

**FACTORS INFLUENCING INTEGRATION OF INFORMATION
AND COMMUNICATION TECHNOLOGY IN TEACHING AND
LEARNING IN PUBLIC SECONDARY SCHOOLS IN KENYA: A
CASE OF KAJIADO CENTRAL SUB-COUNTY.**

By

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DECLARATION

This is to declare that this research project is my own original work and it has not been presented to any other university for a degree or diploma award.

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This research project Report has been submitted with our approval as the University supervisors

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DEDICATION

I dedicate this Research Project to My daughter Naserian Leanne Wanjiru and my Mum Laura Wanjiru Wairiuko for being my pillars in my studies and my life as a whole. Your understanding, endurance and constant support while studying gave me the zeal to work hard. I love you all and may the Lord Bless you.

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ABBREVIATIONS AND ACRONYMS

MOE	Ministry of Education
ICT	Information and communication
MOEST	Ministry of Education, Science and Technology
NEPAD	New partnership for African Development
AIDS	Acquired Immune Deficiency Syndrome
NGfl	National Grid for Learning
IRIGOK	Government of Kenya
BOG	Board of Governors
HIV	Human immune virus
IRI	Interactive Radio Instructions
IT	Information Technology
KESSP	Kenya Education Sector Support Programme
MDGs	Millennium Development Goals
MHEST	Ministry of Higher Education, Science and Technology
NCST	National Council for Science and Technology
STIC	School Technology Innovation Center
UNESCO	United Nations Education, Scientific and Cultural Organization
USAID	United States Agency for International Development
SPSS	Statistical Package for Social Sciences

ABSTRACT

Information communication technology (ICT) is a major drive in most world economies. Hardly any aspect of human endeavor can be effectively carried on without Information communication technologies (ICTs) including education. ICT is now at the center of education reform in line with the technological development of the 21st century. Although schools have had computers for almost two decades, ways to use them effectively have evolved slowly and patchily. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. This creates a digital divide between the developed countries and the developing countries in relation to integration of ICTs in teaching and learning.

The purpose of this study is; to assess the ICT facilities and infrastructure; to determine Human resource capacity; to establish the school administrative practice and assess the school structure in ICT integration in teaching and learning in public secondary schools in Kajiado Central Sub-County. Descriptive survey design was used to establish the factors that influence the integration of ICT in teaching and learning in public secondary schools in Kajiado Central Sub-County. In 2010/2011, under the Economic Stimulus Programme, Kshs.980 million was allocated for equipping of 5 public secondary schools from each Sub-Constituency with a comprehensive ICT infrastructure. A total of 1021 schools throughout the country benefited. The package included training of 10,500 teachers, 1021 head teachers and 210 ICT champions from the beneficiary schools. The 5 schools constitute 11% of the total population. The Deputy Principal and Subject Heads filled the questionnaire. The principals had a scheduled interview. Questionnaires and interview schedule enabled the researcher to collect data. Piloting was done in one school to test the reliability and validity of the research instruments. The data collected was analyzed using statistical package for social sciences (SPSS). Descriptive statistics such as frequencies, percentages and mean were used to present the results of the study and the general trends; this involved tabulating and describing data. This was followed by a discussion of the finding, drawing conclusions and giving recommendations based on the findings in the study. The study findings revealed that inadequate ICT infrastructure such as number of computers, limited ICT skills and training, limited access to technical support, poor internet connection, and unreliable power supply hinder the integration of ICT in teaching and learning in secondary schools. Despite the school leadership supporting ICT integration, they lacked the ICT knowledge, funds to purchase more computer and to maintain those purchased through the government project. Four years down the line, most of the school still maintained the eleven computers, one projector and one laptop given to them by the government. The study therefore recommends that the Government continues funding the schools to increase the number of computers. More in-service training for teachers to enhance ICT skills in teaching and learning. Communication Network should be improved to ensure reliable internet connectivity. Rural Electrification should be enhanced to ensure reliable power without rationing.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Research shows that adopting and using ICT in schools leads to significant expansion of education and pedagogical outcome which are beneficial to both teachers and students. When used appropriately, ICT can help to strengthen the importance of education to increasingly networked society, raising quality of education by making learning and teaching an active process connected to real life (Zaman, Shamim & Clement, 2011). Further studies shows that the adoption and use of ICT in schools can promote collaborative, active and lifelong learning, increase students' motivation, offer better access to information and shared working resources, deepen understanding, help student think and communicate creatively (Khan, Hasan & Clement, 2012). In other words, ICT seems to change the way teaching and learning is carried out in schools. With emerging uses of ICT in schools, teaching could be changed from emphasis on teacher centered to student centered, hence creating interesting and interactive learning environment. ICT facilitates a pedagogical shift entailing an educational interaction between teachers and learners.

However, studies suggest the benefits of adopting and use of ICT in schools all over the world has not been automatic. The effective implementation of ICT in schools is a multifaceted, complex process that just not involves providing the technology to schools but also involves infrastructure, teachers' competencies, schools readiness, long term financing and curriculum restructuring, among others (Zaman et al, 2011).

In practice, the usual teaching and curricula approaches still remain basically unchanged in many schools, while the technology is typically poorly adopted and underused in classroom (Dzidonu, 2010). It appears that the emphasis is on students ICT capabilities rather than application of ICT knowledge and skills to other subjects across the syllabus. Keengwe, & Onchwari, (2011) notes that, despite rapid growth in ICT access by teachers and students both at home and school, and substantially improved school ICT infrastructure (connection to internet, computer labs, availability of educational software, etc.) most teachers are not keen in adapting and using ICT tools during

teaching and learning. It appears that their skills and attitudes towards ICT remain a challenge for them to adopt and use efficiently the technology in classroom.

Considerable research establishes that teacher skills and attitudes influence the decisions they make during planning for teaching. Jimoyiannis, & Komis, (2007) observed that most of reforms and initiatives initiated in schools failed due to their top-down approach that did not take into account teachers' skills, interest, and existing knowledge. Therefore an investigation of teachers ICT skills can provide insights into their preparedness in adopting and using technology in classroom. Both policy makers and research community in the world have been pre-occupied with establishing efficient and best ways of preparing teachers to adopt and use ICT as part of their daily teaching strategy.

Studies shows that all over the world, different countries have consistently initiated programs that are directed in making teachers adopt and use ICT in their day-today teaching and learning practices in school. According to Jimoyiannis, & Komis, (2007) countries like UK, Singapore, China, Australia, European Union (EU), etc. have established programs that aim at enhancing teachers' skills important in adapting and using ICT during teaching and learning processes. Many researchers consider designing and integrating efficient ICT teacher preparation programs as a key aspect to essential and successful, wide-ranging school reforms (Khan et al, 2012).

Across Africa, many countries have started investing considerable amount of money and designing new policies all aimed at making teachers adopt and use ICT in schools. However, there are many challenges some of which could be attributed to the teachers' skills in using ICTs (Zaman et al, 2011). For ICT to be effectively implemented in schools, teachers should be prepared to face challenges that come with its implementation.

In Kenya, the government has recognized ICT as a vehicle for driving the country economy and as one of the pillars for realization of Vision 2030 due to its positive effect in making the country a middle level economy. Effort to implement ICT in schools was first initiated by publishing sessional paper No.1 of 2005 where ICT was given prominence. The idea was to equip public secondary schools with ICT infrastructure and integrate it in existing school curriculum in order to meet the challenges of information society.

The publication stated that in every school; teacher, student and communities around it should participate in acquiring ICT skills desirable to benefit from knowledge-based economy by year 2015.

Learning and teaching in schools was to be transformed to embrace ICT skills appropriate for twenty first century (GOK, 2005).

In 2006 the government disseminated National ICT policy on education with a section emphasizing that the government will encourage adoption and use of ICT in schools through; 1) promoting affordable ICT infrastructure in schools in order to facilitate acquisition of skills and knowledge through e-learning, 2) creating awareness of opportunities offered by ICT in schools, 3) promoting development of local e-content in order to address the needs of individual schools, 4) promoting enabling environment for integrating e-learning in curriculum to support ICT in schools, 5) promoting integration of ICT resources with other existing school resources, 6) establishing a national ICT centre of excellence where schools can draw parallels, 7) facilitating sharing of ICT resources between schools, 8) promoting public – private partnership in mobilizing resources to support ICT initiatives in schools, 9) promoting and facilitating training of teachers and school managers on ways to adopt and use ICT through in-service courses, and 10) facilitating rural electrification and connecting schools to electricity grid in order to support ICT, among other policies (GOK, 2006).

The Ministry of Education Science and Technology (MOEST) and the private sector are doing a commendable job in introducing ICT to schools. Private non-governmental organizations such as Computer for Schools Kenya (CFSK) who are donating computers to Kenyan public secondary schools. Some of achievement so far include; connecting over 300 rural schools with electricity, equipping over 500 public secondary schools with computers, establishing a unit at Kenya Institute of Education (K.I.E) to provide leadership in implementation of ICT in schools, Launching of e-content for schools in March 2010 by K.I.E, partnering with several organizations and private sector in providing computers to schools, among others (Laaria 2013). These efforts reflect the seriousness the government is attaching to implementation of ICT to schools.

Despite its importance and strategies developed by government to implement ICT in schools, research conducted in many schools in the country has established that most of them are not effectively adopting and using ICT to support learning, teaching and management as intended (Manduku, Kosgey, & Sang, 2012). Laaria, (2013) revealed that despite efforts made by various stakeholders and importance of the ICT in education sector, the National ICT policy on education of 2006 has not been effectively implemented as was intended. While many countries have reported over 41% adoption of ICT in classroom in public secondary schools, the proportion remains

considerably low in Kenya. This may be, because the strategy adopted by the government did not take into consideration teachers' skills, attitudes and reactions towards these new tools.

It is with this background that an investigation of the factors affecting integration of information and communication technology in teaching and learning in public secondary schools in Kajiado Central Sub-County was conceptualized.

1.2 Statement of the Problem

Research shows that ICT plays a leading role in promoting the economy of a country. Studies have shown that the rapid development of economies in countries like China, Brazil, India, Russia and other developed economies can be attributed to the impacts of ICT. Kenya vision 2030, which was formulated to make Kenya a middle-level economy by lowering cost of doing business, improving security and providing Kenyans with a friendly working environment, recognized this, by placing implementation of ICT in schools at center of achieving the vision (GOK, 2007).

While other countries have achieved over 41% implementation of ICT in secondary schools, the percentage in Kenyan schools remains very small (Laaria, 2013). ICT is important in school because it performs 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.

To successfully implement ICT in schools, access to good quality electricity is a elemental provision. Secondly, equipping school with relevant infrastructure like building, retrofitting physical facilities, purchases of hardware and software and the like must be considered. Thirdly, professional development of teachers through in-service courses should be well planned. Lastly, school leaders should have interest, committed and champion the implementation. To achieve this, the government has partnered with private sector and other stakeholders in the process of implementing ICT in schools. Further, the Ministry of Education has been conducting in-service courses to equip teachers and school leaders with necessary ICT skills.

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 factors affecting integration of information and communication technology in teaching and learning process as well as challenges that hinder efficient implementation of ICT in public secondary schools in Kajiado Central Sub-County.

1.3 Purpose of the Study

The purpose of the study was to investigate factors affecting integration of information and communication technology in teaching and learning in public secondary schools in Kajiado central Sub-County, Kenya.

1.4 Objectives of the Study

The following were the objectives of the study:

- i. To determine the influence of availability and access to ICT infrastructure on the integration on ICT in teaching and learning process by public secondary schools in Kajiado Central Sub-County.
- ii. To examine the extent to which the human resource capacity influences ICT integration in teaching and learning process by public schools in Kajiado Central Sub-County.
- iii. To establish the influence of school leadership on ICT integration in teaching and learning process by public secondary schools in Kajiado Central Sub-County.
- iv. To examine the extent to which school structures influence ICT integration in teaching and learning process by public secondary schools in Kajiado Central Sub-County.

1.5 Research Questions

This study sought to answer the following broad questions:

- i. What is the influence of availability and access to ICT infrastructure on ICT integration in teaching and learning process by public secondary schools in Kajiado Central Sub-County?
- ii. To what extent does the human resource capacity influences ICT integration in teaching and learning process by public Secondary schools in Kajiado Central Sub-County?

- iii. What is the influence of school leadership on ICT integration in teaching and learning process by public secondary schools in Kajiado Central Sub-County?
- iv. What is the Status of the school structures in ICT integration in teaching and learning teaching and learning in Kajiado Central Sub-County?

1.6 Significance of the Study

The emerging global economy has sharpened the focus of education towards innovation, initiative; accessing, processing, and applying large amounts of information; exercising appropriate judgment; and collaborating with others to make sense of new situations. The stakes are high as the new labor force must meet the demands of the changing world in order to participate in market-driven economies, as well as understand and take on social responsibilities to conserve and utilize precious resources, protect the environment, and mitigate public health issues such as HIV/AIDS. ICTs have the potential to play a powerful role in enhancing the tools and environment of learning and preparing students to acquire skills, competencies and social skills fundamental for competing in the emerging global “knowledge” economy.

Research and experience has shown that ICT tools, if well utilized in the classroom, have the potential to enhance the learning process. The research study is meant to enlighten the general public and various education stakeholders that ICT tools hold a great promise for developing economies like Kenya. The study can help in formulation of policies and strategies that can be used to enhance or improve the academic standards in our schools

This study sought to examine the hindrances that Public school face in ICT integration in teaching and learning process, therefore there will be appropriate coping mechanism applied as a result of studying the presence or absence of hindrances, their extent and the alternative measure. The significance of the study was to make recommendations on how address the challenges at policy formulation level, integration level as well as instructional level.

The education sector in Kenya will have firsthand situational report on the current practices whereby institutional and operational bottlenecks will be exposed so as to embrace the industry best practices to enhance competitiveness in ICT integration.

Industrial players will also be in a position to take advantage of the findings and recommendation of the study.

The study was carried out at a time when the taskforce on a Re-alignment of the education sector to constitution and Vision 2030 have made recommendations to integrate ICT in teaching and learning. As a result the study sort to collect data when it is timely enough in order to reflect the gaps that exist in terms of Policy framework, institutional preparedness as well as infrastructural capabilities. The Ministry of Education will benefit from the findings of this study greatly in their contexts since it highlighted any areas that required their attention.

1.7 Limitation of the Study

The study was carried out in Kajiado Central Sub-County, which is approximately 83 kilometers from Nairobi. It has five Sub-Counties. It's well-endowed with Natural resources such as wildlife, open grasslands, wooded bush lands, open bushes, woodlands and forests. The Main Economic Activities include pastoralist livestock herding, tourism, agriculture and urban-life activities like cattle trading. The investment in education includes both the private and public primary schools that feed the fairly well distributed secondary schools.

Time, financial constraints, poor road and communication network were expected in this study. Use of Questionnaire helped in saving time in the data collection process. The schools were located in the interior with untamacked roads and no access by public transport. Use of Motorbike made it easier to maneuver through all routes and collect data.

1.8 Scope of the Study

The study was designed to examine factors influencing integration of information and communication technology in teaching and learning in public schools in Kajiado Central Sub-County. The scope of the study under education institutions was narrowed down to schools that benefited from government project that Equipped 5 public secondary schools in each Sub-County with ICT infrastructure. The population under study was limited to the 5 school which benefited from the project.

1.9 Assumptions of the Study

In this study, the researcher assumed that, the respondents would cooperate, participate in the study, voluntarily give the correct information and return the questionnaires in time, permission would be

granted by the County Education office and that the schools in which research was to be done would be in session.

This happened as evidenced by the high return rate of the questionnaire and support given by the County education office that granted permission to collect data. Data was also collected during the school term session.

The research assumed that schools had computers, internet connectivity and other ICT devices and teachers in those schools were using the devices for ICT integration in teaching and learning. It also assumed that Kenya Institute of Curriculum Development had developed digital content and availed it for utilization in teaching and learning.

1.10 Definition of significant Terms as used in the study.

Information- This is textual, pictorial, video or audio ideas. It can be looked as radio broadcast, still images, motion pictures or multimedia presentations.

Communication- This is the transmission of information is through an appropriate media from the sender to the receiver. The transmission is through the media called the transmission cables, wires, satellite links wireless networks etc.

Information and communication technology (ICT)-This is a term used to describe a range of technologies for gathering, storing, retrieving, processing, analyzing, and transmitting information. These technologies includes tools like computers, the internet, projecting technologies, smart boards and interactive boards, Broadcasting technologies (audio and visual), mobile telephony etc. Basically ICT includes both tools and technologies accompanying them. It can be hardware and software. In this education context, ICT mainly will refer to various resources (hardware) and tools (software) presented on the computer.

