DETERMINANTS OF NATIONAL INFORMATION AND COMMUNICATION TECHNOLOGY STRATEGY IMPLEMENTATION: A CASE STUDY OF PUBLIC SECONDARY SCHOOLS IN NAIROBI COUNTY, KENYA

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MASTER'S DEGREE

(ICT Policy and Regulation)

JOMO KENYATTA UNIVERSITY OF

AGRICULTURE AND TECHNOLOGY

2019

Determinants of National Information and Communication Technology Strategy Implementation: A Case Study of Public Secondary Schools in Nairobi County, Kenya

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A Research Project Submitted in Partial Fulfillment for the Master's Degree in ICT Policy and Regulation in the Jomo Kenyatta University of Agriculture And Technology

2019

DECLARATION

This research thesis is my original work and has not been presented for the award of Degree in any other university.

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This research project has been submitted for examination with our approval as University Supervisor.

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DEDICATION

This study is dedicated to my family and friends for their support, encouragement and patience during the entire period of my study.

ACKNOWLEDGEMENT

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ACRONYMS/ABBREVIATIONS

ANOVA   Analysis of Variance

CBD   Central Business District

DOI   Diffusion of innovation

DPT   Department of Post and Telegraph

ICT   Information and Communication Technology

IS&E   Information Society and Economy

IT   Information Technology

JKUAT   Jomo Kenyatta University of Agriculture and Technology

MTS   Mobile Telephone Service

OECD   Organization of Economic and Cooperative Development

ROK   Republic of Kenya

SPSS   Statistical Package for Social Sciences

TAM   Technology Acceptance Model

UTAUT   Unified Theory of Acceptance & Use of Technology

OPERATIONAL DEFINITION OF TERMS

Information and communications technology (ICT)

This is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information ((Laaria, 2013)

ICT Capacity Development

ICT Capacity Development refer to special ability (or expertise) that assists one to perform an activity by using a computer efficiently and its related peripherals in either teaching or learning (Hawkins, 2014).

ICT Infrastructure

ICT Infrastructure refers to an integrated system of facilities used to give one or more ICT services such as computers or internet (Aguyo, 2010)

ICT Integration

ICT integration refers to introduction, consolidation and full use of electronic means of capturing, processing, storing and disseminating information (Laaria, 2013)

ICT Legal and regulatory framework

This refers to laws and regulations that governs all ICT issues privacy, e-security, ICT legislation, cyber crimes, ethical and moral conduct, copyrights, intellectual property rights and piracy (Pelgrum, 2012)

ABSTRACT

Research shows that information communication technology plays a critical role in growing the economy of a country. Studies have demonstrated that the rapid development of economies in countries like China, Brazil, India, Russia and other developed economies can be ascribed to the impacts of information communication technology. Kenya vision 2030, which was designed to make Kenya a middle-level economy by bringing down cost of doing business, improving security and giving Kenyans a friendly working environment, recognized this, by putting implementation of information communication technology in schools at center of achieving the vision. This study sought to examine the determinants of the national information communication technology strategy implementation in public secondary schools in Nairobi County in Kenya. Specifically, the study sought to evaluate the effect of information communication technology infrastructure; information communication technology development; information communication technology legal and regulatory framework and information communication technology integration on the national information communication technology strategy implementation. Descriptive research design was used where the target population for the study consisted of all public secondary schools in Nairobi County. The study sampled each school principal and the information communication technology/curriculum teacher in data collection. A questionnaire was used to collect data. The study found out that infrastructure was the biggest determinant to the implementation of the information communication technology strategy in Kenya. Similarly, personnel training, regulatory framework and access to electricity played a significant role to the success of the information communication technology strategy in Kenya. The study concluded that the legal and regulatory framework is a major determinant of national information communication technology strategy implementation. The study recommended that for the strategy to successful all schools should have resources, both financial and technical, to help them to mitigate the effects of technical challenges that may choke the implementation process.

CHAPTER ONE

INTRODUCTION

According to Oliver, (2012) the rapid and pervasive implementation of new information and communication technologies (ICT) in the education system raises expectations regarding its potential for and contribution to the improvement of education. Blend of technologies have seen rapid changes in some areas, particularly in knowledge management, covering areas of knowledge creation, processing, storage, sharing, dissemination, collaboration and human resource development, in the level of education and training as well as work output and productivity. Leveraged by human capacity, this has prompted the creation of the current famous advantages referred to as 'Information and Communication Technology (ICT)' (Aduwa-Ogiegbaen & Lyamu, 2015).

ICT provides a powerful paradigm for economic development. Telecommunications infrastructure is the means through which information technology products and services are delivered to consumers (for local consumption and exports (Aguyo, 2010). According to Albirini, (2006) the economic benefits of information technology cannot be delivered to the economy and society without fast and competitive telecommunications.

ICT has impacted the way business is conducted, facilitated learning and knowledge sharing, and generated global information flows, empowered citizens and communities, resulting in a global information society (Sahin, 2006). Information and Communication Technology permeates the business environment and underpins the success of modern corporations as well as providing government with cost efficient civil service systems (Rebecca & Marshall, 2012). According to Priscilla *et al* (2008) countries must be able to benefit from the technological developments. To be able to do so, a cadre of professionals has to be educated with a sound ICT-background, independent of specific computer platforms or software environments.

From the 1980s implementation of ICT in schools has been mandatory in the developed countries. This is not the same in developing economies such as Kenya, where implementation came more recently, in small-scale and test manner. notwithstanding, it is generally recognized that implementation of ICT in schools has grown gradually in nearly similar pattern, from policy development, basic computer skills attainment, computer aided teaching and learning, communications and research, to utilization in every subject (Republic of Kenya, 2009).

According to Peeraer and Petergem, (2011) although Internet access in Africa is among the lowest in the world, ICT in Africa is rapidly increasing despite the lack of infrastructure. ICT policies are yet to be developed by governments in Africa to ensure successful integration of ICT in all spheres of society, especially in education (Akunja, 2011). At this time, the state of ICT in South African schools was worth considering, since only 26.5% of schools in South Africa were found to be having access to computers for teaching and learning in 2002, according to the White Paper on e-Education (Hawkins, 2014).

In 1921 the Department of Post and Telegraph (DPT) was set up. Jordan developed satellite communication links in the late 1970s and mobile telephone service (MTS) in the mid-1980s. This is not so in third world counties such as Kenya, where ICT integration in education is considerably more recent, small-scale and exploratory in most of the developing countries including Kenya (Ministry of Education, 2011). It is however, generally recognized that adoption of computers in education has progressed, in nearly identical pattern, from acquisition of basic computer skills, computer aided teaching, communications and research, to usage in every subject (Grabe, & Grabe, 2007). It is worthwhile pointing out that most developing countries including Kenya are largely at the basic levels of integration (Omwenga, 2007).

According to a report by UNESCO for the year 2015 on Information and Communication Technology (ICT) in education in Sub-Saharan Africa showed wide variations of ICTs

within secondary schools across Sub-Saharan Africa (Akunja, 2011). In 2014, ICTs were least common in Malawi, Mozambique and Zimbabwe, where 25% or fewer schools had neither radio, television nor computers. In Malawi just 14%, 1% and 2% of schools had radio, television and computers, respectively. SACMEQ defines radio as an essential class resource in secondary schools, given the scarcity of television and computers and the electricity to operate them (Hennessy, 2010).

However, many countries were not able to provide radios in the majority of schools, including Malawi, Mozambique, Tanzania, Uganda and Zimbabwe, resulting in the majority of children in secondary schools in these countries having had no access to any form of ICT (Oliver, 2012). In contrast Lesotho, Ghana, Nigeria and Zambia could partially bridge the ICT gap having established radio in 80%, 89% and 64% of secondary schools, respectively. Finally, ICTs were relatively well integrated in countries in Southern Africa. More than 60% of secondary schools in Botswana, Namibia and South Africa have radio, television and/or computers, while this figure increased to more than 90% of schools in Mauritius and Seychelles (Laaria, 2013).

1.1 Background of the Study

In Kenya, the Ministry of Education developed Kenya Education Sector Support Program (KESSP) in 2005 that highlighted ICT as one of the priority areas with the goal of mainstreaming ICTs into the teaching and learning process (Republic of Kenya, 2009). The National lCT Policy embedded this intent as a national priority and provided the impetus for the ministry to develop its sector policy on lCT in Education. The Ministry of Education was given the role to lead the monitoring and evaluation of the strategy's implementation, in line with overall government policies on education and lCT, specific education strategic documents for implementing its mandate, and global goals such as Education for All (EFA) and the Millennium Development Goals (MDGs).

The National ICT Strategy for Education and Training has fourteen components or rather objectives to be implemented. For the purpose of study, only four will be looked at with relevance to secondary schools. In 2008/2009, the Ministry selected three schools per district and each was given 1.5 million shillings. This money was to cater for buying of computers, installation of local area network and Management Information System and training (Kariuki, 2014).

According to Ministry of Education, (2011) educational systems around the world are under increasing urge to utilize Information and Communication Technology (ICT) to show students the knowledge and skills required in the 21st century (Omwenga, 2007). Development and application of ICT in African institutions of higher learning is critically important if the continent is to reduce the knowledge, technological and economic gaps between itself and the rest of the world (Hennessy, 2010). The government of Kenya recognizes implementation of ICT in secondary schools will contribute to knowledge production, information and communication sharing among the school community (Manduku, Kosgey & sang, 2012).

The government in sessional paper no. 1 of 2005 pointed that ICT has a straight role to play in schools and if utilized appropriately. It can bring numerous advantages to school as well as to the community. It was pointed that ICT will create new opportunities for teaching and learning by providing chances for teacher-to-learners, teacher-to-teacher and learner-to-learner communication and collaboration, enhanced access to various technologies offered by teachers, creating superior attention for learning among students and providing access to a wider variety of courses (Government of Kenya, 2005).

To this end, the government formulated national ICT policy on education in 2006 with a vision "A prosperous ICT-driven Kenya society" and mission "To increase the livelihood of Kenyans by facilitating the availability of efficient, accessible, reliable and affordable ICT services" (Government of Kenya, 2006). The policy indicated that the government

will facilitate implementation and utilization of ICT by schools in order to enhance quality of teaching and learning.

1.2 Statement of the Problem

Kenya vision 2030 was developed to shape Kenya to become a middle-level economy by bringing down cost of doing business, enhancing security and offering a friendly working environment for Kenyans and by placing implementation of ICT in schools at center of achieving the vision (GoK, 2007). ICT is essential in school since it supports various school functions such as; record keeping, research work, instructional uses like PowerPoint presentations, financial analysis, examination results analysis, communication, supervision and general school management functions (Ensminger *et al.,* 2014).

To successfully implement ICT in schools, equipping school with relevant ICT infrastructure, ICT integration, ICT Capacity Development and compliance with ICT legal and regulatory framework must be considered. Despite the apparent benefits of the use of ICT in schools, past research shows little commitment in implementing it thus depriving learners and the school community from accessing the potential of ICT (Hawkins, 2014).

The study identified that in Kenya, despite having a clear regulatory framework, the implementation process has been wanting as various schools had not implemented the ministry of education recommendation. The ratio of one computer to the number of students is still below the expected status. The study also noted that more needs to be done in respect to capacity development, human resource training and infrastructure development. This study therefore sought to fill this gap by analyzing the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya.

