# INFORMATION AND COMMUNICATION TECHNOLOGY ADOPTION AMONG PUBLIC SECONDARY SCHOOLS IN KISUMU COUNTY, KENYA

**PRESENTED BY**

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**A Management Research Project Submitted In Partial Fulfillment Of The Requirements For Award Of The Degree Of Master Of Business Administration, School Of Business, University Of Nairobi**

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## DECLARATION

I declare that this management research project is my original work and has not been submitted for a degree in any other University.

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

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## DEDICATION

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## ABSTRACT

Information and Communication Technologies (ICTs) adoption has become a core issue in many sectors of the economies. In the education sector, considerable benefits have been derived as a result of adopting ICT. Public Secondary schools have also experienced the benefits of adopting ICTs in their daily operations, both for instructional, administrative and management purposes. This study sought to determine the types of ICTs adopted by Public secondary schools, factors affecting their adoption and the benefits they derived as a result of adopting the various ICTs.

The study adopted a stratified sampling design with respondents drawn from 93 public secondary schools from six districts forming Kisumu County. The Districts are Kisumu East, Kisumu West, Kisumu North, Nyando, Muhoroni and Nyakach. The study found out that radio, television, video mobile phone, desktop computer, email printers, flash disk, CD and DVD were the ICT items adopted by most schools in Kisumu County, Kenya, with over 50% of the respondents indicating that they have been adopted in their school. Among the least adopted Information and Communication Technologies included DSTV, Website, Intercom, Scanner, fax Machine and the LCD projector. It emerged that schools that had adopted ICTs derived many benefits from ICT technologies compared to those that had not. These include collection of data, data storage, data processing, analysis of data, management of data, external communication, printing, presentation of information, retrieval of information, enhanced data and information security and entertainment.

However, the study reveals that more should be done to enhance the status of ICT adoption in the public secondary schools in Kisumu County and nationally. It also emerged that lack of ICT implementation plan, lack of finances, lack of technicians and ICT training programs remain the main factors affecting ICT adoption in public secondary schools. It is worth noting however that factors that were once major hindrance to ICTs adoption such as teacher attitude, phobia for technology, age and gender were no longer major barriers in public secondary schools. There is need for more research to be done on the roles of various stakeholders especially parents in influencing adoption of ICTs in our public secondary schools.

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**Acronyms and Abbreviations**

| | |
|---|---|
| AIS | -Accounting Information System |
| CD | -Compact Disc |
| DVD | -Digital Versatile/Video Disc |
| EFA | -Education For All |
| HRMIS | -Human Resource Management Information System |
| ICT | -Information and Communications Technology |
| IICD | -International Institute for Communication and Development |
| IRI | -Interactive Radio Instruction |
| IT | -Information Technology |
| LCD | -Liquid Crystal Display |
| MIS | -Management Information System |
| MIC | -Ministry of Communications |
| MOEST | -Ministry of Education, Science and Technology |
| MDGs | -Millennium Development Goals |
| NEPAD | -New Partnership for Africa's Development |
| SITES | -Second information Technology in Education |
| TAM | -Technology Acceptance Model |
| TPS | -Transaction Processing System |
| TV | -Television |
| UNESCO | -United Nations Educational, Scientific and Cultural Organization |
| E-Mail | -Electronic Mail |

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# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Globalization and technological change have created a new global economy which has driven organisations to adopt Information and Communication Technologies (ICTs) in their operations. Economies that have implemented Information and Communications Technology successfully have greatly benefited in all aspects of business transactions (Gutierrez & Berg, 2000). In developing countries however, adoption of ICTs has been rather slow, partly contributing to the slow growth in their economies. User acceptance has been identified as a major impediment to the success of adopting these information and Communication technologies (Gould, Boies & Lewis, 1991; Nickerson, 1981). Like many African nations, Kenya still lags behind in adoption of ICT in many areas, including the education sector and especially at primary and secondary schools. As pointed out by Shibanda and Musisi-Edebe (2000), there is need for countries in Africa to accept ICT as a priority area for development and hence invest adequately in it to promote economic development.

