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**Evaluation of the schools' Information and Technology infrastructure and its Influence on ICT Integration in Public Secondary Schools in Kitui County, Kenya**

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**Abstract**

This study was an evaluation on the integration of information and communication technology programme in public secondary schools of Kitui County, Kenya. The purpose of the study was to evaluate the level and extent to which schools have integrated ICT into teaching and learning process so that incase of any implementation gaps, recommendations can be proposed to improve the integration process. The study was guided by the following research question: How does the schools' ICT infrastructure influence ICT integration in the Secondary schools of Kitui County in Kenya? The evaluation adopted a mixed method approach whereby quantitative and qualitative approaches were used concurrently. Specifically, a convergent parallel mixed method design was used. Across sectional survey design was used as the quantitative design while a phenomenological design was used for qualitative design. Probability sampling and non-probability sampling procedures were used to select representative samples. Data was collected quantitatively and qualitatively using questionnaires, in-depth interviews, observation and document analysis guides. Quantitative data was analyzed and presented using descriptive statistics such as frequencies and percentages. Qualitative data was carefully transcribed and observed behaviors and attitudes recorded, and analyzed according to themes and be presented in narrative form. The findings of the study show that, schools' ICT infrastructure does affect ICT integration; The study recommends that, there is need to improve ICT infrastructure by increasing funding, investing on the ICT facilities and other equipments.

**Key Words:** Evaluation, Integration, Information, Communication, Technology, programme

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## **Evaluation of the schools' Information and Technology infrastructure and its Influence on ICT Integration in Public Secondary Schools in Kitui County, Kenya**

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### **Introduction**

Globally, information, communication and technology (ICT) has taken a centre stage in every aspect of life including education. The use of ICT in schools has led to significant pedagogical and educational outcomes that benefits both teachers and students. It has also enhanced students' understanding, motivation, active collaboration and lifelong learning, offering better access to information and shared working resources (Laaria, 2013, Andoh, 2012, Jimoyiannis & Komis, 2017). Integration of ICT in schools has changed methods of teaching and learning traditionally practiced in schools through creation of a more interactive learning environment in schools.

Many countries including Kenya recognizes the positive effect of ICT in enabling the country to move to a middle level economy as envisaged in Kenya vision 2030, which states that education sector will play a critical role in propelling the country to achieve economic, social and political aspirations. ICT has immense contribution to effective teaching and learning, knowledge diffusion, and the development of more efficient school services. Furthermore, the implementation of ICT in schools has been seen as an influential way to contribute to school change, improving learning outcomes, enhanced preparation of students for the information age, improving competencies of learners, and providing students with survival skills for the information society (Wong & Li, 2010).

In today's world, information and communication technology (ICT) has been thought of as the centre piece of any society, and education is one of the most important sectors where the intervention and integration of ICT can bring a lot of positive outcomes which is better for the society and country in the long run. Integrating ICT into teaching and learning for generating better outcomes in formal education is very demanding and digital technologies are a potential tool for transforming how we go about learning in deep and meaningful ways (Prestridge, 2012).

Information Communication and Technology cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. Further, ICT may be regarded as the combination of 'Informatics technology' with other related technology, specifically communication technology. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes and CD ROMs have been used in education for different purposes (Bhattacharya and Sharma, 2017).

Information Communication and Technology, encompasses equipment and services. For them, ICT includes the computing industry(hardware, software, networks, the Internet, and related services); electronic data processing and display (such as photocopiers, cash registers, calculators, and scanners, as well as a myriad of less well-known machines specifically tailored to production and manufacturing);telecommunications and related services (such as fixed and cellular telephones, facsimile machines, instant messaging,

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teleconferencing, and so on.); and audiovisual equipment and services (including television, radio, video, DVDs, digital cameras, compact discs and MP3 players among others. ICT is a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information'. These technologies include computers, the internet, broadcasting technologies (radio and television), and telephony (Tinio (2009). Therefore, ICT is widely viewed as a means of effecting change in education, which can translate directly to increased economic growth and development. Therefore, many countries the world over have embraced integration of ICT into their education system as herein elaborated.

In Kuwait, the implementation of computer use in secondary schools began in 1987 with the commencement of an introductory course in computing. However, progress in embedding ICT into wider school use was slow, and until 1996 teaching computer use was made on an ad hoc basis, dependent upon local organizational ambition and plans. Despite intentions to initiate a national project to support the use of computers in schools, there was no overarching strategy in place to support it (Alharbi, 2014). In 2005, the Ministry of Education in Kuwait announced a strategic plan for education for the subsequent twenty years, ending in 2025. One of the significant themes of this strategy was the divide between developing countries and the advanced world. The strategy also referred to the necessity of bridging the gap between the Kuwaiti educational system and the use of Information and Communication Technology (ICT) in everyday life.

Despite these broad strategic aims, the strategy did not specify how these may be delivered operationally (Hargreaves *et al.*2010). Since the mid-nineties there has been an increasing trend towards more openness in ICT use, notably the use of computers or other aspects of ICT in teaching across the curriculum. This was enhanced by the first national project to teach ICT in schools which started in four girls' secondary schools in 1996. This project formed the first step in implementing the government educational strategy in bridging the gap between the old education system, and the emergent needs of teaching ICT in schools; however, there remains a significant gap between possessing ICT skills and applying them in the school setting (Muijs and Reynolds, 2010).

Kenya disseminated its ICT policy in 2006 with its vision to become a prosperous ICT-driven Kenyan society and its mission to improve the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services. The Ministry of education ICT vision, strategies and goals are derived from the main policy documents that include: The Kenya vision 2030, National ICT policy (2006), The National ICT Strategy for Education and Training (2006), Sessional Paper No.1 of 2005 on Policy Framework for Education, Training and Research and the Sessional Paper No.14 of 2012 on reforming education and training sectors in Kenya and Basic Education Act (2013).

The objectives of government's ICT policy include among others, transforming and modernizing Kenya's education system using ICT to improve and expand access to education, training and research resources and facilities, while improving the quality of education and training. The Kenya vision 2030, which is the government's new long-term blueprint for the country aims at creating a globally competitive and prosperous country with a high quality of life by 2030 (GoK, 2007). 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.

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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 has 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 has to a large extent remained in draft form. No attempt is made to implement the policies in schools. Farrell (2007) observed that high levels of poverty, limited rural electrification, and frequent power disruptions result in limited access to ICT in secondary schools.

Despite its importance and the strategies adopted by government to integrate ICTs in schools, research conducted countrywide points out that most schools have not adopted use of ICT to support teaching, learning and management as envisaged (Manduku, Kosgey, & Sang, 2012). Furthermore, there is a scarcity of ICT resources available in most schools for ICT integration, and that the teaching and curriculum administration functions of most teachers have been negatively impacted by a lack ICT equipments. Notably, there is insufficient use of these ICT resources for those schools who have them. In addition, while some teachers had received some form of ICT training, it has been observed that such training has had minimal or no influence at all on the abilities and confidence of teachers to use ICT in their teaching. It is against this backdrop that the intended study seeks to evaluate Integration of ICT in Public Secondary Schools in Kitui County, Kenya.

### **Statement of the Problem**

There has been concern that the initial ICT installation cost had significantly and negatively affected the ICT utilization in secondary schools in Kitui County. There are teachers' ICT competency concerns for them to effectively implement the utilization and integration of the ICT in the secondary schools in the County and the principals' did not adequately comply with ICT requirements and application. Neither did they support it, so the school management negatively affected the ICT utilization and integration of ICT in secondary schools in Kitui County (Syombua, K. F. 2013).

Further, despite the ICT programme in schools in Kitui County, only 30% of the schools have integrated ICT in teaching and learning, a Kitui ICT officer noted. Kitui County ICT officer Nicholas Babu raised concern on slow digital learning uptake in schools as the government pushes for 100% basic education transition. "Although connectivity to the national grid has been a challenge to some schools which were established after the pilot survey, some teachers are opposed to the new way of teaching and have opted to stick to the chalk and board method," said the ICT officer. Speaking during a County Development Implementation Coordination Committee meeting, Babu decried a common tendency observed where ICT equipments were neglected in some school stores and never used in classes despite the extensive ICT awareness campaigns mounted by the ICT Authority in the county through teachers' training and sensitizations (Kenya News Agency, April 12<sup>th</sup>, 2019). Some studies conducted in the area of ICT indicate that there are contextual, methodological, findings and generalization gaps that exist hence this study. For example, a Kuvuuka (2013) conducted a study in Kitui County and revealed that most students were not exposed to ICT, inadequate ICT resources, inadequate teacher skills in ICT and insufficient support from school leadership to integrate ICT in schools. Similar concerns were echoed in a study conducted in the same County by Kivuli (2013). Majority of these studies have not paid attention to the issue of ICT integration in the teaching and learning process.

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Based on this, the current intended Evaluation study was an attempt to look at the Integration of Information Technology in the Public Secondary Schools' in Kitui County, Kenya to establish the level and extent to which schools have integrated ICT into teaching and learning and factors affecting the integration. This formed the basis for making proposals for strengthening the integration process.