1.3 Objectives of the study

1.3.1 General Objective

To analyze the determinants of the national ICT strategy implementation in public secondary schools in Nairobi county in Kenya

1.3.2 Specific Objectives

i.   To evaluate the effect of ICT infrastructure on the national ICT strategy implementation in public secondary schools in Nairobi county in Kenya.

ii. To establish the influence of ICT Capacity Development on the national ICT strategy implementation in public secondary schools in Nairobi county.

iii. To establish the influence of ICT legal and regulatory framework on the national ICT strategy implementation in public secondary schools in Nairobi county in Kenya.

iv. To examine the effect of ICT integration on the national ICT strategy implementation in public secondary schools in Nairobi county in Kenya

1.4 Research Questions

i.   How does ICT infrastructure affect the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya?

ii. What is the effect of ICT Capacity Development on the national ICT strategy implementation in public secondary schools in Nairobi County Kenya?

iii. To what extent does ICT legal and regulatory framework affect the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya?

iv. How does ICT integration affect the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya?

1.5 Justification of the Study

The study findings specifically benefits:

1.5.1 Public Secondary Schools

The study findings can help various public secondary schools since it reveals the determinants of the national ICT strategy implementation in education and training thus enhancing effective implementation. The study highlights a full description of major determinants of the national ICT strategy implementation in education and training thus making it possible to pinpoint the crucial areas that need much attention when the national ICT strategy implementation this is expected to enhance productivity, effectiveness and efficiency in the school management process

1.5.2 ICT Policy Makers

This study is significant to ICT policy makers since it provides insights on how to develop relevant policies to facilitate the national ICT strategy implementation. Using the findings, they can base the ICT strategy on four guiding principles: infrastructure development, human resource development, stakeholder participation and appropriate policy and regulatory framework.

1.5.3 Academic Researchers

The study extends existing literature by addressing the gap on the determinants of the national ICT strategy implementation in education and training in public schools in Kenya. Moreover the study open areas for further research and a source of reference to academic researchers who are doing or tackling like topic in other institutions

1.6 Scope of the Study

The study used descriptive study design to analyze the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya. The study concentrated on four variables; ICT infrastructure, ICT Capacity Development, ICT legal and regulatory framework and ICT integration in implementation of the national ICT strategy in public secondary schools in Nairobi County in Kenya.

The target population for this study consisted of all public secondary schools in Nairobi County. The County has 60 public secondary schools which are categorized as Boys schools, Girls schools and mixed day/boarding schools. There are 29 mixed day/boarding schools, 16 girls' schools and 15 boys' schools making a total of 60 schools. In sixty schools there are 60 Head teachers and 60 ICT/curriculum teachers. The study sampled each school principal and the ICT/curriculum teacher in data collection where in sixty schools there are 60 Head teachers and 60 ICT/curriculum teachers. Thus, a sample of 120 respondents was used.

1.7 Limitations of the Study

The study is a preliminary descriptive study to the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya. The study covered all public secondary schools in Nairobi in Kenya as the case study. The study experienced the challenge of reluctant of respondents to disclose

some data and information they deemed confidential or some of respondents did not reveal some of information due to fear of victimization. Since the study used questionnaire as an instrument for data collection, some respondents were reluctant in filling the questionnaire where some questionnaires were returned late, unfilled and some were not returned at all.

This was mitigated through constant reminder to the respondents during the period they were having the questionnaire. The study presented an introduction letter obtained from the university to the organization management and this helped to reduce suspicion and enable the organization management to disclose much of the information sought by the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This literature review section analyzes relevant literature on the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya. This includes brief historical background and succinct definition of the national ICT strategy. The chapter develops conceptual framework, theoretical framework, and empirical review that was used in the study in regard to each variable in the study. Lastly it draws a critique of the existing literature relevant to the study and identified research gaps.

2.2 Theoretical Review

The theoretical review of a research relates to the philosophical basis on which the research takes place, and forms the link between the theoretical aspects and practical components of the investigation undertaken. As cited by Luhmann, (2010) good research should be grounded in theory. This study is guided by Diffusion of innovation theory, Unified Theory of Acceptance & Use of Technology (UTAUT), Technology Acceptance Model (TAM) and Institutional theory.

2.2.1 Unified Theory of Acceptance & Use of Technology (UTAUT)

The UTAUT theory was developed as an attempt to unify the constructs of the prominent competing IT acceptance models, including TAM. UTAUT conveys four key constructs that includes; performance expectancy, effort expectancy, social influences and facilitating conditions (Windschitl & Sahl, 2012). Performance expectancy relates to the degree to which an individual perceives that using a new innovation can facilitate improving his/her performance.

Effort expectancy measures the degree to which an individual perceives that the innovation will be easy to use. These two constructs are similar to those from TAM. Social influence refers to the degree to which an individual perceives that an important person around him/her feels that he/she should use the innovation (Sheingold & Hadley, 2000). Finally, facilitating conditions measure the degree to which an individual perceives that organizational and technical infrastructure exists to support the use of the system. Mooij and Smeets, (2001) suggest that adoption will occur when users perceive that performance expectancy; social influence and facilitating conditions are high. Contrarily, a high degree of effort needed to use an innovation will not favour adoption.

Other researchers Malcolm and Godwyll, (2008) have tried to extend the model, because the significance of the UTAUT factors may vary in different contexts. This makes it necessary to identify contextual interpretations and implications. Therefore this theory supports the variable by explaining how ICT infrastructure and access, development, legal and regulatory framework and integration affect the National ICT strategy implementation in public secondary schools in Nairobi County in Kenya.

2.2.2 Technology Acceptance Model (TAM)

TAM is a popular model in Information System adoption research (Kwake & Adigun, 2008). TAM suggests that technology acceptance is determined by perceived usefulness and perceived ease of use of an innovation. In addition, perceived ease of use influences perceived usefulness. Perceived usefulness and perceived ease of use are both influenced by external variables such as system characteristics, organizational influences, and the nature of development process.

Jimoyiannis and Komis, (2007) points out that the perceived usefulness refers to the degree to which a person believes that using a particular system would help to perform his/her job better; while perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort. This theory links: What is

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the effect of ICT Capacity Development on the national ICT strategy implementation in public secondary schools in Nairobi County Kenya?

2.2.3 Institutional Theory

The institutional theory is the traditional approach that is used to examine elements of public procurement (Malcolm & Godwyll, 2008). Higgins and Moseley, (2011) recognizes three pillars of institutions as regulatory, normative and cultural cognitive. The regulatory pillar focuses on use of rules, laws and sanctions as enforcement mechanism, with expedience as reason for compliance. According to Andoh, (2012) institutions consist of cultural-cognitive and regulative aspects that, together with associated activities and resources give meaning to life.

The normative pillar relates to norms (how things should be done) and values (the preferred or desirable), social responsibility being the reason for compliance (Hennessy, 2010). The cultural-cognitive pillar relies on shared understanding (common beliefs, symbols, shared understanding). According to Makau, (2006) the Kenyan Government has put in place a vast range of policy, institutional and legislative frameworks to solve the major causes of environmental degradation and negative effects on ecosystems caused by industrial and economic development programmes.

ICT does not exist in a vacuum; it exists within an organizational setup. The various components of ICT such as strategy and implementation, integration, infrastructure, and development must therefore be subject to the regulatory frameworks, procurement policies, and the value systems of the public schools in Nairobi County.

2.2.4 Rogers' Diffusion of Innovation Theory

The study is founded on the Rogers' Diffusion of Innovation Theory (Rogers, 2010) which seeks to explain how new ideas or innovations are adopted, and this theory proposes that there are five attributes of an innovation that effect its integration: relative advantage,

compatibility, complexity, triability, and observability. Relative advantage refers to the degree to which an innovation is seen to be superior to the idea it supersedes.

Rogers' theory proposes that innovations that have a clear, unambiguous benefit over the previous approach will be more easily embraced and implemented. Current research evidence indicated that if a potential user saw no relative benefit in using the innovation, it would not be adopted (Rogersand Kim, 2010). Compatibility referred to the degree to which an innovation fit with the current values, previous experiences, and needs of potential adopters.

There is solid direct research evidence proposing suggesting that the more compatible the innovation is, the greater the probability of adoption (Rogersand Kim, 2010). Complexity is the degree to which an innovation is viewed as difficult to comprehend and use. This theory is relevant to the current study because the integration of ICT in secondary schools in Kenya requires investing time, energy, resources, and innovations that can be attempted prior to being fully implemented and are more promptly adopted.

And lastly, observability refers to the degree to which the outcomes of an innovation are recognizable to the adopters. If there are observable positive outcomes from the implementation of ICT then the technology is more adoptable and implemented. The theory serves a diverse range of innovation adopters such as administrators, information technologists and change agents as well. The theory also benefits the targets of change, since respect and consideration for all involved stakeholders are intervened with robust strategies for implementing innovative change (Kaminski, 2011).

Diffusion of Innovations Theory helps communities to identify qualities such as relative advantage, compatibility among others that will make innovation more appealing to potential users who in this case, are the teachers. Furthermore, technologies are constantly changing and new hardware and software components are being introduced. It is therefore

imperative to have a solid understanding of how to introduce these new ideas in the social system. Diffusion theory helps further such understanding (Yates, 2001).

2.3 Conceptual Framework

A conceptual framework is used in to outline possible courses of action or to present a preferred approach to an idea or thought. Conceptual framework is a concise description of the phenomenon under study accompanied by a graphical or visual depiction of the major variables of the study (Mugenda, 2008). According to Kothari, (2004) conceptual framework is a diagrammatical representation that shows the relationship between dependent variable and independent variables. In the study, the conceptual framework will look at the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya.

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┌─────────────────────────────────┐
│ ICT infrastructure              │
│   •   Computers/laptops/ Projectors• │
│   •   Internet/network  connectivity │
│   •   • Availability of Electricity │
└─────────────────────────────────┘

┌─────────────────────────────────┐
│ ICT Capacity Development        │
│   •   ICT Personnel training     │
│   •   ICT training material in the │
│       library                    │
│   •   ICT skills and competence  │
└─────────────────────────────────┘

┌─────────────────────────────────┐
│ ICT legal and regulatory framework │
│     •   ICT policy               │
│   •   ICT regulations and        │
│       compliance                 │
└─────────────────────────────────┘

┌─────────────────────────────────┐
│ ICT integration                 │
│   •  ICT curriculum              │
│   •  Administrative support      │
│   •  Efficiency of using ICT     │
└─────────────────────────────────┘
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The National ICT strategy implementation
- Use of ICT tools in teaching
- Use of ICT in teachers training
- Access of ICT to teachers, staff and students

Independent Variables   **Dependent Variable**

Figure 2.1: Conceptual Framework

2.3.1 ICT infrastructure

Infrastructure refers to an integrated system of facilities used to provide one or more ICT services such as computers, internet and electricity. Aguyo, (2010), points out that, schools should be equipped with modern ICT devices for them to access internet fast. The computers ought to have latest version and computer packages so that students perform a wide range of tasks. She indicates that such hardware must be the latest multimedia with enough storage capacity and memory. Bauer and Kenton, (2015) points that lack of adequate ICT infrastructure has hindered provision of efficient and cost effective ICT

services in the country. She proposed that emphasis should be put on provision of hardware and software development in accordance changing technologies,

Regardless of a typical claim that investing in ICT is cost-effective, as well as the continuous decrease in ICT prices, the entire cost of procuring ICT software and hardware as well as upgrading, maintenance, development and acquiring right skills still remains high. Putting resources in ICT for schools could be perceived as an additional cost, and supporting appropriate ICT implementation is a problem experienced by several schools in third world countries, especially those that depend on donor support. Braak, (2011) argues that high cost for acquisition and maintenance of ICT infrastructure is a problem that has continued to hinder adoption and implementation of ICT in schools.

