



UNIVERSITY OF NAIROBI

FACULTY OF SCIENCE & TECHNOLOGY

DEPARTMENT OF COMPUTING & INFORMATICS

**TO ASSESS THE INFLUENCE OF POLICY AND LEGAL FRAMEWORK ON ICT
INNOVATION**

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P54/72913/2014

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30 NOVEMBER 2021

This project is submitted in partial fulfilment of the requirement for the award of masters of science in information technology management of university of Nairobi

DECLARATION

This research project is entirely my original work, and it has never been submitted to any other Institution. Without my permission or that of the University of Nairobi, no part of this should be replicated.

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ABSTRACT

The study assessed the how policy and legal framework influence software innovation in Kenya. It concentrated on Government laws, policies, industry related issues as well as copyright infringement and enforcement establishment in Kenya. The general objective was an assessment of how legal framework influence software innovation in Kenya. Whereas sub-objectives involved establishing the influence of ICT regulations; establishing the effects of ICT innovation policies; and assess how industry related economic issues affect innovation of software in Kenya. The target population were drawn from software firms in Nairobi. Sampling approach was purposive, to select sample who were competent, knowledgeable and experts in ICT innovation field. Research data were obtained by use of questionnaires, they were then sorted, coded grouped and analyzed using the Statistical software. The findings of the study were that economic factors influence innovation in the form cost of products produced, the size of the market available that dictates demand and supply. Additionally, market prices determine the available innovation due determination market prices before launching products so as not to produce products that are overpriced and out of reach of most customers. Further, rivalry among large industry players affect innovation as each player intends to competitive advantage over the rest. Government play critical role in innovation by setting rules and regulation that govern ICT sector by issuing license to industry actors with conditions that they need to comply with to operate legal businesses. The study recommends need to create ICT hubs to voluntarily equip and incubate innovative ideas. The regulatory framework should create more incentives that promote innovation as this sector has potential of creating massive employment. Future study should be carried to establish how emerging technology would influence the policy direction of a country, as this study has established that existing regulation only cover the existing innovations.

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ABBREVIATIONS AND ACRONYMS

EPO	European Patent Office
GOK	Government of Kenya
IPR	Intellectual Property Right
PC	Personal Computer
TRIPS	Trade Related areas of Intellectual Property rights
WIPO	World Intellectual Property Rights
USPTO	United States Patent and Trademark Office

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

As postulated by Laplante (2007) software innovation is methodological use technology, scientific knowledge, procedures as well as skill in designing, analyzing, documenting and rolling out a software. Recently, there has been a fundamental shift on development and deployment of software's. Previously there were few software's that were custom built and used on disconnected computers (Apiwattanapong &Harrold 2002). Technological advancement led to increased software development as more applications were developed in response to changing needs. Additionally, internet greatly improved connectivity of computers as well as the connectedness of computer systems around the world. Over the years, software engineering has led to social, economic and technological advancement. Organizations companies and even countries have agreed on the notion that the ability to produce software is a strategic financial capability (NESSI, 2008).Therefore the need for laws to govern their innovation and deployment.

In the United States, many individual states have access to policies for information and communication technology (ICT), often these policies have been referred to the International or National Standards. They have for decades since inception provided technical information to ensure users gain access to information (Mambi 2010).

Today almost all execution of the new EU legislations requires the support of ICT systems, exchange of information amid authorities across borders or for the supply of online public services to citizens. Consideration of ICT consequences early in the drafting procedure will ensure a timely

implementation of legislation and offers the likelihood of reusing and adapting existing solutions as much as possible (Mambi 2010).

European Commission in 1999, begun reviewing EU telecommunications law which was adopted in 2002. July 2003, the new framework came into use, with exclusion of data shield that was ratified in July 2002 and became functional end of October 2003(European Union Information Society, 2009). The new law expected to spur competition in e-communications sector; create a operational market within; as well as defend user interests that may not be assured through market forces(Eurpean Union Information Society, 2010). Rules of the new regulations aims to de-regulate, are simple, technology-neutral, flexible hence are relevant in computer communications sector(European Union Information Society, 2011).

Regulations existed in the EU prior to application of the 2002 framework. These were intended to manage change over from monopoly to competition. Thus the focus was on the creation of a competitive market as well as establish the rights of new entrants. The fast changing technologies, the newly freed up markets have led to a solitary, clear regulatory framework that covers electronic communications (European Union Information Society, 2010).

The new structure is in response to the large, dynamic, erratic telecommunications market associated with speedy rise of players. Due to increase in merging amongst technologies, services, and networks, legislations have changed from emphasis on telecommunications to flexible law geared towards regulating all areas in e-communications, associated set-up as well as its services (European Union Information Society, 2013). Thus, the approach points out that ICT is greater than telecommunications alone. Additionally, telecommunications services and networks include broadcasting services (European Union Information Society, 2013).

By law, the roles of regulatory authorities is to encourage competition in electronic communications services and networks sector. Regulators ensure users obtain utility with regard value and quality; promote investment and innovation in organizations.

In Asia, in 2000 India adopted Information Technology Act, intended at promoting e-commerce. It has modified 2008 to include substantive penal and also procedural rules. Additionally many other Asian countries like Pakistan, the Maldives and many more have no substantive cyber regulation laws of their own and, therefore, tend to rely on international laws that govern information Communication techniques (Cyber Law Asia, 2010). Other Asian countries that have struggled to form their legislations concerning cyber crimes were seen to infringe on the privileges of the people given to them by the Constitution.

Bangladesh, an Asian country for example are in the process of developing a digital security law designed to cover undertaking in digital crimes. Experts opinion were that the proposed law may be used to curtail freedom of expression (Domínguez, 2016). A jail term of 14 years is provided for in the draft law for lawbreakers. The new law was meant to end disagreements in relation to Section 57 of the 2006 ICT Act that regulates Internet use.

Study by Obutte (2011) found out that in Nigeria, the importance, relevance and the idea of regulating ICT sector was not properly designed. Operators in the industry were issued with licences around ten years ago and there have been contemporary experiences in the sector yet regulations have not been updated to reflect the current status. The national regulator has not made decision to purposively regulate the sector.

In South Africa, the law governing ICT is relatively new and as it was amended recently, their ICT Law is comprehensive. It focuses on information as opposed to the storage method (the

computer). Further, user and readers learn the impact of ICT on formulation of laws, the growing need regulating of telecommunications sector (Nexis, 2014).

In Tanzania ICT laws are under review, so as to incorporate emerging issue such as cybercrime that is on the rise. According to the Assistant Minister of Communications, Science, and Technology, the policy in place was enacted in 2003 hence was not reflecting emerging issues in the sector. Actors in the ICT sector had grown as well as the mobile phones subscribers additionally, users of PC too are on the rise (Majaliwa, 2012).