Teaching/ Learning Process- This is the prose of delivering instruction that are structured within a certain framework with an objective of building on the ideas previously held or charging attitudes. Every time teaching occurs, a change of behavior or attitude is expected to occur thereafter (Learning). Therefore Teaching/Learning process is looked at as a synchronized process in this study.

ICT Integration-This is the process of introducing technological tools (both hardware and software) into the institutional process with an aim of improving content delivery or provoking the creativity and innovativeness among the learners.

Application of ICT-Use of ICT to enhance instruction and create rich environment to help each individual student develop a depth of understanding and critical thinking.

ICT knowledge and skills-Teacher pre-service training In-service training and induction courses Technical support and computer consultants.

Digital age-a period in the last quarter of the 20th century when information becomes easily accessible through publications and through the manipulation of information by computers and computer networks.

Digital divide-refers to inequality of access to ICT services such as telephone, computer and internet.

ICT infrastructure-physical equipment/hardware and software that enables a network to function.

Information communications technologies-includes technologies both traditional (for example radio, television, print, video) and newer technologies for example (internet virtual reality, distance education, mobile phones etc.) that are intended to fulfill information processing and communication.

Innovation-is an idea, practice, or object that is perceived as new by an individual.

IT capacity building-as the process of creating or enhancing local human and organizational abilities to use IT to perform specific tasks in organizations in order to attain organizational objectives, and it is based on the idea of human capital.

Knowledge-based economy-an economy directly based on the production, distribution and use of knowledge and information.

Pedagogy-is commonly defined as the science and art of education. It refers to the actual teaching skills a teacher uses to impart content knowledge related to a specific subject.

Technical support- basic skills to overcome technical problems when ICT are applied. It can be provided by in-school staff or external service provider.

1.11 Organization of the Study

The Study was organized into five chapters namely; Introduction, Literature Review, Research Methodology, Data analysis, Conclusion and Recommendations. The introductory chapter explored the background information of ICT integration and identify knowledge gaps that exist in this area of study. On the Literature Review, the researcher gathered existing literature related to the study and organized it as global literature, regional literature and literature in the Kenyan context. The chapter on Research Methodology outlined the target population, sampling design and the data collection instruments used to collect data. The data collected was analyzed in chapter four, while the last chapter illustrating the conclusion that was drawn from analysis and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter looked at the available literature on integration of ICT in the teaching and learning process. In addition the section explored the use of ICT in secondary schools its role, the impact of ICT on delivery of the content when used in learning experiences and the challenges faced in the ICT integration process in these secondary schools. It also highlighted the ICT policies Globally in Africa and in Kenya with the intention of forming the framework for carrying out the study.

Contemporary discourses on development consistently identify ICT as a requirement for economic growth and the improvement of social conditions (Korpela 2003).

The link between ICT and development has been articulated in the alarming terms of the ‘digital divide’ and the widening of the gap between ‘developed’ and ‘developing’ countries. There is concern that developing countries are deprived of the opportunities for economic growth and life improvement generally enjoyed by advanced economies because of the scarcity of ICT, particularly limited Internet connectivity. Capacity of a country’s information and communication technology capability can potentially bring about development (Kamal & Qureshi, 2009). Countries like Singapore and Malaysia were more like Kenya at the time of independence; they have recorded a remarkable economic development because of the heavy investment in ICT.

Other developed countries have heavy investment in ICT which many researcher feel that it has been a contributing factor to the development by minimizing the gap between the rich and the poor Spence and Smith (2009), Langamia (2005), Harris (2004), Kozma (2005). Kozma 2005, further notes that knowledge creation, technological innovativeness, organizational networking, and knowledge sharing can support both sustained economic growth and social development. Labelle (2005), articulates that Asian national leaders hold the conviction that electronics, information and communication technologies are key to the future competitiveness of their domestic economies, of their peoples’ standards of living, and of their countries’ abilities to fully participate in the global economy. Singapore is a world class leader in science and technology and she is building a multi-technology, ultramodern telecommunications and information infrastructure.

Malaysia is committed to the use of ICTs to achieve its development objectives and to transform Malaysia successively to an information society, a knowledge society and finally a values-based knowledge society. According to UNDP HDR (2001), most developing countries [that] are dynamic in the use of new technology can be defined as dynamic adopters which include are Brazil, China, India, Indonesia, South Africa and Tunisia, among others. Many of these countries have important high technology industries and technology hubs, but the diffusion of old inventions is slow, uneven and incomplete to all levels of society, including rural dwellers and the poor. The Philippines and Sri Lanka also fall in this category.

China's commitment to e-enable the country is supported at the highest levels and represents a significant national investment in technology and other capabilities. A clear objective is to make China a major participant in the global economy. China's efforts to connect all major centers with fiber-optic cabling is another clear example of the enthusiasm with which ICTs are being rolled out in countries. Other developed countries have expansive ICTs in all aspects of their daily activities (Samad 2009). Kriz and Quresh (2009) in their research they concluded that there is close link between ICTs and economic growth and development.

There has seen increasing debate about information and communication technology (ICT) as an engine of growth that could lift developing nations. Kamal and Qureshi (2009) provides insights for the ways in which information technology (IT) can be used as a tool for economic development and can help in the achievement of the Millennium Development Goals (MDGs).

There is a lot of literature on the use of ICTs in Africa, which reports on the rapid growth of ICT use, especially in urban areas. African governments have liberalized their information and communication technologies (ICT) sectors and invested huge portions of their annual budgets in ICT (Bollou,F. and Ngwenyama,O. 2002) amid other necessities like hunger and combating of diseases. There are Challenges that confront sub-Saharan Africa as a whole which pose challenges in striking a balance between technology and the need for local development.

Slow connectivity in Africa is characterized by; scarce resources-absence of access or the lack of ICT, the lack of integration of the local languages into the system, varying and updating the contents of materials that are posted on the websites (Kamel and Weigler, 2001). Many rural areas do not yet

form part of the national electricity grid” (Conradie et al., 2003, p.31) this is particularly an acute problem since technology and the Internet can only be very effective if it is generated by electricity.

Africa is facing today the uneven access to and skills in information and communication technology (ICT) which results to digital divide with the developed countries. This has resulted to over dependence on the developed western countries.

Zheng (2009) notes that Western values and advice have been often imported without deep reflection and consideration of their compatibility with local conditions. Conradie et al (2003) argue that since technology is coming from outside, sometimes it does not address the local problems.

Majority of poor countries, Africa included are lagging behind in the information revolution. Not surprisingly, the quest for connectivity has been problematic and will require fundamental shifts in the regulatory environment, as well as renewed attention to public-private partnerships and social services. Developed countries have 80 per cent of the world's Internet users. (UNHD 2001).

Jensen (2002) observes that prohibitive cost and sparse and unreliable telecommunication networks form the major hindrance for many people in Africa to use ICTs. Findings show that the greatest number of Internet users in Africa resides in either South Africa or Kenya in the sub Saharan region or in Morocco and Egypt in the northern region.

South Africa has a well-developed Internet infrastructure in business and academia, and its degree of connectivity places it in the top 25 in the world. (Langmia 2005)

Like many other countries in the world, Kenya has developed National ICT Policy (2006). It sets out the nation’s aims, principles and strategies for the delivery of Information and Communications Technology to improve the livelihoods of Kenyans. Ministry of Education (MoE) introduced the National ICT Strategy form Education and Training (Farrell 2007).The ICT policy gives an opportunity for establishment grass root based infrastructure for knowledge sharing (Mureithi and Munyua 2006).

The ICTs in Education Options Paper (MOEST 2005), discusses the ways in which information and communications technologies (ICTs) can be leveraged to support and improve the delivery of quality education for all Kenyans. It provides a comprehensive range of potential technologies to improve

teaching, learning, and management. It is intended to enable the government of Kenya (GOK) to plan appropriate ICTs in education interventions as they move forward with the comprehensive Kenya Education Sector Support Programme (KESSP). This includes interactive radio instructions (IRI), use of computers in schools, development of ICT skills and the access of internet.

There is rich literature on ICT initiatives in Kenya both by GOK and nongovernmental organizations (NGOs). GOK and the U.S. Agency for International Development (USAID) have a joint commitment to improve education in Kenya in collaboration with Kenya's Ministry of Education. This is aimed at accelerating 21st Century Education (ACE) by improving the quality of primary and secondary education through the effective use of information and communications technology (ICT). The initiative to establish a School Technology Innovation Center (STIC) in Nairobi will serve as a hub where education leaders and teachers access the latest information on technology solutions that are proven to enhance innovative teaching and learning, thus improving the skills needed by students to thrive in the 21st century.

Kenya has government ICT Board whose main objective is to avail quality and affordable technical support to the Digital Villages to enable their smooth operation. The board has technical support focus points of standardized method for the testing and implementation of new software, the upgrading of hardware and the overall tracking of licenses and equipment. It also develops a collaborative relationship with the person responsible for Technical support and encourage them to include capacity building in the planning of future changes. The board works closely with the education institutions to ensure quality technical services as well as the internet providers.

From research, the attempt to integrate ICT in Kenyan secondary schools is faced by various challenges such as Lack of adequate number of computers in the schools, inability to acquire sufficient computers or update those which are obsolete is due to lack of finances, fast changing technology and high overhead costs, loaded curriculum which make it difficult to find time to prepare ICT teaching materials, Lack of a unified school curriculum in primary and secondary schools, resistance by teachers to use ICT in teaching and learning, the lack of government employed Teachers the schools are forced to hire thus draining the scarce resources which could have been used for upgrading the ICT facilities (Kidombo 2009, Oloo 2009, Farrel 2007). This is backed by the government report on ICT capabilities in secondary schools in Kenya (MHEST and NCST 2010).

2.2 Benefits of ICT

Use of ICTs enhances all forms of information exchange, observation, learning and decision-making. Business transactions are expanded and speeded up with ICTs and business opportunities easily identified and markets operate more efficiently (Labelle 2005). ICTs promote access to information for private and professional decision making which expand the range of choices and opportunities by facilitating greater access to economic, educational and development-related information. They create more awareness of factors affecting individual well-being and greater ability to influence and participate in decision-making.

ICTs also facilitate reduction of geography and distance as a factor in social and economic participation: research is much easier with ICTs, especially through the Internet. There is greater ability to learn: distance learning permits students to get accreditations online from recognized universities. ICTs empower individuals, businesses, local and community groups, and women and marginalized or disenfranchised people or groups to do what they do, only better. With ICTs and the capacity to use ICTs, these groups can access the same information that government and large corporations use.

Access to information can help level the playing field by increasing participation in economic and human development activities and in those applications that depend on information, such as markets. ICTs create greater environmental awareness: information about the weather and the environment is more readily available. It can help to predict and prepare for environmental perturbations, catastrophes, predict crop failure and prepare for emergency food relief. ICTs enhance and facilitate trade and make markets more efficient. Commerce is enabled and extended. They speed up and ease transactions of all types, and are especially important for business and government transactions. With ICTs, all markets have the potential of being international or of being selective, depending on their requirements.

Given the many benefits of ICTs, policies should aim to strengthen the competitive and comparative advantage of hardware and ICT service providers locally, regionally and internationally.

2.3 ICT Policy

In 1997 the government of Kenya released the telecommunication and postal sector policy guidelines that created the environment for competition in several market segments and paved way for the

enactment of the Kenya Communication act of 1998 which repealed the Kenya Post and Telecommunications Act. The ICT sector in Kenya lags behind those of Tanzania and Uganda because of the regulatory control and lack of focus and coordination in addressing ICT challenges and opportunities. Attempts to develop a national ICT policy have failed twice in the recent past because the government neglected to include all the public and private sector stakeholders and failed to Link ICT policies to other national development plans.

Determined to avoid these pitfalls and a third attempt which would inhibit economic and social development in the country the government of Kenya commissioned the international development research center (IDRC) of Canada in 2003 to support a consultative, participatory and inclusive process for developing, implementing and assessing the national ICT policy (IDRC, 2003)

Many aspects of people's lives in Kenya including the way education is delivered have been influenced greatly by developments in the information and Technologies. The Kenyan government through the key Ministries in Education, Science and Technology and Information and communication technology has developed several policy and strategy documents to guide the integration if ICT in education. These includes; National ICT Policy 2006, Session paper No. 1, 2005, Kenya Education Sector Programmed (KESSP 1), 2005-2010 and a more recent recommendation by a taskforce on Re-alignment of the Education Sector to the constitution of Kenya, 2010. After several years of effort, Kenya promulgated a National ICT Policy in January 2006 that aims to "improve the livelihood of Kenyans by ensuring the availability of accessibility, efficient, reliable and affordable ICT services". The National Policy has several sections, including information technology, broadcasting, telecommunication and portal services. However, it is the section on the information technology that sets out the objectives and strategies pertaining to ICT and education. The relevant objective is tis section states that the government will encourage the use of ICT in schools, colleges, universities and other education institutions so as to improve the quality of teaching and learning. The ministry of Education developed a Kenya Education Sector Support Programme (KESSP) in 2005 that featured ICT as one of the priorities areas with the aim of mainstreaming ICTs into the teaching and learning process. The National ICT Policy embedded this intent as a national priority and provided the impetus for the ministry to develop its sector policy on ICT in education. The ministry moved quickly and in June 2006 introduced the National ICT strategy for Education and Training. This document referred to us as The ICT Policy for Education Sector consists of the following components, each with its own statement of strategic objectives and expected outcomes; ICT inn Education Policy, Digital Equipment, Connectivity and Network Infrastructure, Access and Equity, Technical Support and Maintenance, Harnessing Emerging Technologies, Digital Content,

Integration of ICT on Education, Training (Capacity building and professional development) and research and Development.

2.4 ICT integration in Teaching and Learning.

There has been a high level of investment in information and communications technology (ICT) in education over a prolonged period of time throughout the ‘developed world’ (Twining 2002). Interest in ICT in education in England stretches back to at least the mid-1960s, when the original National Council for Educational Technology was first formed (CET 1975). At this time the main focus was often on further and higher education rather than on schools. Later there was expansion to the schools starting with secondary then primary schools through government funding. Twining (2002) outlines some of the policies employed by government in England in order to meet the government targets for ICT in education.

Funding was made available for; The National Grid for Learning (NGfL), connecting every school in the country to the Internet; providing additional computer equipment for every school; training every teacher in state schools in the United Kingdom (UK) to make effective use of ICT as a tool to support teaching; cutting bureaucracy in schools through the use of ICT and setting up of a number of Centres of Excellence for IT and High Technology training and Skills Challenge projects.

United States of America (USA) also has a long history about technological innovation revolutionizing education in the US since the mid-1800s, starting with the introduction of text books and moving through technologies such as film, radio, television and computers (Kent and McNergney 1999). The use of computers in school level education in the US started in the sixties (Hasselbring 1986 p25). The first national educational technology plan, Getting America’s Students Ready for the 21st Century: Meeting the Technology Literacy Challenge, was developed including four key goals for educational technology: giving all teachers in the nation the training and support they needed to help students learn using computers; all teachers and students were to have modern multimedia computers in their classrooms; every classroom to be connected to the information superhighway and making effective software and on-line learning resources an integral part of every school’s curriculum.

Advanced countries with integrated ICT in the education system also include;

Australia, South Korea, Denmark, Finland, Belgium Sweden, Singapore among others. Some typical characteristics of these countries are as follows: almost all classrooms are equipped with computers and other ICT tools; the student/computer ratio is high; Internet access is available in all schools; curriculum revision ensures nationwide ICT integration; delivery of education is increasingly online (UNESCO 2004).

Integration of ICT in schools in developing countries especially in Africa, is slow and uneven as indicated by the table below which provides some estimates of numbers of the schools reached with computers in a sample selection of African countries through NEPAD e- schools project (Farrel G. and Shafika I. 2007)

Many governments have realized the positive impact of ICT in education henceforth developed national ICT policies and ICT education strategies to guide on its integration for maximum benefits (Bryderup & Kowalski 2002, Brunemann et al. 2000, Gulbahar & Guven 2008). According to Balanskat (2006), various countries have ICT projects for instance Denmark project ran from 2001 to 2004 with the aim to strengthen the pedagogical use of ICT.

ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to the underserved for reasons of cost or because of time constraints are unable to enroll on campus. Using ICTs in the classroom has been to better prepare the current generation of students for a workplace where ICTs, particularly computers, the Internet and related technologies, are becoming more and more ubiquitous.

Technological literacy, or the ability to use ICTs effectively and efficiently, is thus seen as representing a competitive edge in an increasingly globalizing job market. ICTs can enhance the quality of education by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training to empower students for lifelong learning. ICTs enable new ways of teaching and learning which constitute a shift from a teacher-centered pedagogy to one that is learner-centered.

