses was 2.63 which indicate that many respondents who are developers of local software disagreed that local software are easy to use.

Table 4.16: Perceived Ease of Use

Perceived Ease of Use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software are easy to use compared to international software.	26.9%	15.4%	26.9%	0.0%	30.8%	2.92
Local software require less ICT knowledge to understand compared to international software	11.5%	42.3%	0.0%	38.5%	7.7%	2.88
Local software come in more than one language and this improves understandability	26.9%	26.9%	38.5%	7.7%	0.0%	2.27
Local software come with manuals which are well illustrated	26.9%	15.4%	50.0%	0.0%	7.7%	2.46
Avarage	23.1%	25.0%	28.9%	11.6%	11.6%	2.63

4.7.3: Perceived Usefulness

This section tested the views of the developers of local software regarding their view on the usefulness of local software. Table 4.17 shows that 38.4% of the respondents disagreed that local software has more benefits compared to the international software, 46.1% agreed local software has more benefits compared to the international software, 15.4% disagreed that Local software enable them to save money compared to other software, and 57.7% agreed that local software enable them to save money compared to other software. In addition, 46.1% disagreed that local software have more customised modules compared to other software and 38.4% agreed that local software have more customised modules compared to other software while 50% disagreed that local software take less time to develop. Nineteen point two percent agreed that local software take less time to develop. The mean score for the responses was 3.0 which

indicate that many respondents who are developers of local software were neutral on their perceived usefulness of the local software.

Table 4.17: Perceived Usefulness

Perceived usefulness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software has more benefits compared to the international software	26.9%	11.5%	15.4%	19.2%	26.9%	3.08
Local software enable us to save money compared to other software	15.4%	0.0%	26.9%	23.1%	34.6%	3.62
Local software have more customised modules compared to other software	34.6%	11.5%	15.4%	19.2%	19.2%	2.77
Local software take less time to develop	34.6%	15.4%	30.8%	0.0%	19.2%	2.54
Avarage	27.9%	9.6%	22.1%	15.4%	25.0%	3.00

4.7.4: Compatibility

This section tested the views of the developers of local software regarding the compatibility of local software to other software. Table 4.18 shows that 23.1% of the respondents disagreed that local software are easily compatible with existing applications, 34.6% agreed that local software are easily compatible with existing applications, 23.1% disagreed that local software are compatible with other international software, and 46.1% agreed that local software are compatible with other international software. In addition, 34.6% disagreed that local software have been added with interfaces which increase compatibility to existing software and 65.4% agreed that local software have been added with interfaces which increase compatibility to existing software while 15.4% disagreed that local software can be linked together with other networks and 73.1% of the respondents agreed that local software can be linked together with other networks. The mean score for the responses was 3.32 which indicate that many respondents who are developers of local software agreed that local software are compatible with other software.

Table 4.18: Compatibility

Compatibility	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software is easily compatible with existing applications	15.4%	7.7%	42.3%	15.4%	19.2%	3.15
Local software is compatible with other international software	15.4%	7.7%	30.8%	26.9%	19.2%	3.27
Local software has been added with interfaces which increase compatibility to existing software	26.9%	7.7%	0.0%	57.7%	7.7%	3.12
Local software can be linked together with other networks	15.4%	0.0%	11.5%	42.3%	30.8%	3.73
Avarage	18.3%	5.8%	21.2%	35.6%	19.2%	3.32

4.7.5: Security and Privacy

This section tested the views of the developers of local software regarding the security and privacy of local software. Table 4.19 shows that 34.6% of the respondents disagreed that local software are less prone to virus attack, 53.8% agreed that local software are less prone to virus attack, 53.8% disagreed that local software are less prone to programming bugs, and 7.7% agreed that local software are less prone to programming bugs. In addition, 46.2% disagreed that local software are less prone to hacking by software hackers and 26.9% agreed that local software are less prone to hacking by software hackers while 42.3% disagreed that local software ensures that the private information is kept confidential and 19.2% of the respondents agreed that local software ensure that the private information is kept confidential. The mean score for the responses was 2.52 which indicate that many respondents who are developers of local software disagreed that local software are safe and confidential.

Table 4.19: Security and Privacy

Security and privacy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Local software is less prone to virus attack	34.6%	0.0%	11.5%	26.9%	26.9%	3.12
Local software is less prone to programming bugs	53.8%	0.0%	38.5%	7.7%	0.0%	2.00
Local software is less prone to hacking by software hackers	46.2%	0.0%	26.9%	11.5%	15.4%	2.50
Local software ensures that the private information is kept confidential	42.3%	0.0%	38.5%	7.7%	11.5%	2.46
Avarage	44.2%	0.0%	28.9%	13.5%	13.5%	2.52

4.7.6: Organization Culture

This section tested the views of the developers of local software regarding their organization`s culture. Table 4.20 shows that 15.4% of the respondents disagreed that it is their firm`s culture to encourage adoption of local software through promotion of local industry, 65.3% agreed that it is their firm`s culture to encourage adoption of local software through promotion of local industry, 26.9% disagreed that their organization`s culture allows proper communication between developers, and 57.7% agreed that their organization`s culture allows proper communication between developers, 23.1% disagreed that their organization`s culture allows proper communication between developers and customers and 57.7% agreed that their organization`s culture allows proper communication between developers and customers while 34.6% disagreed that their organization`s culture challenges the status quo and allows competition and 46.2% of the respondents agreed that their organization`s culture challenges the status quo and allows competition. The mean score for the responses was 3.37 which

indicate that many respondents who are developers of local software agreed that their organization`s culture promotes the adoption of Local software.

Table 4.20: Organization Culture

Organization culture	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
The firm`s culture encourages us to adopt local software through promotion of local industry	15.4%	0.0%	19.2%	53.8%	11.5%	3.46
The organization culture allows proper communication between developers	15.4%	11.5%	15.4%	19.2%	38.5%	3.54
The organization culture allows proper communication between developers and customers	15.4%	7.7%	19.2%	30.8%	26.9%	3.46
The organization culture challenges the status quo and allows competition	26.9%	7.7%	19.2%	30.8%	15.4%	3.00
Average	18.3%	6.7%	18.3%	33.7%	23.1%	3.37

4.7.7: Organization Size and Resources

This section tested the views of the developers of local software regarding their Organization`s size and resources. Table 4.21 shows that 50% of the respondents disagreed that their organisation has acquired other software developing organisations in order to boost its size, 19.2% agreed that their organisation has acquired other software developing organisations in order to boost its size, 38.4% disagreed that their organisation uses economies of scale brought about by size to boost software development and adoption, and 26.9% agreed that their organisation uses economies of scale brought about by size to boost software development and adoption, 42.3% disagreed that their firm has adequate resources for developing and marketing local software to local market and 26.9% agreed that their firm has adequate resources for developing and marketing local software to local market while 15.4% disagreed that their organisation has invested inadequate human resource to enhance software development and 53.9% of the respondents agreed that their organisation has invested inadequate human

resource to enhance software development. The mean score for the responses was 2.87 which indicate that many respondents who are developers of local software disagreed that their organization`s size and resources promotes the adoption of Local software.

Table 4.21: Organization Size and Resources

Organization Size and Resources	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Our organisation has acquired other software developing organisations in order to boost its size	26.9%	23.1%	30.8%	7.7%	11.5%	2.54
Our organisation uses economies of scale brought about by size to boost software development and adoption	11.5%	26.9%	34.6%	26.9%	0.0%	2.77
The firm has adequate resources for developing and marketing local software to local market	15.4%	26.9%	30.8%	11.5%	15.4%	2.85
Our organisation has invested inadequate human resource to enhance software development	15.4%	0.0%	30.8%	46.2%	7.7%	3.31
Average	17.3%	19.2%	31.8%	23.1%	8.7%	2.87

4.7.8: Industry Competition

This section tested the views of the developers of local software regarding industry competition. Table 4.22 shows that 46.2% of the respondents disagreed that their firm reduces the price of local software in order to get more market share of local software, 7.7% agreed that their firm reduces the price of local software in order to get more market share of local software, none disagreed that their firm is faced with strong bargaining power from customers, and 53.8% agreed that their firm is faced with strong bargaining power from customers, 11.5% disagreed that their firm is faced with strong bargaining power from suppliers and 7.7% agreed that their firm is faced with strong bargaining power from suppliers while 23.1% disagreed that their firm is faced with threat of substitute local and international software and 26.7% of the respondents agreed that their firm is faced with threat of substitute local and international software. Seven point seven percent of the respondents disagreed that their firm is faced with

threat of new entrants into Local software and 46.2% agreed that their firm is faced with threat of new entrants into Local software. The mean score for the responses was 3.10 which indicate that many respondents who are developers of local software agreed that their firm is well placed in the industry for competition.