### **Evaluation Questions**

The following evaluation question guided this study

How does the schools' Information and Technology infrastructure Influence ICT Integration in Public Secondary Schools in Kitui County?

### **Significance of the Evaluation**

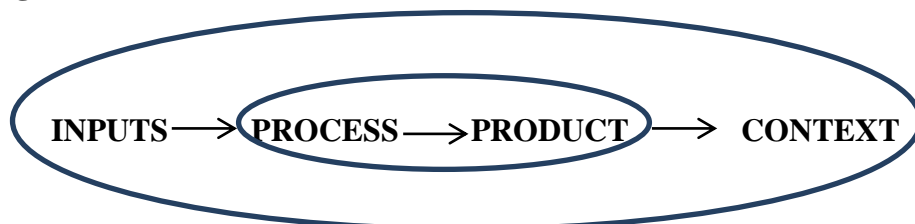
The findings of this study will benefit students through enhanced commitment to the learning task of ICT Integration, enjoyment, interest, increased self-esteem, independence and confidence. Teachers will benefit from the findings of this study because now they will perceive ICT as a tool for improving delivery of content, making lessons more fun for learners.

The evaluation findings will help policy makers including the Ministry of education officials, school principals and other stakeholders to understand and deal with the challenges surrounding efforts to integrate ICT in teaching and learning. Finally, the study will help future researchers and will enrich the knowledge base of other academicians since this information will be readily available to make references on with the aim of building more knowledge in the field of integrating ICT in teaching and learning process.

### **Evaluation model**

This evaluation process employed Stufflebeam and Shinkfields's (2007) Context, Input, Process and Product (CIPP) model because it provides a comprehensive framework for guiding the evaluation of ICT integration in Kitui County. Process evaluation has the basic purpose of giving feedback for improvement of a programme and is undertaken during development of a programme or its ongoing operation (Stufflebeam & Shinkfield, 2007).

**Figure 1. Evaluation Model**



### **Source: Stufflebeam and Shinkfield (2007)**

The model has four key components which the researcher considers pertinent in the evaluation of the ICT integration programme in Kitui County. The evaluator adopted the four types of evaluation from the context, inputs, process and product. The CIPP model proposes a four-part evaluation for any programme and suggests a number of questions which should be asked within the various parts. The four parts of an evaluation asks the following questions. What needs to be done? (Context); How should it be done? (Input); is it being done? (Process) and has it succeeded? (Product).

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### **Theoretical Framework**

This study adopted the theory of diffusion of innovations. According to Rogers (2003), diffusion research centers on the conditions, which increase or decrease the likelihood that members of a given culture will adopt a new idea, product or practice? Rogers asserts that people's attitude toward a new technology is a key element in its diffusion. Since Rogers uses the terms innovation and technology interchangeably, the diffusion of innovations framework seems particularly suited for the study of diffusion of ICT in the school curriculum.

Roger's Innovation Decision Process theory states that innovation diffusion is a process that occurs over time through five stages: knowledge, persuasion, decision, implementation and confirmation. Accordingly, the innovation-decision process is the process through which an individual or other decision-making units passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to reject it, to implementation of the new idea, and to confirmation of this decision (Rogers, 2003).

Innovation diffusion research explain variables that influence how and why users adopt a new information medium, such as the Internet. Opinion leaders exert influence on audience behavior via their personal contact, but additional intermediaries called change agents and gatekeepers also influence the process of diffusion (Rogers, 2003). The traditional adoption/diffusion continuum recognize five categories of participants: innovators who tend to be experimentalists and "techies" interested in technology itself, early adopters who may be technically sophisticated and interested in technology for solving professional and academic problems; early majority who are pragmatists and constitute the first part of the mainstream; late majority who are less comfortable with technology, and are the skeptical second half of the mainstream; laggards who may never adopt technology and may be antagonistic and critical of its use by others. Moore (1991) views these groups as significantly different "markets" in the "selling" of an innovation to faculty adopters.

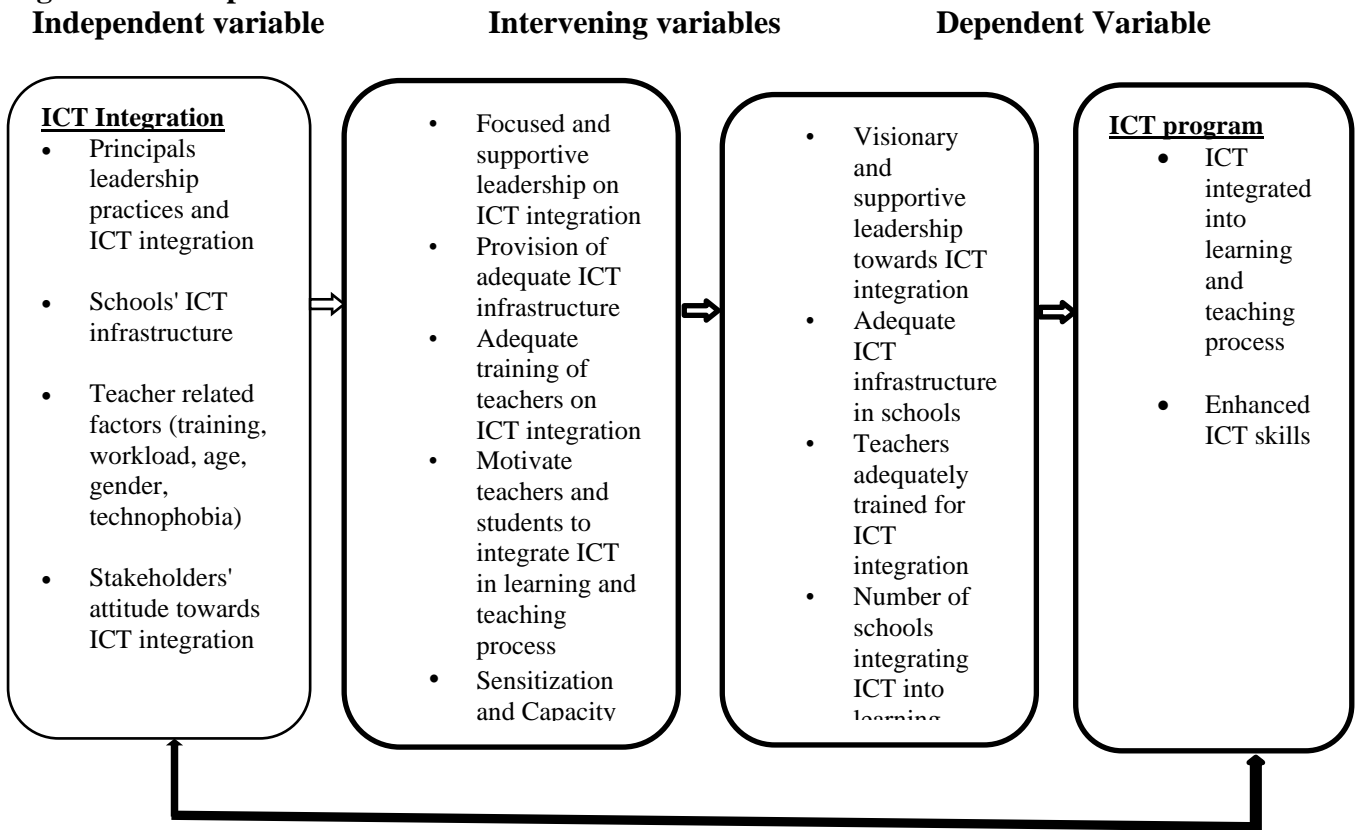
The Theory of diffusion of innovations rests its strength on the following: It brings out three aspects within the contextual factors of the adoption decision making models. First, the notion that innovation itself is important. Secondly, communication channels that spread information about the innovation influence the adoption decision making process. Thirdly, the nature of the society to whom it is introduced. The five stages of the innovation decision making process theory correspond to the stages of the adoption decision making model. It adds the extent of change agents' promotion efforts as contextual factors. Such agents in relation to this study could be the government, teachers, school principals, and County education officers and students' council presidents. It confirms that the adoption of ICT is a mental process that evolves overtime.

### **Conceptual Framework**

To enhance understanding of the effectiveness of ICT integration in public secondary schools in Kitui County, the evaluator developed a conceptual framework to help understand the way the study was conceptualized. The framework generated for this evaluation explains the elements and linkages that exist within the study. The framework consists of four major elements that details the interplay of all parts to produce desired outcomes as illustrated in Figure 2:

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**Figure 2: Conceptual Frame work**



**Source: Adapted from Infodev (2007)**

Figure 2 shows that the independent variable is the ICT Integration and that Principals leadership practices and ICT integration are closely related and this is as well as the schools' ICT infrastructure, teacher related factors such as training, workload, age, gender and technophobia. There is also the stakeholder’s attitude towards ICT integration. In between the independent variable and the dependent variables are the intervening variables. According to this conceptual framework this may include, focused and supportive leadership on ICT integration, provision of adequate ICT infrastructure, adequate training of teachers on ICT integration, motivate teachers and students to integrate ICT in learning and teaching process as well as the sensitization and Capacity building on ICT Integration.