Hennessy, (2010) sees balancing educational goals with economic realities as one of the greatest problems that hinder implementation of ICT in school. Since implementing ICT requires large capital investments, schools should be keen in making decisions about what models of ICT to be implemented and should be aware of maintaining economies of scale. Truly, the main issue is whether the value added by implementing ICT counterbalances the cost considering the cost of alternatives. Many researchers and authors have argued that lack of physical educational facilities, like buildings, is the major challenge to implementation of ICT in schools in Africa (Hennessy, 2010).

ICTs need supporting physical infrastructure to be setup prior to their implemented. Instead, for many schools in third world countries like Kenya, there is seldom free room and in some schools, no suitable building at all. For these schools, the implementation of ICTs always require putting up special ICT rooms (computer lab) which can be costly.

Kenya Education Management Institute (2011) argues that, for effective integration of ICT in teaching and learning, schools should acquire appropriate hardware and software which should be well maintained. Such infrastructure includes computers, connectivity, projectors and laptops which are requisite for integration of ICT. Kenya Education

Management Institute, (2011) further points out that, schools in Kenya are gradually integrating ICT in teaching and learning. Procurement of ICT equipment depends on the vision and mission of the school and thus learning institutions are required to formulate the relevant policies that will assist in making ICT integration a reality in the teaching and learning process.

2.3.2 ICT Capacity Development

According to Hawkins, (2014) skill refers to the ability to do something well. ICT Capacity Development in this study will mean special ability (or expertise) enabling one to perform an activity using a computer and its related peripherals efficiently in either teaching or learning. Braak, (2011) argues that training is aimed at changing people's knowledge, experience, skills and attitudes. The shortage of adequately trained and experienced analysts, software engineers, systems and network managers hinder ICT Capacity Development in Kenya.

According to Albirini (2006), computer competence refers to educators beliefs about their computer knowledge and skills. Technology competency training enables the teachers to become most efficient individuals in handling daily tasks such as communicating with the student's parents; keeping records; conducting research in their domain; as well as preparing presentations (Priscilla *et al,* 2008). Hence, computer competence can be viewed in terms of teachers' beliefs regarding their knowledge, basic skill, and ability in performing essential tasks using the computers.

Computers are a crucial part of many work places and employers require both men and women with computers skills. Despite the fact that some workers come to the job with computer skils, many workers require training or retraining to cope with new computer hardware or software updates (Fu-Kwun, 2007). Sahin (2006) observed that computer training should not be confined to teachers who teach computing but to all teachers on the usage of computers. The need for computer training is augmented by the fact that most of

the teachers presently recruited receive little or no training in their formal education on the use of computers in teaching. It could also be an indication of the need to refresh teachers' knowledge in the world of fast moving communication technology.

Training of all teachers on the use of computers in education gets special importance when considering integrating computers into regular curriculum (Ministry of Education, 2011). Teachers are supposed to know how to use computers first before they can incorporate them in the curriculum. This could make ICT innovation easy to adopt and implement as the innovation to fit in the current users' objectives. Mumtaz, (2010) recommends professional development and training as a remedy for successful ICT implementation.

According to Schaffer and Richardson (2004) cited in (Afshari *et al,* 2009), when technology is brought into teacher education programs, the emphasis is often put on teaching about technology instead of teaching with technology. Hence, inadequate training on use of technology is one of the reasons why teachers do not systematically use computers in their classes. Teachers have inadequate skills and thus should be given opportunities to practice to utilize information communication technology during their teacher training programs for them to see how technology can be used to enhance their classroom activities (Afshari *et al,* 2009).

2.3.3 ICT Legal and Regulatory Framework

According to Pelgrum, (2012) ICT legal and regulatory framework provides for the creation of an enabling legal and regulatory environment that ensures the growth and development of the Information and Communications Technology (ICT) sector. The growth and development of ICT in schools is determined by legislations addressing issues including, inter alia, computer and computer related crime, consumer protection, intellectual property rights, dispute resolution and security, legal framework for e-business and innovation (Oliveira & Martins, 2011).

ICT Legal and Regulatory Framework ensure fair and equitable competition amongst service providers and promote rapid growth of new services and applications, promote appropriate training for the legal community on regulatory issues, including law enforcement agencies and monitor trends in ICT legislation internationally and adopt legislations that will establish a framework for creation of an Information Society and Economy (IS&E) (Oliver, 2012).

2.3.4 ICT Integration

ICT integration refers to introduction, consolidation and full use of electronic means of capturing, processing, storing and disseminating information. Infiltration of ICT in organizations should be carefully managed to better prepare for future ICT application adoption (Laaria, 2013). The forces that have driven adoption and incorporation of ICT in teaching and learning institutions include greater information access; greater communication, synchronous and asynchronous learning, increased cooperation and collaboration, cost-effectiveness and pedagogical enhancement (Liverpool, 2012).

ICT can be integrated into curriculum delivery through use of e-learning, video conferencing, electronic platforms, World Wide Web and open source software. Much as investment in ICT continues to increase, information communication technologies such as computers; video players and projectors have not been effectively used into lecture rooms in institutions of learning in Kenya (Aguyo, 2010).

Most teachers do not use these ICTs in lecture room as frequently in institutions of higher learning as policy makers and researchers expect (Akunja, 2011). However, inability to access and adopt information and communication technologies and knowledge has greatly hindered sustainable progress for individuals and communities as we enter the 21st century (Andoh, 2012). Although several studies had shown minimal ICT implementation in institutions of higher learning, ICT implementation had been investigated under different perspectives (e.g. attitude, time, age, motivation and income). Acquisition of

digital materials in learning institutions is essential because it helps to establish the probabilty that ICT will be embraced by the institutions.

Braak, 2011) shows that teachers show great interest and motivation to learn about the potential of ICT even though in practice, the use of ICT is relatively low and it is focused on a narrow range of applications, with word processing being the most predominantly used. Braak further indicates that lack of ICT infrastructure is one of the factors that contribute to non-usage of ICT in teaching and learning.

2.3.5 The National ICT Strategy Implementation

The National ICT Strategy offer guidelines for transformation of national into a digital society with aim of facilitating sustainable economic growth and development, and poverty eradication through productive and effective technologies According to Ministry of Education (2011) information and communication technologies in education generally refer to wide set of technological tools and resources used to communicate, create, disseminate, store and manage information.

Technologies of information and communication consists of computers, internet and broadcasting technologies such as radio, television and mobile phones (Kariuki, 2014). In educational context ICT defines various resources and tools presented on the computer that help connect various learning communities together in new and various ways (Mumtaz, 2010). Integrating ICT in teaching and learning is not a new concept in education. It is as old as other technologies such as radio. According to the Ministry of Education (2011) ICT integration refers to the seamless incorporation of technology to support and enhance student engagement in meaningful learning and for attainment of curriculum objectives.

Integration of ICT in education is essential in learning and teaching process as it increases learner's motivation, makes students to understand better abstract concepts, allows

collaborative learning and provides the opportunity for learning through simulation (Sahin, 2006). The origins of computer-assisted instructions where students learn from programmed computer package can be traced to the works of Marshall, (2012) on his work on experiments with ICT teaching machines which came as a result of dissatisfaction with traditional methods of learning which were teacher based and did not exploit the individual student potentials.

Marshall, (2012) suggested that, the experimental analysis of behavior could be applied in the construction of a teaching machine. The ICT teaching machine would present a carefully sequenced set of ideas to a student and reinforce his or her responses to direct behavioral capabilities. Skinner's ideas led to the development of programmed learning materials (Pelgrum, 2012). According to Grabe and Grabe, (2007) some factors influence the likelihood that ICT will be integrated in schools which include access to ICT facilities, teachers' expertise, ICT resourcing or cost, ICT leadership and general teaching. On teachers' ICT expertise, there is growing and widespread awareness that the pedagogical and technical expertise of the teacher is absolutely critical in the teaching and learning (Grabe and Grabe, (2007).

Information and communication technology integration is basically an individualized approach to teaching which allows students to work independently developing self-reliance which promotes mastery of content thus helping in mastery of learning sciences, (Bauer & Kenton, 2015). Effective introduction of ICT technology into schools is also widely dependent on the availability and accessibility of ICT resources such as hardware, software, and communication infrastructure (Liverpool, 2012).

Therefore, if technology cannot be accessible to as many educational institutions in sub-Saharan Africa, such as Kenya, then, its integration might face challenges or progress slowly, (Liverpool, 2012). However, Higgins & Moseley, (2011) noted in their study that, the situation has been progressing well in the last few years. Schools are increasingly being equipped with computers for teaching, learning and administrative purposes;

connectivity is improving and the students are enthusiastic about using computers for learning inspite of inadequacy of computers in the institutions (Higgins & Moseley, 2011)

2.4 Empirical Review

The empirical review bring into light previous research studies conducted on the field of research or study. It involves related study or exact previous study on the area of research. The empirical review encompasses the findings and recommendations in the previous studies on the determinants of the national ICT strategy implementation.

2.4.1 ICT Infrastructure

According to Liverpool, (2012 effective introduction of ICT technology into schools widely depend on the availability and accessibility of ICT resources including hardware, software, and communication infrastructure. Thus, if technology is not accessible to as many educational institutions in sub-Saharan Africa such as Kenya; then, its integration might face challenges or progress slowly, (Liverpool, (2002). instead, Bransford & Brown, (2010) noted in their study that the situation has improved in the last few years. Schools are increasingly being equipped with computers for teaching, learning and administrative purposes; connectivity is improving and the students are enthusiastic about using computers for learning inspite of inadequacy of computers in the institutions (Bransford & Brown, 2010).

2.4.2 ICT Capacity Development

Teachers' ICT skills and access to professional development play an important role in implementation of ICT in public schools. Many studies show that if teachers believe in ICT programs as either fulfilling their own needs or the needs of their students, it is likely they would adopt it in school. Research suggests teachers' attitudes, beliefs, skills, and adequacy of equipment influence effective implementation of ICT in schools (Hennessy 2010).

Unfortunately, in many African countries, shortage of well trained teachers and low levels of teachers' ICT skill and knowledge has been indicated as major hindrance in implementation of ICT in schools (Dzidonu, 2010). For effective implementation of ICT in schools, adequate personnel with correct skills is needed. It would be difficult to fully implement the technology in schools where such skills are missing. Research shows that the main challenge affecting most schools in the continent development is how to meet the severe deficit of skilled, competent and qualified teachers (Hennessy, 2010).

To successfully implement ICT in schools, there should have comprehensive pre-service courses on ICT that equips teacher trainees with the required skills. A study by Higgins, & Moseley, (2011) revealed that inability of teachers to understand why they should implement ICT in teaching and how exactly to implement was a hindrance to its implementation. Sadly, many teachers' training institutions in Africa often teach more about what is ICT rather than teaching how to utilize it during teaching and learning in classroom.

In addition, in-service courses for subject teachers already in the professional ought to be designed so as to direct them on how to utilize ICT during teaching and give them basic skills required for its implementation. Many authors believe that a continued professional development of teachers can help to successfully implement ICT in schools (Higgins, & Moseley, 2011; Dzidonu, 2010). A promising way forward should be a sustained professional development that offers teachers local professional capabilities, supports reflective classroom performance, and promotes peer learning by teachers of same age group and similar subjects. Teachers need to become constant learners, while teaching and even learning from students.

2.4.3 ICT legal and regulatory framework

According to Kozma (2012) policymakers are in a unique position to bring about change. This is illustrated in a study of 174 ICT-supported innovative classrooms in 28 countries.

In 127 cases, there was an explicit connection between the innovation and national policies that promoted the use of ICT (Jones, 2012). But while the introduction of ICT policy is necessary for change, it is not sufficient to result in its implementation or impact (Tyack and Cuban, 2014).