Table 4.22: Industry Competition

Industry competition	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
Our firm reduces the price of local software in order to get more market share of local software	46.2%	0.0%	46.2%	7.7%	0.0%	2.15
Our firm is faced with strong bargaining power from customers	0.0%	0.0%	46.2%	53.8%	0.0%	3.54
Our firm is faced with strong bargaining power from suppliers	0.0%	11.5%	80.8%	7.7%	0.0%	2.96
Our firm is faced with threat of substitute local and international software	0.0%	23.1%	42.3%	23.1%	11.5%	3.23
Our firm is faced with threat of new entrants into Local software	0.0%	7.7%	46.2%	23.1%	23.1%	3.62
Avarage	9.2%	8.5%	52.3%	23.1%	6.9%	3.10

4.7.9: Regulatory Environment and developing environment

This section tested the views of the developers of local software regarding Regulatory Environment and developing environment. Table 4.23 shows that 42.3% of the respondents disagreed that the current legal requirements in Local software effectively accommodates the local software adoption, 26.9% agreed that the current legal requirements in Local software effectively accommodates the local software adoption, 53.9% disagreed that there are minimal requirements in adoption of local software relative to other adopted software, and 7.7% agreed that there are minimal requirements in adoption of local software relative to other adopted software, 57.7% disagreed that recent local lT regulations have been modified to encourage

more local software use and none agreed that the recent local lT regulations have been modified to encourage more local software use while 46.2% disagreed that the government has put laws that effectively deal with software piracy and 23.1% of the respondents agreed that the government has put laws that effectively deal with software piracy. Fifty seven point seven percent of the respondents disagreed that the government has put laws that effectively deal with software quality and 11.5% agreed that the government has put laws that effectively deal with software quality while 50% disagreed that the government has put laws that effectively TAX incentives and 11.5% agreed that the government has put laws that effectively TAX incentives. The mean score for the responses was 2.29 which indicate that many respondents who are developers of local software disagreed that there are environmental factors on the adoption of Local software.

Table 4.23: Regulatory Environment and developing environment

Regulatory Environment and developing environment	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Likert Mean
The current legal requirements in Local software effectively accommodates the local software adoption	30.8%	11.5%	30.8%	26.9%	0.0%	2.54
There are minimal requirements in adoption of local software relative to other adopted software	30.8%	23.1%	38.5%	7.7%	0.0%	2.23%
Same software developed in Kenya and USA is regarded differently.	38..4%	19.0%	30.8%	0.00%	11.4%	2.26%
Recent local lT regulations have been modified to encourage more local software use	30.8%	26.9%	42.3%	0.0%	0.0%	2.12%
Software development environment is important to consider.	42.0%	7.6%	38.4%	11.5%	0.1%	2.18%
Government has put laws that effectively deal with software piracy	46.2%	0.0%	30.8%	15.4%	7.7%	2.38%
Government has put laws that effectively deal with software quality	38.5%	19.2%	30.8%	0.0%	11.5%	2.27%

Government has put laws that effectively deals with TAX incentives	42.3%	7.7%	38.5%	11.5%	0.0%	2.19%
Average	36.6%	14.7%	35.3%	10.3%	3.2%	2.29

4.7.10: Number of customers that bought local software

This section tested the views of the developers of local software regarding the number of software they sell per month. Figure 4.13 shows that 50% of the respondents indicated that they sold local software to between one and five customers, 27% indicated that they sold local software to between six and the customers and 23% of the respondents indicated that they sold local software to over ten customers.

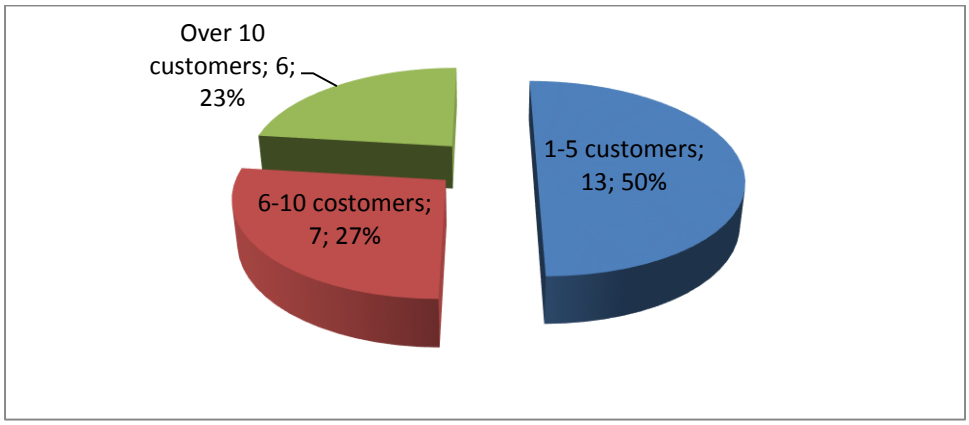


Figure 4.13: Number of Customers sold to Local Soft wares

4.7.11: Satisfaction with Adoption

This section tested the views of the developers of local software regarding the number of software they sell per month. Figure 4.14 shows that 58% of the respondents indicated that they were moderately satisfied with the rate at which customers are adopting the local software they develop and 19% disagreed that they are not satisfied with the rate at which customers are adopting the local software they develop.

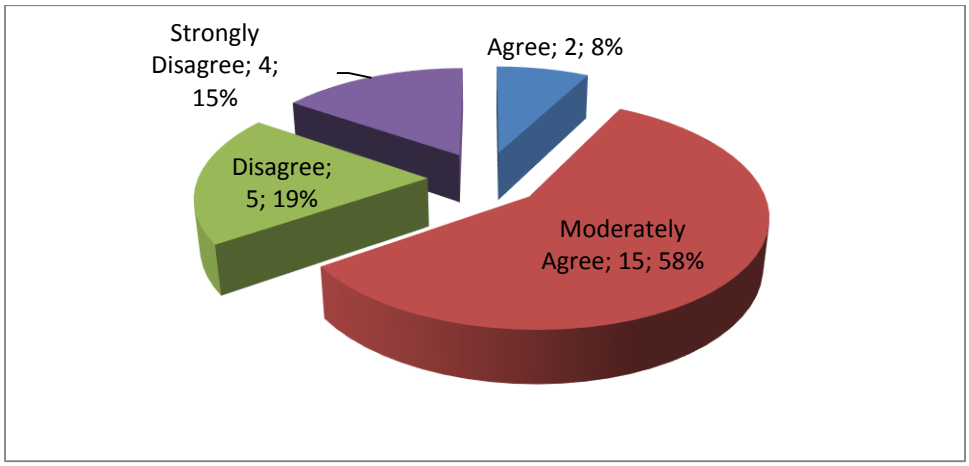


Figure 4.14: Satisfaction with Adoption

4.8 Inferential Statistical Analysis for Developers of Local Software

This section presents the correlation and regression analysis.

4.8.1 Bivariate Correlation

Table 4.24 displays the results of correlation test analysis between the dependent variable (adoption of local software) and independent variables and also correlation among the independent variables themselves. Results on Table 4.24 show that adoption of local software is positively correlated with all the independent variables. This reveals that any positive change in individual factors, technological factors, organizational factors and environmental factors can lead to increased adoption of local software.

Table 4.24: Bivariate Correlation for Developers

Variable		Adoption of local software	Individual Factors	Technological Factors	Organizational Factors	Environmental Factors
Adoption of local software	Pearson Correlation	1				
	Sig. (2-tailed)					
Individual Factors	Pearson Correlation	0.197	1			
	Sig. (2-tailed)	0.335				
Technological Factors	Pearson Correlation	0.488	0.705	1		
	Sig. (2-tailed)	0.011	0.000			
Organizational Factors	Pearson Correlation	0.693	0.492	0.725	1	
	Sig. (2-tailed)	0.000	0.011	0.000		
Environmental Factors	Pearson Correlation	0.748	0.691	0.728	0.800	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	

4.8.2: Regression Analysis

In order to establish the statistical significance of the independent variables on the dependent variable (adoption of local software) regression analysis was employed. The regression equation took the following form.

$$Y=\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Adoption of Local software

X_1 = Individual related constructs

X_2 = Technology related constructs

X_3 = Organizational related constructs

X_4 = Environmental related constructs

In the model, α = the constant term while the coefficient $\beta_i i = 1 \ldots 4$ was used to measure the sensitivity of the dependent variables (Y) to unit change in the predictor variables. μ is the error term which captures the unexplained variations in the model.