**Logical Framework**

For purposes of this evaluation, the evaluator utilized the logical framework which was used to guide project planning and implementation. The evaluator adopted this logical framework in order to concisely summarize the elements of ICT integration programme and bring structure and logic to the relationships between project purpose and intended inputs, planned activities and expected results.

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**Table 1. Log frame for ICT Integration**

Programme description	Performance Indicators	Sources and means of verification	Critical assumptions
<b>Goal:</b> Evaluation of Integration of ICT in Public Secondary Schools	Number of schools integrating ICT ICT equipment in schools	Analyze ICT integration reports	The government is in full support of ICT integration in schools
<b>Objective 1.</b> Schools' ICT infrastructure and their influence on ICT integration in sec. schools	-Adequate ICT equipment in schools -Students actively engaged in ICT aided learning -Digitized curriculum content	-Records of ICT inventory in schools -School records on ICT integration -Peruse the curriculum being used to integrate ICT in schools	Government has provided adequate ICT infrastructure for effective ICT integration -Surrounding communities shall provide a conducive environment for ICT integration

The logical framework brings into perspective the ICT integration programme goals and objectives. It describes the programme's overall goal and objective/ purpose of ICT integration on one side, while giving the programme's verifiable indicators, sources and means of verification and critical assumptions on the other. It outlines the indicators that demonstrate achievement of results, sources and means of verification and critical assumptions.

### Description of the ICT Integration Programme

After several years of effort, Kenya promulgated a National ICT Policy in January 2006 that aimed at improving the livelihood of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services. The national policy has several sections, including, information technology, broadcastings telecommunications, and postal services. It is the section on information technology that sets out the objectives and strategies pertaining to ICT and education. The relevant objective in this section states that government will encourage the use of ICT in schools, colleges, universities and other educational institutions in the country so as to improve the quality of teaching and learning (Infodev, 2007). Related strategies under E-Learning are to: Promote the development of e- learning resources; Facilitate public-private partnerships to mobilize resources in order to support e- learning initiatives; promote the development of an integrated e-learning curriculum to support ICT in education among other objectives.

The National ICT Policy embedded the intent of ICT integration as a national priority and provided the impetus for the Ministry to develop its sector policy on ICT in Education. The MoE introduced the National ICT strategy for Education and Training in June 2006. This document is referred to as the ICT policy for the education sector and consists of the different components, each with its own statement of strategic objectives and expected outcomes (GoK, 2006). Guided by the National ICT policy (2006), the Sessional paper No. 1 of 2005, the Kenya Vision 2030 and the Sessional paper No.14 of 2012, the Ministry of Education has prioritized ICT integration in teaching and learning process.

Information and Communication Technology (ICT) integration is therefore a project of the Ministry of education whose vision is to facilitate ICT as a universal tool for education and training (GoK, 2007). In order to achieve this vision every educational institution, teacher, learner and the respective community should be equipped with appropriate ICT



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infrastructure, competencies and policies for usage and progress. It calls for recognition of the fact that ICT provides capabilities and skills needed for a knowledge-based economy (GoK, 2007). It also calls for transforming teaching and learning to incorporate new pedagogies that are appropriate for the 21<sup>st</sup> century.

Education and training sector priorities include the integration of ICT into teaching and learning, enhancement of financing in education and training, and improvement of governance among others. The sector will contribute to the 'big four' Agenda development initiatives by providing the requisite skilled human resource and promoting research and development (GoK, 2018).

### **Goals and Objectives of the Programme**

The objectives of ICT integration programme are geared towards the following:

1. Equipping education institutions with digital equipment to streamline integration of ICT in education at primary, secondary and tertiary levels
2. Supporting initiatives that provide digital equipment to educational institutions. Priority has been given to secondary and primary schools
3. Establishing a national ICT assembly Centre in Kenya to build computers specifically designed and earmarked for educational institutions.
4. Capacity building for teachers as well as educational managers for effective integration of ICT in to education.
5. Supporting the refurbishment of ICT equipment and establishment of mechanisms for disposal of obsolete digital equipment taking into consideration environmental concerns and regulations (KESSP), (2005).

The overall objective of the programme is to ensure that ICT is fully integrated into teaching and learning to enhance the quality of delivery by teachers as well as enrich the students learning experience and foster research and innovation. This is aimed at producing graduates with the necessary skills to effectively compete in the global knowledge economy in the 21<sup>st</sup> century.

### **Structure and Management of the ICT Programme**

The programme was introduced with the goal of integrating ICT use in education both at secondary and tertiary institutions in the country. After its inception in 2005, the MOE aimed at equipping students with modern ICT skills in order to achieve the vision 2030 goals of mainstreaming ICTs into the teaching and learning process. The benefit of such effort would be improved access to ICT services to schools countrywide and mainstreaming of ICT in schools (GoK, 2010).

In June, 2006, the MoE introduced the National ICT Strategy for Education and Training in a document referred to as the ICT policy for the education sector (GoK, 2006-2011). The MoE was mandated to lead the monitoring and evaluation of the strategy's implementation. This was to be guided by overall government policies on education and ICT, specific education strategic documents for implementing its mandate, and global goals such as Education for All (EFA) and the Millennium Development Goals (MDGs), which have now been replaced by the sustainable development goals (SDGs). The 2030 Agenda for sustainable development adopted by all United Nations member states in 2015 provides a blueprint for peace and prosperity for people and the planet, now and into the future. All

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member states recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education.

At the Ministry level, the mandate of ICT integration is carried out through a ministerial ICT committee that meets monthly and reports quarterly on progress. The committee is chaired by the Permanent Secretary and supported by the Ministry's ICT Unit. It has representation from stakeholders involved in implementing the strategy and mobilizing resources such as donors and private sector partners. The implementing agencies include: The Semi-Autonomous Government Agencies (SAGAs) of the ministry; The Network Initiative for Computers in Education (NICE), a consortium of NGOs involved in ICT in the education sector; Individual NGOs that meet specified criteria; Civil society organisations involved in ICT in education activities and academia and/or individuals with experience in ICT in education projects.

During the year 2010/11, the Ministry of Education strengthened the coordination office to help coordinate and harmonize ICT in education issues particularly integration of ICT in teaching and learning. This has been done by the setting up of institutional framework at the MoE to cater for both the technical and the pedagogical aspects of ICT. Key among the institutions set up include: The ICT Integration Team; the ICT Unit and the ICT E- Unit (Kenya ICT Trust fund strategic plan 2006 – 2011).

### **Content of the Programme**

The New Partnership for Africa's Development (NEPAD) e-Schools Initiative (2006). This was a multi-partner demo project by e-Africa Commission, MoE and two consortia led by Oracle and Microsoft that equipped six secondary schools with state-of-the-art ICTs and provided teacher training and learning content. Following this initiative, the MoE established more than 210 Kenya E-schools in line with the NEPAD e-schools model. In 2007/2008, these schools received funds for acquisition of ICT infrastructure, supplementary electronic materials covering languages and sciences and mathematics. Funds were also availed for training of teachers and for software concession where the Ministry entered into agreement with Microsoft to ensure that all software is genuine and most current.

According to GoK (2012/2013) in 2010/2011, under the Economic Stimulus Programme, Ksh.980 million was allocated for equipping of 5 public secondary schools from each constituency with a comprehensive ICT infrastructure. A total of 1400 public secondary schools throughout the country have benefited. The package included training of 10,500 teachers, 1021 head teachers and 210 ICT champions from the beneficiary schools (GoK, 2012/2013). A further Ksh.480 million was allocated in 2011/2012 financial year. District education officers from all 285 districts in Kenya and the beneficiary schools have been sensitized on the ESP programme, the philosophy of ICT integration and the procurement process. Backup support and advice during the implementation has also been offered. In 2012/2013, under the Economic Stimulus Programme, Ksh.438 million was budgeted for equipping of 2 public secondary schools from each constituency with a comprehensive ICT infrastructure. A total of 420 schools throughout the country are targeted to benefit. The package includes training of 2,000 teachers and 420 head teachers from the beneficiary schools. It is expected that by the close of the financial year, this goal will have been achieved (GoK, 2012/2013).

In the year 2011, the National ICT Integration and Innovation Centre (NI3C) was established at an initial cost of Ksh. 34 million with the support of Flemish Association in partnership with Smoothtel and other educational stakeholders for Development, Cooperation

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and Technical Assistance (VVOB). It was officially launched on 10<sup>th</sup> August, 2011 by the then Minister for education Professor, Dr. Sam Ongeru. The Centre is located at the University of Nairobi's former Kenya Science Campus along Ngong road, Nairobi. The center's mandate is to facilitate learning institutions on ICT integration and provide a national help desk on new innovations in schools. The national ICT innovation and integration centre gives first hand help to both teachers and schools on appropriate hardware specifications as well as troubleshooting.

Through the Kenya Institute of Curriculum Development (KICD), the Ministry has developed digital content for Mathematics and Science for standards four to seven in primary level and 12 subjects in form one and two for secondary schools (Gacicio, E. Assistant Director for e-learning (KICD. Personal communication, October, 2012). The content and equipment has been disseminated to 22 sites under the USAID sponsored TAFAKARI project which began in 2007 and was initially funded by WDC through USAID, South Africa(Kithome, 2009). The digitization of the content for the rest of the classes is currently underway. Further, the Ministry of Education has established one model center at St. Peters Clavers School as an ICT center for adult learners.