Previous study report that the integration of ICT into the curriculum remains problematic in the schools context (John, 2005). The core factors that influence the integration and diffusion of ICTs in education have been identified in many studies and projects reports such as UNESCO Meta survey on the use of Technologies in Asian and the Pacific and in the context of East Africa, by IDRC in its thorough analysis of ICT Policy-Making in the region.

This literature proves that there is a big technological gap between the developed countries and African countries which represent a digital divide. African Governments should work quickly to bridge digital divide so that the African states can be up to date technologically. Literature also reveals that comprehensive use of ICTs in education is dependent on:

2.4.1 Availability, Accessibility and Adequacy of ICT infrastructure

Schools have to be equipped with the necessary ICT infrastructure in order to provide the next generations with the needed tools and resources for access and use and to attain the expected skills (Gulbahar & Guven 2008). Schools are equipped with different kinds of technological infrastructure and electronic resources available; hardware, software and network infrastructure must be available to integrate ICT in education (Afshari 2009). He further argues that limited access to computers is a barrier to effectively using computers in classes. Mumtaz (2000) states that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes.

Efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students and administrative staff. Use of ICT in teaching and learning must be accompanied by a corresponding change in curriculum. Tin (2002) explains that proper integration of ICT may require substantial pedagogical component in the IT curriculum of any teacher education program. He cautions that teaching ICT as an isolated discipline is not an effective way to encourage the use of ICT in learning. Clearly, the curriculum must be adapted or re-designed so that it is ready for ICT integration.

This shows a big gap between the traditional teaching methods and use of print content and the modern methods using the ICTs and soft copies of curriculum materials. There is a need to develop original educational content, adapt existing content, and convert print-based content to digital media. This is not only technical but also time consuming for the teachers.

2.4.2 Human resource Capacity and its influence in ICT integration

Capacity Building refer to developing an organization individual's core skills and capabilities to help them achieve their development goals. The full realization of the potential of ICTs require skills, training, individual and institutional capacity among the users and beneficiaries (Kandiri, 2006).

ICTs in the form of Multimedia Community Centers/Telecentres especially at the rural levels can act as a nodal point of community connectivity, local capacity building, content development and communications as well as serving as a hub for applications such as distance education, electronic commerce, telemedicine and environmental management (Havris, 2004). According to Mooji and Smeets (2001), lack of interest that has been displayed by teachers in most countries may be due to misconception of the concept “integration” which is due to the insufficient knowledge they possess. A further inhibiting factor would seem to be lack of or inadequate training. It’s through the training of teachers that the objective of ICT integration can be clarified (Kennewell et al, 2000). Furthermore, the attitude of the management in supporting the process is also viewed as influential to teachers’ use of computers (Schiller, 2003)

Lau and Sim (2008) established that teachers need training which should be offered on a continuous rather than one off basis so that their IT knowledge is upgraded over time. They further proposed the need to put in place measures to ensure that adequate access to technical support is provided. According to them, a teacher with ICT competency should be appointed as ICT coordinator in each schools to provide technical and pedagogical support.

According to Baylor and Ritchie (2002) regardless of the amount of technology and its sophistication, technology will not be used unless members have skills, knowledge and attitude necessary to infuse in into curriculum. Karsenti and Larose (2011) stated that a major obstacle to necessary use of technology across all grades levels and the curriculum is due to lack of critical mass of teachers who feel comfortable in using technology and who can provide support and exemplary instances of good practice to those who are still not well versed with technology.

A research study by Wims and Lawler (2007) that used both Quantitative and qualitative survey in three secondary schools on the expansive Rift Valley in Kenya revealed that there was an absence of education software, lack of internet access and use of email in the schools. Some 35-40% of the secondary schools teachers has never used a computer. The study revealed that exposure to computers in schools influenced the careers choices of the former students. The main issue of concern that came out of the study included the staff training, mainstreaming of ICT cross the curriculum and provision of adequate ICT equipment.

The costs of training has been identified to be very high such that some schools cannot meet the expenses of making provision for the teachers and learning of computers. On some cases teachers who are trained in ICT have done so at their own expenses. Even where training has been organized by schools and computer centers, payments in many cases have been from personal purses (Jegede, 2009).

Mumtaz (2000) identifies some inhabiting factors in integrating ICT into the curriculum, amongst these factors is lack of Computer availability, lack of financial support and insufficient knowledge possessed by teachers. The need for schools management in the planning committee remains crucial due funding purposes. In the event that the school organization is willing to meet the demands of OCT, there is a likelihood that teachers may take up the opportunities afforded by ICT (Kennewell et al 2000).

2.4.3 ICT knowledge, skills and technical support

Teacher professional development is a crucial component of the educational improvement (Tin 2002). Thus the teacher pre-service and in-service training in ICT is a must for proper integration of ICT in the education system in any country.

Teachers need to be prepared to empower students with the advantages technology can bring. More to this the teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn, and communicate (UNESCO 2008).

Research findings have revealed that most teacher training courses focused on basic computer operations rather than advanced computer skills and subject-specific pedagogical applications (Tin 2002). Use of new technologies requires new teacher roles, new pedagogies, and new approaches to teaching and learning. Before teachers have developed the ability to achieve all of the above, they must have a comfortable level of ICT skills. Unless teachers are functioning at a comfortable level of ICT skills and knowledge, they will be unable to use ICT as a primary tool for teaching and learning across the curriculum. Teachers need to be competent and confident users of hardware and software, to understand how to organize the classroom to structure learning tasks so that IT resources become a necessary and integral part of learning rather than an add-on technical aid" (ibid.). Teaching becomes a process to initiate, facilitate, and sustain students' self-learning and self-actualization; therefore, teachers should play a role as a facilitator who supports students' learning. The focus of teaching is to arouse students' curiosity and motivation to think, act, and learn. The change from the traditional chalk-n-talk pedagogy to new modes of pedagogy within secondary schools might introduce much uncertainty which tend to induce teachers' anxiety and cause them to feel frustrated in work. Hence many teachers have been found to offer stiff resistance to change involving technology intervention, technology integration and technology incorporation (Albirini 2007).

Preparing students for real life in our technological and diverse world requires that teachers embed ICT in significant learning experiences (Braun & Kraft 1995). Research findings indicate that the use of ICTs alone does not change traditional teaching practices and that ICTs need to be supported by innovative pedagogic techniques to enhance students' self-learning and active interaction.

To reduce the anxieties associated to the use of new technologies by the teachers, there has to be a reliable professional support. The technical experts should be employed to do things the teachers might struggle to do. There is a serious need for technical support staff with high level expertise in the maintenance aspects of ICTs.

Because of poor maintenance and insufficient skills to diagnose system problems and swap parts, there are many out-of-commission machines which could easily be re-activated and used. The problem of technical expertise is two faceted. In the first place, there are not enough people qualifying or attaining ICT specialist skills at the speed at which the technologies are adopted. Secondly, the problem of brain-drain whereby the few experts opt for better paying jobs overseas (Minishi-Mananji 2007).

Having technical staff available also allow them to provide assistance to students in using software applications, when they are not engaged in servicing the technology.

(ibid.) Whether provided by in-school staff or external service providers, or both, technical support specialists are essential to the continued viability of ICT use in a given school. Without on-site technical support, much time and money may be lost due to technical break downs. In the Philippines, for example, one of the major obstacles to optimizing computer use in high schools has been the lack of timely technical support. In some extreme cases involving schools in remote areas, disabled computers take months to be repaired since no technician is available in the immediate vicinity and so the computers have to be sent to the nearest city hundreds of kilometers away.

2.4.4 School administration/Leadership and its influence in ICT integration.

For successful integration of ICT in teaching and learning there has to be proper planning at the school level. This is because the school is expected to provide the necessary ICT resources for the teachers and the students to use. An ICT integration plan provides a detailed blueprint of the steps

and methods needed to translate the school ICT vision into reality (Afshari 2009). A plan is a guide to action not a substitute for it; the existence of a written ICT plan and strategy does not guarantee the comprehensive use of ICT in schools, nor does the absence of an ICT plan necessarily equate to the lack of ICT integration in a given school (Bryderup and Kowalski 2002).

Research shows that investments in ICT for enhancing formal and non-formal education systems are essential for schools improvement (Tong & Trinidad, 2010). School leaders are chief accounting officers in their schools and therefore are concerned in allocating budgets to various school activities including implementation of ICT.

According to Betz (2011), implementation of ICT in schools would be successful when school leader supports, learns, provide up to-date infrastructure, adequate professional development and support staff during its implementation. School leaders have responsibility of supervising implementation of ICT programs in their schools. A study carried out by Anderson & Dexter (2010) on technology leadership behaviors of school principals established that apart from ICT infrastructure being important in school, school leadership was the most determining factor in the process of effectively implementing ICT in schools.

More research support the idea that school leadership behavior determines success or failure of schools to implement ICT in its activities (Schiller, 2011, Hennessey, 2010, Aguyo, 2010, Chang, Chin & Hsu, 2012). From these studies it can be concluded that school leader's behaviors is very important in implementation of ICT in schools. Researchers and authors view leadership behavior of educational managers has having a positive role in determining the process of ICT implementation in education. A positive behavior towards ICT would set clear visions and good conditions for its implementation. In schools, positive behavior towards ICT would manifest itself by the way the school leaders use ICT and encouraging others to use it. For efficient implementation of ICT in schools, school leaders must address challenges of implementing new technologies, starting with their own challenges.

However, due to many challenges in implementing ICT in schools in sub-Sahara Africa, school leaders find themselves in a situation that requires them to understand and undertake some of these challenges. Failure to meet these challenges would mean many schools would not be able to effectively implement ICT in their teaching and learning activities. This would mean further widening knowledge gap, deepening existing economic and social inequalities between those who have access to and control technology and those do not.

Kenya Vision 2030 (GOK, 2007) implied that ICT could be used to propel the country to a middle level economy by improving security, lowering cost of doing business and providing Kenyans with a friendly working environment among others. Specific strategies were to include improving the quality of education by providing quality teachers, space and technology for delivery. Key to this was implementation of ICT in schools. Despite its importance and the strategies developed by the government on implementation of ICT in schools, research have established that many of them are not effectively using ICT to support learning, teaching, research and management as intended by Kenya National ICT policy. Meoli (2007) revealed that despite efforts made by various stakeholders and the importance of ICT in education sector, the National ICT policy have to a large extent remained in draft form. No attempt is made to implement the policies to schools.

Several challenges encountered during integration of ICT in schools have been identified by researchers. Hennessey (2010) identifies several constrains that hinder effective adoption of technology by schools in sub-Sahara Africa as financial constraints, lack of adequate ICT facilities, lack of reliable electricity and inadequate teachers ICT skills. Khan et al, (2012) also identifies content characteristics, user characteristics, and organizational capacity and technological considerations as factors influencing implementation of ICT in schools. Andoh, (2012) found that teacher-level factors, school-level factors and system-level factors determined implementation of ICT in schools. Implementation of ICT in schools is also influenced by organizational factors, teachers and leaders attitudes towards technology and other factors (Laaria, 2013; Manduku et al, 2012; Makhanu, 2010).

2.4.5 Availability of School Structure to support ICT integration

According to Langimia (2009) Kenya experiences many challenges in the implementation of ICT in schools due to the fact that it lags behind in information superhighway technology. In terms of telecommunication infrastructure expansion, development of fixed telephone network throughout Kenya has been below expectations. Therefore many schools lack fixed telephone networks, which is important for connectivity. Kessy, Kaemba, and Gachoka, (2006) and Ford (2007) discussed several reasons for under use of ICT in education in the African context. The cost of adopting ICT including acquiring hardware and software, setting up telecommunication networks, and the maintenance and repair of facilities is often prohibitive for developing nations. Kessy et al. recommend privatization as a means to enhance competition and reduce cost. In general, African

countries have poor infrastructure including unreliable transportation, limited electricity supply, and broadcast and telecommunication facilities. This makes it difficult for institutions to maintain Internet connections and in the case of Kenya electricity is not government subsidized making it relatively expensive at an average cost US\$ 0.08/KWh compared to US\$0.02/KWh

It is estimated that less than 1 per cent of people in Africa uses or have access to the Internet (Bigum, 2000). The figure of 139 students per computer is given for World participants. Listed in order of rank, aspects that inhibit schools from acquiring computers are an absence of electricity, lack of funding, insufficient building space, lack of network and internet access, and poor security.

To support integration of ICT in Learning and teaching the schools requires electricity that is stable, regularly and readily available due to devices used ranging from the use of radio or television to computers, Internet and newly-emerging mobile devices. They also require dedicated computer labs with proper electrical wiring, heating/cooling and ventilation, and safety and security.

Kajiado Central Sub-County is located in a remote location, thus may suffer greatly from unstable power supply which time to time is subjected to rationing, lack of telephony networks may affect their internet and network connection, and poor security.

2.5 Theoretical Framework

2.5.1 Roger's theory of Diffusion of Innovations (2003)

The study was based on Roger's theory of Diffusion of Innovations. The theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. The original diffusion research was done as early as 1903 by the French sociologist Gabriel Tarde. Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice is adopted by members of a given culture or a social system.

This was extended by Rogers (2003) hence at present is commonly known as Roger's theory of diffusion of innovation. Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the Internet. The diffusion of information technology and telecommunications hardware, software, and services turns out to be a powerful driver of growth, having an impact on worker productivity (Bollou, 2002). Robinson 2009 observes that, instead of focusing on persuading individuals to change, the theory sees change as

being primarily about the evolution or “reinvention” of products and behaviors so they become better fits for the needs of individuals and groups.

Five Stages in the Decision Innovation Process

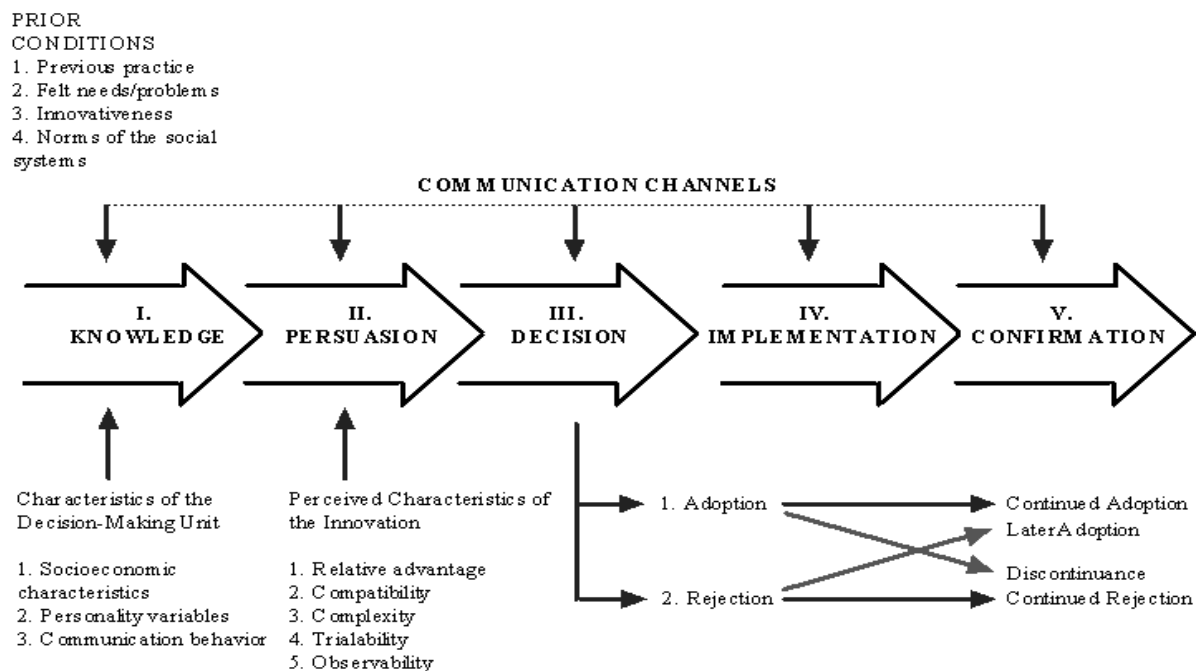


Figure 2.5-1

A Model of Five Stages in the Innovation-Decision Process(Source: Rogers(2003)).

This theory has four elements: (i) Innovation-is an idea, practice, or object that is perceived as new by an individual. (ii) A communication channel- is the means by which messages get from one individual to another. (iii)Time- is the length of time required to pass through the innovation-decision process. Rate of adoption is the relative speed with which an innovation is adopted by members of a social system. (iv) Social system- is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal.

Each member of the social system faces his/her own innovation-decision that follows a 5-step process; Knowledge – person becomes aware of an innovation and has some idea of how it functions, Persuasion – person forms a favorable or unfavorable attitude toward the innovation, Decision – person engages in activities that lead to a choice to adopt or reject the innovation, Implementation – person puts an innovation into use, Confirmation – person evaluates the results of an innovation decision already made (Orr2003, Sahin 2006). This compels the user to continue adoption or later reject the technology.