Table 4.25 shows that the coefficient of determination also called the R square is 96.1%. This means that the combined effect of the predictor variables (developers' entrepreneurship capabilities, perceived ease of use, perceived usefulness, compatibility, security and privacy, organization culture, organization size and resources, industry competition and Regulatory Environment and developing environment) explains 96.1% of the variations in adoption of local software. The correlation coefficient or R of 98.0% indicates that the combined effect of the predictor variables has a strong and positive correlation with adoption of local software. This also meant that a change in the drivers of adoption of local software has a strong and a positive effect on adoption of local software.

Table 4.25: Regression Model Fitness for Developers

Indicator	Coefficient
R	0.980
R Square	0.961
Std. Error of the Estimate	0.12993

Analysis of variance (ANOVA) on Table 4.26 shows that the combined effect of developers' entrepreneurship capabilities, perceived ease of use, perceived usefulness, compatibility, security and privacy, organization culture, organization size and resources, industry competition and Regulatory Environment and developing environment was statistically significant in explaining changes in adoption of local

software. This is demonstrated by a p value of 0.000 which is less that the acceptance critical value of 0.05.

Table 4.26: Analysis of Variance (ANOVA) of Developers

Indicator	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.576	9	0.731	43.279	0.000
Residual	0.270	16	0.017		
Total	6.846	25			

Table 4.27 displays the regression coefficients of the independent variables. The results reveal that developers' entrepreneurship capabilities, perceived ease of use, compatibility, security and privacy, organization culture, organization size and resources, industry competition and Regulatory Environment and developing environment are statistically significant in explaining adoption of local software. Regression results indicate that developers' entrepreneurship capabilities and adoption of local software was positive and significant relationship (beta=0.142, p value 0.036). Regression results indicate that perceived ease of use and adoption of local software was positive and significant relationship (beta=1.246, p value 0.000). The findings imply that an increase in perceived ease of use by one unit leads to an increase in adoption of local software by 1.246 units. Results further indicate that compatibility and adoption of local software was negative and significant relationship (beta=-1.940, p value 0.000). The findings imply that an increase in compatibility by one unit leads to a decrease in adoption of local software by 1.940 units. Results also indicate that security and privacy and adoption of local software was positive and significant relationship (beta=1.018, p value 0.000). The findings imply that an increase in security and privacy by one unit leads to an increase in adoption of local software by 1.018 units. Results indicate that organization culture and adoption of local software was positive and significant relationship (beta=1.036, p value 0.000). The findings imply that an increase in organization culture by one unit leads to an increase in adoption of local software by 1.036units.

In addition the results indicated that industry competition had a negative and significant relationship with adoption of local software (beta= -2.777, p value 0.000). The findings imply

that an increase in education by one unit leads to a decrease in adoption of local software by 2.777 units. Results also indicate that Regulatory Environment and developing environment and adoption of local software was negative and significant relationship (beta=-0.245, p value 0.001). The findings imply that an increase in Regulatory Environment and developing environment by one unit leads to a decrease in adoption of local software by 0.245 units.

The results reveal that, perceived usefulness is not statistically significant in explaining adoption of local software. The findings imply that there is a positive and significant relationship between developers' entrepreneurship capabilities and adoption of local software (beta=0.142, pvalue=0.036). Finally organization size and resources was statistically significant in influencing adoption of local software (beta=-1.810, p value 0.000). The findings imply that there is a negative and significant relationship between organization size and resources and adoption of local software.Results also indicate that perceived usefulness and adoption of local software was negative and insignificant relationship (beta=-0.001, p value 0.973)

Table 4.27: Regression Coefficients for Developers

Variable	Beta	Std. Error	t	Sig.
Constant	8.009	0.664	12.070	0.000
Developers entrepreneurship capabilities	0.142	0.062	2.283	0.036
Perceived ease of use	1.246	0.165	7.551	0.000
Perceived usefulness	-0.001	0.035	-.035	0.973
Compatibility	-1.940	0.330	-5.878	0.000
Security and privacy	1.018	0.210	4.841	0.000
Organization culture	1.036	0.208	4.990	0.000
Organization size and resources	-1.810	0.280	-6.464	0.000
Industry competition	-2.777	0.475	-5.849	0.000
Regulatory Environment and developing environment	-0.245	0.062	-3.932	0.001

Given the regression results above, the model for developers showing only significant variables was presented next.

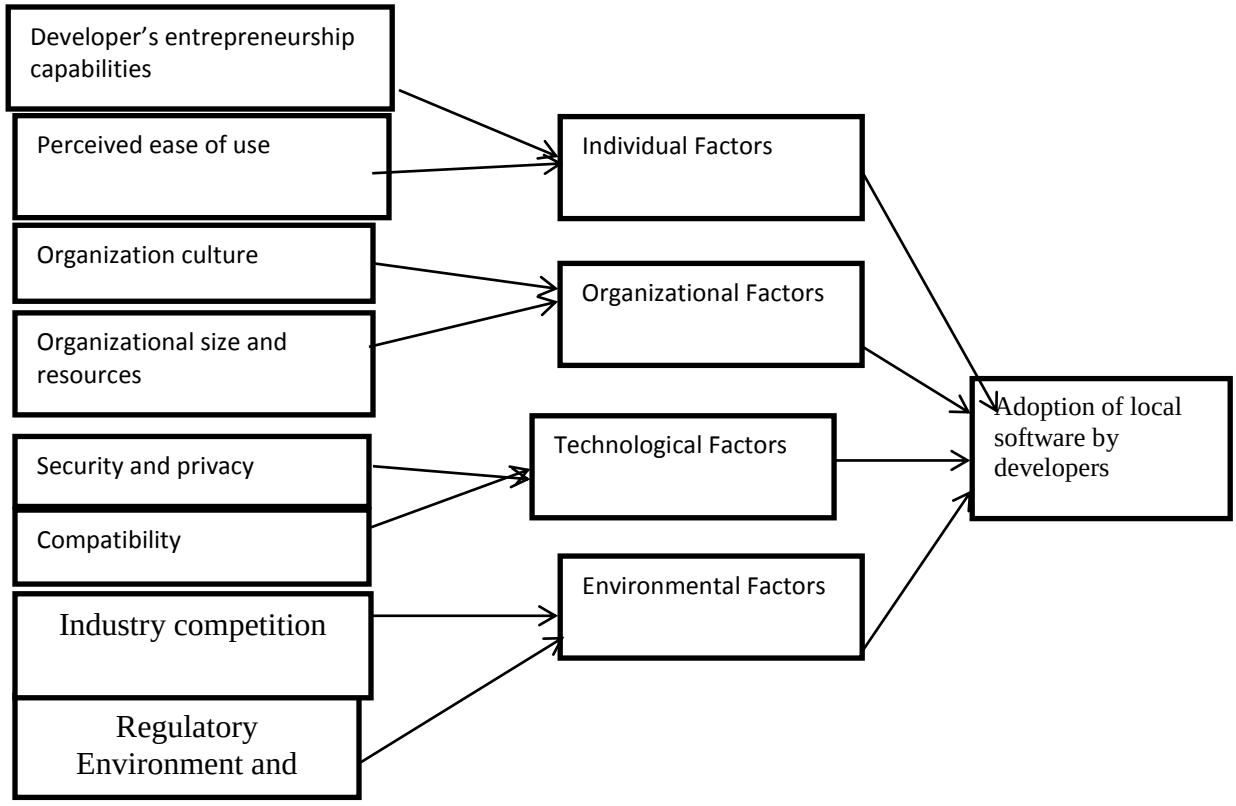


Figure 4.15: Validated Model for Developers (Validation done using p values)

4.8.3 Optimal Model for Developers

Table 4.28 shows that the coefficient of determination also called the R square is 77%. This means that the combined effect of the predictor variables (individual factors, technological factors, organizational factors and environmental factors) explains 77% of the variations in adoption of local software. The correlation coefficient or R of 87.7% indicates that the combined effect of the predictor variables has a strong and positive correlation with adoption of local software. This also meant that a change in the drivers of adoption of local software has a strong and a positive effect on adoption of local software.