The project provides 2 CPUs with 18 ports and a multi-point server in each centre. The British Council proposed to equip 50 primary schools with ICT equipment by the end of 2012/2013 to go along with the Ministry of Education Initiative in ES-3. Accelerating 21<sup>st</sup> Century Education (ACE) – is a private public partnership between the MoE, USAID, Intel, Microsoft and CISCO. It has engaged in supplying twenty-six educational institutions (including 3 TTCs and 23 primary school based in Coast, Garrisa and Kiambu Counties) with both Hardware (computers, accessories, and internet) as well as capacity building for teachers. Over 3,000 pre-service and 1,000 in-service teachers have been trained on ICT integration (MoE, 2012).

The MoE and VVOB collaboration on ICT integration Programmes has made notable progress towards the promotion of ICT integration. The Kenya Education Management Institute (KEMI) has developed a 'Holistic Model' for secondary schools to benefit with a comprehensive ICT infrastructure. KEMI has developed an ICT integration module for education managers (head teachers and their deputies, DEOs) in all its training programmes. The Centre for mathematics, Science and Technology for Education in Africa (CEMASTEA) is charged with teacher professional development especially in the area of science and mathematics. It has developed an ICT integration strategy for teachers aimed at ensuring that teachers are trained on key integration skills on use of ICT in all subject areas; training of senior management in basic ICT competencies through the VVOB support; capacity building of ICT technical team and ICT integration team. This is achieved through study tours and technical support.

Having been introduced to schools in 2006 the ICT integration programme is in the twelfth (12<sup>th</sup>) year running. The government requires that all educational institutions follow the ICT integration guidelines with the support of school administration in order to develop an institutional framework for the policy development and review based on institutional context (Republic of Kenya, 2006). However, studies conducted have found out that schools are ill prepared for the adoption of e-learning (Mulwa & Kyalo, 2010; Migwi, 2011). Therefore, evaluations ought to be carried out to gauge the gains being realized and challenges being faced in its implementation in all public secondary schools in the 47 counties of the Republic of Kenya. This evaluation only focused on Kitui County which has

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three hundred and ninety-four (394) public secondary schools which have some form of ICT equipment. These schools include National, County and Sub County schools.

### **Review of Related Literature**

According to Vanderlinde and van Braak (2010), ICT infrastructure measures the perceived availability and suitability of the ICT tools such as hardware, software and peripheral equipment provided in the school. Information Communication and Technology infrastructure refers to the availability of equipment, software, Internet access and other similar resources in the school.

Organization for Economic Cooperation and Development (OECD, 2010) conducted a Study in a school from each of the following Countries; Belgium, Finland, Holland, Portugal, Spain and Sweden which shared common features such as infrastructure, educational level and socio-economic conditions. The objective of the study was to contribute to the quality of education which was a concern shared by groups of students, teachers and educational administrators who felt there was a need to implement changes in physical learning environments through provision of appropriate ICT infrastructure. The study (OECD, 2010) found out that, physical learning environment is pivotal to users' desire to develop the school's operational environment as well as their need to renew its operational culture. Therefore, the study concluded that, the more meaningful and challenging the operational environment is, the more the user is willing to improve the physical learning environment, and that the impact of ICTs on student learning strongly depends on their specific uses and on the environment in which they are used. Therefore, the researcher finds it beneficial to gather information on effects of schools' ICT infrastructure in ICT integration in teaching and learning in one of the study objectives.

Ulf (2009) carried out a study in order to explore how ICT can be used to support teaching and learning in schools. Two schools were selected in each of the five European countries (Denmark, England, Latvia, Poland, and Slovenia). The study applied a qualitative research approach. Questionnaires, individual interviews and focus group interviews were used as data collection Instruments. The findings of the study indicated that all schools visited had according to themselves a more or less sufficient number of computers available. In some schools the wish was expressed to have more computers. Most available computers also seemed to be modern computers equipped for multimedia use and with access to the internet and e-mail. Schools also seemed to have access to the software considered to be relevant for the learning and teaching in the schools. The infrastructure was not experienced as a problem in any of the schools. On the contrary most schools seemed to be rather satisfied with the ICT equipment they had.

Menkiti (2014) conducted a study on Prospective Application of Information and Communication Technology Usage among Secondary School Teachers in Enugu Urban, Nigeria. 253 teachers were randomly selected from 40 public secondary schools in Enugu Urban, Nigeria. Assessments were made on ICT facilities available to teachers, adequacy level of exposure to these ICT facilities, perceived benefits and challenges facing ICT usage and adoption among teachers. The study used questionnaires as the main data collection instrument. The study found that irregular power supply, low level of funding and non-availability of computer hardware and software were the major impeding factors inhibiting ICT integration in schools (Menkiti, 2014). Similarly, Ukpebor and Maria (2012) conducted a study on ICT integration in Edo State, Nigeria. The study findings established that the level of access of internet to high school students was poor. Despite schools having computer

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laboratories, students accessed internet from cyber cafes. These studies recommended further research on ICT Integration in schools.

Makhanu and Kamper (2012) carried out a survey to investigate the relationship between ICT access to principals and secondary school performance in Western province of Kenya. The study was quantitative in nature and data was obtained through questionnaires. The research findings showed that schools' access to ICT infrastructure has a positive influence on secondary school performance in the Western province of Kenya. It also revealed that a relatively low percentage of schools (42 percent) had access to ICT. This study is a useful source of reference especially on the distribution of ICT infrastructure in schools in Kenya. However, the study only concentrated on principals and did not involve teachers and students who play pivotal role in the implementation of ICT programs in secondary schools. The availability and accessibility of ICT facilities may not automatically translate into ICT integration in schools.

Boit, Menjo and Kimutai (2012), conducted a study to evaluate the implementation of ICT to support, teaching, learning, school administration and use of e-communication between co-operating rural schools in Western Kenya under Rotary Project. The study was conducted in two selected counties where a case study research design was used. The findings from the study identified lack of adequate training in computer use by teachers and administrators, and limited hardware for administrators as factors hindering computer use in school administration. The study is quite informative and forms a very vital source of empirical evidence regarding the success of implementation and use of ICT in secondary school administration. It has shown that the use of ICT enhances efficiency in performance of administrative tasks.

Kiptalam and Rodrigues (2010) conducted a study on accessibility and utilization of ICTs among secondary school teachers in Kenya. The study employed a cross-sectional descriptive survey design, using quantitative approaches for data collection, analyses and reporting. The survey design was used to guide the research process and participants were drawn from eleven secondary schools that were connected to the internet. The study highlighted importance of school physical environment especially in availability, storage and maintenance of both ICT soft and hardware. Although the schools studied were from both rural and urban settings as is the case with the suggested study, the findings could, however, not be generalized to all the schools in Kenya as only schools with internet connection were selected. This implies that schools with infrastructure other than internet connectivity were not represented in the sample.

Hennessy, Harrison and Wamakote (2010) in their study on Teacher Factors Influencing Classroom Use of ICT in Sub-Saharan Africa concluded that the biggest limitation to the use of computer technology in Kenya public secondary school system is lack of telephone facilities, interruption of connections to the ICT superhighway, electricity limitation to the urban centers and poor road network making the increased cost of transporting materials unavoidable.

Kiptalam (2011) investigated the levels of access and extend of use of ICT among teachers in selected secondary schools in Kenya. The findings were that although ICT integration into secondary education is getting widespread, the use of ICT and its related technologies is still at its early stages of development and implementation. This study did not seek the views of the learners on their level of interaction with the technology but put more focus on teachers. The current study will be all inclusive so as to gather views from students on their level of interaction with the technology.

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A study by Ayere, Odera and Ogak (2010) compared the application of e-learning in NEPAD and non-NEPAD schools in Kenya. The study utilized a combination of descriptive survey and Ex post facto design to compare areas of ICT application in two categories of schools. The main focus was the students' interaction with the technology and students' performance. The findings were that the NEPAD schools performed better than the non-NEPAD schools in science related subjects that applied ICT. This study did not focus on ICT integration across the curriculum but focus was on ICT use in specific subjects. Therefore, the current study will fill this gap by focusing on evaluation of ICT integration in all curriculum subjects.

A study by Karanja (2011) investigated the status of e- learning readiness in public secondary schools in Nakuru municipality. The findings were that schools are ill prepared for e- learning. This study used descriptive survey that dealt with quantitative data only. The gap in this study is that it ignored some qualitative aspects of e- learning that could not be captured by use of questionnaires as the research instruments. On the strength of the findings and the subsequent conclusions drawn, this study recommended among other things that education stakeholders in the country should finance provision of ICT facilities, digital equipment and Internet connectivity in public secondary schools. The Ministry of Education should also train all the teachers on how to integrate ICTs in education in addition to providing standardized E- learning software, application programmes and digital content to all schools in the country. This will enhance their uptake of E- learning delivery systems. The current evaluation will examine teacher related factors such as the level of training for teachers in Kitui County to establish whether the Ministry of education has made remarkable strides in teacher training for ICT integration.