In Kenya, the Cabinet Secretary in-charge of ICT on several occasions emphasized that the country is committed to coming up with legislation in relation to Cyber Crime in collaboration regionally & internationally partners so as to eliminate the vice (GOK, 2015). Through CCK and the ICT Authority the Ministry are in the process of creating Public Key Infrastructure (PKI) that will aid the government to offer digital certification facilities through CCK. The PKI will involve creation of a Root Certification Authority (RCA) to offer citizens digital certificates for use in e-commerce dealings. In line with the above, CCK has come up with a licensing context for Electronic Certification Service Providers (E-CSP) (Benjamin, 2005).

In 2009, Kenya enacted laws geared towards fighting Cyber Crime, the Act provide for sanctions and penalties for cyber crime offenders (Government of Kenya, 2010). A committee was set up in June 2012 so as to spear head war against cyber crime, the Act provides rigid penalties against unlawful cyber acts (GOK, 2015). Technically, the covers the Electronics as well as Transactions law that covers mobile money transactions (Government of Kenya, 2010). Whereas, Electronic Transactions covers; Unlawful access to PC data; unauthorized disclosure of password; Access with intent to commit offenses; interfering with computer source documents; Electronic fraud;

publication of indecent as well as deceitful materials, amongst other crimes. The intention of of this research is to determine how laws influence the innovation in the market.

1.2 Problem Statement

Due to changes in technology, information is transferred from one individual to another in a matter of seconds. Technological advancement has affected the economic activities greatly as we are in information era and, no much focus is towards anyone who is injured in information transfer (Baker, 2010). Raising ethical and legal concern which relates to issues like; right to information and right to privacy that are threatened by the need for free movement of information, visa-viz the need to guard economic right of intellectual property proprietors (Benjamin, 2005). Private information is broken into categories relating to; personal privacy, communication, possessions as well as body privacy information, each person strives to ensure that the personal information is kept within themselves. Technological changes have brought difficulty in maintaining privacy (Baker, 2010).

There are so many software innovators world over, some have unique ideas whereas some share same lines of thought. This has led to competition in the sector hence consideration is based on first come first serve basis especially in software industry where piracy is common (Rivette & Kline, 2000). Previously intellectual rights lasted more than a decade in order to derive economic benefit (Kitch & Perhan, 1989).

Various Countries across the world have come up with laws so as to regulate software innovation so to ensure safety, as well ensure well-being the general public when developing software. Through this that developers of software are assessed and permitted or denied chance to roll out their ideas (Layton, 1986). In instances where public safety and well being is in question the

innovator may require to be registered or licensed. Certain countries have "industrial exemption" which may allow software innovators to be placed internally an organization devoid of license so long as are not the ultimate decisions decision makers in relation to release of products for communal use (American Council of Engineering Companies, 2007). While several studies have been undertaken in Kenya's information and communication technology industry, there is no conclusive study that has focused on the Kenya's legal system and the innovation of software products, consequently this study intends to focus on this gap through assessing the connection between the formulation of laws and the invention of software products.

1.3 Objective of the study

1.3.1 General Objective

The general objective of study was to analyze the legal factors affecting the innovation of ICT products in Kenya.

1.3.2 Specific Objectives

- i. To determine the influence ICT regulations on the innovation of software developers in Kenya
- ii. To assess how ICT innovation policies affect innovation of software developers in Kenya.
- iii. To determine whether industry related economic factors influence on the innovation of software developers in Kenya.

1.4 Research Hypothesis

H1: Legal systems influence the innovation of software firms in Kenya

H0: Legal Systems does not influence the innovation of software firms in Kenya

1.5 Justification of the study

In the recent past technology advancement have been rapid. Since the invention of the Internet, information and ideas have been passed from one point to another in a matter of seconds; hence people learn and solve problems faster. This situation has led to more innovations, inventions and more software being developed and advanced. The number of persons involved in this field of technology doubles every half a decade thus a reason to control and direct the methods and purpose for these inventions.

Over the years, the use of technology has increased tremendously globally, thereby, increasing the number of people with access to software technology globally. Personal computers, tablets, and mobile phone are some of the gadgets in which users store both personal and business information. With the rise in the number of users as well as the developers of software for the gadgets, it means an increase in the number of personal and business information, competition and ideas in innovation all-around the globe. The inputs of legal analysis in software engineering techniques will ensure that there is privacy for the users of the same technology as well as ensure economic growth and stabilization in the markets, since there will be control on software development. The software will be more likely developed to help human course rather than destroying it. Legal analysis will also ensure a significant drop in cybercrime globally.

1.6 Scope of the Study

Assessment was done amongst software firms in Nairobi, targeting senior software innovators from the firms as the respondents.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter there are literature reviewed and existing theories that explain innovation of software developers and legal systems, lastly the conceptual framework used in the study.

2.2 Theoretical Review

2.2.1 General Equilibrium Theory

This theory are the works of Leon Walras in his write up on Elements of Pure Economics (Walras, 1957). This theory explains the connection amongst the following factors demand, supply and price. Legal analysis and laws govern the development and deployment of engineered software thereby allowing the market to be stable. This by the issuance of licenses and patents thereby allowing the original investor to be able to navigate the market and determine which side his or her invention should incline towards.

Certain software features, ideas and code concepts in it, needs to kept and secured inform of trade secrets. The defense remains in place so long as the gaurded component possesses trade secret position. Though patents offer full cover for softwares trade secret may not cover them fully. Rarely do people “enroach on” trade secrets but are subject being stolen as protected as patents and copyrights. Trade secrets are protected under Intellectual Property (IPR) laws provided the proprietor can prove it was un known and measures were placed to keep it secret (Freibrun, 2010). In order to obtain maximum economic benefit from software asset one needs a proper understanding of IPR laws and how to leverage on legal protection to benefit from their rights.

Whereas patent safeguard the original ideas in a computer program the same cannot be provided by copyright. To protect the precise nature of a concept copyrighting is adopted. As for software copyright laws guards the origin and the codes, novel ideas by the innovator. Copyright owner has rights to replicate, generate derivative or come up with better of the software as well as sell to members of the public by issuing license or any otherwise legal means . Anybody invading the limited rights given to copyright owner without consent is violating the rights and subject to imprisonment or fines (Obutte, 2011).

The rights provided under copyright law are geared towards rewarding for creation of the unique idea. The authority to regulate duplication protects the copyrighted owner against any form of competition. Moreover, indirect copying of copywritten program is prohibited by copyright law this prevents unsanctioned use of the software (Banjamin, 2005).

Upon creation of unique idea Copyright protection is inevitably, right last for as long as the author lives plus additional seventy years. In instances where software is created by an employee during his service it would be copyrighten for 75 years from when it is publicized. The right ensures protection of the work of the technicians as the software cannot be copied creating a stable market for the use and sale (Baker, 2010).