Table 4.28: Regression Model Fitness for Developers

Indicator	Coefficient
R	0.877
R Square	0.77
Std. Error of the Estimate	0.27412

Analysis of variance (ANOVA) on Table 4.29 shows that the combined effect of individual factors, technological factors, organizational factors and environmental factors was statistically significant in explaining changes in adoption of local software. This is demonstrated by a p value of 0.000 which is less that the acceptance critical value of 0.05.

Table 4.29: Analysis of Variance (ANOVA) of Developers- Optimal Model

Indicator	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.268	4	1.317	17.527	0.000
Residual	1.578	21	0.075		
Total	6.846	25			

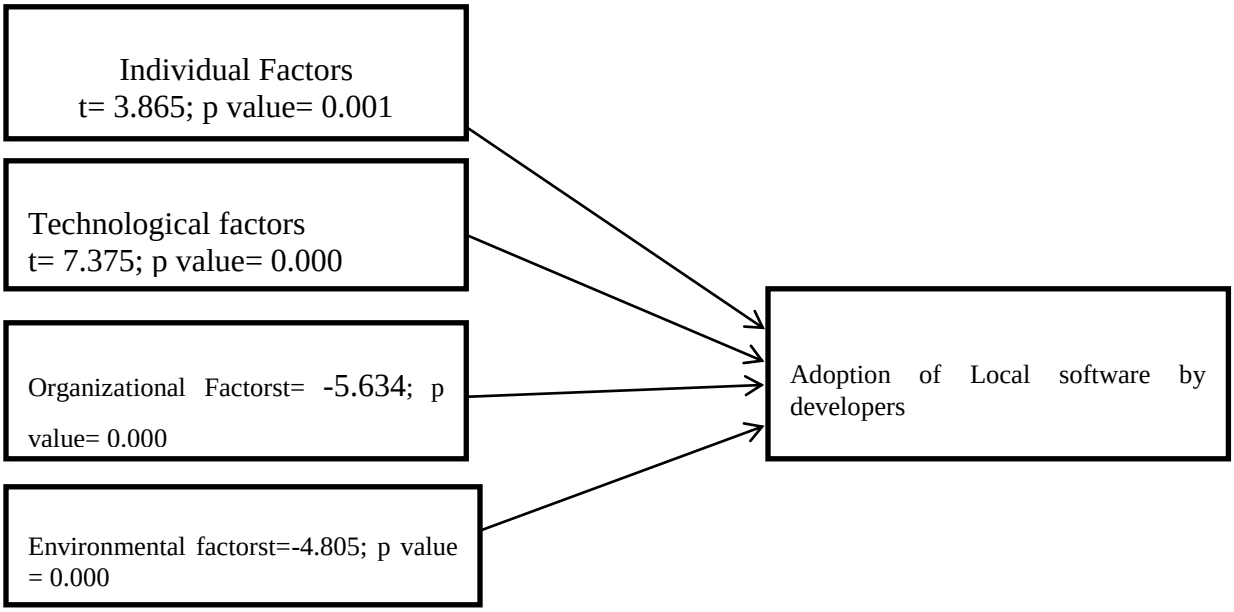
Table 4.30 displays the regression coefficients of the independent variables. The results reveal that individual factors, environmental factors, technological factors and organizational factors are statistically significant in explaining adoption of local software. The findings imply that there is a significant and positive relationship between environmental factors, organizational factors, technological factors, individual factors and adoption of local software.

Table 4.30: Regression Coefficients for Developers- Optimal Model

Variable	Beta	Std. Error	t	Sig.
Constant	4.272	0.325	13.157	0.000
Individual Factors	0.471	0.122	3.865	0.001
Technological Factors	0.059	0.008	-7.375	0.000
Organizational Factors	0.062	0.011	-5.634	0.000
Environmental Factors	1.038	0.216	-4.805	0.000

Given the regression results above, the model for developers showing only significant variables was presented next.

Figure 4.16: Optimal Validated Model for Developers (Validation done using p values)



4.9 Combined Model regression and analysis

Table 4.33 shows that the coefficient of determination also called the R square is 58.9%. This means that the combined effect of the predictor variables (individual factors, technological factors, organizational factors and environmental factors) explains 58.9% of the variations in adoption of local software. The correlation coefficient or R of 76.7% indicates that the combined effect of the predictor variables has a strong and positive correlation with adoption of local software. This also meant that a change in the drivers of adoption of local software has a strong and a positive effect on adoption of local software.

Table 4.31: Model Summary for Combined Model

Indicator	**Coefficient**
R	0.767
R Square	0.589
Std. Error of the Estimate	0.27371

Analysis of variance (ANOVA) on Table 4.34 shows that the combined effect of individual factors, technological factors, organizational factors and environmental factors was statistically significant in explaining changes in adoption of local software. This is demonstrated by a p value of 0.001 which is less that the acceptance critical value of 0.05.

Table 4.32: **Analysis of Variance (ANOVA) of Combined Model**

Indicator	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	2.254	4	0.563	7.522	0.001
Residual	1.573	21	0.075		
Total	3.827	25			

Regression Coefficients

It was important to look at the regression of the final validated model so as to get the significance values of the validated model and to check if the independent variables were affecting the dependent variable negatively or positively. The table 4.35 shows the significance and the beta values for both unstandardized and standardized model.

Table 4.33 Validated model Regression Coefficients

Model	Unstandardized Coefficients			
	B	Std. Error	t	Sig.
Constant	1.727	0.300	5.759	0.000
Individual Factors	0.294	0. 043	-2.178	0. 034
Technological Factors	0.178	0. 049	-3.638	0.001
Organizational Factors	0.127	0. 030	-4.222	0.000
Environmental Factors	0.125	0. 022	-4.177	0.000

The above table shows the regression coefficients of the combined and final model. All the independent variables were significant in predicting adoption of local software. Individual factors, technological factors, Environmental factors and organization factors had p-values of 0.034, 0.001, 0.000 and 0.000 respectively.

Increase in individual factor by one unit increases adoption of local software by 0.294 while increase in the Technological factors by one unit will increases adoption of local software by 0.178. On the other hand increase environmental factors by one unit increases adoption of local software by 0.127. Finally increase in organization factor by one unit increases adoption by 0.125.

Order of importance among the four factors is as follows: Individual factors (Perceived Ease of Use, Perceived Usefulness and Developers Entrepreneurial Capability) affect the adoption of Local software the most. This is because the PEOU and PU cannot easily change, they are personal perceptions. If a user is told by someone that Oracle is the best software then they can

easily believe them and stick to using that Oracle software. It is then followed by Technological factors (compatability, security and privacy); this is because when the software is compatible and is secure more people will use it. Environmental factors (competition, regulatory and developing environment) are the third factor to affect adoption of local software. Organization factors (culture, size, resource) affect the adoption of local software but at a low rate. This is because when the organization develops a good culture towards Local software then they will develop good software with high quality and also when the organization is big and have enough resources they will be able to invest more in the process of software development.

Table 4.31 shows that the model fitness is good. A good fit indicates that the model is fit. This is indicated by a CMIN Value of 14.260 and a p value of 0.65.

Table 4.34: CMIN

Model	**NPAR**	**CMIN**	**DF**	**P**	**CMIN/DF**
Default model	20	14.260	5	0.65	2.852
Saturated model	20	.000	0		
Independence model	5	90.269	15	.000	6.018

Baseline Comparisons

NFI [Normed Fit Index] shows how far between the (terribly fitting) independence model and the (perfectly fitting) saturated model the default model is. In this case, it's 91% of the way to perfect fit. RFI [Relative Fit Index] is the NFI standardized based on the degree of freedom (df)of the models, with values close to 1 again indicating a very good fit. IFI [Incremental Fit Index], TLI [Tucker-Lewis Coefficient], and CFI [Comparative Fit Index] are similar. Note that TLI is usually between 0 and 1, but is not limited to that range. Results in table 4.32 reveal an NFI of 0.912, RFI of 0.9, IFI of 0.875, TLI of 0.945 and CFI of 0.921. This indicates a good fit of the model.