In Machakos County neighboring Kitui County, a study was conducted by Mbithe (2016) on Factors influencing teacher participation in integration of ICT in teaching and learning in public secondary schools. This study adopted descriptive survey design with a sample of twenty-one (21) secondary school head teachers and one hundred and twenty-six (126) teachers. Questionnaires were used as the main data collection instruments. The findings of the study indicated that many secondary schools had computer laboratories but inadequate computers.

In Makueni County still neighboring Kitui County, Ndunge (2016) carried out a study on integrating information and communication technology in public secondary school administration. The study sample of 210 respondents consisting 17 Principals, 125 Heads of Departments and 68 Class teachers was selected using simple random sampling. Data was collected through questionnaires and was analyzed using descriptive and inferential statistics. The study (Ndunge, 2016) concluded that there is low integration of ICT in secondary school administration which is caused by challenges such as internet connectivity, lack of electricity, low government funding on ICT and lack of computer skills by the personnel concerned. The study recommended that the government should equip schools with necessary ICT infrastructure, ensure that secondary schools are supplied with electricity. It also suggested that similar studies be conducted in other parts of the country.

Kuvuka (2013) conducted a study on factors affecting information communication technology integration in teaching and learning in public secondary schools in Mutitu constituency, Kitui county Kenya. The findings of the study revealed that where there is high students' exposure to ICTs, high access to ICT resources, adequate teacher training on ICT skills and support from the school leadership, then there is also high level of ICT integration in teaching and learning. The study (Kuvuka, 2013), was based on theoretical framework of

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Technology Acceptance Model (ATM) and quantitative analysis of data collected from questionnaire-based survey. The target population was 240 students, 72 teachers, 6 Principals of 6 public secondary schools in Mutito constituency, Kitui County. The questionnaires were administered to students, teachers and Principals while observation schedules were used to obtain data on number of computers. Studies reviewed in this section, both globally and locally indicate that there is a knowledge gap in the area of ICT integration in schools which the intended study intends to fill.

## **Evaluation Design and Methodology**

### **Evaluation Design**

This study used a mixed method approach. Specifically, a convergent parallel mixed method design was used. A convergent parallel mixed-methods design is an approach to inquiry that combines both qualitative and quantitative methods concurrently, prioritising both methods almost equally (Creswell & Clark, 2011, and Creswell, 2014). In this case, the quantitative and qualitative methods complemented each other, and provided for the triangulation of findings, hence greater validity of the emerging inferences. Whereas the former approach provided a more general understanding of the issue of ICT integration, the latter provided a detailed and in-depth understanding of the same.

The convergent parallel mixed methods design was preferred because the researcher prioritized the methods (qualitative and quantitative) equally and keep the strands independent during data collection and then mixed them during analysis and at the findings during overall interpretation. It was also preferred because it enabled the researcher to compare and relate data collected and analysed easily before interpretations were made (Teddlie and Tashakkori, 2009). In this study, the researcher collected data on the ICT integration programme quantitatively and qualitatively from the different targeted population. At the same time, the researcher analyzed the data collected using both quantitative and qualitative data analysis techniques and then merged, related and compared the two data sets. Data was then presented using a side-by-side method as opposed to a joint display method. A cross sectional survey design from the quantitative approach was used while a from the qualitative paradigm a phenomenological design was used.

### **Target population**

The evaluation targeted all the three hundred and ninety-four (394) Public Secondary schools in Kitui County, their head teachers, three ninety-four (394) heads of departments and three hundred and ninety-four (394) student's council presidents (formerly referred to as head boy's/head girls) fourteen (14) Quality Assurance and Standards Officers (QASOs) and the Kitui County Director of Education.

### **Sample and Sampling Procedure**

This evaluation study used both probability and non-probability sampling procedures to arrive at a sample of public secondary schools, headteachers, heads of department and student council representatives from the sampled schools. Probability sampling techniques was used to select Quality Assurance and Standards Officers (QASOs) and one County Director of Education who were purposively included in the sample.

According to Mugenda and Mugenda (2012), in a survey research, a sample size of 10% - 50% of the target population is acceptable. Since the study used a cross sectional survey design to conduct the evaluation, this principle was applied. The evaluator first

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purposively selected the two National schools in the County. Then the evaluator used a 16% of the 392 (The 2 National schools excluded). This percentage was considered adequate and representative enough so that the schools in the sample are not too many or too few. This resulted in 63 schools plus 2 National schools which added up to a total of 65 secondary schools. The Total sample size and sampling procedures is presented in the sampling matrix in Table 2.

**Table 2: Sampling Frame Matrix**

Category	Target Population	Sampling Technique	Actual Sample Size	Percentage
Schools	394	Stratified Random Sampling	65	16
School Principals	394	Random Sampling	65	16
School Heads of Departments	325	Random Sampling	65	20
Student's Council presidents	394	Random Sampling	65	16
Quality Assurance & Standards Officers	14	Purposive Sampling	14	100
County Director of Education	1	Purposive Sampling	1	100

### **Evaluation Instruments**

The evaluator used four types of evaluation instruments, namely; three sets of questionnaires, interview, document analysis and observation guides. The instruments included:

**i. Questionnaires:** The three sets of questionnaires were used to get information the evaluator required from head teachers, Student Council Presidents and Heads of Departments.

### **ii. Interview Guide for QASOs and CDE**

The evaluator used interview guide to collect in-depth information from Quality Assurance and Standards Officers and County Director of Education on ICT integration in Public Secondary schools in Kitui County.

### **iii. Observation Schedule**

This data collection technique is appropriate in understanding the natural environment as lived by the participants without any alteration or manipulation. Observation guide was used to verify availability, adequacy, relevance and status of the ICT facilities in the schools being studied. These facilities included but not limited to computers, printers, scanners, photocopiers, internet connectivity and electricity as well as computer laboratories.

### **iv. Document Analysis Schedule**

Document analysis guide was used to establish whether storage and processing of school records and students' data was computerized or not. Documents to be analysed included, but



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not limited to school admission register, store records, school library records, newsletters, class timetables, schemes of work and progress records.

### **Validity of Evaluation Instrument Results**

The evaluation instruments were validated in terms of content and face validity by the experts in the field of education at Catholic University of Eastern Africa who were requested to review the instruments to determine whether the set of items accurately represents the variables being examined. The experts were requested to read, judge and make recommendations to the evaluator. Face and content validity were also done through the pilot study which was conducted in two schools in the study area. The two schools were not part of the sample. Suggestions given by the experts were incorporated in the instrument and gaps identified during piloting addressed before the instruments are finally used to collect data.

### **Reliability of Evaluation Instruments Results**

In order to determine reliability in this study, the researcher conducted internal consistency within the instrument itself and within the questions/items. This was done using the Cronbach's Alpha technique on Likert scale items. Cronbach's Alpha is a function of the mean inter-correlations of items and the number of elements in the scale. Scholars argue that the Alpha index of 0.5 and above is reliable for use. In this study, a much higher Alpha of 0.7 and above was accepted as reliable.

For reliability of the qualitative evaluation instruments the evaluator looked at dependability and trustworthiness of the instruments. This was done by use of credibility conformability and dependability.

### **Data Analysis Procedure**

Use of quantitative and qualitative data analysis procedures assisted the evaluator. The evaluator categorized the instruments into their homogenous groups, coded the quantitative information and summarized them into frequencies and percentages with the help of SPSS windows version 20. These were then presented using frequency tables and graphical representations of frequencies and percentages. The evaluator transcribed all interviews. Data obtained from observation and document analysis guides was analyzed in line with the evaluation questions as well to obtain a more valid result.

### **Ethical Considerations**

The evaluator was responsible for ethical issues within the evaluation so as to conduct an effective and meaningful investigation. The ethical behavior of individual researchers and evaluators must always be under scrutiny (Best & Khan, 2006; Field & Berhman, 2004). Based on this, the evaluator exercised caution to ensure consent of the respondents and build a rapport with them prior to actual data collection. The evaluator contacted all institutions participating in the evaluation for purposes of introduction and authorization to visit their institution. The evaluator sought permission to carry out the evaluation from all relevant authorities including authorization from Catholic University (CUEA), Research permit from, the National Commission for Science, Technology, and Innovation (NACOSTI). The researcher then used the obtained permission from Kitui County Education office.

The evaluator ensured integrity of ongoing institutional activities and alert appropriate institutional representatives of possible disturbances in such activities which may result from conduct of the research. At the time of data analysis and report writing, the

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evaluator ensured protection of the anonymity of respondents, their roles and effectual incidences (Creswell, 2009; Cohen et al., 2007).

To ascertain the views of principals, heads of departments and student council president's Schools' ICT Infrastructure and their Effects on ICT Integration, a five-point Likert scale was used. Teachers were provided with statements and asked to choose their level of agreement by indicating that they: Strongly Agree (SA) =5, Agree (A) = 4, Not Sure (NS) = 3, Disagree (D) = 2, Strongly Disagree (SD) = 1. Table 8 below shows results summary on ICT equipment's that are owned by individual schools and help schools integrate ICT.