2.3 Software Development and Innovation

Development of computer software is a specialized field requiring expertise of system analysts and programmers The analysts identify the needs of computer users that require solutions while programmers develop instructions that direct the computer on how to accomplish the specific tasks (Philipson, 2014). The developed software is then rendered in a programming language. The first language in which the software is rendered is known as the object code. This refers to the

actual instructions understood and directly executable by the computer's central processing unit (CPU) and is rendered in binary digits (Siyanya, 2014).

Sihanya (2014) further asserts that programmers often translate the same into a human readable form that is referred to as the source code. Both the object and source codes comprise the subject matter of IPRs in computer software. Computers have been adopted in all conceivable sectors of human undertakings. That fact coupled by computers' availability caused the emergence of computer software as commercially viable item, forced a reconsideration of IPRs they embody and brought to the fore legal issues arising there from including IPRs, software licensing regimes and criminal law sanctions for defined infringements.

There has been a debate on whether or not to allow IPRs (particularly patents) for computer software and if so, the nature and extent of such protection. On one hand are the proponents of proprietary software who support IPRs to protect software development. At the opposite side are those who either oppose IPRs on software or champion limited scope of such rights.

Disclosure of ideas and provides innovators with incentive to commit more resources on research and development. The result is increased development of software geared towards offering more computing solutions. Software IPRs therefore can provide a merger platform between the developer's economic interest and the utilitarian goals of advancing the interest of the larger number in society. Aside from the economic interest, the software developer possesses moral rights as the inventor of the product to have the works associated with him exclusively (Smith, 2010).

Compared to countries in the west, per capita computer availability and use in Kenya is still low (GoK, 2015). However, there has been a marked increase in the country's computerization

since early 1990s which is expected to improve further with the implementation of vision 2030 one of whose pillars is enhancement of the ICT Sector. The role of software developers cannot therefore be ignored (Sihanya, 2014).

The nature of computer software makes them prone to quick and widespread infringement especially via the internet. They also undergo rapid change and development. Further, most proprietary computer softwares in Kenya belong to large corporations from the developed world, particularly Microsoft. Protection of such corporations' IPRs is mandatory under TRIPS. There is a danger of such corporations turning into monopolies and stifling competitions in the sector. Finally, a software IPRs regime ought to offer quick protection in view of the nature of software. It should also be inexpensive and accessible to majority of the startup software developers who are likely to be individuals (Bainbridge, 2013).

2.4 ICT Industry Regulations

Jurisdiction refers the limit of power to make legal decision, it can be based on some different things: a branch of the law, grade of offense, monetary damage, the level of government and the geographical area (Shinder, 2011).

Jurisdiction entails prescribing, adjudicating as well as enforcing (Yousef, 1987). Jurisdiction to prescribe is an independent entity's power "to formulate laws in line with its activities or the interests by an administrative order or by determination of a court (UCLA, 2010). Jurisdiction to arbitrate is an independent entity's authority to take people through courts or administrative committees in order to determine if prescriptive law has been breached (Schinder, 2011). Jurisdiction to enforce is the power given to a body to ensure people comply with requirements

failure to which they are penalized through prosecution by the courts or arrest by authorized authority, or by non-judicial action.

According to Walden (2009) deregulation concept refers to liberalization in economic division. It entails doing away with certain restrictions so as to enhance easy of access to services or products, to spur competition and deter creation of monopolies. Re-regulation on the other hand implies reinstatement of a regulatory system in order create harmonious way of working (Walden, 2009).

According Benyehle et al. (2005) Of concern has been to find the applicable jurisdiction where two parties from different jurisdictions get into agreement over the internet. The subject been dealt with by private international law level, this isn't conclusive, the solution provided have been through "forum state" and "target state" system (Benyehlef & Fabien, 2005).

Buckingham et. al. (2006) contends that the safeguarding of ICT consumers in Africa has been very challenging. The challenge has been aggravated by the fact that ICT is an emerging area/ fast developing. Currently, ICT frameworks in place do not adequate guarantee synergy as well as create an enabling environment to protect consumers. Of concern is, is that Consumer Affairs Bureau departments of several Communications Commission haven't remedied the grievances of customers in the face of convergence. With regards to the situation, there is need to ensure there are appropriate consumer defense mechanisms (Buckingham & Williams, 2006).

Son (2011) asserts that formulation and adoption of data protection rules and regulations at each state across Africa is necessary, based on trends, occurrences in these countries and across the world. Laws protecting data are geared towards monitoring operators, ensuring safety and to secure everyone to enhance confidentiality in social sites, communication, e-commerce, transactions, as well as computer applications and across networks.

2.5 Policy

Ezekiel (2010) contends that proper regulation has promoted deployment and enjoyment of privacy rights. In Africa ICT is rapidly growing and there are no proper regulation to safeguard private lives. Case in point when government attempted to seize subscribers' information during the SIM registration. The misunderstanding could be traced to inadequate framework that regulates obtaining, storing as well as retrieving of data. Based on the many detrimental uses data can be put to, there is a need to formulate framework to manage and regulate how to access and use personal information held by telecommunications players. Some countries in Africa do not have laws to protect data access and use (Ezekiel, 2010).

2.5.1 Patents

Empirical evidence reveals that patents have been effective means of promoting innovation with some variation across industries. Surveys done in Japan, Europe and USA in 1980s and 1990s, revealed that majority of respondent agreed that patents are key in guarding their competitive advantage especially in the following industries: biotechnology, machinery, drugs, computers and chemicals (Levin et al, 1987). Whereas some respondents felt that patents to a limited extent leads to protection to innovation in their industries due to use of alternative means like trade secrets, control of complementary assets and technological complexity (Cohen et al 2000).

Patenting may limit further innovation, through limitation of access crucial knowledge, in instances of emerging technological areas whereby innovation contains a distinct cumulative character protected by patents. Consequently, broad protection on foundational concepts may suppress follow-on inventors in instances where owner of patent necessary for development of innovation denies access to would be innovators. (Bessen & Maskin, 2000; Bessen and Hunt, 2003).

2.5.2 Copyright

Formulation Copyright Act of 2001 was in line with meeting standards under trade related areas on intellectual property (TRIPs) Agreement of 1994, WIPO Copyright treaty of 1996. The law redefined infringement to comprise direct or indirect involvement in activities protected by copyright, as well as importing or causing to be imported infringing copies (Lemley, 2006).

Emerging trends have outpaced the changes in the laws. In 1960s and 70s, intellectual property did not cover computer software's, hence the proprietors protected their programs by use of either trade secrets or by contract or both. Due to the challenge innovators started licensing of software this compelled buyers to keep the software confidential. Thereby proving that copyright as the most appropriate means of legally protecting computer software's and programs. Copyright's law's provide lengthy protection duration hence is appropriate for protecting software (Munell, 2008).