Policies can, of course, fail to succeed and this happens when: i) they are viewed as mere symbolic gestures; ii) teachers actively resist policy-based change that they see as imposed from the outside without their input or participation (Tyack & Cuban, 2000); iii) they do not have explicit connections to instructional practice (e.g. focus on hardware rather than their relationship to pedagogy); iv) they do not provide teachers with an opportunity to learn the policies and their instructional implications; and v) there is a lack of programme and resource alignment to the policies' intentions (Cohen & Hill, 2011).

Despite the importance of ICT in schools and the strategies developed by the government and other stakeholders, as formulated in sessional paper no. 1 of 2005, research has revealed that several schools were not efficiently implementing ICT to support teaching, learning and management in school. Manduku et al (2010) observed that despite the benefits of ICT, the school management had not fully implemented the policies developed by the Ministry of Education. Laaria, (2013) assert that some schools had developed guidelines on how to implement ICT but no attempt was made to implement them. This prompted an investigation of challenges that hindered efficient implementation of ICT in public secondary schools in Nairobi County.

2.4.4 ICT integration

Nchunge, Sakwa and Mwangi (2013) observed that many schools teachers are ill equipped to effectively integrate ICT in classroom due to inadequate number of computing infrastructure including computers, communication infrastructure involving telecommunication structures and roads as well as internet connectivity. This shows a very

slow integration pace and may lead to all benefits of ICT's un-equitably realized or not being realized in schools in the near future.

Many teachers perceive that adoption of ICT in school will leader them jobless due to it foreseen benefits such as e-learning and efficiency in the mode of delivery. A study by Unachukwu and Nwankwo (2012) on principals' readiness for the use of ICT in school administration in Anambra State of Nigeria revealed that most principals of secondary schools in the state shy away from computers claiming that the innovation is for the new age.

2.4.5 The National ICT strategy implementation

Kiptalam and Rodrigues (2010) conducted a study on implementation of ICTs among secondary school teachers in Kenya. The study employed a cross-sectional descriptive survey design, using quantitative approaches for data collection, analyses and reporting. The survey design was used to guide the research process and participants were drawn from eleven secondary schools that were connected to the internet. The schools studied were from both rural and urban settings. The sample could, however, not be generalized to all the schools in Kenya as only schools with internet connection were selected. This implies that schools with infrastructure other than internet connectivity were not represented in the sample. Furthermore, Kiptalam and Rodrigues (2010) used of questionnaires only to collect data collection, providing only quantitative data. However, there is need to employ qualitative approaches so as to obtain in-depth understanding as far as implementation of ICTs among secondary school teachers is concerned.

2.5 Critique of Existing Literature

Since the 1980s integration of ICTs in education has been compulsory in the developed nations. Jordan was one of the first Arab countries to introduce communication and information technology to the economy. In 1921 the Department of Post and Telegraph

(DPT) was set up. Jordan developed satellite communication links in the late 1970s and mobile telephone service (MTS) in the mid-1980s (Oliver, 2012). This is not so in developing nations such as Kenya, where ICT integration in education is considerably more recent, small-scale and experimental in most of the developing countries including Kenya.

It is however, generally recognized that adoption of computers in education has progressed, in nearly identical pattern, from acquisition of basic computer skills, computer aided teaching, communications and research, to usage in every subject. This has been accelerated by convergence of the computer and telecommunication technologies, particularly e-mail and Internet (Priscilla et al., 2008). This progression has been a result of various efforts, and a wide variation on the levels of ICTs integration to education curriculum, as determined by social and economic conditions of individual countries and regions. It is worthwhile pointing out that most developing countries including Kenya are largely at the basic levels of integration.

Furthermore, most developing countries currently place emphases, on new dimensions, pedagogical approaches and teaching and learning that would enhance knowledge in interactive and self-directed ways. This is commonly referred to as interactive education. Development and application of ICT in African institutions of higher learning is critically important if the continent is to reduce the knowledge, technological and economic gaps between itself and the rest of the world (Bauer & Kenton, 2015). Since the 1980s integration of ICTs in education has been compulsory in the developed nations.

This is not so in developing nations such as Kenya, where ICT integration in education is considerably more recent, small-scale and experimental in most of the developing countries including Kenya. It is however, generally recognized that adoption of computers in education has progressed, in nearly identical pattern, from acquisition of basic computer skills, computer aided teaching, communications and research, to usage in every subject.

This has been accelerated by convergence of the computer and telecommunication technologies, particularly e-mail and Internet.

2.6 Summary of Literature

Implementation of ICT in teaching of sciences in public secondary schools increases participation of students and makes learning more interactive. Ministry of Education, (2011) observes, schools in Kenya were slowly integrating ICT in teaching and its use was yet to become a reality in educational institutions. Pelgrum, (2012) similarly notes that, ICT was not well embedded in teachers' practices in the classroom and its use was ineffective and has proven difficult to integrate with traditional curriculum settings.

Centre for Mathematics, Science and Technology Education in Africa (Ministry of Education Science and Technology, 2005) also notes that, since introduction of SMASE in secondary schools in mathematics and sciences, ICT component has been very minimal. It was therefore important that ICT Integration determinants be studied for effective integration in the teaching of sciences. By being good examples in ICT use, visionary planners and overseers of ICT infrastructure, school leaders ought to be committed, champion and have enthusiasm in the implementation of ICT in their schools. They ought to oversee transformation of the school through being passionate, active and enthusiastic (Laaria, 2013). They should be involved, concerned and supervise the whole process, through encouraging staff professional development, sharing in decision making with other teachers, delegating responsibilities and formulate clear vision for the school. To be able to oversee the implementation, they need to be performance-oriented, creative thinkers, people-centered, promoters of professionalism and standards in the school.

Laaria, (2013) indicate that school leaders in many instances, facilitate implementation of the technology in their schools by maintaining the required infrastructure. Nonetheless, very few of the leaders use these facilities in significant way with students because they lack necessary vision and knowledge to lead transformation of the school through

implementation of ICT. In addition, the fear that the infrastructure can be damaged during the process of learning and teaching has continued to curtail innovative use of the ICT potential by the school community. In overall, implementation of ICT is becoming more crucial in schools and achievement of such implementation is often depends on presence of effective school leadership (Makau, 2006).

Teachers' ICT skills and access to professional development play an essential role in implementation of ICT in schools. Various studies indicate that if teachers view ICT programs as either satisfying their own needs or those of their students, they probably would implement it in school. Research recommends that teachers' attitudes, beliefs, adequacy, and skills influence successful implementation of ICT in schools (Hennessy, 2010). Unfortunately, in many African countries, inadequacy of well trained teachers and low levels of teachers' ICT skill and knowledge has been seen as major impediments in implementation of ICT in schools (Dzidonu, 2010). Thus, adequate personnel with correct skills is essential for efficient implementation of ICT in schools. Whereas it would be difficult to fully implement the technology in schools in which such skills are missing,.

2.7 Research Gap

Educational systems globally are under increasing pressure to use (ICT) to give students the knowledge and skills needed in the 21st century (Omwenga, 2007). Development and application of ICT in African academic institutions is essential if the continent is to reduce the gaps in knowledge, technological and economics existing between itself and the rest of the world (Andoh, 2012).

Manduku *et al* (2010) observed that despite the benefits of ICT, the management of various schools had not fully implemented the policies developed by the Ministry of Education. While the ratio of one computer to 15 students is the norm in most developed countries, the ratio in Africa stands at one computer to 150 students. This ratio is even wider in disadvantaged regions and areas. Despite developments in the use of ICT in

universities in Kenya, secondary schools still lag behind in ICT implementation. Many of the public secondary schools in Kenya have tried to progress in their implementation of ICTs, but it has not been effective (Government of Kenya, 2007).

According to Laaria, (2013) in Kenya, the ratio for university and colleges is one computer to 45 students, one computer to 120 students at secondary school level while access at the primary school level remains much more limited at one computer to 250 students. This suggests that ICT implementation in public secondary schools could be caused by a variety of problems and thus, need for this study analyze the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya. However, few scholars such as Bauer and Kenton (2005) argue that possessing ICT skills does not guarantee effective use of computers in teaching.

Dalton, (2009) found out that challenges affecting adoption of technology by mathematics and science teachers in secondary schools is that teachers with inadequate ICT proficiency are unwilling to upgrade their skills and thus have less confidence in using ICT for teaching. This shows that teachers ICT skills are critical for successful ICT implementation in the classroom. The study also discovered that despite having a clear regulatory framework in Kenya,, the implementation process has not been encouraging because many schools had not implemented the ministry of education recommendations. The ratio of computer to students is still below the required standard. The study also found out that more still needs to be done in capacity development, human resource training and infrastructure development. This study therefore sought to fill this gap by analyzing the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter focused on the research method used in the empirical part of this study, target population of the study, sample size and sampling technique, data collection method and instruments, data analysis and data presentation.

3.2 Research Design

A research design refers to a plan or a map or a framework that acts as a guide to a researcher on how to execute the investigation. Kothari, (2004) defines a research design as the scheme, outline or plan that is used to generate answers to research problems. In order to clearly analyze the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya, descriptive research design was used. This research design was preferred because of its ability to determine and report the way things are and also helps a researcher to describe a phenomenon in terms of attitude, values and characteristics (Mugenda, 2008)

3.3 Target Population

According to Kothari, (2004), a population is a well-defined or set of people, services, elements, events, group of things or households that are being investigated. Target population as defined by Mugenda, (2008) define population as a universal set of the study of all members of real or hypothetical set of people, events or objects to which an investigator wishes to generalize the result. The target population for this study consisted of all public secondary schools in Nairobi County. The County has 60 public secondary schools which are categorized as Boys schools, Girls schools and mixed day/boarding

schools. There are 29 mixed day/boarding schools, 16 girls' schools and 15 boys' schools making a total of 60 schools. In sixty schools there are 60 Head teachers and 60 ICT/curriculum teachers.

Table 3.1: Target population

Category of schools	Target Population
Mixed day/boarding schools	29
Girls schools	16
Boys schools	15
Total	**60**

3.4 Sample size and Sampling Technique

Mugenda, (2008) observed that researchers select a sample due to various limitations that may not allow researching the whole population. According to Kothari (2004) a representative sample is one which is at least 10% of the population thus the study sample involved all head teachers and ICT/curriculum teachers in all public secondary schools in Nairobi County. The study sampled each school principal and the ICT/curriculum teacher in data collection where in sixty schools there were 60 Head teachers and 60 ICT/curriculum teachers. Therefore a sample of 120 respondents was used.

This research study used a stratified random sampling method to select the study respondents. According to Mugenda and Mugenda (2008) a sample size of between 10% and 30% is a good representation of the target population but the population in the target area is too big to apply a 10-30% sample. For the purposes of this study, the number of respondents will be determined using below formula adopted from Mugenda and Mugenda (2008):

$$n = \frac{z^2 pq\mathsf{n}}{d^2}$$

Where by n = the desired sample size, z = the standard normal deviation at the desired confidence level, p = the proportion in the target population estimated to have characteristics being measured (estimated proportion of an attribute that is present in the population). Using 90% confidence level and 10% level of statistical significance set, the sample size:

$$n = \frac{(1.645)^2 \times 0.9 \times 0.5}{0.1^2} \quad 0.1^2$$

$$= 120 \; Respondents$$

Note: Z-values (Cumulative Normal Probability Table) represent the probability that a sample will fall within a certain distribution. The Z-values for 90 percent confidence level is 1.645. The study assumed that at least 90% of the population would be knowledgeable and hence qualified as possible respondents.