**Table 3: Schools' ICT Infrastructure and their Effects on ICT Integration**

Statement	Participants	Available in %	Not available in %
Computers in schools	P	53(88.3)	5(11.7)
	H	46(86.8)	7(13.2)
	S	50(90.9)	5(9.1)
Laptops are in schools	P	47(78.3)	13(21.7)
	H	40(75.5)	13(24.5)
	S	36(65.5)	19(34.5)
Photocopies are available	P	51(85.0)	9(15.0)
	H	47(88.7)	6(11.3)
	S	50(90.9)	5(9.1)
Printers are in schools	P	50(83.3)	10(1.7)
	H	41(77.4)	12(22.6)
	S	45(81.8)	10(18.2)
Scanner is in schools	P	27(45.0)	33(55.0)
	H	26(49.1)	27(50.9)
	S	20(36.4)	35(63.6)
Digital camera is in school	P	20(33.3)	40(66.7)
	H	13(24.5)	40(75.5)
	S	14(25.5)	41(74.5)
Smart board are used in schools	P	16(26.7)	44(73.3)
	H	12(22.6)	41(77.4)
	S	15(27.3)	40(72.7)

**\*Key: P=Participants, P=Principals, H= Heads of departments and S=Student council presidents; Principals n=60, Heads of departments n=53 and Students n=55**

On availability of computers in schools, principal's findings indicate that 88.3% approved that, computers were available in schools while 11.7% said that they were not available. On part of Heads of Departments 86.8% said that computers were available while 13.2% gave a contrary response. The student's response showed that 90.9% agreed that computers were available in schools while 9.1% disagreed. The finding on availability of laptops in schools indicated that 78.3% of principals, 75.5% of heads of departments and 65.5% of students were in agreement that laptops were available in various schools in Kitui County while 21.7% of principals, 24.5% of heads of departments and 34.5% of students were of a contrary opinion on the availability of the laptops in schools. The findings concur with Wanderlinde and van Braak (2010), who pointed out that, ICT infrastructure measures the perceived availability and suitability of the ICT tools such as hardware, software and peripheral equipment provided in the school. ICT infrastructure include the availability of equipment, software, Internet access and other similar resources in the school. Additionally, resources

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and facilities in schools are designed and enabled in the direction of supporting continuous transformation and development of various learning approaches.

The result on photocopies availability show that 85.0% principals agreed, with 88.7% heads of departments holding the same opinion and 90.9% of students making the highest approval that photocopies were available in secondary schools in Kitui County while 15% of principals, 11.3% of heads of departments and 9.1% of students were of a divergent opinion that photocopies were not available in schools. Ulf (2009) who conducted a survey in Denmark, England, Latvia, Poland, and Slovenia.

The findings of the study indicated that all schools visited had according to themselves a more or less sufficient number of computers available. In some schools the wish was expressed to have more computers. Most available computers also seemed to be modern computers equipped for multimedia use and with access to the internet and e-mail. Schools also seemed to have access to the software considered to be relevant for the learning and teaching in the schools. The infrastructure was not experienced as a problem in any of the schools. On the contrary most schools seemed to be rather satisfied with the ICT equipment they had. However, if they perceive the need for new tools, they either improvise or plan to develop infrastructure. It is necessary to conduct the intended study to establish in one of its objectives whether schools' ICT infrastructure especially adequacy of the computers and other ICT related tools have effects on ICT integration in the schools under study.

Table 8 results indicate that 83.3% principals, 77.4% heads of departments and 81.8% students were in agreement that printers were found in schools while 17.7% principals, 22.6% heads of departments and 18.2% students were in disagreement on the availability of printers in secondary schools of Kitui County. The result in Table 3 indicates that a low-rate approval for the availability of scanners in schools. 45.0% principals, 49.1% heads of departments and 36.4% students were in agreement that schools had scanners while 55.0% of principals, 50.9% heads of departments and 63.6% students were in disagreement on the availability of scanners in schools. The high percentages of disagreement show that scanners were generally scarce in secondary schools of Kitui County. The findings agree with Kamariah, Rosnaini and Wong (2011) on ICT Infrastructure, Technical and Administrative Support in Malaysian schools recommended school administration to provide adequate ICT infrastructure if ICT integration in teaching and learning was going to be successful. The study used questionnaires to collect data from 412 teachers.

The result on digital camera availability in schools indicate that 66.7% of principals, 75.5% of heads of departments and 74.5% of students acknowledged that digital cameras were not available in secondary schools in Kitui County while 33.3% principals, 24.5% heads of departments and 25.5% students were of opinion that digital cameras were available in schools. The finding on availability of smart boards in schools show that 73.3% of principals, 77.4% of heads of departments and 72.7% of students opined that smart boards were not available in secondary schools in Kitui County while 26.7% principals, 22.6% heads of departments and 27.3% students were of opinion that smart boards were available in schools. These findings concur with OECD (2010) found out that, physical learning environment is pivotal to users' desire to develop the school's operational environment as well as their need to renew its operational culture. The more meaningful and challenging the operational environment is, the more the user is willing to improve the physical learning environment, and that the impact of ICTs on student learning strongly depends on their specific uses and on the environment in which they are used. On the other hand, Table 4

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below also indicates the ICT infrastructure and their effects on ICT integration in Kitui County.

**Table 4: ICT infrastructure and their effects on ICT integration**

Statement	P	SD	D	NS	A	SA	M	St. Dev.
There is electricity in the school	P	3(5.0)	3(5.0)	1(1.7)	11(18.3)	42(70.0)	4.43	1.095
	H	3(5.7)	2(3.8)	0(0.0)	13(24.5)	35(66.0)	4.42	1.085
	S	3(5.5)	3(5.5)	0(0.0)	15(27.3)	34(61.8)	4.35	1.109
Electricity in my school is reliable	P	5(8.3)	5(8.3)	0(0.0)	16(26.7)	34(56.7)	4.15	1.287
	H	4(7.5)	6(11.3)	0(0.0)	12(22.6)	31(58.5)	4.13	1.316
	S	5(9.1)	5(9.1)	0(0.0)	15(27.3)	30(54.5)	4.09	1.323
There is a computer laboratory in my school	P	22(36.7)	15(25.0)	1(1.7)	6(10.0)	16(26.7)	2.65	1.676
	H	17(32.1)	12(22.6)	0(0.0)	10(18.9)	14(26.4)	2.85	1.669
	S	17(30.9)	16(29.1)	1(1.8)	8(14.5)	13(23.6)	2.71	1.606
Computers are adequate for use	P	28(46.7)	21(35.0)	0(0.0)	6(10.0)	5(8.3)	1.98	1.282
	H	24(45.3)	20(37.7)	1(1.9)	5(9.4)	3(5.7)	1.92	1.174
	S	22(40.0)	19(34.5)	3(5.5)	7(12.7)	4(7.3)	2.13	1.277
The technological equipment's are available	P	14(23.3)	16(26.7)	3(5.0)	18(30.0)	9(15)	2.87	1.455
	H	15(28.3)	11(20.8)	5(9.4)	15(28.3)	7(13.2)	2.77	1.463
	S	16(29.1)	12(21.8)	6(10.9)	14(25.5)	7(12.7)	2.71	1.449
The available technology in school is easy to use	P	11(18.3)	19(31.7)	3(5.0)	18(30.0)	9(15.0)	2.92	1.406
	H	12(22.6)	14(26.4)	5(9.4)	15(28.3)	7(13.2)	2.83	1.411
	S	14(25.5)	15(27.3)	6(10.9)	14(25.5)	6(10.9)	2.69	1.386
There is internet connectivity in my school	P	20(33.3)	18(30.0)	3(5.0)	10(16.7)	9(15.0)	2.50	1.479
	H	17(32.1)	17(32.1)	1(1.9)	11(20.8)	7(13.2)	2.51	1.463
	S	18(32.7)	16(29.1)	4(7.3)	13(23.6)	4(7.3)	2.44	1.358
There are laptops for teachers to ease their work	P	20(33.3)	13(21.7)	6(10.0)	16(26.7)	5(8.3)	2.55	1.407
	H	14(26.4)	16(30.2)	1(1.9)	20(37.7)	2(3.8)	2.62	1.333
	S	20(36.4)	14(25.5)	7(12.7)	9(16.4)	5(9.1)	2.47	1.762
There are enough rooms where teachers prepare computer-based lessons from	P	19(31.7)	22(36.7)	4(6.7)	10(16.7)	5(8.3)	2.33	1.311
	H	23(43.4)	22(41.5)	4(7.5)	4(7.5)	0(0.0)	1.79	.885
	S	23(41.8)	17(30.9)	4(7.3)	7(12.7)	4(7.3)	2.13	1.292
Safety and security of ICT facilities in my school is guaranteed	P	12(20.0)	10(16.7)	8(13.3)	20(33.3)	10(16.7)	3.10	1.411
	H	9(17.0)	8(15.1)	6(11.3)	21(39.6)	9(17.0)	3.25	1.371
	S	8(14.5)	12(21.8)	7(12.7)	15(27.3)	13(23.6)	3.24	1.414
There are teaching and learning resources to facilities ICT-based lessons	P	12(20.0)	15(25.0)	4(6.7)	22(36.7)	7(11.7)	2.95	1.383
	H	8(15.1)	15(28.3)	8(15.1)	18(34.0)	4(7.5)	2.91	1.244
	S	8(14.5)	14(25.5)	8(14.5)	19(34.5)	6(10.9)	3.02	1.284