2.6 Government

Computer software and programs enjoy protection in Copyright Act of 2001 (TCA, 2001), this were excluded before coming into force of the Copyright Act on 1st May 2002, (The Industrial Property Act 1990). Consequently, computer software and programs patentable upon meeting the statutory requirements that involve the idea being unique, inventive and due application are made to register it (The Industrial Property Act, 2001).

There are challenges to the copyright protection of computer software. It does not protect copying of computer program's functionality via reverse engineering and development of another source code that does not infringe the initial source code's copyright (Stoney and Stoney, 2013). Further Stoney and Stoney (2013) assert that fitting computer software within the copyright law

requirement that an idea be “fixed in any tangible” medium can be problematic considering that a computer software is intangible since it constitutes a series of magnetic spots on a magnetized disk. The owner of copyright in computer program could experience difficulties establishing that an alleged infringer had access to the object code and that the alleged copy is substantially like that copyrighted.

A study by Mbote (2013) found out that there is low uptake of patents by Kenyan software innovators, existing patents are mainly from foreign entities. There is a concern as to reason for few registered patents by Kenyans and the effect on growth or creation of software and computer program development in Kenya.

Aharonian (2005) outlines innovators in USA have been rewarded dearly through patenting. United States Patent and Trademark Office (USTPO) issues over twenty thousand software patents yearly and the number is on the rise. The laws governing patent, copyright and trademark in US differ substantially from other countries. Several countries in Europe, Asia, Latin America that have patent laws have not incorporated software protection. They include Countries like France, Brazil and Switzerland (Aharonian, 2005).

Whereas, some countries are silent hence creating room for and software patentabilities they include Taiwan, Japan, Thailand and Korea. European states have a consensus on protection of software under copyright law however this does not override the laws of the land. Patent law can as well cover computer software together with those of copyright among the European Community members (Congress, Office of Technology Assessment, 2000).

The research findings by Lerner and Zhu (2004) revealed that there is correlation between software patenting and creation of software's. Other research papers have been carried regarding software little attention has been given to difference between copyright and patent.

2.7 Empirical Review

Past studies found out that company's patent to leverage over the competitors this reduces competition, legal suits and improves negotiation powers (Cohen et. al 2000; Levin et. al). Patenting is normally carried whenever there is need to protect an idea from authorized access or duplication and the cost of obtaining patent is relatively minimal. Entities do acquire many patents so that just in case a rolled-out product fails break even they may minimize competition and legal suits. Firms that innovative obtain portfolios that are "defensive" to guard it in the event of counterattack. This may result in portfolio cross-licensing, as the entities agree never initiate legal action against one another and others to pay royalty (Grindley and Teece 1997).

Study by Von Hippel and von Krogh's (2003) found out that software developers promote public good through their innovation thereby reaping greatly. Innovators do cost benefit analysis resulting in researching for a solution to a public problem after which returns flow to them. They claimed that consumers innovate faster than producers' in case they are technologically, economically, legally capable, as they have tacit knowledge their wants. Moreover, they need not compromise as manufacturer whose focus is the whole market (von Hippel 2005; Chesbrough 2003).

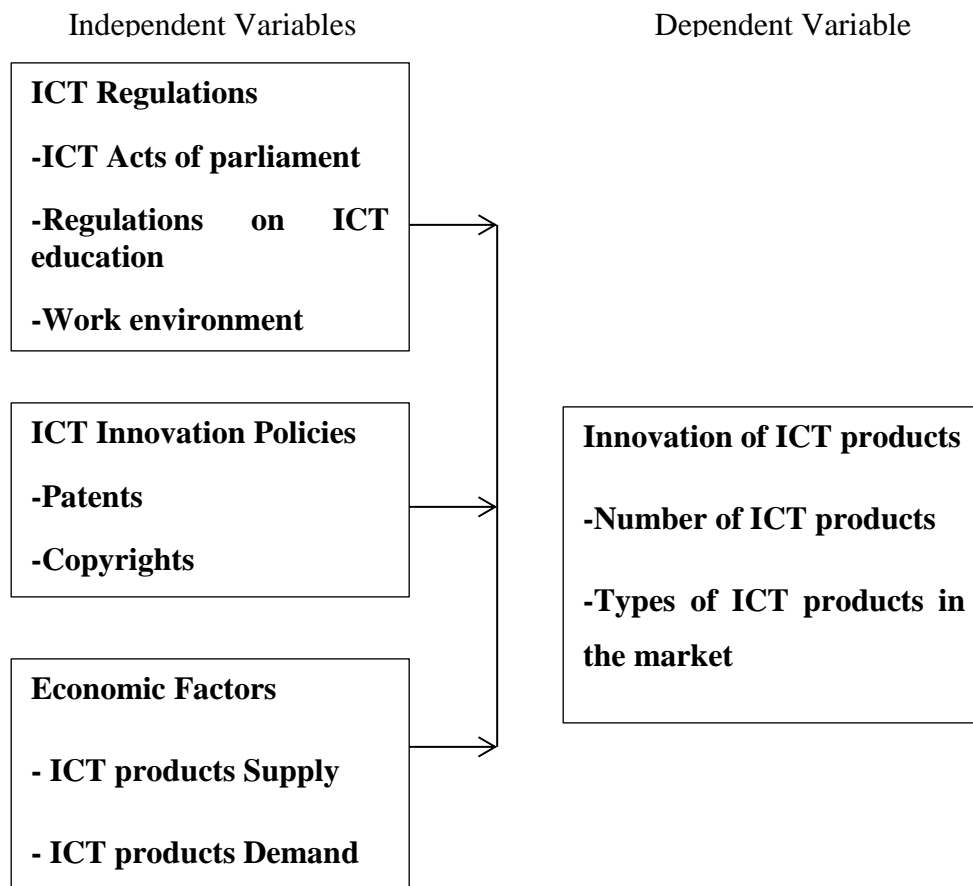
Additionally, other previous research studied the importance of patents in economy (i.e. in heterogeneous industries), they established that each sector differ in relation to the revenue generated by patent (Scherer 1983), the capability vary based research and development around it as well the value apportioned to the patent (Hall et al. 2005; Levin et al. 1987). Hence necessitating

research on patent in certain industries (Cockburn and MacGarvie 2011). Taking into consideration that software innovation as the output of information technology sector, the sector is faced with competition due to rapid changing trends, therefore the need to establish the value of patents. The growth in litigation amongst players such that of Samsung and Apple is a prove of how treasured software patents are. This has led to growing call on the need research on how patents affect value of the firm (Mykytyn et al. 2002), few studies have been geared towards this. Few studies in relation to the effect of software patents in relation to how it performs ((Hall and MacGarvie 2010), hence limited knowledge on patents create competition.

2.8 Conceptual Framework

Government policies and framework was the independent variable whereas software innovation was the dependent variable.