The adoption or rejection of innovations is characterized by; the relative advantage, compatibility, simplicity, trial-ability and observability. So the understanding and utilizing diffusion networks can aid strategy aimed at quickly inducing system-wide change (Orr 2003, Robinson 2009, Sahin 2006).

Given that the education stakeholders are aware of the ICT innovations across the world, the rate of adoption is still very low and especially in the developing states. Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments (Medlin 2001; Parisot 1995).The study will address the factors that affect ICT Integration in education given the relative advantage.

2.6 Conceptual Framework

Conceptual framework refers to how a researcher conceptualizes relationship between variables in a study and shows them graphically or diagrammatically. It shows independent variables and dependent variables and how they are related or influences one another Mugenda (2003).

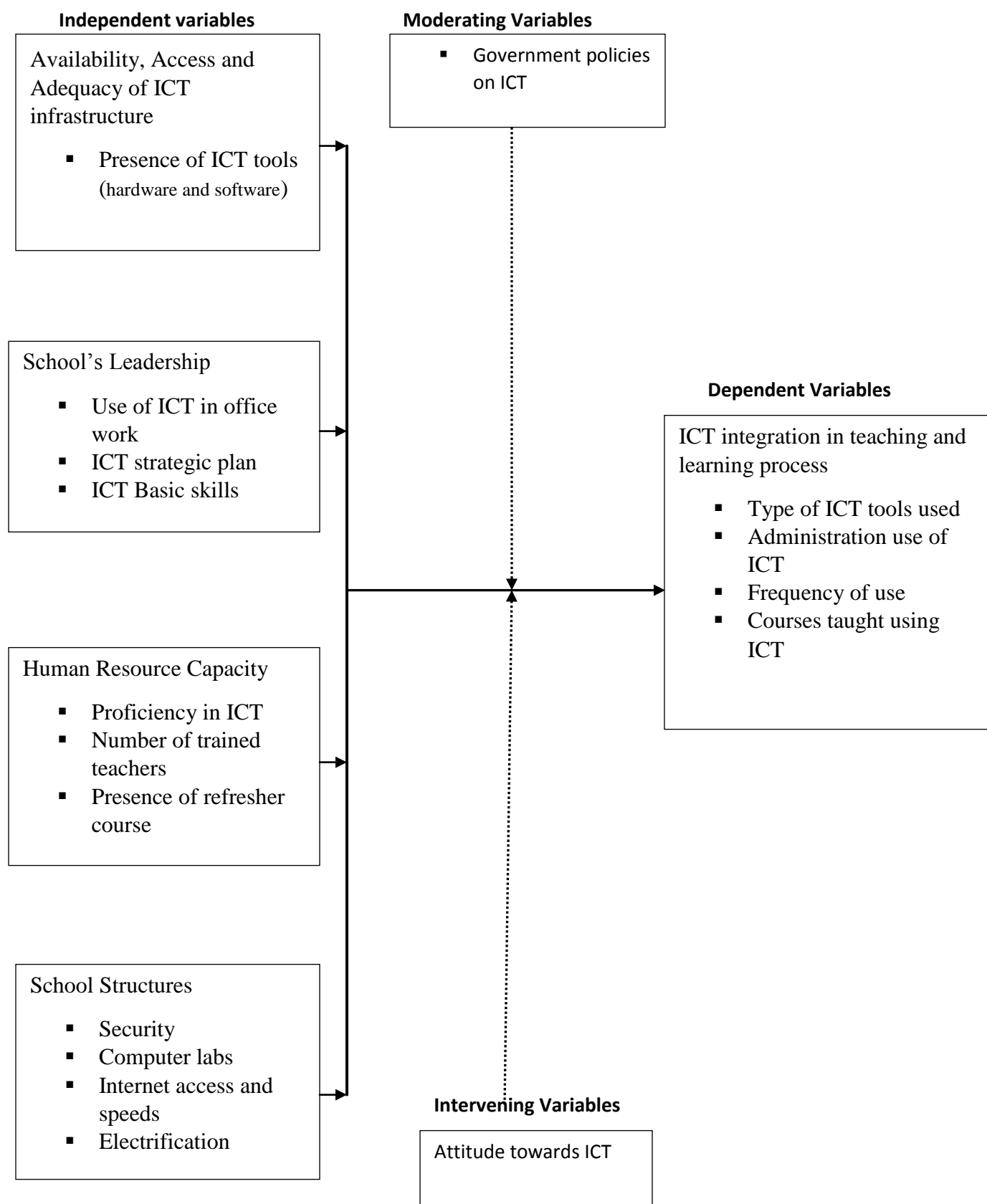
The study focuses on the interaction between the variables that influence the integration of ICT in Public Secondary Schools in Kajiado Central Sub-County. In the study, the survey design will be used to explain the relationship between the independent variables and the dependent variables and how the independent variables influences the dependent variables(Nachmias & Nachimius, 2008).There are also moderating and intervening Variables. The ICT innovation and infrastructure in schools include hardware, software, internet connectivity and electrification. The kind of infrastructure available in schools depends on the users and their knowledge and skills which is pre-service and the in service training.

For efficient performance of ICT, there has to be adequate technical support and computer consultants to help solve technical problems for the teachers and the students to minimize time waste

because of technical problems. The school administration should formulate ICT policies and plans as well as set ICT budget.

These would influence innovations purchase in the schools in terms of quality and quantity. The administration should organize for staff development especially in service training for teachers. The teaching load and the time schedule determine if the teacher have time to prepare ICT learning materials. The result of all these relationships is better learning and other outcomes such as; technology integrated lessons, change in teaching methods, and development of ICT curriculum and efficient use of computer by the students and in the general school administration.

CONCEPTUAL FRAMEWORK



2.7 Summary of Literature Review

The literature has revealed that the developed countries have made remarkable investment ICT as well as integrating ICTs in their education system characterized by well formulated ICT national policies and specific strategies of ICT in education.

On the other hand the developing countries Kenya included are rapidly and heavily investing in ICTs despite the other challenges they face for instance drought and famine. Despite these efforts, the countries still have low internet connectivity, inadequate power supply especially in the rural areas where most schools are located coupled with regular interruptions, low number of computers in schools. This creates a digital divide between the developed and the developing countries and thus the developing countries miss out on the benefits of ICT in almost all aspects including education which is the cornerstone of the economy and an avenue to break the poverty cycles on the developing countries. The study was done to assess the factors that influence the effective integration of ICTs in teaching and learning in public secondary schools specifically in Kajiado Central Sub-County.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes the methodology used in the study. It details the research design, target population of the study, sample size and sampling technique, research instruments, validity and reliability of the instruments used in the research. The chapter also explains data collection procedures, operational definition of variables and method of data analysis. It also presents an analysis of the approach and tools that were used to conduct the study as well as Ethical issues.

3.2 Research design

Research design refers to the procedure selected by a researcher for studying a particular set of questions or hypothesis; this includes the researcher's choice of quantitative or qualitative methodology, and how, if at all, causal relationships between variables or phenomena are to be explored (Orodho, 2009).

Descriptive survey design was used to establish the factors influencing the integration of information and communication technology in teaching and learning in public secondary schools in Kajiado central Sub-County. A survey is a method of collecting information by interviewing and administering a questionnaire to a sample of individuals. Wiesma (1995) pointed out that a survey design is concerned with gathering of facts or obtaining pertinent and precise information concerning the current status of the phenomena and where possible draws possible conclusion from the facts obtained. Creswell (2003), notes that a descriptive survey design helps to gather information about the present and existing condition of phenomena under study.

The purpose of employing this design was to describe the nature of the situation as it exists at the time of the study and to explore the cause (s) of that particular phenomenon. A survey research was used to assess thoughts, opinions and feelings.

3.3 Target population

Target population is a set of people or objects the researcher wants to generalize the results of the research (Borg and Gall, 1989).

In 2010/2011, under the Economic Stimulus Programme, Kshs.980 million was allocated for equipping of 5 public secondary schools from each Sub-County with a comprehensive ICT infrastructure. A total of 1021 schools throughout the country benefited. The package included training of 10,500 teachers, 1021 head teachers and 210 ICT champions from the beneficiary schools. Kajiado County has about 42 public secondary schools, out of which 15 schools from each sub-County by then benefited from the program. The study was limited to the 5 schools from the one Sub-County that benefited at the time from the project. The Subject Heads, Deputy Principal and the Principal were targeted as study population.

Table 3.3-1 Target population

Category	Target population
Principals	5
Deputy principals	5
Head of Departments	60
Total	70

3.4 Sampling size and Sampling procedure

Sample is a representative portion of an entire population. The Sample is expected to fully represent the characteristics of the entire population and be free of personal bias thus reducing the sampling variability. Sampling is a process of choosing the units of the target population to be included in the study. It's normally done because a complete coverage of the population is not practically possible. Slavin, (1984) observed that due to limitation in time, resources and energy, a study can be carried out from a carefully selected sample to represent the entire population. It's recommended that at least 20%-30% sample is good representation (Borg and Gall, 1989)

Sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population, the statement about the sample should be true in relation to the

population (Orodho, 2008). According to Mugenda and Mugenda (1999), for descriptive study 10% of accessible population is enough.

This study considered the public Secondary Schools in Kajiado Central Sub-County that benefited from the government project with the aim of integrating ICT in Teaching and Learning. The Researcher used Non- probability sampling technique to select the sample. Purposive sampling technique was used to select the school, the principal, deputy principal and the heads of the departments.

Kajiado County has about 42 Schools, 15 of the schools from the three Sub-Counties by then were equipped with ICT infrastructure in the year 2010-2011. The research was done in the schools located in the former Kajiado Central Sub-County.

In the 5 schools, 5 principals were to be interviewed, 5 Deputy Principals were to be issued with questionnaires and the subject heads in each school were also issued with questionnaires.

3.5 Data collection Instrument

These are tools that are used by the researcher to collect data from the sampled respondents in a study (Kombo and Tromp, 2006). The questionnaires were used to collect data from the Deputy Principal and the teachers and while the principal was interviewed. The questionnaires were to collect bio-data of the Deputy Principals and teachers, background information of the schools and gather information on the use of ICTs in teaching and learning.

Interview schedule was used to gather information from the principals to establish the ICT policies and usage of computers in general administration as used in their schools.

3.5.1 Validity of the Instrument

Validity is a measure of how well a test measures what it is supposed to measure (Kombo 2006, Orodho 2009, Mugenda 1999). Validity is the degree to which results obtained actually represent the phenomenon under investigation. Validity was established through close consultation and expert judgment of the supervisors; they verified the validity of the research instruments used in the study.

To enhance validity of the questionnaire, the researcher sought the service of the supervisor on validity and relevance of the questions to the topic under study. Comments and suggestions were considered in formulating the final copy. Care was taken in constructing the questionnaire and pre-testing was done to identify and change any ambiguous, awkward or offensive questions as emphasized by

Copper and Schindler (2003). Expert opinions were requested to comment on the structure of the tools. This helped in improving the content of validity of the data to be collected.

3.5.2 Reliability of the instrument

Instrument reliability refers to the level of internal consistency, on the stability of the measuring device (Thorndike and Hagen, 1961). It is the degree to which tests scores are free from measuring errors (Best, 1981). The sample questionnaire was pre-tested by distributing to respondents in schools that are not part of the study. The Deputy, Deputy Principal, and two teacher heading departments participated in the exercise. The school was not part of the study population.

3.6 Data Analysis techniques

Data analysis refers to examining the data collected in the survey and making deductions and inferences. The data collected was analyzed using statistical package for social sciences (SPSS). This is a comprehensive, integrated collection of computer programmes for managing, analyzing, and displaying data (Orodho, 2009). Descriptive statistics was used to present the results of the study and the general trends which involved tabulating, graphing and describing data. A discussion of the finding followed to enable the researcher draw conclusions and give recommendations.

3.7 Operational Definition of Variables

Operationalization of variables means describing of the research objectives into measurable terms, for the purposes of conducting the actual research. The research topic was translated to observable and measurable objectives. The variables were identified and measurable indicators specified. Table 3.9 shows operationalization of variables

Table 3.7-1 Operational definition of Variables

Objectives	Variables	Indicators	Measurement	Measurement scale	Tools of analysis	Type of analysis
To determine the influence of availability and access of ICT infrastructure on ICT integration into teaching and learning	<u>Independent</u> Availability and access of ICT infrastructure	Number of computers	Number of computers ready for use	Ordinal	Frequency percentage	Descriptive
		Software	Software in use	Nominal	Frequency percentage	Descriptive
						Descriptive
To access the influence of the school's leadership on ICT integration into teaching and learning	<u>Independent</u> School leadership commitment to ICT	Vote head on ICT in the school budget	Amount	Ordinal	Frequency percentage	Descriptive
		School policy	ICT policy	nominal	Frequency percentage	Descriptive
		Strategic plan on ICT				
To determine the extent to which Human resource capacity influences ICT integration into teaching and learning	<u>Independent</u> Human resource capacity	Certification in ICT	Professional Certification in ICT	Ordinal	Frequency percentage	Descriptive
		Number of staff trained in ICT and the level of ICT	Number of ICT trained personnel	Ordinal/interval	Frequency percentage	Descriptive
		Presence of training refresher courses	Professional training on ICT	Ordinal	Frequency percentage	Descriptive
		Use of technological tools	Use of basic application software	Nominal	Frequency percentage	Descriptive

	<u>Dependent</u> ICT integration in teaching and learning	Use of technological tools	Use of basic application software	Nominal	Frequency percentage	Descriptive
		Use of technology in school administration	Use of application in school activities	Ordinal	Frequency percentage	Descriptive
		Application of technology in problem solving and search for new knowledge	Numerical analysis, word processing, presentation, database management	Ordinal	Frequency percentage	Descriptive
School structure	Electrification	Availability of constant power supply	Electricity, generator	Nominal	Frequency percentage	Descriptive
	Security					
	Computer Lab	Availability of computer labs	Presence of computer lab	Ordinal	Frequency percentage	Descriptive
	Internet access and speeds	Availability of telecommunication lines	Availability if internet connections	Nominal	Frequency percentage	Descriptive

3.8 Ethical Considerations

The researcher personally administered the instruments to the respondents. An informed consent was sought from all the respondents so that they can participate voluntarily. The respondents were not be required to write their names of the questionnaire.

Clarifications was be given to the respondents where need arose. There was no threats or victimization to the respondents who declined or withdrew from the study. The information collected was kept confidential and used for the purpose of study only.

Permission to access the respondents was sort from the County Director of Education in Kajiado Central Sub-County.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter focuses on data analysis and presentation of the findings from the research questions that investigated whether Human resource capacity, availability and accessibility of ICT infrastructure, school leadership and school structure levels influences ICT integration into teaching and learning in public schools in Kajiado Central Sub-County that benefited in a project that aimed at equipping secondary schools with ICT infrastructure.

The findings were presented using frequent tables for easy analysis and interpretation. Statistical analysis of the findings was done using frequencies and percentages. The findings of the study presented in the following sections are as per the objectives.

4.2 Questionnaire Response rate

The interview schedule was administered on 4 principals accounting for 80% of the total given out. Out of the 5 questionnaires administered to the deputy principals, 4 were returned accounting for 80% of the total given out, there were 33 questionnaire returned from the Heads of department accounting for 73%. The questionnaires and return rate was as shown in the table 4.2-1.

Table 4:2-1 Questionnaire Response rate

Category	No of Questionnaire administered	No of Questionnaire filled and returned	Percentage
Principal	5	4	80%
Deputy principal	5	4	80%
Head of Department	45	33	70%
Total	55	41	75%

Out of the 55 questionnaires distributed by hand, 41 were returned. This brought the responses effectively to 75% and the response was considered adequate as according to Idrus and Newman (2002) a response rate of 50% is good enough for social studies.

4.3 General information of the respondents

This is basically the background information of the population interviewed and administered with the questionnaire in this study. It's the demographic characteristic of the sampled population. The Research sample included the Principal, Deputy Principal and the head of subjects. The section has analyzed gender issues, education, professional information, and work experience.

4.3.1 Distribution of respondents by gender

The population under study was stratified into males and females with distribution as shown on the table 4.3-1.

Table 4.3-1 Distribution of respondents by Gender

Gender Distribution	Frequency	Percentage
Male	27	65.9%
Female	14	34.1%
Total	41	100%

Out of the 41 respondents under the study, 27 accounting for 65.9% were male while 14 accounting for 34.1% were female. This information shows there is a big gender gap in the teaching fraternity in the Sub-County. From the analysis it's evident that more women need to take up their teaching jobs in the Sub-county.

4.3.2 Distribution of respondents by Age

As part of the background information, the respondents were asked to indicate their age group (Deputy Principal and the teachers) and the responses were shown as the table 4.3-2.