**\*Key: P=Participants, P=Principals, H= Heads of departments and S=Student council presidents; Principals n=60, Heads of departments n=53 and Students n=55**

As shown in Table 4 above, principals, heads of departments and student council presidents were asked in the questionnaire to indicate their views on whether there was electricity in

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their school. For principals 70.0% strongly agreed and 18.3% agreed with 1.7% not sure while 5.0% disagreed and another 5.0% strongly disagreed to the statement that there was electricity in their school. Majority of the principals (88.3%) agreed that there was electricity in their school and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools in Kitui County. For the heads of departments, 66.0% strongly agreed and 24.5% agreed while 3.8% disagreed and 5.7% strongly disagreed, that there was electricity in their school; hence majority of the heads of departments (90.5%) were in agreement that there was electricity in their school and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools. The findings concur with Menkiti (2014) who conducted a study on Prospective Application of Information and Communication Technology Usage among Secondary School Teachers in Enugu Urban, Nigeria. The study found that irregular power supply, low level of funding and non-availability of computer hardware and software were the major impeding factors inhibiting ICT integration in schools.

For the student council presidents, 61.8% strongly agreed and 27.3% agreed while 5.5% disagreed and 5.5% strongly disagreed, that there was electricity in their school; hence majority of the student council presidents (89.1%) were in agreement that there was electricity in their school and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools. The statement there was electricity in their school; elicited high means of 4.43 for principals, 4.42 for heads of departments and 4.35 for students' council presidents, an indication that there was high agreement level to the statement, with standard deviation of 1.095 for principals, 1.085 for heads of departments and 1.109 for student council presidents. These findings concur with Ukpebor and Maria (2012) conducted a study on ICT integration in Edo State, Nigeria. The study findings established that the level of access of power and the internet to high school students was poor. Despite schools having computer laboratories, students accessed internet from cyber cafes.

The findings in Table 4 above indicate that, principals 56.7% strongly agreed and 126.7% agreed while 58.3% disagreed and another 8.3% strongly disagreed to the statement that electricity in my school is reliable. Majority of the principals (83.4%) strongly agreed that electricity in my school is reliable and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools in Kitui County. For the heads of departments, 58.5% strongly agreed and 22.6% agreed while 11.3% disagreed and 7.5% strongly disagreed, that electricity in my school is reliable; hence majority of the heads of departments (81.1%) were in agreement that electricity in my school is reliable. For the student's council presidents, 54.5% strongly agreed and 27.3% agreed while 9.1% disagreed and 9.1% strongly disagreed, that electricity in my school is reliable; hence majority of the student council presidents (81.8%) were in agreement that electricity in my school is reliable. The statement electricity in my school is reliable; elicited high means of 4.15 for principals, 4.13 for heads of departments and 4.09 for students' council presidents, an indication that there was high agreement level to the statement, with standard deviation of 1.287 for principals, 1.316 for heads of departments and 1.323 for student's council presidents. The findings concurred with the work of Makhanu and Kamper (2012) which revealed that a relatively low percentage of schools had access to electricity to support ICT. This study is a useful source of reference especially on the distribution of ICT infrastructure in schools in Kenya. However, the study only concentrated on principals and did not involve teachers and students who play pivotal role in the implementation of ICT programs in

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secondary schools. The availability and accessibility of ICT facilities may not automatically translate into ICT integration in schools.

The results in Table 4 above show that, principals 36.7% strongly disagreed and 25.0% disagreed with 1.7% not sure while 10.0% agreed and another 26.7% strongly agreed to the statement that there is a computer laboratory in my school. Majority of the principals (61.7%) were in disagreement that there is a computer laboratory in my school. For the heads of departments, 32.1% strongly disagreed and 22.6% disagreed while 18.9% agreed and 26.4% strongly agreed that there is a computer laboratory in my school; hence most of the heads of departments (54.7%) were in disagreement that there is a computer laboratory in my school. These findings agree with Boit, Menjo and Kimutai (2012), who conducted a study to evaluate the implementation of ICT to support, teaching, learning, school administration and use of e-communication between co-operating rural schools in Western Kenya under Rotary Project. The findings from the study identified lack of adequate training in computer use by teachers and administrators, and limited hardware for administrators as factors hindering computer use in school administration.

For the student council presidents, 30.9% strongly disagreed and 29.1% disagreed, with 1.8% were not sure while 14.5% agreed, 23.6% strongly agreed, that there is a computer laboratory in my school; hence most of the student council presidents (60.0%) were in disagreement that there is a computer laboratory in my school and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools. The statement there is a computer laboratory in my school; elicited low means of 2.65 for principals, 2.85 for heads of departments and 2.71 for students' council presidents, an indication that there was high disagreement level to the statement, with standard deviation of 1.676 for principals, 1.669 for heads of departments and 1.606mfor students council presidents. The findings agree with Mbithe (2016) who conducted a study on Factors influencing teacher participation in integration of ICT in teaching and learning in public secondary schools. The findings of the study indicated that many secondary schools had computer laboratories but inadequate computers.

The results in Table 4 above show that, principals 46.7% strongly disagreed and 35.0% disagreed while 10.0% agreed and another 8.3% strongly agreed to the statement that computers were adequate for use in schools. Majority of the principals (81.7%) were in disagreement that computers were adequate for use in schools. For the heads of departments, 45.3% strongly disagreed and 37.7% disagreed with 1.95 not sure while 9.4% agreed and 5.7% strongly agreed that computers were adequate for use in schools; hence majority of the heads of departments (83.0%) were in disagreement that computers were adequate for use in schools. For the student council presidents, 40.0% strongly disagreed and 34.5% disagreed, with 5.5% not sure while 12.7% agreed and 7.3% strongly agreed, that computers were adequate for use in schools; hence majority of the students council presidents (74.5%) were in disagreement that computers were adequate for use in schools and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools. The statement computers were adequate for use in schools; elicited low means of 1.98 for principals, 1.92 for heads of departments and 2.13 for students' council presidents, an indication that there was high disagreement level to the statement, with standard deviation of 1.282 for principals, 1.174 for heads of departments and 1.277 for student's council presidents.

The findings in Table 4 show that, principals 26.7% disagreed and 23.3% strongly disagreed with 5.0% not sure while 30.0% agreed and 15.0% strongly agreed to the statement

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that technological equipment's were available in schools. Over half of the principals (55.0%) were in disagreement that technological equipment's were available in schools. For the heads of departments, 28.3% strongly disagreed and 20.8% disagreed with 9.4 not sure while 28.3% agreed and 5.7% strongly agreed that computers were adequate for use in schools; hence majority of the heads of departments (83.0%) were in disagreement that computers were adequate for use in schools. For the student council presidents, 40.0% strongly disagreed and 34.5% disagreed, with 5.5% not sure while 12.7% agreed and 7.3% strongly agreed, that computers were adequate for use in schools; hence majority of the student council presidents (74.5%) were in disagreement that computers were adequate for use in schools and thus had a direct impact on principal's leadership practices and their role in integrating ICT in their specific secondary schools. The statement computers were adequate for use in schools; elicited low means of 1.98 for principals, 1.92 for heads of departments and 2.13 for students' council presidents, an indication that there was high disagreement level to the statement, with standard deviation of 1.282 for principals, 1.174 for heads of departments and 1.277 for student council presidents.

Table 4 above, principals, heads of departments and student council presidents were asked in the questionnaire to indicate their views on whether the available technology in school is easy to use. 27.3% disagreed to this statement while an equal 25.5 strongly disagreed and agreed respectively. Similarly, and equal 10.9% were not sure and strongly agreed respectively. This presented a mean of 2.69 and a standard deviation of 1.38 an indication that regarding the issue of whether the available technology in school is easy to use student presidents rated it below average. These finding were in agreement with Kiptalam and Rodrigues (2010) who conducted a study on accessibility and utilization of ICTs among secondary school teachers in Kenya. The study highlighted importance of school physical environment especially in availability, storage and maintenance of both ICT soft and hardware.

Table 4 also shows that 28.3% of Heads of Departments agreed to this statement on whether the available technology in school is easy to use while 26.4% disagreed to the statement and 22.6% strongly disagreed. A few 13.2% strongly agreed that the available technology in school is easy to use and 9.4% of the Heads of Departments were not sure as to whether the available technology in school is easy to use. This demonstrate that Heads of Departments have different views to those of the student presidents and they tend to confirm that the available technology in school is easy to use. However, their mean of 2.83 with a standard deviation of 1.411 still indicate that the available technology in school is not easy to use since the mean is still low.