Figure 2.1 Conceptual framework



Source: Researcher, 2016

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter is about the methodology optimized in the study that incorporating research design, the population under study, the sampling to be drawn, procedures and instruments utilized in data gathering, assessment of validity and reliability, analysis as well as presentation of data finally the ethical matters taken into consideration.

3.2 Research Design

According to Kisilu and Trom (2010) research design opined methodological manner a study is undertaken involving even the techniques used. They believe this is the backbone of any. Whereas according to Orodho (2012) describes it a comprehensive outlay regarding the manner of collecting and analyzing data objectively with aim an aim to meet the research objectives. Research design lays out the foundation on how the research is to be carried out. For purposes of this study a survey design will be applied.

3.3 Population

According to Nachmias and Nachmias (1990) states that population is a group meeting the set criteria needed for the study or investigation they could be group of people, a category of services, a household. Further, population of interest need to be homogeneous to be representative. Each character under study has same chance of being used as a sample. Target population was drawn from software firms in Nairobi.

Table 3.1: Population of Registered Application Software Innovators

Type of Software	Number	Weight	Percentage
Packaged (off-shelf)	150	0.375	37.5%
Suite	150	0.13	37.5%
Custom	100	0.11	25.0%
Total	400		100%

Source: Communication Authority of Kenya, 2015

3.4 Sampling Design

According to Orodho (2012), taking samples refers to picking out subsets in a population. Based on the sample inference can be made in relation to the general population. Nachmias and Nachmias (1990) contend that samples can be picked subjectively based on the knowledge, experience, competence, expertise. This was the rationale for purposive sampling a sample of 75 respondents were chosen based on years of experience.

3.5 Data Collection instruments and procedures

3.5.1 Collection Instruments

According to Mugenda and Mugenda, (2013) as a guarantee to uniformity in the data gathering use of questionnaires are of great importance, in the questionnaire use of questions requiring yes or no answers as well as those requiring explanation are necessary. The study adopted use of Likert scale having closed ended questions. Brace (2014) asserts that use of five-point Likert is to clearly bring out various aspects of the same attitude.

3.5.2 Collection Procedure

Consideration of type of data determines collection procedures of gathering it. This may involve obtaining permission, coming up with a sampling strategy, capturing information electronically or manually on paper then storing it (Brace, 2014). Management of the selected software engineering firms to seek authority to collect data. Researcher with the help two research assistants administered the questions, in some cases they delivered the questionnaires and later picked the fully filled questionnaires after a fortnight.

3.6 Validity and Reliability

Mugenda and Mugenda (2013), validity is the level of precision and relevance obtained from inferences in relation to findings of research. This represents the degree to which findings of the study fully represent the idea a researcher is assessing. To improve on construct and content validity, the project supervisor, lecturers in the field of Information Technology were consulted to provide feedback on the instruments used in the study.

Mugenda and Mugenda (2013), reliability blueprints a level to which a tool leads to coherent results or data upon repeated trials. Random errors may influence reliability in research that increase in as random errors reduce the reliability reduces. Errors may be caused by ambiguity in data collection, inaccurate coding. The researcher will use the internal consistency techniques Cronbach's alpha to test for reliability.

3.7 Data Analysis and Presentation

An assessment of sourced data was done to ensure they are complete, consistent any omission were left out. Coding and grouping into categories were done then version 20 of Statistical Package for Social Sciences (SPSS) was utilized. The findings are in form of narratives, graphs, bar charts

and tables. Regression predicts how an independent variable affects dependent variable, in this study multiple regression was adopted as there were three independent variable against one dependent variable the model was.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where Y represent the innovations of ICT; β_0 Constant; X_1 = ICT Regulations; X_2 = ICT innovation Policies; X_3 = Economic factors; β_1 , β_2 and β_3 represent Beta coefficient, and ε represent the error term.

3.8 Ethical considerations

The researcher ensured right to privacy was provided as respondents were allowed to fill questionnaire at the convenient time and sensitive information were safeguarded, by ensuring the information obtained were treated with uttermost confidentiality. All the responses were treated as anonymous as the results were no allude to specific respondent.

3.9 Operationalization of Variables

Objectives	Variable	Indicator	Measurement scale	Data Collection Instrument	Data Analysis
	Dependant Variable	-Types of software developed	-Ordinal	Questionnaire	Descriptive
	-Innovation of software developers	-Functionality of software developed -Percentage of milestones achieved using the developed software			
Objective I: To examine the influence of national privacy policies on the innovation of software developers in Kenya	Privacy Policies	Software Code Review	-Ordinal -Likert Scale	Questionnaire	Descriptive
		Traceability of liability	-Ordinal -Liker Scale	Questionnaire	Descriptive
		Software testing	-Ordinal	Questionnaire	Descriptive

			-Likert Scale		
Objective 2 To establish the effects of intellectual property rights on the innovation of software developers in Kenya.	Intellectual Property	Copy rights	-Ordinal -Likert Scale	Questionnaire	Descriptive
		Patents	-Ordinal -Likert Scale	Questionnaire	Descriptive
		Property rights	-Ordinal -Likert Scale	Questionnaire	Descriptive
Objective 3. To determine the effects of government regulations in the information and Communication Technology (ICT) industry on the innovation of software developers in Kenya.	Industry Regulations	Regulations on software innovation	Likert scale	Questionnaire	
		Industry ICT regulations	Likert scale	Questionnaire	

CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION

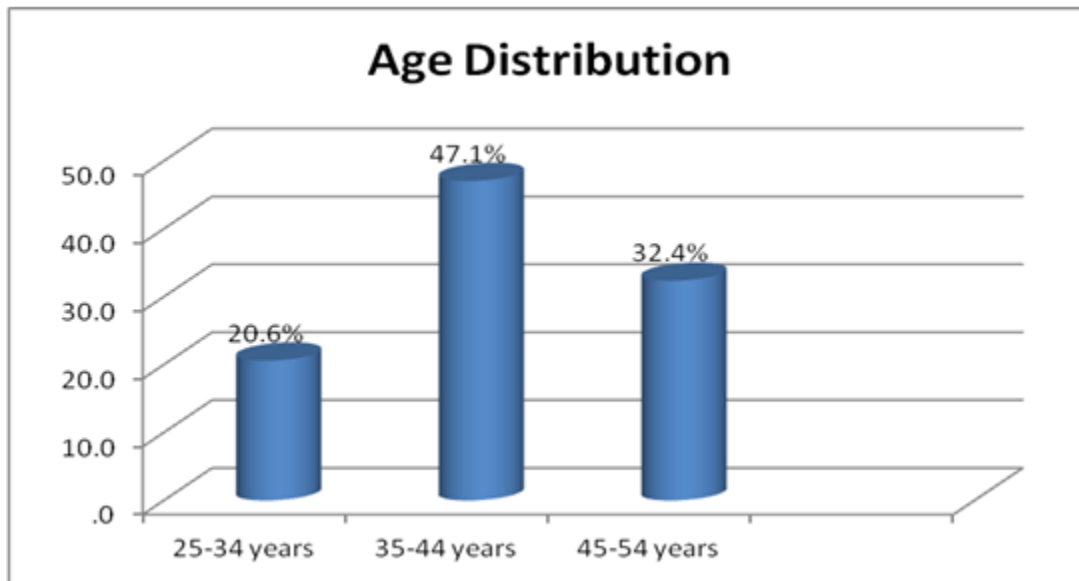
4.1 Introduction

Chapter comprises the study fundamental findings accompanied by explanation in narrative form. Further broken down as demographic information, description and interpretation of responses on factors innovations, the data was scrutinized by statistical software SPSS version 20. Analysis to determine relationship between the study variables was done using multiple regression.