Table 4.35: Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.912	.900	.875	.945	.921
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA – F0 tends to favor more complex models. RMSEA is a corrected statistic that gives a penalty for model complexity, calculated as the square root of F0 divided by DF (RMSEA stands for "root mean squared error of approximation"). Again, upper and lower bounds of a 90% confidence interval are given. RMSEA values of .05 or less are good fit, <.1 to >.05 are moderate, and .1 or greater are unacceptable. RMSEA = .00 indicates perfect fit. The "PCLOSE" statistic that goes with this result is the probability of a hypothesis test that the population RMSEA is no greater than .05 (so, you want this result to be non-significant [p >.05], because you do not want to prove that the RMSEA is significantly greater than .05). Results in table 4.33 indicate that the RMSEA value was 0.051. This indicates good fit.

Good models should have RMSEA below 0.06 and TLI between 0.90 and 0.95 according to (Hu and Bentler, (1995). For models with about 75 to 200 cases, the chi square test is a reasonable measure of fit. According to David A. Kenny (2014), lower samples (below 200) can be used for models with no latent variables. This case suites my study.

Table 4.36: RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.051	0.000	0.083	0.40
Independence model	.297	.239	.357	.000

The research by Lule et al. (2012) had the standards to be used to show a good fit model. The standard values for $\chi 2$ /df, CFI, TLI and RMSEA. Table 4.34 shows the standard values used and which were compared with the values which the validated TOIE model produced. The values in table 4.34 shows that the model was fit.

Table 4.37 Results of the model goodness of fit.

Fit Measures	**Standards Fit**	**Model Fit**
2⁄df CMIN/DF	A value close to 1 and not exceeding 3 indicates a good fit.	2.852
IFI (Incremental Fit Index)	IFI values close to 1 indicate a very good fit.	0.875
TLI (Tucker-Lewis Coefficient)	A value close to 1 indicates a very good fit.	0.945
NFI (Normed Fit Index)	NFI values close to 1 indicate a very good fit	0.912
CFI (Comparative Fit Index)	A value close to 1 indicates a very good fit.	0.921
RFI (Relative Fit Index)	RFI values close to 1 indicate a very good fit	0.900
RMSEA(Root Mean Squared Error of Approximation)	A value should not be greater than 0.1 and should be below 0.06 for a very good model.	0.051

4.10 Model Formulation and Evaluation

The final model tested using AgenaRisk tool is shown in the figure 4.17. The researcher assumes that all the variables under each factor have an equal chance of occurring (hence the 33.33%) distribution.

The model follows the intuitive process of software adoption and is informed by both the existing models and primary data analysis in the initial determination of software adoption. In this regard, organization and environmental factors are considered first; this provides a general criteria for selection of software for adoption including the culture, resources (including budgetary allocations), the size of the organization. Considered here are also environmental factors such as regularory environment (which instill quality assuarance and standards) and competition among developers. This first consideration provides the first mean of 28.24 for adoption of local software that make the cut. Individual factors including perceived usefulness, perceived ease of use are then used to assess the software, this could be done mostly by end users or IT proffessionals; the mean after consideration of individual factors reduces to significantly to 14.17.After this the technical aspects of the software(s) intended for adoption are then assessed; this include security, privacy and compatibility. After this consideration the mean of local software adoption reduces even further to 7.19. This final local software adoption mean varies from one adapter to another and this model allows for changes to suit the various scenarios and software users be it individuals or organizations.

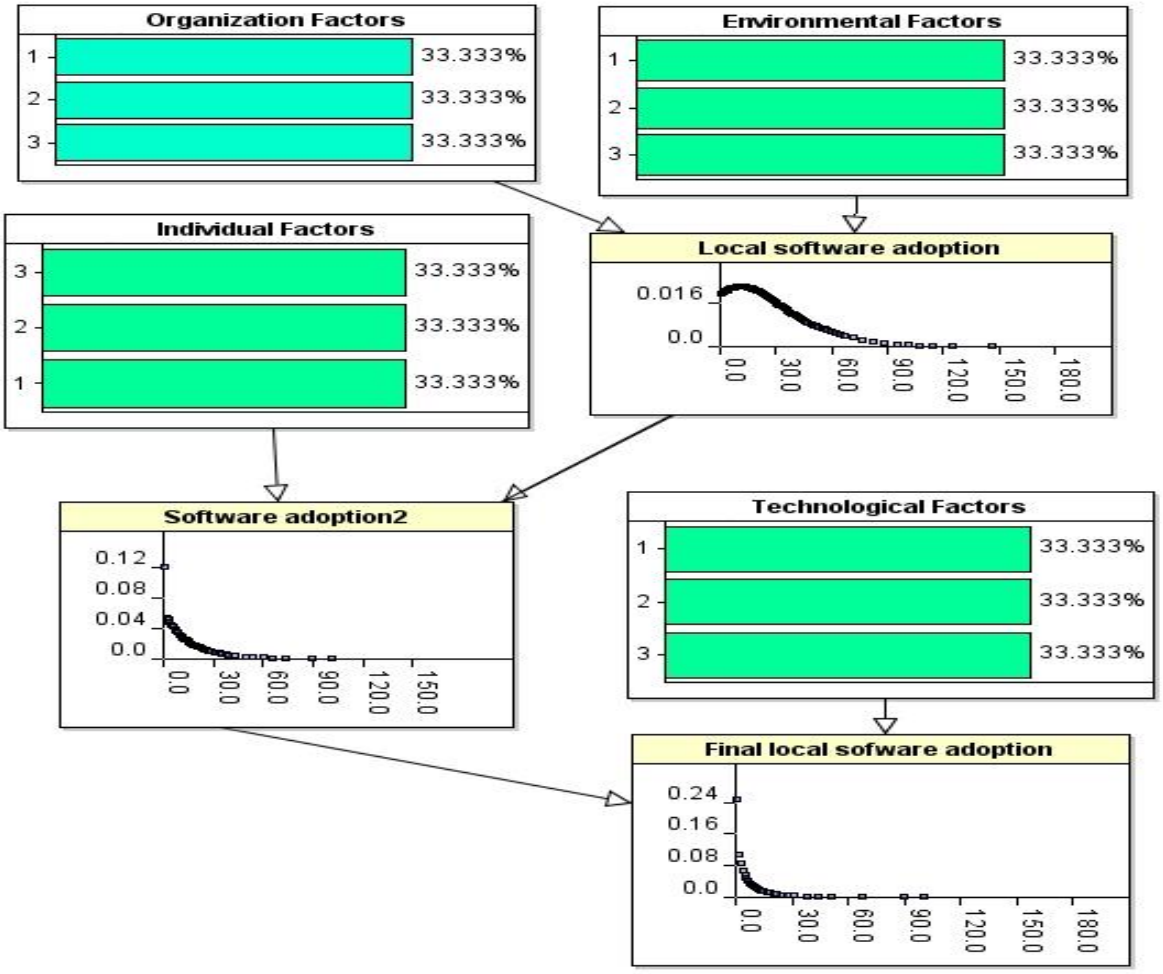


Figure 4.17: The final model tested using AgenaRisk tool

To further understand this model, let's assume a scenario in which the software(s) under question meet all the three technological variables, in this scenario the mean for adoption of the local software(s) improves to a mean of 11.91 from 7.19. This shows that the technological factors are important and must be considered during software development. This will the process of software development better and the market demand will trust such local softwares and adopt them.