Table 3.2: Sample Size

Category of schools	Total number of schools	Sample Size	
		H/teachers &	**ICT/curriculum teachers**
Mixed day/boarding schools	29	58	
Girls schools	16	32	
Boys schools	15	30	
Total	**60**	**120**	

3.5 Data Collection Instruments

According to Ngechu (2006), Barampuram & Zhang (2011), Hooykaas (2010) & Rivera *et al*., (2012) there were many methods of data collection. The choice of a tool and instrument depends mainly on the attributes of the subjects, research topic, problem question, objectives, design, expected data and results. The study used both primary and secondary data. Primary data was gathered by use of questionnaires, while secondary data was obtained from published documents or materials such as journals and magazines. These supplemented the primary data received from questionnaires.

A research questionnaire was used as the main instrument for data collection which is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from the respondents. The questionnaire was structured to provide for open and closed ended questions. The study considered questionnaires for they have advantages over other types of research instruments in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys and often have standardized answers that make it simple to compile data. A sample of the survey questionnaire is provided in appendix I.

A cover letter from JKUAT Nairobi CBD Campus was taken along to enable the administering of the questionnaire. The respondents were assured of confidentiality of their names and responses and that the responses were not be handled by any other person but rather was used purely for academic purposes. Each questionnaire was coded and only the researcher was able to know which person responded. The coding technique was only used for the purpose of matching returned, completed questionnaires with those delivered to the respondents.

3.6 Pilot Study

According to Mugenda, (2003) pilot test is necessary and the validity of a study. A pilot test was conducted using questionnaires administered to school head teachers and ICT/curriculum teachers. This constituted 10% of the 60 public schools in Nairobi County for school head teachers and ICT/curriculum teachers (10% of 60) = 6 was selected using simple random sampling. In each school the head teachers and ICT/curriculum teachers were targeted. This constituted the respondents in each school and therefore the total number of the respondents for the pilot was 6 respondents. The pilot was undertaken to pretest data collection instrument for validity and reliability. According to (Orodho, 2003) a pilot study is necessary for testing the reliability of data collection instruments.

3.6.1 Reliability of the Instrument

Reliability is the degree to which an assessment tool produces stable and consistent results (Kothari, 2004). Reliability of research as determines whether the research truly measures that which it was intended to measure or how truthful the research results are. Pilot study was thus conducted to detect weakness in design and instrumentation and to provide accurate data for selection of a sample.

Reliability of the questionnaire was evaluated through administration of the said instrument to the pilot group. Reliability is the degree to which an assessment tool produces stable and consistent results. The Cronbach's Alpha Test of Reliability was used to test the reliability of the constructs describing the variables of the study. According to Mugenda, (2008) a-score exceeding 0.7 indicates high internal reliability of the scale items. The attained alpha scores imply acceptable level of reliability of the measures. This study used 0.7 score which was adequate to test acceptable level of reliability.

3.6.2 Validity of the Instrument

According to (Kothari, 2004), validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon. The validity of the questionnaire was determined using construct validity method. Construct validity is the degree to which a test measures an intended hypothetical construct (Mugenda, 2003). Using a panel of experts familiar with the construct is a way in which this type of validity can be assessed; the experts can examine the items and decide what that specific item is intended to measure (Kothari, 2004).

The study used different groups of experts in the field of ICT and issued them with the questionnaires. The experts were required to assess if the questionnaires helped in establishing the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya. Validity measured the degree to which data collected using a particular instrument represented a specific domain of indicator of content of a particular concept.

3.7 Data Analysis and Presentation

This study produced both quantitative and qualitative data to explain the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya exhaustively. Once the questionnaires were received, they were coded and edited for completeness and consistency. Quantitative data was analyzed by employing descriptive statistics and inferential analysis using statistical package for social science (SPSS).

This technique gives simple summaries about the sample data and present quantitative descriptions in a manageable form, (Orodho, 2003). Together with simple graphics analysis, descriptive statistics form the basis of virtually every quantitative analysis to data, (Kothari, 2004). The study conducted a regression analysis to establish the

relationship between the dependent and independent variables of the study. The study also conducted a correlation analysis to establish the strength of the relationship between the independent and dependent variables were employed. The data was then presented using frequency distribution tables, bar charts and pie charts for easier understanding.

3.7.1 Multiple Regression Analysis Model

The national ICT strategy implementation in public secondary schools in Nairobi County in Kenya was regressed against four variables: ICT infrastructure, ICT Capacity Development, ICT legal and regulatory framework and ICT integration. The equation was expressed as follows:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mathcal{E}$.   Where:

Y= The National ICT strategy implementation;

α= Constant of Regression;

β=Beta Coefficients;

X_1= ICT infrastructure;

X_2= ICT Capacity Development;

X_3= ICT legal and regulatory framework;

X_4= ICT integration

$\mathcal{E}$=Error of Regression

3.7.2 Analysis of Variance

The study conducted an analysis of variance in order to test the following hypothesis;

H0:   There is a significant relationship between ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework and National ICT strategy implementation in Nairobi County.

Ha: There is no significant relationship between ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework and National ICT strategy implementation in Nairobi County.

CHAPTER FOUR

RESEARCH FINDINGS, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter discusses the findings as obtained from the data analysis. Various techniques of data analysis were applied including descriptive statistics of frequencies, percentages, mean and standard deviation. Moreover, inferential statistics were used in which case regression analysis was applied to determine the relationship between variables. The first sections of the chapter present the response rate and general information of the participants. The other part discusses the main findings in the light of the objectives of the study. Findings were presented in tables, pie charts and bar graphs.

4.2 Response Rate

The study targeted 120 officials. However, those who completed and submitted their questionnaires were 103 while the rest 17 did not respond to the questionnaire. This is an indication that the response rate for the study was 85.8%. According to Kothari (2004) a response rate above 75% is considered adequate to base the conclusions of a study on. Based on this preposition, the researcher found a response rate of 85.8% adequate to base the inferences and conclusions on. The findings are presented in figure 4.1 below;
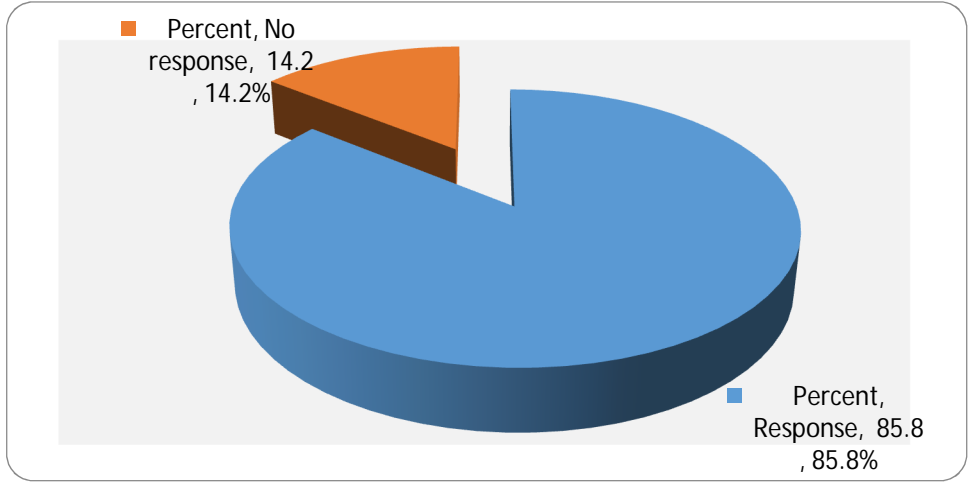
Figure 4.1: Response rate for the study

4.3 General Information

4.3.1 Gender of the Respondent

With regard to gender, majority of the respondents were male (71.8%) while female were 28.2%. This implies that headteachers and ICT/Curriculum teachers are mostly men in public secondary schools in Nairobi County.
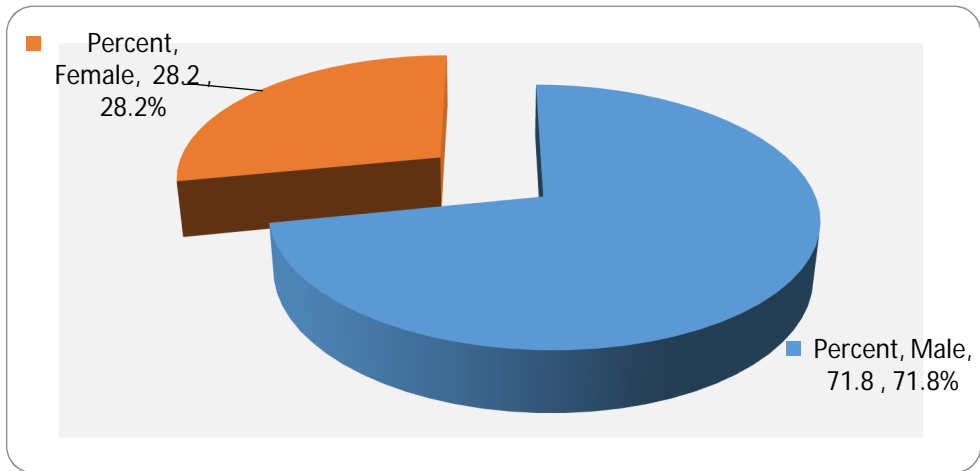
Figure 4.2: Respondents' gender

4.3.2 Age of the Respondents

As illustrated in Figure 4.3, 56.3% of the respondents were aged 31-40 years while 18.4% of them were 21-30 years old. Those aged 41-50years were 16.5% while only 8.7% were over 50 years old. This indicates that majority of the headteachers and ICT/Curriculum teachers in public secondary schools in Nairobi County are 21 to 40 years old.
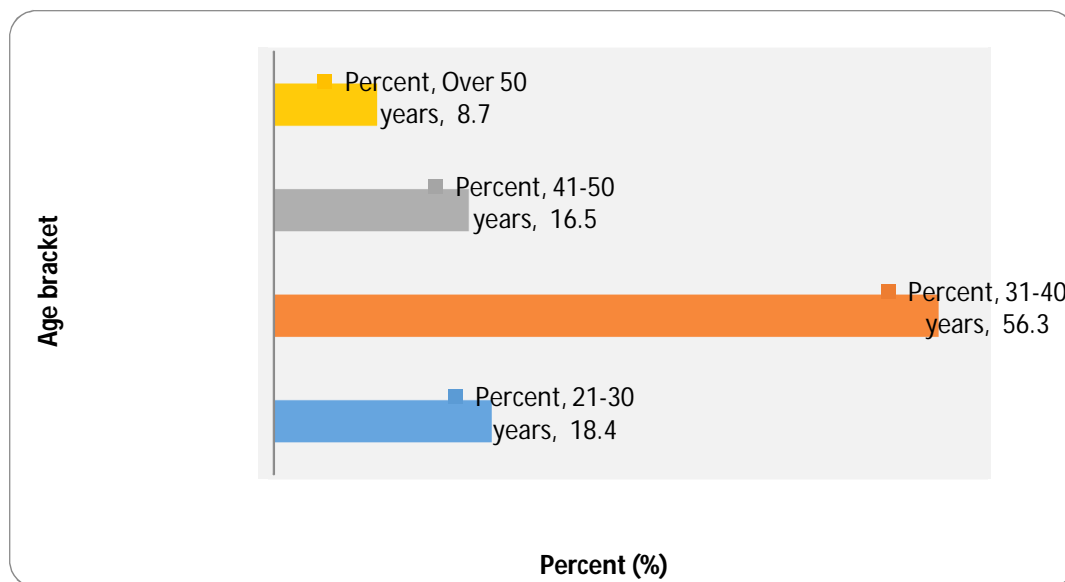
Figure 4.3: Respondents' age bracket