The subject of ICT adoption can be understood through theories and models that have been developed by various scholars. According to Pedersen (2003), studies on ICT adoption have generally taken three possible approaches: a diffusion innovation theory (Rogers, 1995) which comprises four elements namely invention, diffusion through the social networks, time and consequences (Rogers, 1995); an adoption approach which describes and explains the adoption decision of users applying different individual and social decision making theories and a domestication approach which focuses on the process in which technology becomes an integral part of our everyday habits(Rogers, 1995). There is also the technology acceptance model (TAM) based on theory of Reasoned action (Fishbein & Ajzein, 1975) from social psychology.

### 1.1.1 Information and Communication Technology (ICT) in Education

Dornisch and Land (2000) underscore the importance of ICTs in the education sector as a means for collaboration; "The information-rich and communicative aspects of the Internet might offer a much needed avenue for collaboration among people with alternate perspectives by providing environments devoted to supplying learners with information and activities that could cross ethnic, cultural, and socio-economic boundaries and by providing spaces for negotiation". Soby (2000) in the description of the "Norwegian network for IT-research and competence in education" claims that ICTs contributes to create a more flexible school and a "decentralized and varied educational system". ICTs in education sector must produce institutional changes which will not be possible without systemic changes.

According to Hargreaves and Meighan (1997) the merging of ICTs and education require organizational changes on the level of the whole system – in the direction of allowing more distance-learning or even virtual schooling, thus changing the attitude towards time, place, curriculum and other connected attributes of the system on a systemic level. ICTs and good teaching combine to produce generic skills, like team work and problem solving, that are so important not only for life in the information age, but also for lifelong learning (Cradler, 1997). ICTs can also improve administrative practices in schools. Johnson (1996) in his study showed the improved productivity that accompanies automated timetabling and other automated administration practices.

### 1.1.2 Public secondary schools in Kisumu County

Kisumu County covers a vast area consisting of six districts namely Nyakach, Nyando, Muhoroni, Kisumu East and Kisumu West and Kisumu North. There are about 170 public secondary schools in this County located in diverse geographic, administrative and economic backgrounds (PDE, 2011). The diverse backgrounds of schools in this county was the motivating factor for conducting the research in this County since the sample would be very representative for the population of schools in the whole country.

Public secondary schools in Kisumu County grapple with challenges of quality curricular supervision. Nyamu (1986) in his study observed that supervisory methods employed by head teachers in public schools were inadequate since they were limited to checking of teachers' professional records. Doharly (1993) suggested that head teachers should ensure quality curricular supervision and provision of adequate physical resources in the schools. Inadequate physical resources such as classrooms, boarding facilities and other necessary infrastructure like reliable sources of electricity to support adoption of ICT also remain a major challenge for public schools (Doharly, 1993; Farrell, 2007). Public secondary schools also face financial challenges like lack of adequate finance, which result in inadequate supply of teaching and learning materials and equipment (Gogo, 2002).

## 1.2 Statement of the problem

Kenya promulgated a National ICT Policy in January 2006, where a section on information technology sets out the objectives and strategies pertaining to ICT and education. It 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" (MIC, 2006). This was in recognition of the important role ICT plays in the education sector. ICT has made a positive contribution towards achieving universal access to education-the

Millennium Development Goals (MDGs) and the Education for all (EFA) principle developed by UNESCO. Evidence gathered during the study by the International Institute for Communication and Development (IICD) and its partners in using Information and Communications Technology to enhance education showed that up to 80% of participants were more aware and felt empowered, while 60% indicated that they had experienced a direct improvement in the teaching and learning processes (IICD, 2007). Despite these benefits of ICT in teaching and learning in schools, their adoptions remained a major challenge.