4.2 Demographic information

Figure 4.1 Summary of distribution in terms age of the respondents.

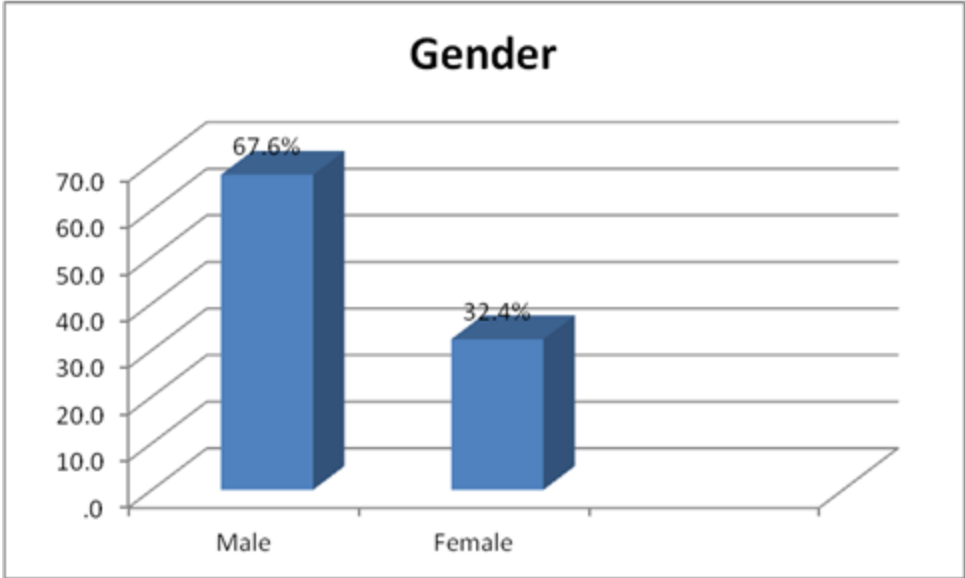
Figure 4.1: Age Distribution



Source: researcher, 2016

Based on Figure 4.1 above, respondents in age bracket 25-34 years were 20.6 % whereas those in 35-44 years bracket were 47.1 %, and those in 45-54 years were 32.4% hence majority were in ages 35-44 years.

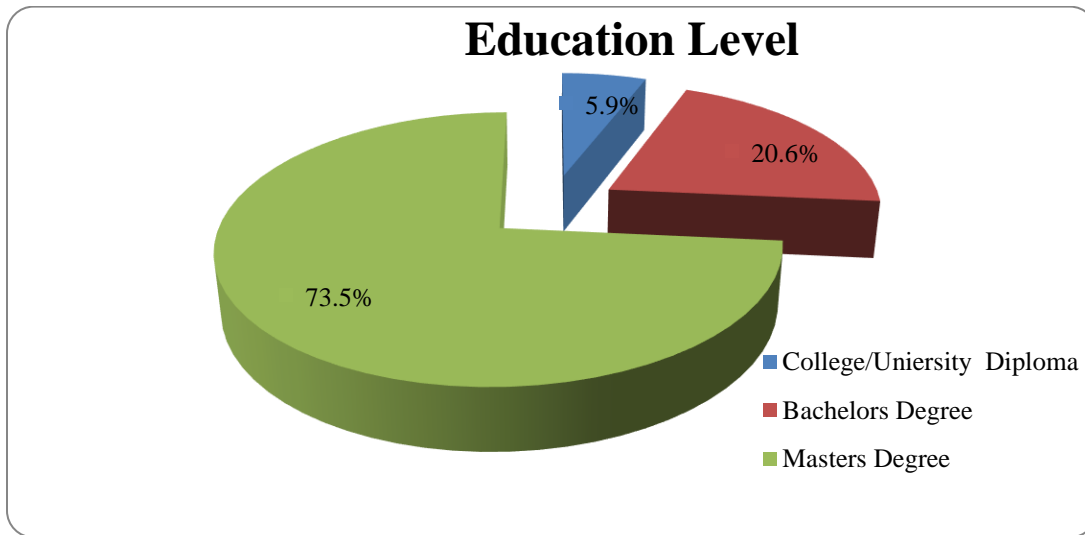
Figure 4.2: Gender Distribution



Source: researcher, 2016

Based on figure 4.2 above males 67.6% while 32.4% were female, implying a larger portion of software innovators are male.

Figure 4.3: Level of education



Source: researcher, 2016

Figure 4.3 above, is an analysis of the highest education levels attained, based on the analysis, 73.5% of the respondents had master’s degrees, 20.6% had bachelor’s degrees while only 5.9% had college/university Diploma.

Table 4.1: Duration of working at the organizations

Number of years	F	%
3 years and below	58	77.3
4-5 years	12	16.0
6-7.0 years	5	6.7
Total	75	100

Table 4.1 above, provides an analysis of years of service each respondent had served a majority representing 77.3% reported to have worked in the ICT innovation firms for three years or less, while 16% reported to have worked for about 4-5 years while 6.7% reported having worked for 6-7 years.

4.3 Legal Factors affecting the innovation of Software Developers in Kenya

Table 4.2: Economic Factors

Factors	Mean	Std. Deviation	N
The cost of ICT products in the market	4.53	0.763	75
Competition between ICT innovation firms	4.54	0.836	75
The market size of ICT products	4.94	1.091	75
Demand of ICT products	4.91	0.830	75
Supply of ICT products	4.91	0.923	75
The costs of ICT innovation	4.58	0.836	75
The cost of training ICT innovators	3.47	0.937	75

A questionnaire was administered with Likert scale type of statement whereby 1 meant strongly disagree, 2 postulated disagree, 3 showed neutral, 4 meant agree and 5 opined strongly agree.

Based on table 4.2 above, majority of respondents agreed that the cost of ICT products in the market influence innovation as the mean score was 4.53. This indicates that innovators look at the market price of products in market in order not to produce an overpriced product.