Table 4.3-2Distribution of respondents by age

Age Distribution	Frequency	Percentage
Below 20 Years	1	2.7%
21-30 Years	13	35.1%
31-40 Years	18	48.6%
41-50Years	4	10.8%
51 and Above Years	1	2.7%
Total	37	100%

The findings indicate that's only 1 accounting for 2.7% of the respondents was below 20 years, 13(35.1%) of the respondents were aged between 21 and 30 years, Most of the respondents 18(48.6%) were in the 31-40 years age bracket. In the 41-50 age brackets there were 4 respondents accounting to 10.8% while only 1 accounting for 2.7% was above 51 years.The purpose of this data was to ensure that the information gathered was representative of all the teacher population across all the age groups.

4.3.3 Distribution of the Highest Education Level of the respondents

The Education levels attained by the respondents (**Deputy Principal and the teachers**) showed a notable variation as shown in the table 4.3-3.

Table 4.3-3Highest Educational Level of the respondents

Education Level	Frequency	Percentage
Post Graduate	3	8.1%
Graduate	26	70.3%
Diploma	7	18.9%
K.C.S.E	1	2.7%
Total	37	100%

From the findings of the study, it was clear that most of the respondents, 26 accounting for 70.3% had attained a graduate level of education qualification, a small portion of 8.1% had post graduate

qualification, 1 respondent accounting for 2.7% had Kenya Certificate of Education Qualification while 7 accounting for 18.9% had a diploma level of qualification.

4.3.4 Length of Service of the respondents as a principal

The study sought to know the length of service of the respondents and the findings were as shown in the table 4.3-4.

Table 4.3-4 Length of Service as a Principal

Length of service	Frequency	Percentage
Less than 5 years	2	50.0%
6-10 years	1	25.0%
11-15 Years	1	25.0%
16 years and above	0	0.0%
Total	4	100%

Out of 4 respondents, 2 accounting to 50% had been in service for less than five years, 1 accounting to 25 % had been in the service for six to ten years, 1 respondent accounting to 25% had been in service for eleven to sixteen years while none was in service for more than 16 years.

4.3.5 Length of Service of the respondents

The study sought to know the length of service of the respondents (**Deputy Principal and the teachers**) and the findings were as shown in the table 4.3-5.

Table 4.3-5Length of service of the respondents

Length of service	Frequency	Percentage
Less than 5 years	14	42.4%
6-10 years	13	39.4%
11-15 Years	2	6.1%
16 years and above	4	12.1%
Total	37	100%

Out of the 37 respondents in the study, 14 accounting for 42.4% have been in the service for less than 5 years while 13 respondents accounting for 39.4% have been in the service for the period between six years and ten years. 2 respondents, minority accounting for 6.1% have been in the service for a period of between eleven years and fifteen years. 4 respondents accounting for 12.1% have been in the service for a period exceeding sixteen years.

4.3.6 Level of ICT training of the respondents

Proper use of ICT is not possible without knowledge, skills and experience to use the available infrastructure in the schools. ICT knowledge and experience depend of teachers' pre-service and in-service training.

The ICT training levels attained by the respondents (**Deputy Principal and the teachers**) showed a notable variation as shown in the table 4.3-6.

Table 4.3-6Level of ICT training of the respondents

Level of ICT training	Frequency	Percentage
Certificate proficiency packages	27	73.0%
Diploma in ICT	3	8.1%
Degree in ICT	1	2.7%
No Training	6	16.2%
Total	37	100%

The study found out that 27 accounting for 73.0% of the respondents had certificate in computer application packages while 3 respondents accounting for 8.1% had a diploma in ICT. Only 1 respondent, accounting for 2.7% had a degree in ICT while 6 respondents accounting for 16.2% had no training on ICT. This showed that a big percentage of the teachers have the ability to use the computers although their ICT skills are very basic.

4.3.7 Use of Computer in teaching the Subjects taught by the respondents

The use of computers in teaching their subjects by the respondents (**teachers**) showed a notable variation as shown in the table 4.3-7.

Table 4.3-7 Use of computers in teaching subjects.

Response	Frequency	Percentage
Yes	17	52%
NO	16	48%
Total	33	100%

The study showed that 17 teachers accounting for 52% use computers when teaching their subjects while 16 teachers accounting for 48% do not use computers to teach their subjects. This shows that there is a lot that need to be done before ICT is fully integrated in teaching and learning.

4.4 ICT integration in Teaching and Learning

The respondents were asked to give information on availability and accessibility of ICT infrastructure in their schools.

The following section present findings of the study on integration of ICT in teaching and learning. The researcher paid attention to the common ICTs used, availability and adequacy of ICT tools, and factors affecting use of ICT in teaching and learning.

4.4.1 Common ICTs used by the respondents.

The respondents were asked to indicate the most common types of ICT s used in their course of teaching and learning. The findings are as shown in the table4.4-1.

Table 4.4-1Common ICTS used

ICT tools	Frequency	Percentage
Laptops	30	21.0%
Desktop Computers	29	20.3%
Projectors	27	18.9%
Printers	29	20.3%
Scanners	12	8.4%
Digital content	16	11.2%
Total	143	100%

The study found out that 30 (21%)of the respondents used laptops, 29 (20.3%) of themused desktop computers, 27 (18.9%)of them used the projectors, 29 (20.3%) of them used the printers, and 12 (8.4%) of them usedscanners while only 16 (11.2%) of them used digital content in teaching and learning. This indicated that the main tools of presentation have been used by a few while digital content seems to be absent among many respondents.

4.4.2 Location of the computers.

The deputy principal was requested to state the places where computers were located in the school and the finding are summarized in the table 4.4-2.

Table 4.4-2 Computer location

Response	Frequency	Percentage
PrincipalOffice	1	16.7%
DeputyPrincipal	0	0.0%
TeacherLounge	0	0.0%
Computer Lab	3	50.0%
Classroom	0	0.0%
Library	2	33.3%
Total	6	100%

From the findings majority of the computers 3 (50.0%) were found in the Computer Lab. 2 (33.3%) of the computers were in the library while 1 (16.7%) of the computers were in Principals Office. Deputy Principal, Teacher lounge, and classrooms had no computers. This implied that the teachers and the students were not easily accessing the computers and this limited teacher's use of computers to prepare their lessons.

4.4.3 Adequacy of the computers

The respondents (**Principal, Deputy Principal and the teachers**) were requested to comment on the adequacy and availability of computers in their school. The findings were as shown in the table 4.4-3.

Table 4.4-3 Adequacy of the computers

Response	Frequency	Percentage
Yes	10	24.4%
NO	29	70.7%
Uncertain	2	4.9%
Total	41	100%

From the findings only 10 respondents constituting 24.4% felt that the computers available in their school were adequate while majority, 26 respondents making up 70.7% felt that the computers in their schools were not adequate. 2 (4.9%) were uncertain. Although the schools have computers they are

too few compared to the users in the schools. This not only limits the access but also makes it difficult to rely on them. Thus available resources could not fully support the use of ICT in teaching and learning.

4.4.4 Adequacy of Internet facilities

The respondents (**Teachers heading departments**) were requested to comment on the adequacy and availability of internet facilities in their school. The findings were as shown in the table 4.4-4.

Table 4.4-4 Adequacy of internet facilities

Response	Frequency	Percentage
Available and adequate	6	18.2%
Available but inadequate	19	57.6%
Not available	7	21.2%
Uncertain	1	3.0%
Total	33	100%

The study showed that 6 (18.2%) felt that internet facilities were available and adequate, 19 (57.6%) felt that internet facilities were available but not adequate, 7 (21.2%) felt that it was not available at all while 1 (3.0%) was uncertain about internet facility. From the study access to the Internet was a challenge and severely limited and when available was only for administrative use such as registering student for examination

4.4.5 Adequacy of the printing facilities

The respondents (**Teachers heading departments**) were requested to comment on the adequacy and availability of printing facilities in their school. The findings were as shown in the table 4.4-5.

Table 4.4-5 Adequacy of Printing facilities

Response	Frequency	Percentage
Available and adequate	15	45.5%
Available but inadequate	13	39.4%
Not available	4	12.1%
Uncertain	1	3.0%
Total	33	100%

The study showed that 15 (45.5%) felt that printing facilities were available and adequate, 13 (39.4%) felt that printing facilities were available but not adequate, 4 (12.1%) felt that it was not available at all while 1 (3.0%) were uncertain about printing facility. This shows that a good number of the respondents had limited access to printing facilities.

4.4.6 Factors affecting the use of ICT in teaching and Learning

The teachers were asked to indicate the extent to which the following infrastructural factors affected their use of ICTs in class presentation. The table 4.4-6 presents percentages of how they responded to the statements presented in the questionnaire.

Table 4.4-6 ICT infrastructure usage effects in teaching and learning.

Factor	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree	Unknown
Inadequate number of computers	30.3%	39.4%	6.1%	6.1%	6.1%	12.1%
Lack of internet connectivity	30.3%	27.3%	3.0%	24.2%	3.0%	12.1%
Lack of access to computers	9.1%	24.2%	3.0%	39.4%	9.1%	15.2%
Insufficient or irregular power supply	18.2%	18.2%	6.1%	27.3%	15.2%	15.2%
High cost of hardware and software	18.2%	45.5%	9.1%	12.1%	0.0%	15.2%

Unavailability of appropriate software	21.2%	33.3%	15.2%	15.2%	0.0%	15.2%
Structural arrangement of computers	6.1%	18.2%	21.2%	33.3%	6.1%	15.2%
Computers are very old and slow	6.1%	12.1%	6.1%	48.5%	12.1%	15.2%

30.3% of the teachers strongly agreed that inadequate number of computers hinder them from using them in class, while 39.4% agreed, 6.1% were uncertain while 6.1% disagreed, 6.1% strongly disagreed and 12.1% had no response. Teachers also felt that lack of internet connectivity also contributed to the slow use of ICTs in teaching and learning; 30.3% strongly agreed, 27.3% agreed, 3.0% were uncertain while 24.2% disagreed, 3.0% strongly disagreed while 12.1% had no response. Teachers revealed that they lack regular access to the computers in their schools; 9.1% strongly agreed, 24.2% agreed, 3.0% were uncertain while 39.4% disagreed and 9.1% strongly disagreed while 15.2% had no response. For the insufficient or irregular power supply in the schools; 18.2% strongly agreed, 18.2% agreed, 6.1% were uncertain, 27.3% disagreed, and 15.2% strongly disagreed while 15.2% had no response.

High cost hardware and software made it challenging for the teachers to acquire appropriate ICT facilities in schools; 18.2% strongly agreed, 45.5% agreed, 9.1% were uncertain, 12.1% disagreed while 0.0% strongly disagreed and 15.2% had no response. The teachers also pointed out that software available were not appropriate for efficient use in class; 21.2% strongly agreed, 33.3% agreed, 15.2% were uncertain, 15.2% disagreed while 0.0% strongly disagreed and 15.2% had no response. They also commented on structural arrangement of computers, 6.1% strongly agreed, 18.2% agreed, 21.2% were uncertain, 33.3% disagreed, 6.1% strongly disagreed, while 15.2% had no response.

For the comments on whether the age and slowness of the computer affect the use in the schools; 6.1% strongly agreed, 12.1% agreed, 6.1% were uncertain, 48.5% disagreed while 12.1% strongly disagreed and 15.2% had no response. From the study, it's evident that lack of adequate access to computers, lack of internet connectivity, high cost of hardware and software's and unavailability of appropriate software's were major issues affecting the integration process.

4.4.7 ICT infrastructure and its influence in adoption and integration

The respondents (**Deputy Principal and Head of Departments**) were requested to comment on whether ICT infrastructure had influence on the adoption of ICT in teaching and learning. The findings were as shown in the table 4.4-7.

Table 4.4-7 Influence of ICT Infrastructure.

Factor	Strongly Agree	Agree	Disagree	Strongly Disagree	Uncertain
ICT infrastructure and its influence in adoption and integration of ICT	62.2%	29.7%	2.7%	0.0%	5.4%

Out of the 37 respondents in the study, 62.2% strongly agreed that ICT infrastructure influenced adoption of ICT in teaching and learning, 29.7% of the respondents agreed, 2.9% of the respondents disagreed and none strongly disagreed while 5.4% were uncertain. From the findings, ICT infrastructure must be available and adequate to enable ICT adoption and integration in teaching and learning.

4.4.8 Accessibility of ICT in the school

The respondents (**Head of Departments**) were requested to comment on whether accessibility of ICT was adequate. The findings were as shown in the table 4.4-8.

Table 4.4-8 Accessibility of ICT in the school is adequate.

Factor	Strongly Agree	Agree	Disagree	Strongly Disagree	Unknown
The accessibility of ICT in our school is adequate	12.1%	36.4%	39.4%	6.1%	6.1%

From the study, 12.1% strongly agreed that accessibility of ICT was adequate, 36.4% agreed, 39.4% disagreed, 6.1% strongly disagreed while 6.1% were uncertain. From the Study, the Accessibility was inadequate hindering the use of ICT in teaching and learning.

4.5 Human Resource Capacity

The respondents (**Teachers**) were asked to indicate their level of skills in the use of basic computer programs, utilization of internet and overall use of the computer.

4.5.1 Knowledge of basic computer applications

The researcher was interested in finding out the level of confidence the teacher had in using computer application as well as the general use of a computer. The findings were as shown in the table 4.5-1

Table 4.5-1 Computer application expertise

Program	Very Good	Good	Average	Weak	Others
Word processing	27.3%	30.3%	24.2%	12.1%	6.1%
Spread sheets	21.2%	21.2%	21.2%	30.3%	6.1%
Internet browsing	24.2%	18.2%	39.4%	12.1%	6.1%
Presentation tools (Power point)	12.1%	12.1%	39.4%	33.3%	3.0%
Generally using a computer.	18.2%	24.2%	42.4%	15.2%	0.0%

From the study in Word processing, 27.3% of the respondents indicated they were very good, 30.3% were good, 24.2% were average, 12.1% were weak and 6.1% were uncertain. For Spreadsheet, 21.2% were very good, 21.2% were good, 21.2% were average, majority 30.3% were weak, 6.1% were uncertain. For Internet browsing, 24.2% were very good, 18.2% were good, 39.4% were average, 12.1% were weak and 6.1% were uncertain. For presentation tools, 12.1% were very good, 12.1% were good, 39.4% were average, 33.3% were weak and 3.0% were uncertain. General use of computers, 18.2% were very good, 24.2% were good, 42.4% were average, and 15.2% were weak. From the findings it's evident that a number of the respondents had skills in software packages which

are essential in preparing their lessons, presenting and the general administration tasks in the school. On the other hand, another good number lacks the skills. This is a clear indication that more training is required to enhance knowledge for those with skills and also to cater for the good number without the skills.

4.5.2 Usage of ICT in teaching and learning

The researcher wanted to find out the extent to which teachers were comfortable using ICT in various tasks. The findings were as shown in the table 4.5-2.

Table 5-2 ICT usage in teaching and learning

Statement	Strongly agree	Agree	Disagree	Strongly disagree	uncertain
I can prepare lessons that involve the use of ICT by students	24.2%	51.5%	15.2%	9.1%	0.0%
I know which teaching/learning situations are suitable for ICT use	27.3%	45.5%	15.2%	6.1%	6.1%
I can find useful curriculum resources on the internet	33.3%	48.5%	9.1%	3.0%	6.1%
I can use a computer in monitoring student's progress	24.2%	45.5%	18.2%	6.1%	6.1%
I can use ICT in giving effective presentation/explanations	21.2%	45.5%	21.2%	6.1%	6.1%
I can use ICT for collaborating with others	18.2%	34.4%	21.2%	18.2%	6.1%
I can install educational software on my computers	12.1%	27.3%	33.3%	21.2%	6.1%
I can use the internet to support student learning	24.2%	48.5%	12.1%	9.1%	6.1%
I can use ICT to keep student records, prepare	21.2%	48.5%	15.2%	6.1%	9.1%

exams and other administrative tasks					
I have acquired enough technical skills on the use of ICT through training	9.1%	27.3%	33.3%	24.2%	6.1%
Most of the time I use ICT to collect and analyze data in school	9.1%	27.3%	39.4%	18.2%	6.1%
Using ICT has improved my job performance in managing students data	20.6%	41.2%	20.6%	11.8%	5.9%

From the study 24.2% strongly agreed that they can prepare lessons using ICT, 51.5% agreed, 15.2% disagreed while 9.1% disagreed strongly. 27.3% of the respondents strongly agreed that they know teaching /learning situations suitable for ICT use, 45.5% agreed, 15.2% disagreed, 6.1% disagreed strongly while 6.1% were uncertain. 33.3% strongly agreed that they find useful curriculum resources on the internet, 48.5% agreed, 9.1% disagreed, and 3.0% disagreed strongly while 6.1% were uncertain. 24.2% strongly agreed that they can use a computer to monitor student progress, 45.5% agreed, 18.2% disagreed, 6.1% disagreed strongly while 6.1% were uncertain. 21.2% strongly agreed that they can use ICT to give effective presentations, 45.5% agreed, 21.2% disagreed, 6.1% strongly disagreed while 6.1% were uncertain. 18.2% strongly agreed that they can use ICT to collaborate with others, 34.4% agreed, 21.2% disagreed, 18.2% disagreed strongly while 6.1% were uncertain. 21.2% strongly agreed they can install educational software in their computers, 27.3% agreed, 33.3% disagreed, 21.2% disagreed strongly, while 6.1% were uncertain. 24.2% agreed strongly that they can use internet to support student learning, 48.5% agreed, 12.1% disagreed, 9.1% disagreed strongly, while 6.1% were uncertain. 21.2% agreed strongly that they can use ICT to keep students records, prepare exams and other administrative work, 48.5% agreed, 15.2% disagreed, 6.1% disagreed strongly while 9.1% were uncertain. 9.1% strongly agreed that they have acquired enough technical skills on the use if ICT through training, 27.3% agreed, 33.3% disagreed, and 24.2% disagreed strongly while 6.1% were uncertain. 9.1% agreed strongly that most of the time they use ICT to collect and analyze data in school, 27.3% agreed, 39.4% disagreed, and 18.2% disagreed strongly while 6.1% were uncertain. 20.6% agreed strongly that using ICT had improved their job performance in managing their student data, 41.2% agreed, 20.6% disagreed, 11.8% disagreed strongly while 5.9% were uncertain.