A number of studies have been done on ICTs adoption in various sectors. A study by Muinde (2010) identified socio-cultural factors such as appreciation and perception of ICTs; attitude of the scientific research community; demographic issues such as age, level of qualification, gender, poverty and literacy levels; communication networks and traditional cultural values , communalism and education culture as factors affecting the adoption of Information and Communication Technologies for Communication of Research Output in Research Institutions in Kenya . Furthermore, institutional factors which included issues to do with ICT governance such as political, institutional leadership and culture; institutional framework; policy and strategy and legal and regulatory framework; and control over mass media communication channels were also found to be affecting the adoption of ICTs. Another study on ICT adoption by Nyirongo (2009) found out that utilization and integration of electronic technologies was affected by limited availability of the technologies; unreliability of the available technologies due to related issues like power outages and poor reception; lack of training; lack of technical, pedagogical and administrative support; and lack of faculty involvement in decision making relating to electronic technologies.

Although these studies had been done on ICT adoption, none focused on ICT adoption in Public Secondary Schools in Kisumu County. This study therefore sought to determine the factors that have influenced ICT adoption, types of ICTs and their use in the public secondary schools in Kisumu County so as to inform the various stakeholders on ICT adoption status and help in formulating policies for effective ICT adoption in Public Secondary schools. The study sought to answers the following questions: what are the factors that affect the adoption of ICTs in public secondary schools in Kisumu County? Which types of ICTs have been adopted by public schools in Kisumu County? What are the benefits of ICTs adopted by public secondary schools in Kisumu County?

## 1.3 Research Objectives

The objectives of the study were to;

a) Establish the factors that affect adoption of ICTs in public secondary schools in Kisumu County.
b) Determine the types of ICTs used by public secondary schools in Kisumu County.
c) Determine the benefits of ICTs adopted in public secondary schools in Kisumu County.

## 1.4 Value of the study

The findings of this study will be useful to the various stakeholders in the education sector namely the Government, school administrators and managers, teachers, students, the school community, donors and other educational partners. The government will find information about types of ICT adopted, factors influencing ICT adoption and their usage in public secondary schools useful because it will be in a position to establish the extent of success of its endeavour to implement its ICT policy of adopting and integrating technology in the school system. The study will identified the factors that have hindered the success of ICT

adoption in schools and make recommendations on how they can be overcome by the government and other agencies.

The school management and administration will also find information from the study useful because they will be informed about their role in the adoption process such as need to support ICT adoption through provision of funds; need to improve on supervision of ICT integration in curriculum the school curriculum and their need to be techno savvy to ensure successful adoption of ICT in schools. The study will also inform them of the role of ICT in effective management through adoption of MIS applications such as Human Resource Management Information Systems (HRMIS) and Accounting Information systems (AIS) to help in the management of employees and school funds respectively.

The study seeks to inform teachers about their central role in ensuring successful adoption of ICT and help them change their attitude towards technology use in their schools. They will also be informed about the important role of ICT in facilitating their teaching through helping them in carrying out research and enable them collaborate with their colleagues in other institutions through ICT enabled services such as emails and the internet. The students will find the findings of the study useful to them in their career choices, research opportunities, improved communication and information sharing and help them learn to reduce overdependence on their teachers, but instead rely on ICT availed learning opportunities such as e-learning.

There are many donors and other educational partners that are involved in programs aimed at ICT adoption and integration in schools. Some of the examples of initiatives towards ICT adoption in the educational sector include: The Learning Resource Centre which Offers

training in educational management and integration of ICT for school managers, lecturers, and students initiated by Flemish Association for Development and Technical Assistance and UNESCO; ICT equipment for schools initiated by Kenya ICT Trust Fund, NEPAD e-Schools Initiative: Multi-partner demo project that equipped six secondary schools with state-of-the-art ICTs and provided teacher training and learning content which was funded by Oracle, Microsoft, and the Ministry of Education. This study will provide a feedback to these donors and educational partners on the status of their initiatives and projects and help in formulating a way forward for future ICT adoption initiatives identify challenges in the adoption process and develop strategies to overcome such challenges.