4.3.3 Position Held

On the position held, 62.1% of the respondents were ICT/Curriculum teachers while headteachers were 37.9%. The low number of headteachers could be attributed to their busy schedules which made some of them unable to complete and return their questionnaires. Even so, the distribution of the positions was considered a good representation of the targeted population.
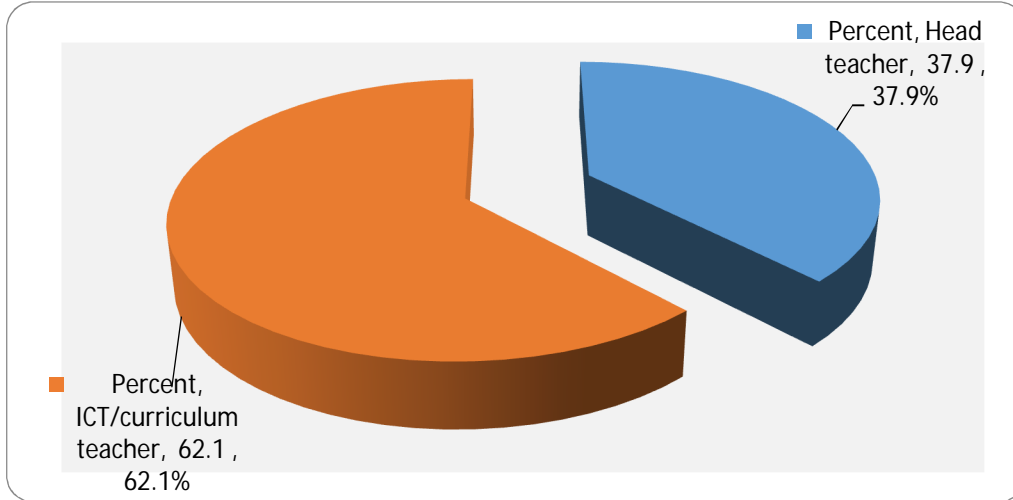
Figure 4.4: Respondents' position

4.3.4 Years Worked in the School

Regarding the number of years worked at their current school, 47.6% of the respondents asserted that they had served in their respective schools for 6-10 years. Quite a number had served for 11-15 years (24.3%) while a few had worked for 1-5 years (16.5%). The remaining 11.7% had worked for over 15 years. This is an indication that majority of the respondents had an experience of six to fifteen years in their present schools. This is adequate experience to have an in-depth understanding of the issues investigated in this study, hence this enhanced reliability of the information collected.
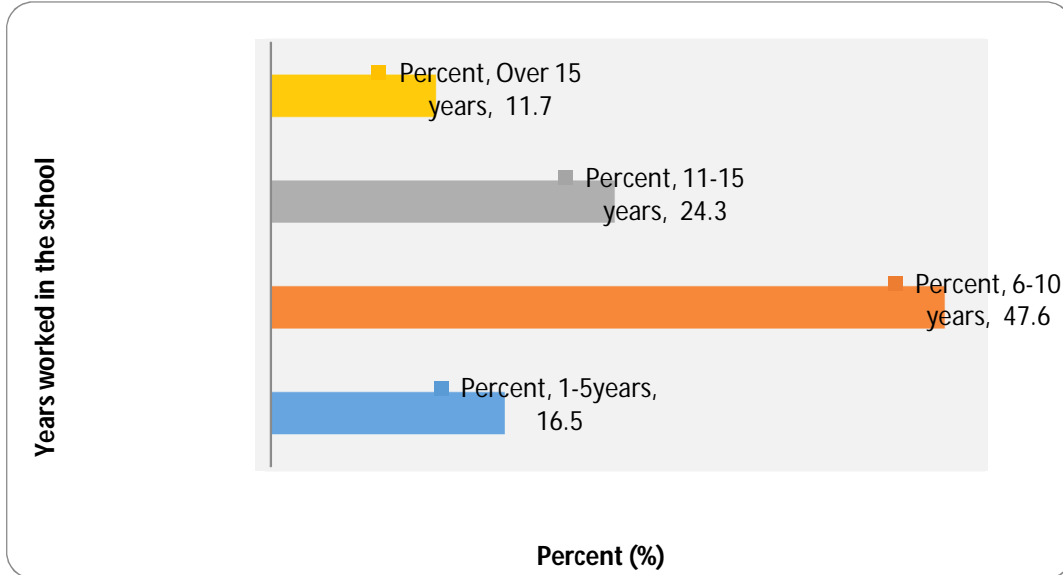
Figure 4.5: Duration worked in the school

4.3.5 Education Level

As to their education level, most of the respondents (51.5%) affirmed that they had a bachelor's degree. Those who had masters were 39.8% with few having a diploma (7.8%). Only 1.0% had a certificate. This implies that majority of the respondents had quite a high level of education which made it easy for them to understand the subject matter examined in the questionnaire hence stood a better chance to give relevant and useful information.
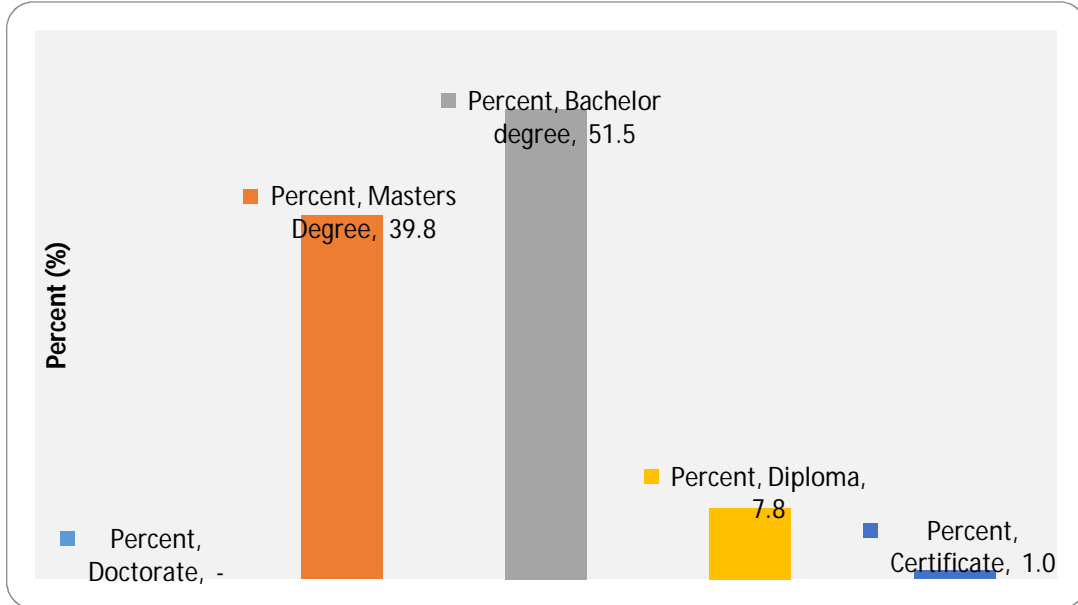
Figure 4.6: Respondents' level of education

4.4 Descriptive Statistics

Descriptive statistics were used to assess the effect of ICT infrastructure, ICT Capacity Development, ICT legal and regulatory framework as well as ICT integration on the national ICT strategy implementation. On each aspect, respondents were presented with a range of statements proposing the various ways each aspect was likely to influence national ICT strategy implementation. They rated the statements on a scale of 1-5 where: 1 was strongly disagree; 2 was disagree; 3 was neutral, 4 was agree, and 5 was strongly agree. The mean as well as the standard deviations were then computed for the ratings. High mean (closer to 5) indicated a high dominance level of the subject indicator in influencing national ICT strategy implementation and vice versa. Standard deviation was used to measure the degree of unanimity in responses. Lower standard deviation was interpreted to express similar or close to similar opinions among the respondents. The findings for the various aspects were as discussed in sections 4.4.1 through 4.4.5.

4.4.1 Effect of ICT Infrastructure

With respect to the effect of ICT infrastructure, the overall effect averaged at a mean of 4.3 with a standard deviation of 0.8. This is an indication that in general, ICT infrastructure greatly affects national ICT strategy implementation in public secondary schools in Nairobi County. In this regard, respondents affirmed that the major effect is from electricity with the highest mean of 4.5 with a low deviation of 0.8. This is followed by the effect exerted by Computers, laptops and Projectors (mean = 4.3; Sdv 0.9) and internet and network connectivity (mean = 4.1; Sdv 0.7) in that order. This implies that while addressing the ICT infrastructure issues (with a view to enhance national ICT strategy implementation), the first priority should be on electricity installation and maintenance; then avail and maintain ICT hardware (computers, laptops and projectors) and last but not least, ensure stable internet and network connectivity.

Table 4.1: ICT Infrastructure and National ICT Strategy Implementation

Statements	1	2	3	4	5	Mean	Sdv
Computers, laptops and Projectors affect National ICT strategy implementation in public secondary school			25.6	17.9	56.4	4.3	0.9
Internet and network connectivity affect National ICT strategy implementation in public secondary school			19.2	47.4	33.3	4.1	0.7
Electricity affect National ICT strategy implementation in public secondary school		1.3	12.8	24.4	61.5	4.5	0.8
Average						**4.3**	**0.8**

4.4.2 Effect of ICT Capacity Development

Pertaining to the influence of ICT Capacity Development, its overall rating stood at a mean of 4.0 with a standard deviation of 0.9. This indicates that national ICT strategy implementation in public secondary schools in Nairobi County is greatly determined by ICT Capacity Development. In particular, findings indicated that the ICT Capacity Development aspect that exerts the greatest effect, is ICT Personnel training (mean = 4.4; Sdv 0.6) followed by ICT skills and competence (mean = 4.2; Sdv 0.9). ICT training material was found to have a moderate effect as implied by its lower mean of 3.5 although its standard deviation was relatively high at 1.3 indicating that quite a number of respondents had a different opinion.

Table 4.2: ICT Capacity development and National ICT Strategy Implementation

Statements	1	2	3	4	5	Mean	Sdv
ICT Personnel training affect the National ICT strategy implementation in public secondary schools	-	-	6.4	48.7	44.9	4.4	0.6
ICT training material in the library affect the National ICT strategy implementation in public secondary schools	12.6	12.6	32.0	6.8	37.9	3.5	1.3
ICT skills and competence affect the National ICT strategy implementation in public secondary schools	-	9.0	1.3	48.7	41.0	4.2	0.9
Average						**4.0**	**0.9**

4.4.3 Effect of ICT Legal and Regulatory Framework

From the findings, the overall effect of ICT legal and regulatory framework was rated at a mean of 4.1 with a standard deviation of 0.7. This is an indication that ICT legal and regulatory framework is a major determinant of national ICT strategy implementation in public secondary schools in Nairobi County. Specifically, its greatest effect was attributed to ICT Standards as indicated by its highest mean of 4.3 and a standard deviation of 0.8.

This was followed by ICT policy (mean = 4.1; Sdv 0.7) while the effect of ICT regulation compliance was last at a mean of 3.9 and a standard deviation of 0.7.

Table 4.3: ICT Legal & Regulatory framework and National ICT Strategy Implementation

Statements	1	2	3	4	5	Mean	Sdv
ICT policy affect the National ICT strategy implementation in public secondary schools			19.2	47.4	3.3	4.1	0.7
ICT regulation compliance affect the National ICT strategy implementation in public secondary schools			32.1	44.9	23.1	3.9	0.7
ICT Standards affect the National ICT strategy implementation in public secondary schools		1.3	5.4	37.2	46.2	4.3	0.8
Average						**4.1**	**0.7**

4.4.4 Effect of ICT Integration

Regarding the ICT integration, its overall effect was rated at a mean of 4.3 with a standard deviation of 0.7. This implies that ICT integration also has a great effect on national ICT strategy implementation. In line with this, respondents highly affirmed that cost of using ICT exerts the major effect with a mean of 4.4 and a minimal deviation of 0.6. On the same note, the effect of ICT curriculum and Administrative support were rated equally at a mean of 4.3 each.