From the findings, a good number agreed and strongly agreed to most of the statement requested, while quite a good number disagreed and strongly disagreed to the statement. It's clear that teacher require more training to enhance ICT integration in teaching and learning and general administration work in the schools. This will enhance their confidence in using ICT in teaching and learning.

4.5.3 Knowledge level of the Teacher and its influence on ICT integration.

The respondents were requested to comment whether the knowledge of the teacher had influence on ICT integration. The findings were as shown on the table 4.5-3.

Table 5-3Influence of Teacher knowledge in ICT integration

Factor	Strongly Agree	Agree	Disagree	Strongly Disagree	Uncertain
Knowledge of the teacher has influence on ICT integration in teaching and Learning	60.6%	30.3%	3.0%	3.0%	3.0%

Majority 60.6% strongly agreed that Teacher knowledge has great influence on ICT integration, 30.3% agreed, 3.0% disagreed while 3.0% strongly disagreed and 3.0% were uncertain. From the findings the level of ICT knowledge has a strong influence on ICT integration in teaching and learning.

4.5.4 School ICT Support Personnel

The respondents were requested to indicate whether they had an ICT support personnel in their school. The findings were as shown on the table 4.5-4.

Table 5-4ICT personnel presence in the school

Response	Frequency	Percentage
Yes	23	62.2%
NO	14	37.8%
Total	37	100%

From the findings 24 respondents constituting 62.2% indicated they had ICT personnel while 14 respondents accounting for 37.8% did not have ICT personnel in their school. The study shows that a good number did not have a technical support who can aid to reduce anxieties associated with new technologies.

4.5.5 Training on ICT for the Deputy Principal

The respondents Deputy Principal were requested to state if they had undergone any ICT training; the findings were as shown in the table 4.5-5.

Table 5-5 Training on ICT for the Deputy Principal

Response	Frequency	Percentage
Yes	02	50%
NO	02	50%
Total	04	100%

The study shows that out of the four only 2 (50%) had undergone some ICT training while 2(50%) had not gone through any ICT training. This shows a gap since some of them are also teaching some subjects and for them to use and support ICT integration, they require adequate knowledge on ICT.

4.5.6 Presence of a computer in the Deputy Principal office

The Researcher wanted to find out if the Deputy Principal had a computer in their office; results were as shown in the table 4.5-6.

Table 5-6 Computer in the Deputy Principal office

Response	Frequency	Percentage
Yes	00	0.0%
NO	04	100%
Total	04	100%

The findings showed none of the Deputy Principal's offices had computers. This indicates that they may have no access to the computers for their own administration tasks as well as for teaching and learning especially those who take various subjects.

4.5.7 Level of ICT proficiency among teachers

The Researcher wanted a rating from the **Deputy Principal** on the level of ICT proficiency among the teachers. The results were as shown in the table 4.5-7.

Table 5-7 ICT Proficiency Level

Factor	Very High	High	Low	Very Low
Level of ICT proficiency among Teachers	0.0%	0.0%	100.0%	0.0%

From the findings of the study, all the respondents 100% stated that the level of proficiency among their teacher was low. This is a clear indication that there is a need to more in-service training to enable then embrace ICT integration in teaching and learning. Majority of the teachers indicated they had very basic computer packages knowledge and they recommended need more training to enhance their use of ICT in teaching and learning.

4.5.8 Government Employed ICT Teacher

The researcher sought to find out of the schools had ICT teacher employed by the government to aid in integration of ICT in teaching and learning. The findings were as indicated in the table 4.5-8below:

Table 5-8 Employed ICT teacher

Response	Frequency	Percentage
Yes	02	50.0%
NO	02	50.0%

Total	04	100%
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The study found out that some schools 2(50.0%) had an ICT teacher who undertaking the task of championing the ICT integration in teaching and learning. While 2 (50%) did not have an ICT teacher. They were relying on those who had undergone basic training on ICT.

4.6 School Leadership and its influence on ICT integration

The study sought to find out a number of issues regarding the influence of school leadership on the integration on ICT into teaching and learning. These issues included the school leader's capacity in ICT, management commitment to ICT integration, possession of ICT strategic plan.

4.6.1 School administration and ICT Integration in Teaching and Learning

The respondents (**Teachers**) were requested to indicate whether school management supported ICT integration in Teaching and Learning. The findings were as shown on the table 4.6-1.

Table 4.6-1 Role of School Administration

Statement		Strong Agree	Agree	uncertain	Disagree	Strongly Disagree
Enhancing training development	staff and	30.3%	39.4%	9.1%	6.1%	15.2%
Mobilizing necessary resources for ICT integration		15.2%	69.7%	9.1%	0.0%	3.0%
Encouraging staff to embrace ICT		33.3%	48.5%	15.2%	3.0%	0.0
Recognizing and rewarding efforts made by staff in ICT integration		18.2%	21.2%	27.3%	21.2%	3.0%

Role of Principal and teachers have been made easier with ICT introduction	9.1%	63.6%	18.2%	6.1%	3.0%
I feel ICT generated data have improved the efficiency of school administration.	30.3%	45.5%	12.1%	3.0%	3.0%

From the findings, in enhancing staff training and developments, 30.3% of the respondents strongly agreed, 39.4% agreed, 6.1% disagreed, 15.2% strongly disagree and 9.1% were uncertain. In mobilizing resources necessary for ICT integration, 15.2% of the respondents strongly agreed, 69.7% agreed, 3.0% disagree and 9.1% were uncertain. In encouraging staff to embrace ICT, 33.3% of the respondents strongly agree, 48.5% agreed, 3.0% disagreed while 15.2% were uncertain. In Recognizing and rewarding efforts made by staff in ICT integration, 18.2% of the respondents strongly agreed, 21.2% agreed, 21.2% disagreed, 3.0% strongly disagreed while 27.3% were uncertain. In Role of Principal and Teachers made easier with ICT integration, 9.1% of the respondent strongly agreed, 63.6% agreed, 6.1% Disagreed, 3.0% strongly disagreed while 18.2% were uncertain. In ICT generated Data and improvement of efficiency of school administration, 30.3% of the respondents agreed, 45.5% strongly agreed, 3.0% disagreed, and 3.0% strongly disagreed while 12.1% were uncertain. From the study, majority of the respondents agreed and strongly agreed that school administration was involved in staff training and development, encouraged staff to embrace ICT, ICT had made work easier and data generated from ICT has improved the efficiency of the school administration. A good number, minority did not agree to the fact that the school administration was involved in staff training and development, encouraged staff to embrace ICT, ICT had made work easier and data generated from ICT has improved the efficiency of the school administration. Many respondents did not agree that school administration was involved rewarding and recognizing efforts made by staff in ICT integration.

4.6.2 Role of School Administration

The respondents (**Deputy Principal**) were requested to indicate whether school management supported ICT integration in Teaching and Learning. The findings are as shown on the table 4.6-2 below.

Table 4.6-2 School Administration Role

Statement		Strong Agree	Agree	Disagree	Strongly Disagree
Enhancing training development	staff and	25.0%	50.0%	0.0%	25.0%
Mobilizing necessary resources for ICT integration		25.0%	50.0%	25.0%	0.0%
Encouraging staff to embrace ICT		25.0%	75.0%	0.0%	0.0%
Recognizing and rewarding efforts made by staff in ICT integration		25.0%	50.0%	0.0%	25.0%
Role of Principal and teachers have been made easier with ICT introduction		0.0%	75.0%	0.0%	25.0%
I feel ICT generated data have improved the efficiency of school administration.		0.0%	75.0%	0.0%	25.0%

From the findings, on enhancing staff training and developments, 25% of the respondents strongly agreed, 50% agreed, and 25% strongly disagree. In mobilizing resources necessary for ICT integration, 25% of the respondents strongly agreed, 50% agreed, 25% disagree. In encouraging staff to embrace ICT, 25% of the respondents strongly agree, 75% agreed while not disagreed. In Recognizing and rewarding efforts made by staff in ICT integration, 25% of the respondents strongly agreed, 50% agreed while 25% disagreed. In Role of Principal and Teachers made easier with ICT integration, 75% of the respondent agreed while 25% strongly disagreed. In ICT generated Data and improvement of efficiency of school administration, 57% of the respondents agreed while 25% disagreed. From the Finding, majority agreed that the leadership was encouraging staff to embrace ICT and their roles had improved greatly as a result of using ICT in school administration.

4.6.3 Role of School leadership in ICT integration in teaching and learning

The researcher was interested in finding out the contributing role played by school leadership/management in integration ICT in teaching and learning.

The deputy principal felt that they had participated in creating awareness to the teachers in use of ICT, they had encouraged teachers to use ICT, provided computer lab and softwares necessary for ICT integration in teaching and learning. On the other hand the teacher felt that the management played a part in mobilizing teachers to use ICT, has organized several workshop and trainings to create awareness in ICT integration. They had also been involved in ensuring the school has internet connectivity by providing budget for the services.

From the principal interview, all the school had a culture of promoting ICT and they had ICT policy and plans. However they stated that there was no government funding for maintenance of the computers, internet connectivity or for refresher courses in ICT.

Computers have been useful and will remain useful in the school, a lot of tasks were being carried out using computers such as student national exam registration, Research on course work, Book keeping and accounting, Exam analysis, Learning and teaching and computers studies where basic computer classes give to the students who are taking computers as a subject.

4.7 School Structure in relation to ICT integration in Teaching and learning

The section present findings of the study on school structure. The researcher paid attention on presence of Computer Lab, internet connectivity, availability of power and power backup plans and measures put in place to ensure security of ICT infrastructure.

4.7.1 Presence of a computer Lab in the school

The researcher sort to find out if the schools had Computer Lab(s). The finding were as shown in the table 4.7-1.

Table 4.7-1 Presence of School lab

Response	Frequency	Percentage
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Yes	34	92%
NO	03	08%
Total	37	100%

The study found out that Majority, 34 respondents accounting for 92% had a computer lab in the school while only 3 respondents, accounting for 08% did not have a computer lab in the school. To ensure Security of the school lab, teacher stated the lab is fitted with metal grills on the windows and the doors, the computer teacher is in charge on the lab controlling those who get access to the lab and ensuring that all students are under the guidance of the teacher when using the computers. Some schools have employed security personnel to guard the computer lab.

4.7.2 Location on the computers in the school

The study sought to find out if the schools had computers available in other areas within the school. The findings were as shown in the table 4.7-2.

Table 4.7-2 Location of Computer on other areas other than LAB

Response	Frequency	Percentage
Office	32	84.2%
Staffroom	03	7.9%
Classroom	00	0.0%
Others	03	7.9%
Total	38	100%

Majority of the computers are located in the office 32(84.2%) mainly in the secretary, accountant or bursar office. Apart from the computer lab, classes did not have any computers (0.0%) while the staffroom had one or none 3 (7.9%). This indicates that teachers may not have access to the computers especially when the lab is occupied for lessons. This makes it difficult for teachers to have ample time with a computer to prepare the lessons.

4.7.3 Availability of internet connectivity

The study sought to find out if the schools had internet connectivity in the school. The findings were as shown in the table 4.7-3.

Table 4.7-3 Internet connectivity

Response	Frequency	Percentage
Yes	20	54.1%
NO	17	45.9%
Total	33	100%

Out of 33 respondents, 20(54.1%) had internet connectivity while 17(45.9%) did not have internet connectivity in their schools. Those with internet connectivity, the deputy principal stated that the school must meet the payments. Internet connectivity from the service providers was expensive and unreliable due to poor communication signals and network. Internet usage was limited to exam registration.

4.7.4 Reliability of the internet connection

The study sought to find out if the schools internet connectivity was reliable. The findings were as shown in the table 4.7-4.

Table 4.7-4 Internet connection Reliability

Response	Frequency	Percentage
Yes	07	18.9%
NO	30	81.1%
Total	37	100%

Out of the 37 respondents, 7 (18.9%) agreed that internet connectivity was reliable while majority, 30 (81.1%) felt that their internet connectivity was unreliable. This is due to the fact that Kajiado Central is in rural area where communication network is poor and most of them rely on service providers who have not invested in the area due to poor population distribution.

4.7.5 Reliable power supply

The study sought to find out if the school had reliable power supply. The findings were as shown in the table4.7-5.

Table 4.7-5Power supply

Response	Frequency	Percentage
Yes	18	48.6%
NO	19	51.4%
Total	37	100%

Out of the 37 respondents, 18 accounting to 48.9% had power supply in the schools, while 19 accounting to 51.4% felt that the power supply was not reliable. The area is affected by the rural electrification rationing.

4.7.6 School and backup plan(s)

The study sought to find out if the school had power backup plans. The findings were as shown in the table4.7-6.

Table 77-6Back up plans

Response	Frequency	Percentage
Yes	00	0.0%
NO	37	100%
Total	37	100%

All the respondents 100%, had no backup plans. During the power rationing and blackout, the class conducted through ICT are affected.

4.8 Challengesfacing the use of ICT in teaching-learning processes

The researcher sought to find out the challenges that the schools experienced in integrating ICT in teaching and learning. Principal, Deputy Principals were requested to state the biggest challenges they were facing;

The principals stated that the challenges they were facing were Teacher attitude towards ICT thus rigidity for change, computers not adequate for the school in relation to the number of students and staff, unreliable powersupply with no backups, poor internet connectivity, lack of a dedicated ICT teacher, lack of funds for servicing the computers making the computers expensive to maintain with school budget. Some didn't have a dedicated computer lab, the lab was used for other activities making access to machines and security difficult. They also felt that teacher were not well equipped with ICT skills the training that was done was not adequate.

4.9 Possible recommendations in the use of ICT in teaching-learning process

The researcher was interested in finding out some recommendations that would ensure that the schools are able to integrate ICT in teaching and learning. Principal, Deputy Principals were requested to state such recommendations;

Majority stated that they required funding to maintain the computers and also cater for the internet connectivity. The computers were inadequate in relations to students and the staff which they wished would be increased to allow more accessibility. ICT Knowledge and skills of the teachers were low and they required more training to effectively use ICT infrastructure. They were experiencing power rationing and blackouts and wished they had backup power plans to enable conduct teaching without interruptions. Kajiado being in the rural area suffered poor communication network making internet connectivity in the schools to be slow and unreliable. Some schools felt they required a dedicated ICT teacher as well as a dedicated computer lab. Relevant software to enable train all the subjects using computers was also a recommendation.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study findings, discussions, conclusions and recommendation of the research. The chapter also contains suggestions of related studies that may be carried out in the future.

5.2 Summary of findings

The purpose of this study was to investigate the factors influencing ICT integration in teaching and learning in public secondary schools specifically those that benefited from the government project that was geared towards enhancing ICT integration in teaching and learning. The objectives of the study were to determine the influence of availability and access to ICT infrastructure, how human resource capacity influences ICT integration, how school leadership and technical support influence ICT integration, how school structures affect ICT integration in teaching and learning in public secondary schools in Kajiado central Sub-County, Kenya. The researcher wanted to answer the following questions: What is the influence of availability and access to ICT infrastructure on ICT integration, to what extent does the human resource capacity influences ICT integration, what is the influence of school leadership on ICT integration and what is the Status of the school structures on ICT integration in public schools? The research employed a descriptive survey design where questionnaires, and interview schedules were used to collect data from the respondents.