The standard deviation was small indicating that most respondent's answers were around the mean. Most respondents agreed that competition influences innovation with a mean score of 4.54 indicating competitive advantage is the key to survival. Innovator relies on forces of demand and supply. Innovators look for niche within the markets to exploit and make good returns on their IT innovation, this was demonstrated by higher response. Majority of the respondents agreed that innovators are influenced by what is available in the market with slight modification and improvement. Additionally, respondents agreed that the cost of training ICT innovators moderately influenced innovation.

The finding are in line with Crespi and Pianta (2006) who established that innovation enhances productivity growth thereby affecting demand and supply as end users prefer items that offer competitive advantage. Nesta (2010) corroborates the findings that consumers prefer new ideas that are readily available and affordable. Hence innovators respondent directly to consumer needs, they also consider production the cost of production and selling price. OECD (1996c) confirms competition in the market encourages research and innovation hence new ideas in the market.

Table 4.3: ICT Regulations

Factors	Mean	Std. Deviation	N
Government regulations on the development	4.75	0.884	75

of new technologies			
Government agencies issuing ICT	4.58	0.913	75
Control on the usage of ICT innovations by government	4.53	0.892	75
Regulations of incentives to ICT innovators by the government	4.61	0.912	75
ICT innovators' ability to comply with government policies and regulations	4.37	0.932	75

Majority of the interviewees concurred that the government is a key stakeholder in regulation of ICT innovation this was demonstrated by a mean of 4.75. The government has the power to issue licenses to firms to engage in economic activities. Majority of respondents opined that the government regulates and promote the ICT industry through tax holidays to encourage innovators and promote growth in ICT industry.

The findings corroborate OECD (1996c) that states regulation has various effect on innovation: on the economic sphere it encourages competition and openness, while on social sphere it creates technical demands for industries acting as focal point a round which they focus their work. Kahn et.al (1999) ascertains that incentive based regulation tend to aid market and social innovation as firms ride on the leeway to maximize on the commercially viable options offered. Pelkmans and Renda (2014) affirms that government regulation have varied effects on innovation stringent rules hamper innovation while flexible rules encourage innovation. Low compliance and red tape requirement have positive effect on innovation.

Table 4.4: ICT Innovation Policies

Factors	Mean	Std. Deviation	N
Patents and copyrights are important concerns for software developers within the company.	4.56	0.972	75
The company learns from previous liability lawsuits relating to patents and copyrights	4.45	0.894	75
The company provide training/education that addresses patents and copyright issues	4.53	0.874	75
The software innovators are guided by the applicable safety-laws.	4.64	0.987	75
Software developers follow internal policies	4.56	0.780	75
The company provides training/education that addresses policy issues to software developers	4.38	0.982	75

Most of the respondents agreed that patents and copyrights are important as innovators need to have ownership of the property in order to earn royalties from them. Lawsuits can be costly for individuals and firms hence they avoid them at all costs. Most firms rely on past judgement to determine liability of lawsuits in case of infringement of copyright and patent. Staff training goes a long way in enabling staff to understand the rights and laws governing innovation hence a mean of 4.53 indicating that most respondents were in agreement that training affects innovation.

All software's have terms and conditions that users are expected to adhere to before use, the terms and conditions follow prescribed software safety-related policies and regulations. A large portion of the respondents agreed that innovators creation are in compliance with policies and regulations

when developing software to minimize legal challenges resulting from failures of software. In addition, most software companies have internal policies, procedures and regulations that govern innovation. This is aided by training and capacity building of staff to develop ICT products which are unique and innovative. The findings are in tandem with Davis (2006), who ascertained that patents and copyrights give firms exclusive right to earn incentive from their invention. Landes and Posner (1987) contend that patents stimulate firms to invest in research and development as it gives them exclusive right to earn rents from the innovation.

Table 4.5: Techniques for Mitigating Legal Liability

Factors	Mean	Std. Deviation	N
Safety consideration	4.55	0.892	75
Software testing autonomous from its development	4.62	0.923	75
Formal verification	4.67	0.782	75
Defect tracking	4.67	0.978	75
Traceability of liability-related requirements	4.45	0.890	75
Code reviews	4.53	0.895	75
Architectural/design reviews	4.36	0.943	75
Fault injection (software testing)	4.71	0.873	75
Code/test coverage analysis	4.62	0.899	75

In view of table 4.5 above, innovators mitigate liability through several ways. Majority of the respondents agreed that innovators do software analysis that is conducting hazard analysis of threat posed to health, property and environment. In addition, the innovators assess how a system can fail and how best to reduce the risk so as to minimize risks the software can cause, as the mean

was 4.55. The standard deviation for the response was small indicating the data is normally distributed around the mean.

The innovators seek a second opinion from third parties who were not involved in the development the software so as to create room for critic and improvements. Hence most respondents agreed that third party testing enhances second opinion on the software, as the mean was 4.62. The software's are formally verified in case they meet some requirement before being launched into the market. Most respondents agreed with the statement to a greater extent, as the mean was 4.67.

Code review and software testing enable innovators to collaborate to determine faults hence reducing the impact of mitigation. While architectural design review and debugging by external vendor help to identify faults and trace liabilities and omissions which may affect the quality of innovation.

4.4 Regression Analysis

Assessment was done using equation: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$ where Y represent the innovations of ICT; β_0 Constant; X_1 = ICT Regulations; X_2 = ICT innovation Policies; X_3 = Economic factors; β_1, β_2 and β_3 opined the Beta coefficient; and ε represent the error term.

Table 4.6 Model Summary

		Adjusted R	Std. Error of the	Sig.
R	R Square	Square	Estimate	

.7879 ^a	.7802	.7709	40.3056836	0.010
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Based on Table 4.6, P-value obtained indicate there is significant the relation between policy and legal framework on ICT innovation as it is less than 0.05. Whereas the R-value obtained show a positive relation between independent and dependent variables. Additionally, R squared is .7802 indicating that the 78.02% change in policy and legal framework influences ICT innovation.

Table 4.7: ANOVA Table

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	26466.215	4	6616.554	4.073	0.021 ^a
Residual	22743.674	70	1624.548		
Total	49209.889	74			

Test of Hypothesis Using ANOVA

From the table 4.7 above, the calculated F 4.073 while the critical F 0.021 since F- calculated is greater than the critical the null hypothesis is rejected.

Table 4.8: Regression Coefficients

	Unstandardized		Standardized		T	Sig.
	Coefficients		Coefficients			
	B	Std. Error	Beta			
(Constant)	.041	.258			.930	.000
ICT Regulations	.494	.077	.297		3.798	.002
Economic Factors	.430	.070	.188		3.290	.001
ICT Innovation Policies	.413	.062	.013		.215	.001

The model result indicating how each variable influence the dependent variable:

$$Y = 0.041 + 0.494X_1 + 0.430X_2 + 0.413X_3$$

From table 4.8, in case of unit change on ICT regulation the corresponding change of 0.494 units in ICT innovation; that of 0.430 units in ICT innovations and 0.413 units in ICT innovations holding other factors constant. Therefore variable under study are influenced legislation in place as the value obtain significance levels is less than 0.05.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides summarized study findings, warrant the areas that the policy needs focus on, recommended pivotal points are discussed in detail, limitations encountered in the course of the study and potential areas requiring research.