Table 4.4: ICT Integration and National ICT Strategy Implementation

Statements	1	2	3	4	5	Mean	Sdv
ICT curriculum affect the National ICT strategy implementation in public schools			16.7	41.0	42.3	4.3	0.7
Administrative support affect the National ICT strategy implementation in public schools	1.0	2.5	4.6	48.7	43.1	4.3	0.8
Cost of using ICT affect the National ICT strategy implementation in public schools	1.9	2.9	3.9	44.2	48.7	4.4	0.6
Average						**4.3**	**0.7**

4.4.5 National ICT Strategy Implementation

The level of national ICT strategy implementation was rated at a mean of 3.6 although there were some considerable different opinions as reflected by the slightly high deviation of 1.1. From the findings, implementation was found to have been largely promoted by the Minister of Education and the Permanent Secretary who were highly affirmed as demonstrating a very strong commitment to the importance of ICT in education (mean = 4.5; Sdv = 0.6). It was also strongly asserted that there is a strong belief that the incorporation of ICTs is essential at all education levels and this is shared from the political to the student level (mean = 4.4; Sdv = 0.8). Respondents further attested that the government has managed to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms (mean = 4.2; Sdv = 1.0).

On the other hand, national ICT strategy implementation was found to be undermined by failure by the government to create awareness of the opportunities offered by ICT as an educational tool to the education sector (mean = 2.6; Sdv = 1.4). The government was also portrayed as having not managed to promote the development of an integrated e-learning curriculum to support ICT in education (mean = 2.8; Sdv = 1.3). It was further blamed as not having managed to facilitate sharing of e-learning resources between schools (mean = 2.9; Sdv = 1.4).

Table 4.5: Perception on National ICT Strategy Implementation

Statements	1	2	3	4	5	Mean	Sdv
a) The Minister of Education and the Permanent Secretary demonstrate a very strong commitment to the importance of ICT in education.	-	1.0	1.0	40.8	57.3	4.5	0.6
b) There is a strong belief that the incorporation of ICTs is essential at all education levels and this is shared from the political to the student level	1.0	2.9	2.9	43.7	49.5	4.4	0.8
c) The government has managed to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms	2.9	4.9	4.9	41.7	45.6	4.2	1.0
d) The government has managed to promote the development of content to address the educational needs of secondary schools	6.8	6.8	4.9	49.5	32.0	3.9	1.1
e) The government has managed to promote the development of e-learning resources.	14.6	20.4	9.7	32.0	23.3	3.3	1.4
f) The government has managed to facilitate sharing of e-learning resources between schools	20.4	26.2	12.6	24.3	16.5	2.9	1.4
g) The government has managed to promote the development of an integrated e-learning curriculum to support ICT in education	18.4	28.2	16.5	24.3	12.6	2.8	1.3
h) The government has managed to create awareness of the opportunities offered by ICT as an educational tool to the education sector	24.3	33.0	10.7	20.4	11.7	2.6	1.4
Average						**3.6**	**1.1**

4.5 Inferential Statistics

4.5.1 Correlation Analysis

Table 4.6: Correlation matrix

		National strategy implementation ICT	ICT integration	ICT infrastructure	ICT Capacity Development	ICT legal and regulatory framework
Pearson Correlation	National ICT strategy implementation	1.000	0.805	0.755	0.780	0.769
	ICT integration	0.805	1.000	0.489	0.658	0.602
	ICT infrastructure	0.755	0.489	1.000	0.507	0.740
	ICT Capacity Development	0.769	0.658	0.507	1.000	0.626
	ICT legal and regulatory framework	0.780	0.602	0.740	0.626	1.000

Variable relationship was based on Pearson correlation coefficient (r). This helped to show the relationship between all the variables under study. Correlation analysis indicated that all the variables were positively correlated with each other. The most positively correlated variables were ICT integration and National ICT strategy implementation with a correlation coefficient of 0.805. On the other hand, ICT infrastructure and ICT integration were the least correlated with a correlation of 0.489.

4.5.2 Coefficient of determination (R square)

Table 4.7: Coefficient of determination on National ICT strategy implementation

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.891	0.793	0.719	0.175

Predictors: (Constant), ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework

Through regression analysis, the Coefficient of determination (R square) was used to show the extent to which any change in dependent variable was explained by the independent variables collectively. From the findings, R square was 0.793 which indicates that ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework collectively influence approximately 79.3% of any change in National ICT strategy implementation. The rest of the changes (that is 20.7%) in National ICT strategy implementation is caused by other factors except the ones covered by the independent variables.

4.5.3 Beta-Coefficients and the Regression Constant

Table 4.8: Coefficients of ICT determinants on National ICT strategy implementation

	Coefficients(a)				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.493	0.177		5.120	.000
ICT integration	0.621	0.064	0.697	9.201	.000
ICT infrastructure	0.447	0.080	0.511	3.775	.009
ICT Capacity Development	0.322	0.050	0.373	2.816	.017
ICT legal and regulatory framework	0.385	0.047	0.425	3.559	.000
Dependent Variable: National ICT strategy implementation					

To determine the relationship between the dependent variable (National ICT strategy implementation) and the independent variables (ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework) the standardized Beta coefficients generated from regression analysis were used to develop the regression model for the relationship. The model was therefore estimated as:

$$Y = 0.493 + 0.511X^1 + 0.373X^2 + 0.425X^3 + 0.697X^4 + \varepsilon$$

Y= The National ICT strategy implementation;

X_1= ICT infrastructure;

X_2= ICT Capacity Development;

X_3= ICT legal and regulatory framework;

X_4= ICT integration

Ɛ=Error of Regression

National ICT strategy implementation was expressed as a function of ICT integration, ICT infrastructure, ICT Capacity Development as well as ICT legal and regulatory framework. To achieve standardized coefficients, all the variables were analyzed using regression tools. From the regression coefficients, the study found that an increase of a unit of ICT integration leads to an increase in National ICT strategy implementation by 0.697 while an increase of a unit of ICT infrastructure increases the National ICT strategy implementation by 0.511.

Similarly, an increase by one unit of ICT legal and regulatory framework results to an increase in National ICT strategy implementation by 0.425 while an increase in ICT Capacity Development by one unit was found to increase National ICT strategy implementation by 0.373. The regression constant was 0.493 which means that if ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework are held constant (at zero); in other words, if they are absent, National ICT strategy implementation would be 0.493 out of 5.

4.5.4 Hypothesis Testing

In further analysis, the researcher further considered the t-statistics generated alongside the beta coefficients to test hypotheses at bivariate levels. At this level, t-test (Student's t-distribution) was considered. The following were the hypotheses:

H0$_1$: There is no significant relationship between ICT infrastructure and National ICT strategy implementation

H0$_2$: There is no significant relationship between ICT Capacity Development and National ICT strategy implementation

H0₃: There is no significant relationship between ICT legal and regulatory framework and National ICT strategy implementation

H0₄: There is no significant relationship between ICT integration and National ICT strategy implementation

The critical value for t at 102 degrees of freedom (df = 103 – 1) at 95% confidence level, 2-tail test was 1.984. Given that calculated t-score was 3.775, 2.816, 3.559 and 9.201 for ICT infrastructure, ICT Capacity Development, ICT legal and regulatory framework, and ICT integration respectively, the criteria is to reject the null hypothesis for all explanatory variables since the values for $t_{calculated}$ for each variable is greater than $t_{critical}$ (1.984). Thus, there is significant relationship between each of the independent variables (ICT infrastructure, ICT Capacity Development, ICT legal and regulatory framework, and ICT integration) and the dependent variable (National ICT strategy implementation).

4.5.5 Analysis of Variance (ANOVA)

Table 4.9: Analysis of Variance (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	21.720	4	5.430	93.621	0.001
Residual	5.659	98	0.058		
Total	27.379	102			
Predictors: (Constant), Change in ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework					
Dependent Variable: National ICT strategy implementation					

At this level F-test was used with Analysis of variance (ANOVA) used to generate the F value. The ANOVA showed relationship in the variables between and within the measure of the dependent variable. It reflects the magnitude the model has on the data compared to those that are not considered in the model (residual). ANOVA table assisted the

researcher in evaluating the general hypothesis at multivariate level to determine the suitability of the model to the data analyzed. The decision criteria is, if $F_{Critical} > F_{Calculated}$ then accept the **H0** and conclude that the independent variables jointly, have no significant relationship with the dependent variable.

The general hypothesis tested at multivariate level for this study was stated as:

H0: There is a significant relationship between the four determinants of ICT (ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework) and National ICT strategy implementation in Nairobi County.

According to the ANOVA results, the probability value for the regression model was 93.621. Given that $F_{Critical}$ (3.719) is less than $F_{Calculated}$ (93.621) then the criteria for decision making is to accept the null hypothesis and reject the alternative hypothesis and conclude that the four independent variables (ICT integration, ICT infrastructure, ICT Capacity Development and ICT legal and regulatory framework) are critical in determining the dependent variable (the National ICT strategy implementation).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study sought to analyze the determinants of the national ICT strategy implementation in public secondary schools in Nairobi county in Kenya by reviewing the current situation in relation to the laid down policy framework being guided by past and recent literature. After a successful data collection and analysis exercise, this chapter presents a summary of the major findings and conclusions drawn from the findings. It also presents recommendations also based on the findings as well as the suggestions for further studies in order of the study objectives.

5.2 Summary of Findings

The purpose of the study was to analyze the determinants of the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya. In particular, the study sought to evaluate the effect of ICT infrastructure; ICT Capacity Development; ICT legal and regulatory framework and ICT integration on the national ICT strategy implementation in public secondary schools in Nairobi County in Kenya.

5.2.1 Effect of ICT Infrastructure

With respect to the effect of ICT infrastructure, the overall effect averaged at a mean of 4.3 with a standard deviation of 0.8. Respondents affirmed that the major effect is from electricity with the highest mean of 4.5 with a low deviation of 0.8. This is followed by the effect exerted by Computers, laptops and Projectors (mean = 4.3; Sdv 0.9) and internet and network connectivity (mean = 4.1; Sdv 0.7) in that order. From correlation analysis, the Pearson correlation coefficient between ICT infrastructure and National ICT strategy

implementation was 0.755 indicating a strong positive correlation between ICT infrastructure and National ICT strategy implementation. From regression analysis the standardized Beta coefficient for ICT infrastructure in the estimated regression model was 0.511 indicating that a unit increase in ICT infrastructure increases National ICT strategy implementation by 0.511 units.

5.2.2 Influence of ICT Capacity Development

Pertaining to the influence of ICT Capacity Development, its overall rating stood at a mean of 4.0 with a standard deviation of 0.9. In particular, findings indicated that the ICT Capacity Development aspect that exerts the greatest effect, is ICT Personnel training (mean = 4.4; Sdv 0.6) followed by ICT skills and competence (mean = 4.2; Sdv 0.9). ICT training material was found to have a moderate effect as implied by its lower mean of 3.5. From correlation analysis, the Pearson correlation coefficient between ICT Capacity Development and National ICT strategy implementation was 0.769 indicating a strong positive correlation between ICT Capacity Development and National ICT strategy implementation. From regression analysis the standardized Beta coefficient for ICT Capacity Development in the estimated regression model was 0.373 indicating that a unit increase in ICT Capacity Development increases National ICT strategy implementation by 0.373 units.