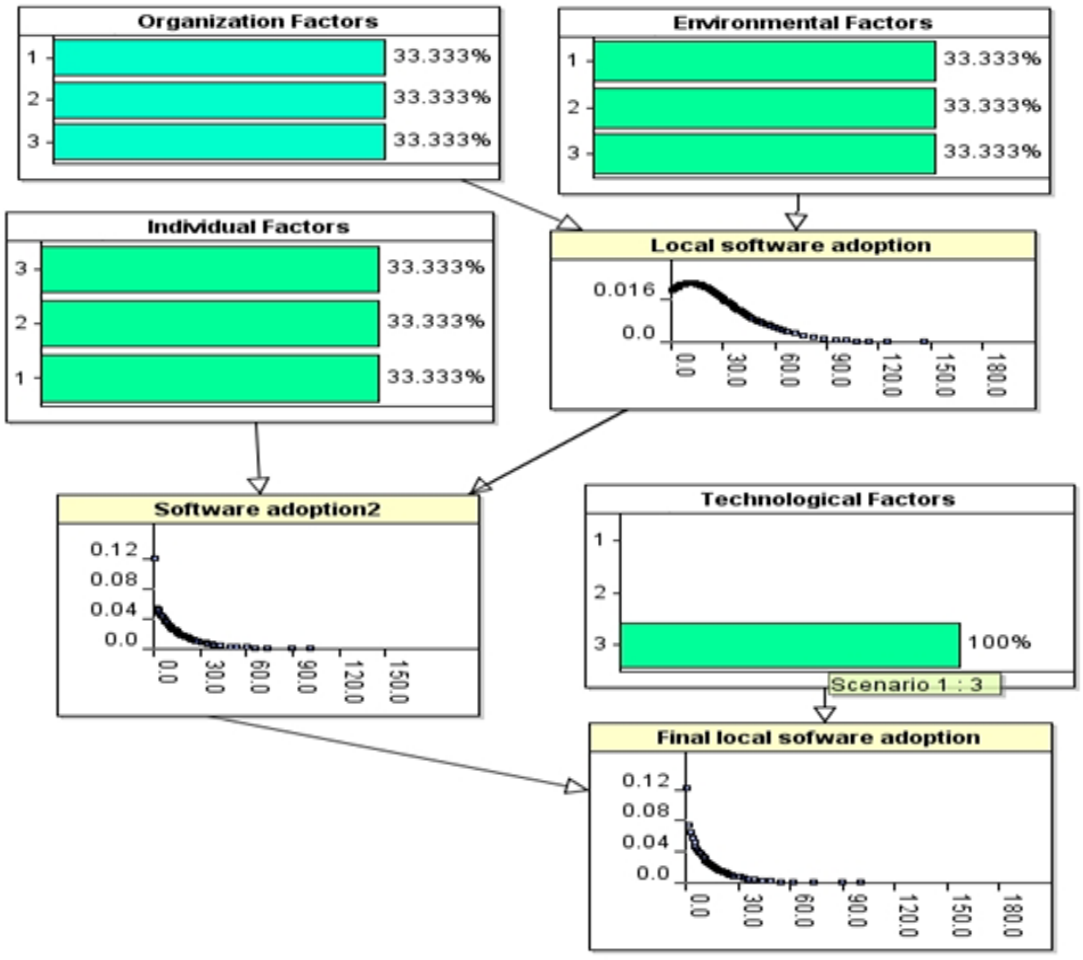


Figure 4.18: First observation scenario

To further understand this model, let's assume a scenario in which the software(s) under question meet all the two organizational variables, in this scenario the first mean for adoption of the local software(s) improves to a mean of 27.22 and the second level reduces to 13.66 and the final level of adoption reduces to 6.88. This shows that the two variables have effect on final adoption. It also shows that the variables have relationship with the main four factors and they affect each other.

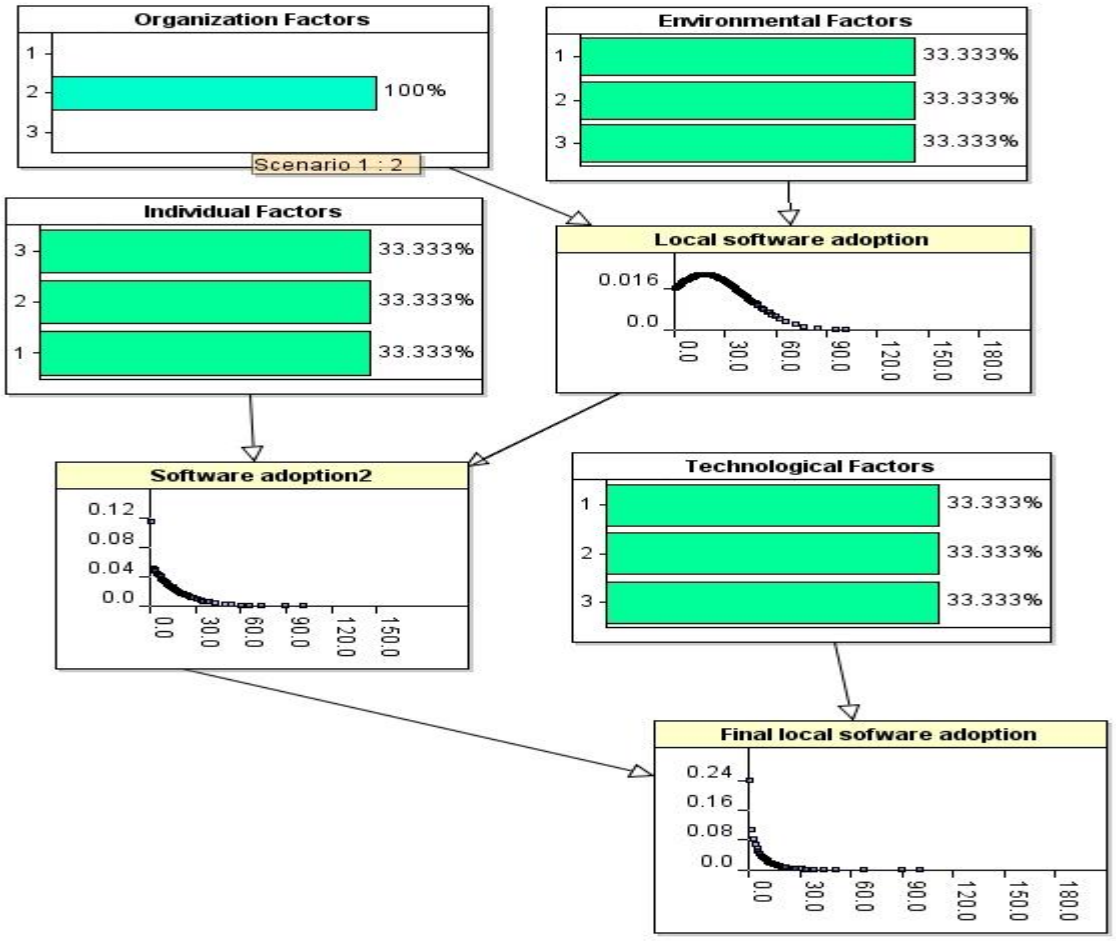


Figure 4.19: Second observation scenario

4.11 Variable Analysis

Variable analysis enables us analyse the relationship between variables, both direct and casual. In this regard we are concerned about the relationship between the variables of the factors of adoption to the final probability of adoption of local software.

There is a direct relationship between the environmental factors and final software adoption as indicated in Figure: 4.20; that is when all the three environmental factors are met there are higher chances of adoption of local software. This could be explained by the fact that the right environment ensure minimum standards and regulations are met by developers and by extension quality assuarance.

		Final sofware adoption level
		Expected Value
Environmental Factors	1	4.297
	2	6.853
	3	10.42

Figure: 4.20: P(Final software adoption| Environmental factors)

Simillary, the higher the satisfaction of individual factors (all the three variables) the higher the probability of a local software being adopted as indicated by the higher expected value when all the three individual factors are satisfied as shown in Figure: 4.20 .

		Final sofware adoption level
		Expected Value
Individual Factors	3	12.073
	2	7.084
	1	2.413

Figure: 4.21: P(final software adoption|Individual factors)

There is an inverse relationship between organizational factors and adoption of local software. For instance organizations that are large, have resources (financial and otherwise), have

policies, minimum reqiurements and standards that need to be met by any software before adoption are less likely to adopt a local software compared to one with less stringent requirements

		Final sofware adoption level
		Expected Value
Organization Factors	1	10.42
	2	6.853
	3	4.297

Figure: 4.22 P(final software adoption| Organization factors)

Technological factors have a significant direct influence on the probablity of a local software being adopted; Local software that meet all the technological requirements such as security, privacy and compatiblity of the adoptee are more likely to be adopted than ones that just meet the minimum requirements

		Final sofware adoption level
		Expected Value
Technological Factors	1	2.37
	2	7.166
	3	12.034

Figure: 4.23: P(final software adoption|Technological factors)

The tornado graph shown in the figure 4.24 indicates the impact that the various variables have on the final software adoption. Individual and technological factors have the greatest influence in whether or not a local software gets adopted; followed by environmental and organizational factors. What this means is that local software developers and stakeholders need to make sure that they improve on the technological aspects of their software to suit the local environment

and adopt an aproach that would apeal to the individual factors and in their favor. This will improve their chances of being adopted, however this does not mean that environmental and organizational factors should be ignored.