For principals 31.7% strongly disagreed on whether the available technology in school is easy to use. and 30.0% agreed to this statement while 15.0% strongly agreed that the available technology in school is easy to use. A sizable number of 18.3% strongly disagreed to the statement that the available technology in school is easy to use. There slightly higher mean of 2.92 tend to support that the principals were of the opinion that the available technology in their schools is easy to use. There standard deviation is equally lower at 1.406.

Table 4 further shows information regarding whether there is internet connectivity in my school. According to the student presidents on this statement, 32.7% strongly disagreed while 29.1% disagreed and 23.6% agreed. On the same, an equal number of 7.3% of the students were not sure and strongly agreed respectively. They had a mean of 2.44 which confirms their low opinion regarding whether there was internet connectivity in my school. A

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standard deviation of 1.35 also indicates their opinion of absence of internet connectivity in the school.

On their part, the Heads of Department on whether there is internet connectivity in the school, an equal number of the HODs (32.1%) strongly disagreed and disagreed respectively, while 20.8% agreed that there is internet connectivity in their school and a few, 13.2% strongly agreed to this statement. Only 1.9% were not sure which presents a peculiar opinion since an HOD is supposed to know whether, there is internet connectivity in the school or not. Their mean was 2.51 with a standard deviation of 1.463. this implies that the internet connectivity in schools in Kitui County is still very low.

Principals were also asked on whether there is internet connectivity in their schools, and Table 4 shows that 33.3% of them strongly disagreed while 30.0% disagreed and 16.7% and 15.0% strongly agreed. Only 5.0% were not sure. It is not clear why some principals of schools some schools are not sure whether there is internet connectivity in their school or not. The principals had a mean of 2.50 with a standard deviation of 1.479. This data in overall tend to show a common trend among the three categories of respondents of the student presidents, Heads of departments and principals.

According to Table 4, principals, heads of departments and student council presidents were asked in the questionnaire to indicate their views on whether there are laptops for teachers to ease their work. It is clear that 36.4% of the student council presidents, strongly disagreed with 25.5% of them who disagreed, while, 16.4% agreed to the statement and 12.7% were not sure. Only 9.1% of them strongly agreed that there were laptops for teachers to ease their work. From the data, this presented a mean of 2.47 with a standard deviation of 1.762 which shows that very few schools had laptops for teachers to ease their work.

Table 4 further shows that 30.2% of the Heads of Department disagreed that there are laptops for teachers to ease their work. On the same 26.4% strongly disagreed that there are laptops for teachers to ease their work while a significant 37.5% agreed to the same statement. Only a few of the HODs 3.8% strongly agreed that there are laptops for teachers to ease their work and only 1.9% were not sure as to whether, there are laptops for teachers to ease their work. It is also clear from the same Table that the mean for the HODs was 2.62 and a standard deviation of 1.333 which is an indication that majority of schools in Kitui County still don't have adequate laptops for teachers to ease their work.

From the same Table 4, it is clear that 33.3% of the principals strongly disagreed that there were laptops in their schools to ease the work of teachers. On the same issue, 21.7% disagreed while 26.7% agreed and 10.0% were not sure. Only 8.3% of the principals strongly agreed that there are laptops for teachers to ease their work. The principals' responses present a mean of 2.55 with a standard deviation of 1.407% which almost concur with the findings of the student council presidents and the Heads of Department.

Table 4 shows that, 41.8% of the student council presidents strongly disagreed that there are enough rooms where teachers prepare computer-based lessons from while 30.9% of them disagreed to that statement and 12.7% agreed that there are enough rooms where teachers prepare computer-based lessons from. An equal percentage of 7.3% were not sure and strongly agreed respectively. Their mean was 2.13 while their standard deviation was 1.292. These findings imply that there are very few schools in Kitui County where there are enough rooms where teachers prepare computer-based lessons from.

From the same Table 4, Heads of Departments, also confirmed the student council president's views whereby 43.4% of the HODs strongly disagreed to whether, there are enough rooms where teachers prepare computer-based lessons from, while 41.5% of them



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disagreed and an equal percentage of 7.5% were not sure and agreed respectively. None of the Heads of departments strongly agreed to this statement. Their mean was 1.79 while their standard deviation was 0.885 which demonstrates a strong view that there are not enough rooms where teachers prepare computer-based lessons from.

Principals also presented their opinions on the same issue and 36.7% disagreed while 31.7% of them strongly disagreed that there are enough rooms where teachers prepare computer-based lessons from. The principal who agreed to this statement were 16.7% while 8.3% strongly agreed and 6.7% were not sure. Their mean was 2.33 and the standard deviation was 1.311. The findings of the three groups of participants tend to concur that there are not enough rooms where teachers prepare computer-based lessons from.

On whether safety and security of ICT facilities in my school is guaranteed, 27.3% of the student leaders agreed to the statement while 23.6% strongly agreed and 21.8% disagreed. On the same, 14.5% strongly disagreed, 12.7% were not sure. In terms of their means and standard deviation, they were 3.24 and 1.414 respectively.

From Table 4, it is also evident that 39.6% of the Heads of Departments agreed that the safety and security of ICT facilities in my school is guaranteed, while an equal percentage of 17.0% strongly disagreed and strongly agreed respectively to the same statement and 15.1% disagreed. On the same issue, 11.3% were not sure. The mean was 3.25 which confirms that the safety and security of ICT facilities in my school is guaranteed and the standard deviation was 1.414 which further confirms their opinion.

Table 4 indicates that 33.3% of the principals, agreed that safety and security of ICT facilities in my school is guaranteed, while 20.0% strongly disagree and an equal percentage of 16.7% disagree and strongly agree respectively. Only 13.3% were not sure. Their mean was 3.10 and the standard deviation was 1.411. This affirms that the principals strongly approve that, safety and security of ICT facilities in my school is guaranteed.

Finally, Table 4 shows that, 34.5% of the students agreed that there are teaching and learning resources to facilities ICT-based lessons while 25.5% disagreed and an equal percentage of 14.5% strongly disagreed and were not sure respectively. Only 10.9% strongly agreed to the statement. Their mean was 3.02 and a standard deviation of 1.284. It implies that according to the students' representatives, the teaching and learning resources to facilities ICT-based lessons are inadequate.

Table 4 also shows that, 34.0% of the HODs agreed that there are teaching and learning resources to facilities ICT-based lessons while 28.3% disagreed and an equal percentage of 15.1% strongly disagreed and were not sure respectively. Only 7.5% strongly agreed to the statement. Their mean was 2.91 and a standard deviation of 1.244. According to the HODs it implies that, the teaching and learning resources to facilities ICT-based lessons are inadequate.

For the Principals, Table 4 shows that, 36.7% agreed that there are teaching and learning resources to facilities ICT-based lessons while 25.0% disagreed and 20.0% strongly disagreed to the statement. It is also clear that 11.7% of the principals strongly agreed to the statement. Their mean was 2.95 and a standard deviation of 1.383. It implies that according to the principals, the teaching and learning resources to facilities ICT-based lessons are inadequate.

## **Discussion of Findings**

The findings on this evaluation study on the Integration of ICT in Public Secondary Schools in Kitui County, Kenya are based on the analysis of the data that was obtained using

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questionnaires, in-depth interviews, observation and document analysis guide. Schools' ICT infrastructure influences ICT Integration in Public Secondary Schools in Kitui County. The ICT integration is yet to be accomplished due to inadequate infrastructure investment in the County. Notable, on availability of computers in schools, it was established that, computers, laptops, photocopies and printers, were available in schools. However, they also all agreed that, digital cameras and smart boards were not available in the secondary schools of Kitui County. There is no adequate infrastructure, that could affect ICT Integration in Public Secondary Schools in Kitui County.

### **Conclusions**

One of the questions which this study sought to answer was on the school principals' leadership practices that influence ICT Integration in Public Secondary Schools in Kitui County. Based on the analysis of the findings it can be concluded that, there is no policy in the school which had been explained to them on the ICT Integration. Further, on ICT infrastructure does influence ICT Integration in Public Secondary Schools in Kitui County. It can be concluded that, on availability of computers in schools, there are computers, laptops, photocopies and printers. It can be concluded that, digital cameras and smart boards were not available in the secondary schools of Kitui County. Therefore, there is not adequate infrastructure, that could affect ICT Integration in Public Secondary Schools in Kitui County.

### **Recommendation**

The following recommendation is made on ICT infrastructure does influence ICT Integration in Public Secondary Schools in Kitui County. It can be recommended that, schools avail the necessary infrastructure for ICT integration. Despite that there were computers, laptops, photocopies and printers in schools, it is recommended that the adequacy levels be achieved in all secondary schools. The study showed that, digital cameras and smart boards were not available in the secondary schools of Kitui County. Therefore, there is no adequate infrastructure, that could affect ICT Integration in Public Secondary Schools in Kitui County. The study recommends that such infrastructure be made available through different groups. One of the groups is that of alumni, therefore, schools should endeavor to set up alumni and encourage the group to help in donations and mobilize resources for the same. The schools can also mobilize resources, through the parents Teachers Associations (PTAs), Constituency Development Funds, None Governmental Organizations (NGOs) and encourage donations from donors such as banks and computer companies. Schools through the Government should improve and install internet connectivity. Promote, and ensure adequate funding of the ICT integration which is required.

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