5.2.3 Influence of ICT Legal and Regulatory Framework

From the findings, the overall effect of ICT legal and regulatory framework was rated at a mean of 4.1 with a standard deviation of 0.7. Specifically, its greatest effect was attributed to ICT Standards as indicated by its highest mean of 4.3 and a standard deviation of 0.8. This was followed by ICT policy (mean = 4.1; Sdv 0.7) while the effect of ICT regulation compliance was last at a mean of 3.9 and a standard deviation of 0.7. From correlation analysis, the Pearson correlation coefficient between ICT legal and regulatory framework and National ICT strategy implementation was 0.780 indicating a strong

positive correlation between ICT legal and regulatory framework and National ICT strategy implementation. From regression analysis, the standardized Beta coefficient for ICT legal and regulatory framework in the estimated regression model was 0.425 indicating that a unit increase in ICT legal and regulatory framework increases National ICT strategy implementation by 0.425 units.

5.2.4 Effect of ICT Integration

Regarding the ICT integration, its overall effect was rated at a mean of 4.3 with a standard deviation of 0.7. This implies that ICT integration also has a great effect on national ICT strategy implementation. In line with this, respondents highly affirmed that cost of using ICT exerts the major effect with a mean of 4.4 and a minimal deviation of 0.6. On the same note, the effect of ICT curriculum and Administrative support were rated equally at a mean of 4.3 each. From correlation analysis, the Pearson correlation coefficient between ICT integration and National ICT strategy implementation was 0.805 indicating a strong positive correlation between ICT integration and National ICT strategy implementation. From regression analysis, the standardized Beta coefficient for ICT integration in the estimated regression model was 0.697 indicating that a unit increase in ICT integration increases National ICT strategy implementation by 0.697 units.

5.3 Conclusion

From the findings, it can be inferred that the national ICT strategy implementation has been moderate. So far, the implementation has been steered through the very strong commitment by the Minister of Education and the Permanent Secretary in the ministry in demonstrating the importance of ICT in education. The strong belief in stakeholders that the incorporation of ICTs is essential at all education levels and the perception that this is shared from the political to the student level has also influenced the implementation positively. The provision of affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms by the government has also made a

positive contribution. However, implementation is being chocked by failure by the government to create awareness of the opportunities offered by ICT as an educational tool to the education sector as well as not being able to promote the development of an integrated e-learning curriculum to support ICT in education.

Generally, ICT infrastructure greatly affects national ICT strategy implementation. To enhance national ICT strategy implementation by addressing the ICT infrastructure issues, the first priority should be on electricity installation and maintenance; then avail and maintain ICT hardware (computers, laptops and projectors) and further ensure that there is a stable internet and network connectivity.

The national ICT strategy implementation in public secondary schools is greatly determined by ICT Capacity Development. In particular, it can be deduced that ICT Personnel training and ICT skills and competence are fundamental in achieving the desired levels of implementation. Moreover, ICT training materials are also vital in realizing ICT Capacity Development for enhanced national ICT strategy implementation.

The study concludes that ICT legal and regulatory framework is a major determinant of national ICT strategy implementation. This will however be realized when there are adequate and quality ICT Standards and ICT policy designed to promote national ICT strategy implementation. While this is important, it also necessary to ensure there is stakeholders' compliance with the set regulation. That is to say, first have quality standards and policy, and then enforce compliance for the legal and regulatory framework to effectively promote national ICT strategy implementation.

It was deduced that ICT integration also has a great effect on national ICT strategy implementation. In this regard, it was inferred that when considering ICT integration to improve the level of national ICT strategy implementation, cost of using ICT, ICT curriculum and Administrative support must be factored. The cost should be affordable,

while the ICT curriculum should be relevant. Those charged with managing the implementation must also be supportive in the process.

5.4 Recommendations

As a part of the implementation process all schools should have resources, both financial and technical, to help them to mitigate the effects of technical challenges that may choke the implementation process. It should be ensured that the hardware is readily available and functional at all times which means organizing for power back-ups in case of black outs. There is also need to team up with telecommunication companies to ensure continuously stable and reliable internet connectivity is ensured.

Moreover, the importance of financial resources to the success of the policy implementation cannot be underplayed. Hence, Governments should strategically plan and continuously support the process financially.

ICT training should be designed to incorporate self-learning methods that allow teachers to truly understand the benefits of ICT aligned to their independent teaching methods. This could include capitalizing on the technology being used, such as online professional development modules. To maintain these benefits over the long term, teachers and students must also be kept up to date with advances in technology, and know how and when to use it.

The government through the Ministry of Information, Communication and Technology should ensure that, they develop adequate policies geared towards ensuring that ICT equipment procured and used to implement the national ICT strategy implementation are up to standards. In conjunction with the Ministry of Education, they also need to see to it that the secondary schools adhere to the set policies in in as much as regulations online consumer protection are developed, enforcement mechanisms are strengthened to ensure

that the regulations are fully enforced. Otherwise, if regulations are well constructed, without appropriate enforcement, their positive contribution will be minimal.

Ongoing feedback should be also be gathered from all relevant stakeholders especially the teachers to assess the applicability, relevance and clarity of the policy. It is recommended the policy also comprise an explicit outline of the evaluation and analysis processes to be used.

Moreover, enabling teachers to integrate ICT into their pedagogy must be a priority. Teachers' prior training should be considered including their current use of technology in the classroom, their existing ICT skills, and their gaps of knowledge. This information should guide the formulation of the professional development modules for teachers in the integration process.

ICT specialist personnel may be needed where teachers may have difficulties utilizing technology correctly and expertise should be readily availed to fix technical difficulties that may arise at any time.

5.5 Suggestion for Further Studies

This study focused on the analyzing the determining factors of the national information communication technology strategy in secondary schools in Nairobi County. This study suggests a further research on the impact of the national ICT policy on ICT literacy around the country. This will be helpful in assessing the success or the failure rate of the strategy as a whole.

The study also suggests a further study to establish in detail the factors leading to noncompliance of the ministry of education directive on the integrations of ICT in the secondary school curriculum since the findings show that some of the schools had not implemented the strategy due to several constraints which were not highlighted in this study.

Lastly, the study suggests an inter-county study showing the state of implementation of the ICT policy in other counties across the country. This will be insightful in order to determine a national average on the level of compliance to the national ICT strategy.

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APPENDICES

Appendix I: Questionnaire

Please help me to collect data for my Master's program by taking a few moments to fill out this survey form. This questionnaire is meant to collect data regarding "*the determinants of the national ICT strategy implementation in education and training in public secondary schools in Nairobi County in Kenya*"

PART 1: GENERAL INFORMATION

(Kindly tick or write where applicable)

1. Gender: Male   ( )   Female   ( )

2. Age: 21-30 years ( ) 31-40 years ( ) 41-50 years ( ) Over 50 years   ( )

3. School position: head teacher ( )   ICT/curriculum teacher   ( )

4. Years worked in the school:

      1-5years ( )   6-10 years (   ) 11-15 years (   )   Over 15 years (   )

5. Education level: *(tick the highest level reached):* Doctorate ( )   Masters Degree ( )   Bachelor degree ( )   Diploma   (   )   Certificate ( )

Any other specify……………………………………………………….................

SECTION B

PART 1: ICT INFRASTRUCTURE

6. How does ICT infrastructure affect National ICT strategy implementation in your school?

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7. On a scale of 1 to 5 where 1. Strongly disagree. 2. Disagree, 3.neutral, 4. Agree, and 5. Strongly agree; please indicate your position on the effect of ICT infrastructure on National ICT strategy implementation in public secondary school, ticking where applicable.

Statements	1	2	3	4	5
Computers, laptops and Projectors affect National ICT strategy implementation in public secondary school					
Internet and network connectivity affect National ICT strategy implementation in public secondary school					
Electricity affect National ICT strategy implementation in public secondary school					

8. In which other ways does ICT infrastructure affect the National ICT strategy implementation in public secondary schools?

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9. What can be done to improve the ICT infrastructure in your school?

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PART 2: ICT CAPACITY DEVELOPMENT

10. How does ICT Capacity Development affect National ICT strategy implementation in your school?

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11. On a scale of 1 to 5 where 1. Strongly disagree. 2. Disagree, 3.Neutral, 4. Agree, and 5. Strongly agree; please indicate your position on the effect of ICT Capacity Development on the National ICT strategy implementation in public secondary schools, ticking where applicable.

Statements	1	2	3	4	5
ICT Personnel training affect the National ICT strategy implementation in public secondary schools					
ICT training material in the library affect the National ICT strategy implementation in public secondary schools					
ICT skills and competence affect the National ICT strategy implementation in public secondary schools					

12. In which other ways does ICT Capacity Development affect National ICT strategy implementation in public secondary schools?

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13. What should be done to improve ICT Capacity Development in your school?

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PART 3: ICT LEGAL AND REGULATORY FRAMEWORK

14. How does ICT legal and regulatory framework affect National ICT strategy implementation in your school?

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15. On a scale of 1 to 5 where 1. Strongly disagree. 2. Disagree, 3.neutral, 4. Agree, and 5. Strongly agree; please indicate your position on the effect of ICT legal and regulatory framework on the National ICT strategy implementation in public secondary schools, ticking where applicable.

Statements	1	2	3	4	5
ICT policy affect the National ICT strategy implementation in public secondary schools					
ICT regulation compliance affect the National ICT strategy implementation in public secondary schools					
ICT Standards affect the National ICT strategy implementation in public secondary schools					

16. In which other ways does ICT legal and regulatory framework on the National ICT strategy implementation in public secondary schools?

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17. What can be done regarding ICT legal and regulatory framework to enhance the National ICT strategy implementation in public secondary schools?

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PART 4: ICT INTEGRATION

18. How does ICT integration affect the National ICT strategy implementation in your school?

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19. On a scale of 1 to 5 where 1. Strongly disagree. 2. Disagree, 3.neutral, 4. Agree, and 5. Strongly agree; please indicate your position on the effect **ICT integration on** the National ICT strategy implementation in public schools, ticking where applicable.

Statements	1	2	3	4	5
ICT curriculum affect the National ICT strategy implementation in public schools					
Administrative support affect the National ICT strategy implementation in public schools					
Cost of using ICT affect the National ICT strategy implementation in public schools					

20. In which other ways does ICT integration affect the National ICT strategy implementation in public schools?

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21. In your own opinion what should be done regarding ICT Capacity Development to enhance the National ICT strategy implementation in public secondary schools?

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PART 5: THE NATIONAL ICT STRATEGY IMPLEMENTATION

22. Using tick (✓) in the box indicate the extent to which you agree with the following statements on National ICT Strategy Implementation. Use a scale where 1 = Strongly Agree; 2 = Agree; 3 = Neutral; 4 = Disagree and 5 = Strongly disagree.

Statements	1	2	3	4	5
The government has managed to promote the development of e-learning resources.					
The government has managed to promote the development of an integrated e-learning curriculum to support ICT in education					
The government has managed to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms					
The government has managed to promote the development of content to address the educational needs of secondary schools					
The government has managed to create awareness of the opportunities offered by ICT as an educational tool to the education sector					
The government has managed to facilitate sharing of e-learning resources between schools					

There is a strong belief that the incorporation of ICTs is essential at all education levels and this is shared from the political to the student level				
The Minister of Education and the Permanent Secretary demonstrate a very strong commitment to the importance of ICT in education.				

23. In your own opinion what need to be done to enhance the implementation of National ICT Strategy in public secondary schools in Kenya?

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Thank you very much for participating in this study.