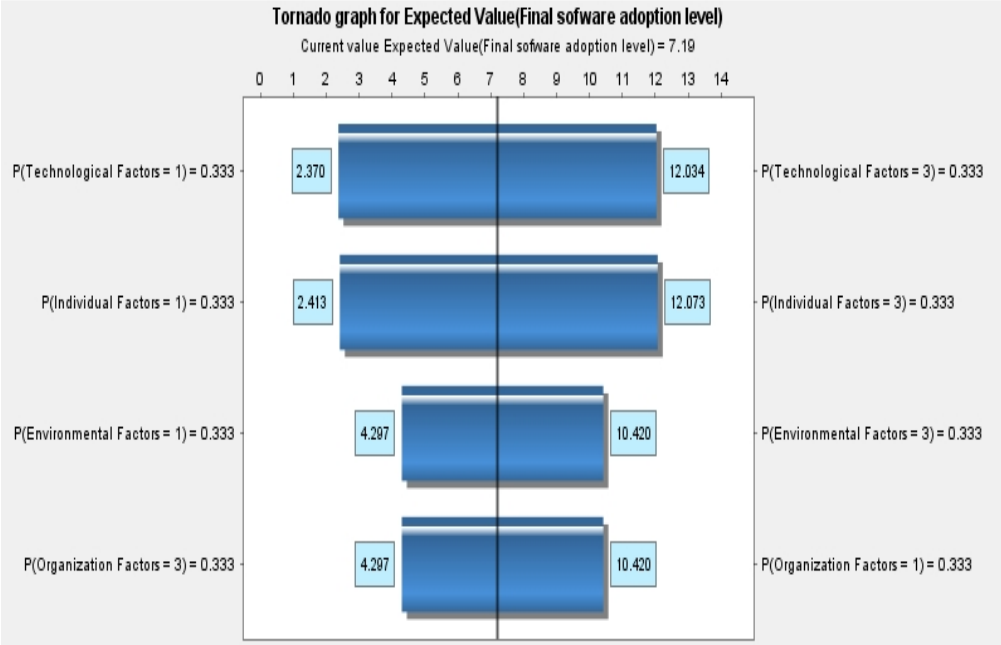


Figure: 4.24: Tornado graph

4.12 The final tested and evaluated TOIE model

The final TOIE model indicates that individual and technological factors should be considered first when developing local softwares. This is shown on figure 4.24. The users who are going to use the software should be given the first consideration. The present technology should also be considered the most , change in technology is very important. People tend to adopt new technology in place.

As illustrated in Table 4.35, the organizational and environmental factors then follows in consinsideration. The technology adopted will determine the amount of money to be used in purchasing software. The resources will also depend on the size of the organization. Then the developers can check on the market competition. The users will buy the software which is readily available in the market.

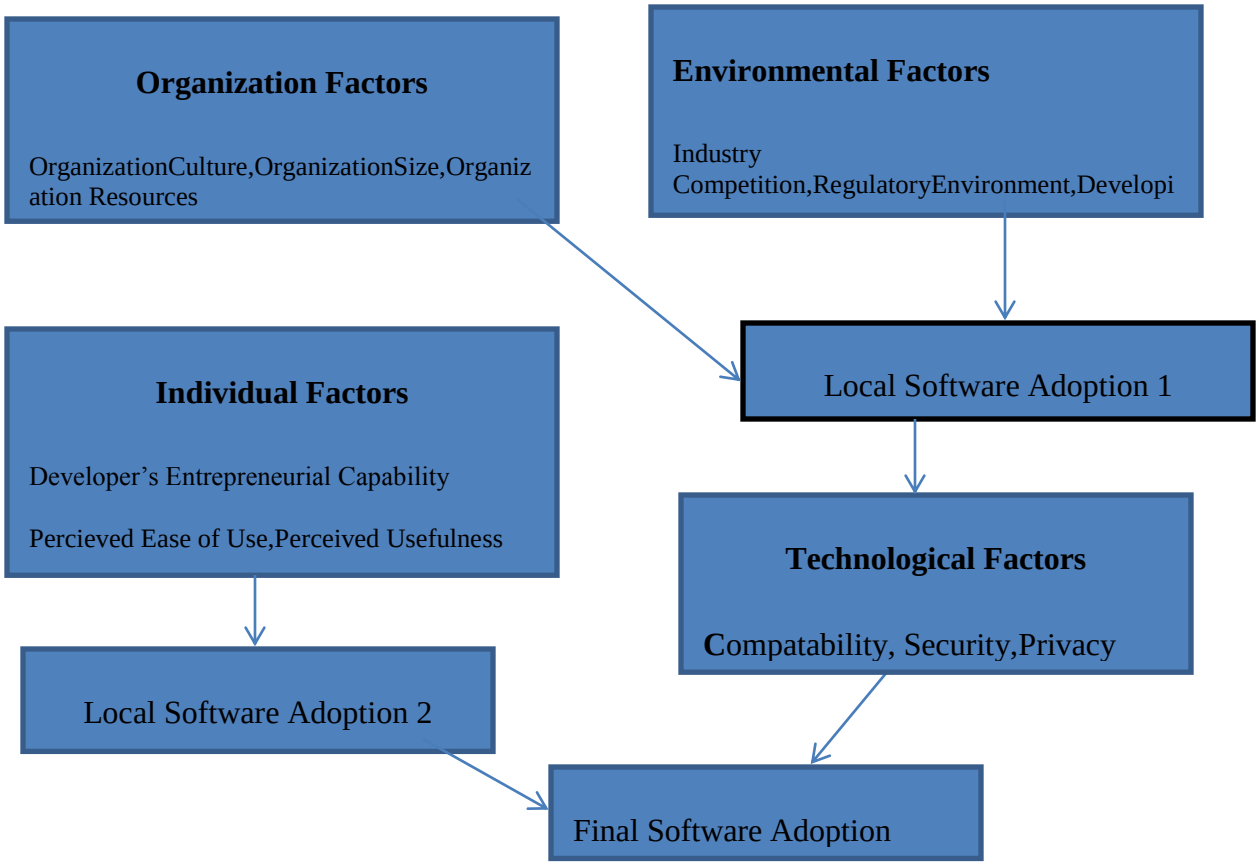


Figure 4.25: Technological-Organizational-Individual-Environmental (TOIE) Model

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Its important to have adoption models to guide in the adoption of Local software in kenya and developing countries as a whole. This will help to improve in the adoption of our local software and improve the software development industry and hence the economy. The TOIE model if implemented will assist the developers and even the government to improve in this industry. The developers should consider the individividual, technological, environmental and organization factors so as to reduce on the cost and make them competitive in the software development industry.

The study uniquely looks at the software adoption for both developers and users at the same time. The research came up with a model that will suite both the developers and the users .

The TOIE model is able to assist the developers and the companies to reduce on the uncertainities involved in the software development industry. Through the testing it was possible to come up with the factors that must be considered first so as to reduce on the uncertainity that may be there. This will help the companies to reduce on the costs.

TOIE model is an enhanced model which is an improvement from the earlier exixting models. This model consists of the factors which are required in adoption of technology and software. It has the individual factors which is lacking in TOE and are very important and also have the Technological, environmental and organizational factors which is lacking in TAM model. It's therefore considered superior than the other earlier models.

This is a unique model developed in Kenya and therefore should be put into use so as o help in improving the adoption of our locally developed software. The study uniquely looks at the software adoption for both developers and users at the same time. The model is generic and can be used in any developing country.

This final local software adoption mean varies from one adapter to another and this model allows for changes to suit the various scenarios and software users be it individuals or organizations.

5.2 Recommendations

The Local software developers and stakeholders need to make sure that they improve on the technological aspects of their software to suit the local environment and adopt an aproach that would apeal to the individual factors and in their favor. This will improve their chances of being adopted. The environmental and organizational factors are also very important and should be looked onto while developing the software. This will make them produce software which can be sold in the local and international markets, reduce on making loss and increase on the profits.

The government should use these findings and be able to give tax incentives to the local software developers so that they can be able to invest more in the Local software. Also the government should be able to put strict laws concerning copyrights and patents. This will enable the developers or the innovators of the technology to have the full rights on the innovation and be able to sell and meet the market demand.

The developers should posses the required entrepreneurial knowledge and skills so as to be able to maintain the business and get advantage over the competitors. The skills will make to be able to market well and retain custiomers. This is one of the reasons why India is one of the biggest producers of software.

Further study on the application of TOIE model in adoption of local software like M-kesho, J-Exams at JKUAT to ascertain the effectiveness of the model.