The researcher found out that inadequate ICT infrastructure, limited ICT skills and training, limited access to technical support, poor internet access, and unreliable power hinder the integration of ICT in teaching and learning in secondary schools.

5.3 Discussion of the findings

The findings of the study answered the research questions since the influence of; availability and access to ICT infrastructure, human resource capacity, school leadership and school structure on ICT integration in teaching and learning has been quantified by descriptive statistics. The discussion and related literature were presented for each of the variables of the study.

5.3.1 ICT infrastructure and ICT integration

In Kajiado Central Sub-County, ICT infrastructure influenced ICT integration in teaching and learning since the findings showed that schools did not have adequate resources. This is as confirmed by Olatunde, (2010) who asserted that resources are vital factors that make a system. It is the provision of these resources that determine the success or achievement of the set goals of the system (Olabanji, 2010, Ekundayo, 2010). Most schools had 11 computers, 1 projector and one laptop that clearly indicated insufficient resources. Compared to the number of students and the teachers, this was too way below the expected ratio of 1:3 due to the screen visibility. Most of the schools have stuck with 11 computers more than 3 years due to the high cost of acquiring both hardware and software.

Empirica's (2006) European study found that lack of access is the largest barrier and that different barriers to using ICT in teaching were reported by teachers, for example a lack of computers and a lack of adequate material. Pelgrum (2001) explored practitioners' views from 26 countries on what were the main obstacles to the implementation of ICT in schools. He concluded that four of the top ten barriers were related to the accessibility of ICT. These barriers were insufficient numbers of computers, insufficient peripherals, insufficient numbers of copies of software, and insufficient simultaneous Internet access. Toprakci (2006) found that low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software in the school were barriers to the successful implementation of ICT into science education in Turkish schools. Similarly, Al-Alwani (2005) found that having no access to the Internet during the school day and lack of hardware were impeding technology integration in Saudi schools.

Access to ICT infrastructure and resources in schools is a necessary condition to the integration of

ICT in education (Plomp, Anderson, Law, & Quale, 2009). Therefore, access to computers, updated software and hardware are key elements to successful adoption and integration of technology.

Most schools did not have digital content which is an integral component of ICT integration in teaching and learning.

5.3.2 Human resource Capacity

Human resource capacity in Kajiado Central Sub-County was very low. Effective teaching practices ensure effective learning takes place which generally results in independent, self-motivated learners (Waimsley, 2010). Cradler (2002) gave some requirements for effective use of ICT in education and among them were providing both in service and pre-service training, providing time for teachers to plan and learn how to integrate technology and provide on-going technical support for technology use. From the vast majority of the respondents who participated in this study indicated there being a great need to enable their capacity in terms of training. In-service training would greatly improve and advance their capacity in handling ICT integration in teaching and learning.

However it's worth noting that ICT impact positively on teaching and learning processes in public Secondary Schools, even though the impact have not been maximized. This is attributed to the fact that many School leaders such as Deputy Principal, head of departments as end users to ICT lacked adequate training. Those with skills were just basic computer packages. Teachers need to continually work at updating their skills and knowledge in the operation and use of ICT given the fact that ICT knowledge is very dynamic. In addition, there is a need to be up-to-date with curriculum content pedagogy.

Other studies have found that personal access to computers for the purpose of preparing and planning is one of the strongest influences on the success of ICT training and subsequent classroom use (Office for Standards in Education, 2002)

Curriculum and technical support requirements may be viewed in terms of supporting users in implementation of appropriate pedagogy. Lack of knowledge and skills in operating ICT can hinder use of ICT in the classrooms. Implementations of computer applications have been hampered by lack of experience and appropriate computer skills. All this can be addressed by considering technical and curriculum support for teachers (Becta, 2002)

5.3.3 School administration/Leadership on ICT integration.

In Kajiado Central Sub-County Principals promoted an atmosphere of trust and sharing of resources but were not resources providers. The study revealed that although the school management had the role of clearly cutting out the route take in terms of strategic plan and provision of resources for ICT integration, their ICT skills and knowledge among them was very low. Most of them did not have computers in their offices and the administration work using ICT was limited to student exam registration.

According to Becta, (2002) supportive, enthusiastic and visionary leadership has a positive impact on teachers' attitude and behavior. Teacher need support in making use of the new technology in administrative work as well as in teaching and learning (Lankshear & Snyder, 2000)

ICT has not realized its full potential as most of the respondents even those in the management level still lacked training on ICT which concurs with Kandiri (2006) who noted that there has been insufficient training and re-skilling of ICT end users as well as technical staff. This has tremendously affected ICT integration.

Studies such as Keiyoro (2010) show that only 9.5 of the teachers from both NEPAD and Cyber E-Schools in Kenya indicated that the principals were supportive of ICT integration and the support was linked to Principals belief in usefulness of ICT. Findings suggested that effective and supportive leaders were the most likely to increase both and deepen ICT integration in school. Principals are therefore likely to make the dreams of ICT integration in teaching and learning be realized through modeling and taking an active role towards this effort.

5.3.4 Availability of School Structures to support ICT

Many rural areas do not yet form part of the national electricity grid" (Conradie et al., 2003, p.31) this is particularly an acute problem since technology and the Internet can only be very effective if it is generated by electricity.

Kaemba, and Gachoka, (2006) and Ford (2007) discussed several reasons for under use of ICT in education in the African context. The cost of adopting ICT including acquiring hardware and software, setting up telecommunication networks, and the maintenance and repair of facilities is often prohibitive for developing nations.

Kajiado Central Sub-County is located in a remote location. The area suffers greatly from unstable power supply which time to time is subjected to rationing and lack of telephony networks. Poor infrastructure including unreliable transportation, limited electricity supply, and broadcast and telecommunication facilities makes it difficult for institutions to maintain Internet connections and in the case of Kenya electricity is not government subsidized making it relatively expensive at an average cost US\$ 0.08/KWh compared to US\$0.02/KWh, Kessy, Kaemba, and Gachoka, (2006) and Ford (2007)

From the study, majority of the respondents indicated that, lack of stable electricity affected learning since none of the schools had power backups, some schools lacked dedicated labs which made access to computer difficult especially when the lab was used for other purposes. This was also a security concern for the computers. Computers and peripherals are expensive component which need extra security which can only be ensured by a dedicated lab under the supervision of computer teacher or support personnel. In addition proper electrical wiring, heating/cooling and ventilation, safety and security remain key requirements of a computer lab.

5.4 Conclusion

The supply of ICT resources by the Government of Kenya to public secondary schools in each constituency in general has boosted ICT integration in teaching and learning Kajiado central Sub-county. ICTs have great advantage in improving all sphere of life including education.

The researcher therefore concludes that the interplay of factors have negatively influenced and slowed the use of ICTs in teaching and learning in public secondary schools. This includes inadequate, unavailability and inappropriate ICT infrastructure in the secondary schools; limited ICT knowledge and skills for the teachers characterized by inadequate time for in-service courses for teachers; limited technical support during teaching and learning process, limited internet connectivity,

unstable power supply and restrictive administrative practices mainly limited budgetary allocations. Therefore there has been limited use of ICTs in class presentation in public secondary school.

5.5 Recommendations

In this section, the researcher has presented recommendation on actions to be taken based on the findings of the study.

The researcher recommends that:

To enhance access to ICT resources, the government and other stakeholders to equip schools with adequate ICT resources and increase the number of schools benefiting per constituency. Government should make available avenues in which the schools can acquire computers at a reduced cost. This can be done through tax waiver on computers meant for learning in the secondary schools.

The Government, through Rural Electrification Authority (REA), should accelerate distribution of mains electricity to connect secondary schools in rural areas to the national grid and improve internet connectivity as major ICT infrastructure in ensuring schools e-readiness. Alternative sources of energy can be used in the remote places where it is very expensive to provide adequately. Power back up system can help solve the problem power interruption.

There ministry of education should develop pre-service and in-service staff training programmes that are tailored to the school programmes to keep teachers up to date with the technological changes which will promote proper integration of ICTs in teaching and learning. More teachers should be deployed to the schools to train the students on the use of computers for more to increase the confidence when learning using ICTs. There should have ICT technician at the regional education levels to help teachers with the computer hardware or the software and also assist the teachers handle any computer breakdown.

More Research need to be done after two to three years to find out the impact of ICT integration on transition rates and performance in national examinations.

5.6 Suggestions for further studies

1. This study was carried out in one sub-County only; a similar study to be carried out in the other sub-Counties.

2. This study to be done on a different geographical areas in Kenya
3. A study could be carried out to find out the factors that influence the use of ICTs in the private secondary schools.
4. A study can be carried out to determine the cost- benefit analysis of using ICTs in secondary schools.
5. A comparative study can be carried out on the impact of using ICTs in secondary school performance.

REFERENCES

- Alade, E.B (2005) *Technology Enhancement primary education Initiatives in Kenya*. Education in the Digital World edited by Ramesh C Sharma, Sanjaya Mishra and .SK. Pulist Viva Books Private Limited. New Delhi.
- Abagi, O. and Odipo, G. (1997). Efficiency of primary education in Kenya. *Situational Analysis Implications. IPAR Discussion paper No.00497/95*. Nairobi: Regal Press.
- Afshari, M., Bakar, K.A. and Luan, W.S (2009). Factors affecting teachers' use of information and communication technology, *International Journal of Instruction January 2009.Vol.2, No.1ISSN: 1694-609X.www.e-iji.net*
- Albirini, A. (2007). The crisis of educational technology, and the prospect of reinventing education. *Educational Technology& Society*, 10 (1), 227-236.
- Ayere M. A., Odera F. Y. andAgak J. O. (2010). E-learning in secondary schools in Kenya: a case of the nepad e-schools Maseno University, Kenya. *Educational Research and Reviews* Vol. 5 (5), pp. 218-223, <http://www.academicjournals.org/ERR2> ISSN 1990-3839 © 2010 Academic Journals
- Balanskat, A. (2006). The ICT Impact Report *.A review of studies of ICT impact on schools in Europe* European Schoolnet in the framework of the EuropeanCommission's ICT cluster.
- Becker, H.J. (2000). Teacher professional engagement and constructivist-compatible computer use. *Teaching, learning and computing: 1998 National Survey. Report7.Center for Research on Information Technology and Organizations*.
- Becta (2004).A review of the research literature on barriers to the uptake of ICT by teachers.Becta.www.becta.org.uk/page_documents/research/barriers.pdf
- Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environment: *A Review of Literature. Eurasia Journal of Mathematics,Science and Technology education* 5(3) 235-245
- Birungi, P. and Musoke, M. (2004). Towards a knowledge society for Africa development. Uganda Library Association (ULA). Kampala, Uganda.
- Birungi and Ngwenyama, (2008). Towards a knowledge society for African development. Uganda Library Association (ULA). Kampala, Uganda.
- Becta, (2002). *The impact of Information and Communication technologies on Pupil learning and attainment. (ICT in Schools Research and Evaluation Series-No-7): DFES*
- Bollou, F. (2006). ICT Infrastructure expansion in Sub-Saharan Africa: An analysis of six West African Countries from 1995 to 2002. *Electronic Journal of Information Systems in Developing Countries*, 26(5), 1–16.

- Bollou and Ngwenyama, (2008). Are ICT investments paying off in Africa? An analysis of total factor productivity in Six West African Countries from 1995 to 2002. *Information Technology for Development*, 14(4), pp 294-307.
- Braun, J. A., & Kraft, C. (1995). Using technology to learn from travelmates' adventures. *Social Studies and the Technology & Society*, 11 (3), 37-51.
- Borg, W. R. and Gall, M.D., (1989). *Educational Research; an Introduction*, 5th Ed New York: Longman
- Bryderup, I.M., Kowalski, K., (2002). The role of local authorities in the integration of ict in learning. *Journal of Computer Assisted Learning*, 18(4), pp. 469-480.
- CET (1975). Two Years On: The National Development Programme in Computer Assisted Learning. London, The Council for Educational Technology (CET): 106.
- Conradie, P. & Jacobs, J. (2003). Bridging the digital divide. *Engineering Management*, 3034.
- Farrell, G. (2007). Survey of ICT and education in Africa: *Kenya country report*. www.infodev.org/en/document.409.pdf.
- Farrell, G. and Shafika, I (2007). Survey of ICT and education in Africa: A Summary Report, based on 53 country surveys. Washington, infoDev. <http://www.infodev.org/en/publication.353.html>.
- Frank, W.T. (2007). Sufficient conditions for sustainable instructional changes in the classroom: *The case of Hong Kong. The Chinese University of Hong Kong*
- GOK, (2007). *A globally Competitive and Prosperous Kenya*. Vision 2030
- Gulbahar, Y., & Guven, I. (2008). A Survey on ICT Usage and the Perceptions of Social Studies Teachers in Turkey. *Educational technology & Society*, 11 (3), 37-51.
- Harris, R. W. (2004). *Information and Communication Technologies for Poverty Alleviation*. United Nations Development Programme's-Asia-Pacific Development Information Programme (UNDP-APDIP) Kuala Lumpur, Malaysia
- Hasselbring, T. S. (1986). History and Status of Computers in Education. Computer Strategies for education: *Foundations and Content-Area Applications*. C.K. Kinzer, R. D. Sherwood and J. D. Bransford. Columbus, Ohio, Merrill Publishing Company: 15-29.
- Jensen, M. (2002). *Information and Communication Technologies (ICTs) in Africa – A Status Report: UN ICT Task Force “Bridging the Digital Divide in the 21st century”*; Presented to the Third Task Force Meeting United Nations-Headquarters. <http://www.unicttaskforce.org/thirdmeeting/documents/jensen%20v6.htm>
- Kent, T. W. and R. F. McNergney (1999). Will technology really change education?: *From blackboard to Web*. Thousand Oaks, California, Corwin Press Inc.

- Kidombo, H.J. (2009). *Status of Pedagogical Integration of ICT in Education in Selected Kenyan Schools, University of Nairobi, Kenya*
- Kombo, D.K. and Tromp, D.L.A. (2006). *Proposal and Thesis Writing: An Introduction*. Nairobi: Paulines Publications Africa.
- Korpela et al, (2003). The link between ICT and economic growth in the discourse of development chrisanthi avgerou London school of economics. *Organizational Information Systems in the Context of Globalization*, Boston Kluwer, pp 373-386 (2003)
- Kozma R.B. (2009). ICT and educational reform in developed and developing Countries, *Center for Technology in Learning SRI International* 333
- Kozma, R. B (2005). *ICT, education reform, and economic growth*. White Paper Kozma, R. B. (2000). Technology, innovation, and educational change: a global perspective. *Eugene, OR: International Society for Technology in Education*
- Kweyu, E. (2009). Use of ICT in enhancing teaching and curriculum delivery in marginalized secondary schools in Kenya, *HP Innovations in Education Grant 2009/11*
- Labelle, R. (2005.). ICT Policy Formulation and e-Strategy Development, *A Comprehensive Guidebook UNDP-Asia Pacific Development Information Programme*
- Langmia, K. (2005). The role of ICT in the economic development of Africa: The case of South Africa. Bowie State University, *USA International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 2005, Vol. 2, Issue 4, pp. 144-156.
- Murphy, Anzalone, Bosch and Moulton, (2007). ICT integration processes in Turkish schools: *Using activity theory to study issues and contradictions* NEPAD – Promoting e-schools in Africa
- Maguire D.W. (2003). The use of clusters to build an ICT industry, informing science In SITE - “Where Parallels Intersect” June 2003 Edith Cowan University, Perth, Western Australia allmaguires@bigpond.com.au
- Medlin, B.D. (2001). The factors that may influence a faculty member's decision to adopt electronic technologies in instruction (Doctoral dissertation, Virginia Polytechnic Institute and State University, 2001). *Pro Quest Digital Dissertations*. (UMI No. AAT 3095210).
- MHEST (2010). ICT capacities and capabilities in secondary schools in Kenya 2009/2010 ncst no: 046 Ministry of Higher Education, Science and Technology and National Council for Science and Technology. REPUBLIC OF KENYA
- Minishi-Majanja, M.K. (2007): Integration of ICTs in library and information science education in sub-saharan Africa, *Department of Information Science, University of South Africa, Pretoria - South Africa*. majanmk@unisa.ac.za