5.2 Summary

This research was to establish in case there is relationship between formulation of policy and legal framework and ICT innovation. The study established that economic factors influence ICT innovation. The factors are cost, competition, market size as well as training. Cost is the leading driver of demand and supply hence greatly influence software innovation. Most innovators create a niche within the market help them gain competitive advantage over existing software's. Cost is influenced by fixed and variable cost hence most innovators take this into consideration so as not to overprice their products

The study found out that ICT regulations influence software innovation, a larger portion of respondents were in agreement that the laws govern and regulate ICT sector. The laws lead to creation of incentives, issuance or denial of license, regulation of innovation. Incentives such as tax holidays, subsidies, financial incentives spurs innovation. Additionally, regulation determine terms and eligibility criteria for issuance of license, those who fail to meet the criteria are denied operation license. Hence every innovator is bound by law to carry out only legal business.

Further, it was established that ICT innovation policies have an effect ICT product in the market through regulation of products in the market. Patents grant exclusive right from copyrighting

innovation thereby strictly benefitting the rightful owner. Violation of the right is an offense punishable by jailing or paying fine(s). Companies infringing on rights pay dearly by hiring legal experts to represent them in court, upon determination of violation of rights they pay fines and penalties as is determined by the court. To reduce liability risk companies have resolved to capacity build their staff as well as have internal policies that safeguard them against violation. The innovators ensure the software developed follow environmental, health and safety policies. This reduces the risk of legal suits due harmful effects of an innovation

P-Value for all the variables were below 0.05 indicating that ICT innovation Policies, ICT Regulations, economic factors significantly influenced software innovation

5.3 Conclusion

In view of the findings above, the null hypothesis was rejected. The study established that government's ICT regulations influence software innovation as they ensure only legal business are licensed to operate. The regulation ensures there are incentives to promote innovation through subsidies and financial incentives. Every innovator aims to comply with the rules to be in good books with regulators.

Further, ICT innovation policies determines the innovation of software through offering exclusive right to innovators to benefit from their innovation, any violation is punishable by payment of fines or serving jail term. Legal suits are costly in case of infringement, so companies avoid it all cost by coming with internal policies to regulate their staff behavior additionally they capacity build their staff to be equipped with legal requirement and as a safeguard for any violation.

Lastly, economic factors such cost, competition, market size, demand, supply influence innovation of software's. Economic benefit derived from sale of the innovation due patent right ensure most innovators create solution to existing problem to reap from them.

5.4 Policy Recommendations

Considering the findings of the study; there is need to create ICT hubs to voluntarily equip and incubate innovative ideas. The regulatory framework should create more incentives the promote innovation as this sector has potential of creating massive employment. Additionally, more awareness is needed in order to capacity companies and general public so as to reduce law suits.

5.5 Limitations of the Study

During study obtaining required information in a timely manner from the ICT innovation sampled was a challenge. Some of the respondents delayed in relaying the requested information citing privacy issues which led to more resources being utilized to acquire such information from other parties such as the ICT industry regulator and other government agencies.

5.6 Areas for Further study

There is need to carryout research to establish how emerging technology would influence the policy direction of a country, as this study has established that existing regulation only cover the existing innovations. Additionally, studies can be done to establish how innovation are influenced by emerging societal problems in health, environment and agricultural sector

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APPENDICES

APPENDIX I: RESEARCH QUESTIONNAIRE

Guidelines to participants

This questionnaire aims to source data on software engineering and legal systems in Kenya.

Please complete the survey by putting a checkmark (✓) at the most accurate answer within the answer box.

The survey data collected will be used only for study purposes.

A: Demographic Information of the Respondents

1. Your organization:
2. Gender: Male
 Female
3. Age in Years
 18.0-24.9 25.0-34.9 35.0-44.9 45.0-54.9 Over 55

Education level

- Diploma Bachelor's Degree Master's Degree Ph.D. Other
(Specify).....

4. What is your designation in the organization.....
5. How long have you been with the firm?
(Kindly tick one below):
 3.0 years and below
 between 5.0 and 6.0 years
 between 6.0 and 7.0 years
 Over 7.0 years

B. Economic factor affecting Innovation in Kenya

7. In your opinion, to what extent is your firm’s capability to handle each of the following Economic factor affecting ICT innovation in Kenya ? (Tick appropriately)

1=Strong Disagree 2= Disagree 3=Neutral; 4=Represent agree; 5= Very Represent agree

Factors	5	4	3	2	1
The cost of ICT product					
Competition between ICT innovation firms					
The market size of ICT products					
Demand of ICT product					
Supply of ICT product					
Cost of innovation					
Cost of training ICT innovators					

C. ICT regulations Factors Influencing software innovation

8. Specify the extent to which the given ICT regulations factors influence ICT innovation during software development. (Tick appropriately)

1=Strong disagree 2= disagree 3=Neutral; 4=Represent agree; 5= Very Represent agree

Factors	5	4	3	2	1
Government regulation on development of new technology					
Government agencies using ICT					
Control on the usage of ICT innovation by government					
ICT innovators ability to comply government policies and regulations					
Other (Specify).....					

D. ICT innovation policies

9. Specify the extent that you are in agreement with the subsequent statements regarding ICT innovation policies? (Tick appropriately)

1=Strong disagree 2= disagree 3=Neutral; 4=Represent agree; 5= Very Represent agree

Factors	5	4	3	2	1
Patents and copyrights are important concerns for software developers within the company.					
The company learns from previous liability lawsuits relating to patents and copyrights					
The company provide training/education that addresses patents and copyright issues					
The software innovators are guided by the applicable safety-laws.					
Software developers follow internal policies					
The company provides training/education that addresses safety issues to employees.					
Other (Specify).....					

E. Techniques for Mitigating Legal Liability

10. Specify the extent to which the following techniques are applied in your organization during software development in order to reduce liability issues? (Tick appropriately)

1=Strong disagree 2= disagree 3=Neutral; 4=Represent agree; 5= strongly Represent agree

Factors	5	4	3	2	1
Safety scrutiny (such as fault tree, hazard, and effect determination)					
Software testing independent/separate from software development					

Official verification					
Bug tracking (of safety/liability-critical defects)					
Traceability of liability-related requirements					
Code reviews					
Architectural/design reviews					
Fault injection (software testing)					
Code/test coverage analysis					
Other (Specify).....					