Further research can be carried out to map the model on a web based system to confirm the results.

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APPENDICES

Appendix I: USERS Questionnaire

NOTE: Local software is developed and packaged by the Kenyan industries and then marketed and sold in Kenya, Africa or other developed countries.

PART A

General Information

a. Kindly indicate your gender

Male	[ ]
Female	[ ]

b. Kindly indicate your age bracket

Below20 years	[ ]
21-40 years	[ ]
41-60 years	[ ]
Above 60 years	[ ]

d. Kindly indicate your highest level of education attained

Primary School	[ ]
High School	[ ]
Undergraduate	[ ]
Postgraduate	[ ]

e. how many years of experience do you have in local software usage ?

No experience	[ ]
Less than 3 years	[ ]
3-10 years	[ ]
Above 10 years	[ ]

PART B (USERS)

- Please tick ☑ in the appropriate box wherever required.

- Please use the codes to respond:

PERCEIVED EASE OF USE 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. The local software are easy to use compared to international software					
2. The local software require less ICT knowledge to understand compared to international software					
3. Local software come in more than one language and this improves undertandability					
4. Loclasoftware come with manuals which are well illustrated					

In what other ways is local software perceived to be perceived to be easy to use?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

PERCEIVED USEFULNESS 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. Local software has more benefits compared to the international software					
2. Local software enables us to save on cost compared to other software					

3. Local software have more customized modules comparedto other software					
4. Local software take less time to develop					

In what other ways is local software perceived to be perceived to useful?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Compatibility 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. Local software is easily compatible with existing applications					
2. Local software is compatible with other international software					
3. Local software has been added with interfaces which increase compatibility to existing software					
4. Local software can be linked together with other networks					

In what other ways is local software compatible?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Security and Privacy

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. Local software is less prone to virus attack					
2. Local software is less prone to programming bugs					
3. Local software is less prone to hacking by software hackers					
4. Local software ensures that the private information is kept confidential					

In what other ways is local software secure and assures privacy?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Regulatory Environment and developing environment: 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. The current legal requirements in software development effectively accomodate the local software adoption					
2. There are minimal requirements in adoption of local software relative to					

other adopted software					
3. Do you believe that software developed in Kenya is different from those developed in USA.					
4. Recent local IT regulations have been modified to encourage more local software use					
5. Does the developing environment affect the software produced?					
6. Government has put laws that effectively deal with software piracy					
7. Government has put laws that effectively deal with software quality					
8. Government has put laws that effectively deal with TAX incentives					

In what other ways is Regulatory Environment and developing environment supportive of local software adoption ?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Adoption of Local software

Would you use local software to

Gather Information Yes () No ()

Pay service charges online Yes () No ()

To Schedule your daily activities Yes () No ()

Do Business Internationally Yes () No ()

How many local software's have you bought in the last one year?.

a) 1 to 5
b) 6 to 10
c) Over 10

I am satisfied with the service i get after adopting the local software. Tick the most applicable

a) Strongly agree [ ]
b) Agree [ ]
c) Moderately agree[ ]
d) Disagree[ ]
e) Strongly Disagree[ ]

Thank you

Appendix II: DEVELOPERS Questionnaire

NOTE: Local software is developed and packaged by the Kenyan industries and then marketed and sold in Kenya, Africa or other developed countries.

PART A

General Information

a. Kindly indicate your gender

Male [ ]

Female [ ]

b. Kindly indicate your age bracket

Below20 years [ ]

21-40 years [ ]

41-60 years [ ]

Above 60 years [ ]

d. Kindly indicate your highest level of education attained

Primary School [ ]

High School [ ]

Undergraduate [ ]

Postgraduate [ ]

e. how many years of experience do you have in software development ?

No experience [ ]

Less than 3 years [ ]

3-10 years [ ]

Above 10 years [ ]

PART B (COMPANY MANAGERS)

- Please tick ☑ in the appropriate box wherever required.
- Please use the codes to respond:

Developer's Entrepreneurial Capability:

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. I am comfortable with introducing new software despite the risk of low adoption					
2. I frequently exploit all the opportunities for improving software development					
3. Our firm is well positioned and has acompetitive advantage as a result of its capabilities					
4. I frequently invest in Researching on new programming software for improving my software products					
5. I aggressively market my products by using above the line marketing approaches					
6. I have sought strategic alliances with other software developers for developing synergies in soft ware development					
7. I frequently subject my software to industry reviews					

and Quality Reviews from customers and other developers					

In what other ways would you describe your entrepreneurial ability ?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

PERCEIVED EASE OF USE 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
5. The local software are easy to use compared to international software					
6. The local software require less ICT knowledge to understand compared to international software					
7. Local software come in more than one language and this improves undertandability					
8. Loclasoftware come with manuals which are well illustrated					

In what other ways is local software perceived to be perceived to be easy to use?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

PERCEIVED USEFULNESS 1 2 3 4 5

	1-	2- Disagree,	3-	4- Agree,	5- Strongly

	Strongly Disagree		Neutral		Agree
5. Local software has more benefits compared to the international software					
6. Local software enables us to save on cost compared to other software					
7. Local software have more customized modules comparedto other software					
8. Local software take less time to develop					

In what other ways is local software perceived to be perceived to useful?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Compatibility 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
5. Local software is easily compatible with existing applications					
6. Local software is compatible with other international software					
7. Local software has been added with interfaces which increase compatibility to existing software					
8. Local software can be linked					

together with other networks					

In what other ways is local software compatible?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Security and Privacy

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
5. Local software is less prone to virus attack					
6. Local software is less prone to programming bugs					
7. Local software is less prone to hacking by software hackers					
8. Local software ensures that the private information is kept confidential					

In what other ways is local software secure and assures privacy?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Organization Culture: 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. The firms' culture encourages us to develop local software					

and hence promote the local industry					
2. The organization culture allows proper communication between developers					
3. The organization culture allows proper communication between developers and customers					
4. The organization culture challenges the status quo and allows competition					

In what other ways is organizational culture supportive of local software adoption ?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Organization Size and Resources 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. Our organization has acquired other software developing organizations inorder to boost its size					
2. Our organization uses economies of scale brought about by size to improve software development and adoption					
3. The firm has adequate					

resources for developing and marketing local software to local markets					
4. Our organization has invested in adequate human resource to enhanced software development					

Industry competition: 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
1. Our firm reduces the prices of local softwareinorder to get more market share of local software					
2. Our firms is faced with strong bargaining power from customers					
3. Our firms is faced with strong bargaining power from suppliers					
4. Our firms is faced with threat of substitute local and international software					
5. Our firms is faced with threat of new entrants into the Local software industry					

In what other ways is industry competition supportive of local software adoption ?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Regulatory Environment and developing environment: 1 2 3 4 5

	1- Strongly Disagree	2- Disagree,	3- Neutral	4- Agree,	5- Strongly Agree
9. The current legal requirements in software development effectively accomodate the local software adoption					
10. There are minimal requirements in adoption of local software relative to other adopted software					
11. Do you believe that software developed in Kenya is different from those developed in USA.					
12. Recent local IT regulations have been modified to encourage more local software use					
13. Does the developing environment affect the software produced?					
14. Government has put laws that effectively deal with software piracy					
15. Government has put laws that effectively deal with software quality					

16. Government has put laws that effectively deal with TAX incentives					

In what other ways is Regulatory Environment and developing environment supportive of local software adoption ?……

Has it influenced the adoption of local software? Yes /No (explain your answer……..

Adoption of Local software

How many customers' for local software's do you sell to per month?

d) 1 to 5
e) 6 to 10
f) Over 10

I am satisfied with the rate at which customers are adopting the local software we develop. Tick the most applicable

f) Strongly agree [ ]
g) Agree [ ]
h) Moderately agree[ ]
i) Disagree[ ]
j) Strongly Disagree[ ]

Appendix III: Kenya Some of the locally developed softwares in.

- Esacco
- SavingsPlus
- Africa Tarvel Guide
- Impex software
- Mshop
- Niko hapa
- Online Registration system
- Mfarm
- Mkesho
- Mysocialmedia
- Websites
- Icow
- Kasha
- Mobi
- Room Allocation System
- Shulepro11
- Digital Management system software
- Turnsoft school management system

- J-exams
- medicentre 2.1
- CliniOps
- ezee fontdesk hotel management systems
- roommaster 2000
- Med Africa