- Minishi-Majanja, M. K. (2003). Mapping and audit of information and communication technologies in lis education in Africa: *A Literature Review.Education for Information*, vol. 21 no. 2-3, pp.159-179.
- Ministry of Education. (2001). *National plan for higher education in South Africa*. Government Printer: Pretoria
- Moahi, K. H. (2006). *The Integration of ICTs in the LIS curriculum: department of LIS*, University of Botwana. A paper presented at the IFLA workshop on integrating ICTs in LIS curriculum in Africa. 21-23 November 2006 at SafariCourt Hotel, Windhoek – Namibia.
- Mugenda, O. M. and mugenda, A. G. (1999). *Research Methods. Qualitative and Quantitive Approaches*. Nairobi: acts press
- Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the Literature. *Journal of InformationTechnology for Teacher Education*, 9(3), 319-342
- Mureithi, M. and Munyua, W.A. (2006). Making ICT work for the poor in Kenya: *In search ofan entry strategy framework working draft Ver 4*mureithi@summitstrategies.co.ke
- Oloo, L.M. (2009). *Baseline Survey Report for ICT in Secondary Schools in Selected Parts of Kenya*. Draft Report, Maseno University, MAY 2009
- Orodho, J.A. (2009). *Essentials of Education and Social Science Research Methods*.2nd Ed Kanezja Publisher, Maseno, Kenya.
- Orodho.J.A. (2009). *Techniques of Writing Research Proposal and Reports in Education and Social Sciences*. Kanezja, Maseno, Kenya.
- Orr, G. (2003). *Diffusion of innovations*, by Everett Rogers (1995) Reviewed Parisot, A.H. (1997). Distance education as a catalyst for changing teaching in the community college: Implications for institutional policy. *New Directions forCommunity Colleges*, 99, 5-13.
- Robinson, L. (2009). *A summary of diffusion of innovations*. Fully Revised andRewritten Jan 2009
- Ravenswood Ave. Menlo Park, California 94025* USArbert.kozma@sri.com Kozma, R., & Wagner, D. (2006). Reaching the most disadvantaged with ict: what works? In R. Sweet & D. Wagner (Eds.), *ICT in non-formal and adulteducation: Supporting out-of-school youth and adults*. Paris: OECD
- Rogers, E.M. (2003). *Diffusion of innovations* (5th Ed.). New York: Free Press. Samad A.A. (2009). Enhancing Human Capital through Teacher Education *proceedings of the 1st International Conference on Educational Research andPractice (ICERP)*
- Sahin, I. Review (2006). Detailed of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *The TurkishOnline Journal of Educational Technology – Tojet April 2006 ISSN: 1303-6521volume 5 Issue 2 Article 3*

- Sookram, C. (2008). *Information Communication Technologies: Utilizing the Internet in the Development of International Studies Curriculum and 'Global' Classrooms*. University of Waterloo Paper prepared for Panel: Learning to Educate: Curricular and Program Innovations 2008 ISA Annual Convention March 28, 2008.
- San Francisco, California. Spence R. and Smith M. (2009). *Information and Communication Technologies, Human Development, Growth and Poverty Reduction: A Background Paper* DRAFT April 28, 2009
- Taylor, R. and Zhang, B. (2007). *Measuring the Impact of ICT: Theories of Information and Development* Telecommunications Policy Research Conference Young Learner, 7 (3), 8-10. September 26-28, 2007, Washington, D.C.
- Tin, K.L. (2002). Effective teaching in the information era: fostering an ICT based integrated learning environment in schools, *Asia-Pacific Journal for Teacher Education & Development* 5(1):pp. 21-45
- Tomar and kumari, (2005). *Education Technology*. Shree Publishers and Distributors, New Delhi.
- Twining P. (2002). *ICT in Schools Estimating the level of investment*. Report No: 02.01
- UNDP, Human Development Report (2001). *Making New Technologies Work for Human Development*, Oxford University Press, New York, 2001
- UNESCO (2000), World Educational Forum; A Statistical Document. Dakar, Senegal.
- UNESCO (2008). *Integrating ICTs in education, lessons learned*. Published by the UNESCO Asia and Pacific Regional Bureau for Education
- Watkins, N. (2009). *A Case Study Investigation of the Impact of Communicative Technologies On Classroom Technology Integration* K20 Center for Educational and Community Renewal, University of Oklahoma Norman, 405.325.5839 Paper presentation for the University Council for Educational Administration Anaheim, California. nwatkins@ou.edu
- World Bank (2003). *ICT and MDGs: A World Bank Perspective*. Washington: World Bank.
- Zheng, Y. (2009). Different spaces for e-development: what can we learn from the capability approach? *Information Systems and Innovation Group, Department of Management, London School of Economics*, Houghton Street, London WC2A 2AE, UK

APPENDIXI: LETTER OF TRANSMITTAL OF DATA COLLECTION INSTRUMENTS

APPENDIX 1: LETTER OF TRANSMITTAL

JENNIFER WANGARI WAIRIUKO,
P.O.BOX 17028-00100,
NAIROBI.
TEL:0721266642,
EMAIL:jaynifa@yahoo.com.

Dear respondent,

I am a computer Technical and Training consultant pursuing a Master of Arts in Project Planning and Management at The University of Nairobi. I am undertaking a research project on factors affecting the integration of ICT in teaching and learning in public secondary schools in Kajiado Central Sub-County.

You are therefore, kindly, requested to give relevant information for the success of this research. The information gathered will be treated confidentially and will be strictly be used for academic purpose only.

Please provide honest and correct information according to your own views objectively in the questionnaire provided.

Thank you, for participating.

Jennifer Wangari Wairiuko

0722-266-642

APPENDIX II:RESEARCH AUTHORIZATION

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY (State Department of Education)

E-mail: educationkajiadocentral@yahoo.com
When replying please quote
Ref: K/R.2/VOL.1/66
And
Date: 9th July, 2014



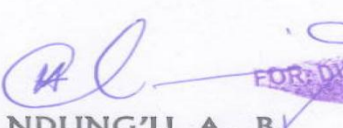
District Education Office
Kajiado Central District
P. O. Box 33
KAJIADO


All Principals
Public Secondary Schools
KAJIADO CENTRAL SUB-COUNTY

RE: RESEARCH AUTHORIZATION FOR JENNIFER WANGARI WAIRIUKO

The above named person, who is a student at the University of Nairobi College of Education and External Studies, has been authorized to undertake a research on "Factors affecting integration of information and communication technology and learning in public secondary schools in Kenya". A case of Kajiado Central Sub-County

Please accord her the necessary assistance she requires.


NDUNG'U A. B.
FOR: DISTRICT EDUCATION OFFICER
KAJIADO CENTRAL



APPENDIXIII: QUESTIONNAIRE FOR TEACHERS

QUESTIONNAIRE FOR TEACHERS (Subject Heads)

INTRODUCTION

The researcher is carrying out a research on factors affecting the integration and use of ICT in teaching and learning in secondary schools in Kajiado Central Sub-County.

INSTRUCTIONS

Please don't write your name on the questionnaire. Kindly provide your honest opinion on all the items in the questionnaire. All the information provided will only be used for study purposes and will be kept confidential.

Use a tick (✓) to show your response where applicable, response can also be written.

PART 1: BACKGROUND INFORMATION

1. Gender

☐ Male ☐ Female

2. Age

- ☐ Below 20 years
- ☐ 21-30 years
- ☐ 31-40 years
- ☐ 41-50 years
- ☐ 51 and Above

3. Your level of professional training.

☐ Post Graduate ☐ Graduate ☐ Diploma ☐ KCSE

4. What is your level of ICT training?

- ☐ Certificate Proficiency packages
- ☐ Diploma in ICT
- ☐ Degree

5. Your teaching experience.

☐ Less than 5 years ☐ 6-10 years ☐ 11-15 years ☐ 16 years and above

6. Do you use a computer to teach your subject(s)?

☐ Yes ☐ No

PART II: FACTORS AFFECTING ICT INTEGRATION IN TEACHING AND LEARNING

Section 1: Availability and accessibility of ICT infrastructure.

1. In the table below please list the main technologies (Devices, equipment) you use to collect, process, share and share information in this institution.

S/No	Technology	Tick if available in the school
1	Laptops	
2	Desktop computers	
3	Projectors	
4	Printers	
5	scanners	
6	Digital content	
7	TV	

2. According to you do you think the computers in the school are enough?

☐ Yes

☐ No

3. Comment on the adequacy of internet facilities in the school

☐ Available and Adequate

☐ Available but inadequate

☐ Not available

4. Comment on the adequacy of the printing facilities in the school?

☐ Available and Adequate

☐ Available but inadequate

☐ Not available

5. Indicate the extent to which the following factors affect the use of ICT in teaching and Learning.

Factor	6 Strongly Agree	5 Agree	4 Uncertain	3 Disagree	2 Strongly Disagree	1 Disagree
Inadequate number of computers						
Lack of internet connectivity						
Lack of access to computers						

Insufficient or irregular power supply						
High cost of hardware and software						
Unavailability of appropriate software						
Structural arrangement of computers						
Computers are very old and slow						

6. Generally, ICT infrastructure has a great influence on the adoption and integration of ICT in learning in a school.

- ☐ Strongly agree
☐ Agree
☐ Disagree
☐ Strongly disagree

7. The accessibility of ICT in our school is adequate.

- ☐ Strongly agree
☐ Agree
☐ Disagree
☐ Strongly disagree

8. List any challenge you experience in the use of the ICT in the school?

.....

9. What possible recommendations would you make towards increasing the use of ICTs in enhancing teaching and learning in secondary schools?

.....

Section 2: Human Resource Capacity

10. Have you had any training on ICT? ☐ Yes ☐ No

11. How do you rate your computer expertise in the following areas

	4 Very Good	3 Good	2 Average	1 Weak
Word processing				
Spread sheets				
Internet browsing				
Presentation tools (Power point)				
Generally using a computer.				

12. In the range of 1 to 4, please rate the following variables regarding the extent to which you agree or disagree with the following statements.

S/No	Statement	4 Strongly agree	3 Agree	2 Disagree	1 Strongly disagree
1	I can prepare lessons that involve the use of ICT by students				
2	I know which teaching/learning situations are suitable for ICT use				
3	I can find useful curriculum resources on the internet				
4	I can use a computer in monitoring student's progress				
5	I can use ICT in giving effective presentation/explanations				
6	I can use ICT for collaborating with others				
7	I can install educational				

	software on my computers				
8	I can use the internet to support student learning				
9	I can use ICT to keep student records, prepare exams and other administrative tasks				
10	I have acquired enough technical skills on the use of ICT through training				
11	Most of the time I use ICT to collect and analyze data in school				
12	Using ICT has improved my job performance in managing students data				

13. The knowledge level of the Teacher has an influence on ICT integration in teaching and learning.

- ☐ Strongly agree
☐ Agree
☐ Disagree
☐ Strongly disagree

14. Our school has ICT support personnel? ☐ Yes ☐ No

Section 3: School's leadership

1. The following statements relate to the role of the Principal in integration of ICT in school administration. Using the rating given below, provide your response in relation to the extent to which you agree to the statements.

S/No	Statement	5 Strong Agree	4 Agree	3 uncertain	2 Disagree	1 Strongly Disagree
1	Enhancing staff training and development					
2	Mobilizing resources necessary for ICT integration					
3	Encouraging staff to embrace ICT					

4	Recognizing and rewarding efforts made by staff in ICT integration					
5	Role of Principal and teachers have been made easier with ICT introduction					
6	I feel ICT generated data have improved the efficiency of school administration.					

2. What role has the school leadership/management played in contributing to ICT integration in teaching and learning?

.....

.....

.....

.....

Section 4: School Structure

1. Does your school have a Computer Lab?

☐Yes ☐No

2. Where else are the computers placed in your school?

☐Office ☐Staffroom ☐Classroom ☐others (Specify).....

3. Do you have internet Connectivity/facility in the school?

☐Yes ☐No

If yes, is the connection reliable? ☐Yes ☐No

4. What are some of the measures the school has put in place to ensure security of the ICT infrastructure?

.....

.....

.....

5. Does the school have a reliable power supply and power back-up plans?

☐Yes ☐No

APPENDIXIV:QUESTIONNAIRE FOR DEPUTY PRINCIPAL

QUESTIONNAIRE FOR DEPUTY PRINCIPAL

PART 1: BACKGROUND INFORMATION

1. Gender
☐ Male ☐ Female
2. Age
☐ Below 20 years
☐ 21-30 years
☐ 31-40 years
☐ 41-50 years
☐ 51 and Above
3. Level of professional training.
☐ Post Graduate ☐ Graduate ☐ Diploma ☐ KCSE
4. Teaching experience.
☐ Less than 5 years ☐ 6-10 years ☐ 11-15 years ☐ 16 years and above
5. What is your Level of ICT training?
☐ Certificate Proficiency packages
☐ Diploma in ICT
☐ Degree

PART II: ICT INTEGRATION IN TEACHING AND LEARNING

Section 1: Availability and accessibility of ICT infrastructure.

1. In the table below please list the main technologies (Devices, equipment) you use to collect, process, share and share information in this institution. E.g. projector computer etc.

S/No	Technology	Tick if available in the school
1	Laptops	
2	Desktop computers	
3	Projectors	
4	Printers	
5	scanners	
6	Digital content	
7	TV	

2. How many students are there in the school?

.....

3. How many computers does the school have?

.....

4. Where are the computers located in the School?

S/No	Location	Yes	No
1	Principal office		
2	Deputy principal office		
3	Teacher Lounge		
4	Computer Lab		
5	Classroom		
6	Library		

5. Are the Computers Adequate for the school? ☐Yes ☐No

6. Generally, ICT infrastructure has a great influence in the adoption and integration in learning in the school.

- ☐Strongly agree
- ☐Agree
- ☐Disagree
- ☐Strongly disagree

7. List any challenge you experience in the use of the ICT in the school?

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Section 2: Human Resource Capacity

1. Have you had any training on ICT? Yes/No

2. Do you have a computer in your office? Yes/No

3. What's the level of ICT proficiency among the teaching staff?

- ☐ Very high
☐ High
☐ Low
☐ Very Low

4. Has the government Employed ICT teacher to Aid in the integration of teaching and learning in the school? ☐ Yes ☐ No
5. Does the school have ICT Technical Support personnel? ☐ Yes ☐ No

Section 2: School Leadership

1. The following statements relate to the role of the Principal in integration of ICT in school administration. Using the rating given below, provide your response in relation to the extent to which you agree to the statements.

S/No	Statement	5 Strong Agree	4 Agree	3 uncertain	2 Disagree	1 Strongly Disagree
1	Enhancing staff training and development					
2	Mobilizing resources necessary for ICT integration					
3	Encouraging staff to embrace ICT					
4	Recognizing and rewarding efforts made by staff in ICT integration					
5	Role of Principal and teachers have been made easier with ICT introduction					
6	I feel ICT generated data have improved the efficiency of school administration.					

2. The school leadership plays a great role in ICT integration in teaching and learning.
- ☐ Strongly agree
☐ Agree

- ☐ Disagree
☐ Strongly disagree

3. What role has the school leadership/management played in contributing to ICT integration in teaching and learning?

.....

4. What do you consider to be the key factors affecting ICT implementation and integration in your School? List four in the order of criticality.

.....

5. What would you propose to be done to hasten implementation and integration on ICT in education in your School?

.....

Section 4: School Structure

1. Does your school have a Computer Lab?

☐ Yes ☐ No

2. Do you have internet Connectivity/facility in the school?

☐ Yes ☐ No

If yes, is the connection reliable? ☐ Yes ☐ No

Who pay for the internet connection?

3. What are some of the measures the school has put in place to ensure security of the ICT infrastructure?

.....
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.....
.....

4. Does the school have a reliable power supply and power back-up plans?

☐ Yes ☐ No

APPENDIXV: INTERVIEW SCHEDULE FOR THE PRINCIPAL

INTERVIEW SCHEDULE FOR PRINCIPAL

1. Gender
☐ Male ☐ Female
2. Year of experience as a principal
☐ 1-5 years ☐ 6-10 years ☐ 11-15 years ☐ Above 15 years
3. Does your school have ICT policy and plan? ☐ Yes ☐ No
4. Does your school have a culture of technology use i.e. in teaching and learning, administration?
5. How many computers do you have in your school?
6. Of the number supplied above, how many are still operational? (). None (). All (). Half of them.
7. Are the Computers adequate for the school?
8. What is the main use of the internet?
9. Does the government grant any funds for the ICT education at your school? ☐ Yes ☐ No
10. What tasks are undertaken by use of computers by both teaching and non-teaching staff?
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11. What do you consider as barriers of ICT utilization in curriculum management?
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12. Does your school have a teacher(s) who specialize in ICT Support education? Yes/No
.....
If Yes, Who pays him/her? PTA/BOG Government.....

13. Are the teacher given a chances and opportunities to learn how to integrate computers into their classroom practices? Yes/No.....

14. Do you believe that teachers are motivated adequately to use ICT in teaching and learning in terms of:

☐ Training

☐ Administrative support

15. List any challenge you experience in the use of the ICT in the school?

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16. What possible recommendations would you make towards increasing the use of ICTs in enhancing teaching and learning in secondary schools?

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