The school community, for example subordinate staff and parents would also benefit from findings of this study. The study provides information about types of ICT available in the schools, their potential benefits and opportunities they avail to the users. For example they would be informed about the internet services available in the mobile phones which they can use to get information in daily newspapers, journal articles or books at little cost. Parents would also make use of ICT to communicate to the school and to access information about the school through email and internet services.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 The concept of Information and Communication Technology (ICT)

Adeya (2002) define Information and Communication Technologies (ICTs) as 'electronic means of capturing, processing, storing and disseminating information' embedded in networks and services that affect the local and global accumulation and flows of public and private knowledge. According to a United Nations report (1999), ICT 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.

According to Schooling Issues Digest (2001), Information and communication technology (ICT) generally relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure and videoconferencing). A report by UNESCO (2003) refers to Information and communication technologies (ICTs) as the combination of informatics technology with other related technologies, specifically communication technology. UNESCO (2003) define informatics as the science dealing with the design, realization, evaluation, use, and maintenance of information processing systems, including hardware, software, organizational and human aspects, and the industrial, commercial, governmental and political implications of these.

ICT can enhance the effectiveness, efficiency, and transparency of the public sector including the delivery of social services (World Bank, 2002). ICT is useful in organisations

and businesses mainly to gather, analyze, modify and exchange information. Use of ICT is essential for efficient business practices; improving living standards, literacy and trade (Danowitz, Nassef & Goodman, 1995). The positive impact of ICT in the service industry have been evident based on findings by a number of scholars (Gershuny and Miles, 1983; Barras, 1990; Evangelista, 2000; Miles, 2004) on productive bond between innovation and growth in services, ranging from micro to macro level.

## 2.2 Types of ICT in education sector

Haddad and Drexler (2002) identify five levels of technology use in education: presentation, demonstration, drill and practice, interaction, and collaboration achieved by use of radio and TV broadcasts, computers and the Internet, teleconferencing and application programs such as Management Information Systems (MIS). Davis and Olson (1985) define MIS as information system that collects, transmits, processes and stores data on an organization's resources, programs and accomplishments. MIS are computer based information system which supports the operation, management and decision making function of an organization (Davis & Olson, 1985). Hicks (1990) defined MIS as a 'formalized computer information system that can integrate data from various sources to provide information necessary for management decision making. McLeod and Schell (2004) defined MIS as a computer based system that makes information available to users with similar needs. There are five major ICT based information systems in organizations; transaction processing systems, management information systems, decision support systems, knowledge based systems and virtual office systems (McLeod & Schell ,2004)

These include radios and television. Bosch (2002) identified three general approaches to the use of radio and TV broadcasting in education: direct class teaching, where broadcast

programming substitutes for teachers on a temporary basis, school broadcasting, where broadcast programming provides complementary teaching and learning resources not otherwise available; and general educational programming over community, national and international stations which provide general and informal educational opportunities.

According to Bosch (2002), the most common and effective direct class teaching methodology is the Interactive Radio Instruction (IRI). Its primary objective is to raise the quality of learning with much success realised in both formal and non-formal Settings. Extensive research around the world had shown that many IRI projects had a positive impact on learning outcomes and on educational equity besides being a cost-effective strategy relative to other interventions due to its economies of scale (Bosch, 2002).

Rama (2002) defines teleconferencing as "interactive electronic communication among people located at two or more different places." Teleconferencing is used in both formal and non-formal learning contexts to facilitate teacher-learner and learner-learner discussions, as well as to access experts and other resource persons remotely. In open and distance learning, teleconferencing is a useful tool for providing direct instruction and learner support, minimizing learner isolation (Tinio, 2002). Teleconferencings are of four types based on the nature and extent of interactivity and the sophistication of the technology: audio conferencing, audio-graphic conferencing, videoconferencing and Web-based conferencing (Rama, 2002)

According to Rama (2002), audio conferencing involves the live exchange of voice messages over a telephone network. Audio graphic conferencing involves exchange of low-bandwidth text and still images such as graphs, diagrams or pictures along with voice messages. On-moving visuals are added using a computer keyboard or by drawing/writing on a graphics

tablet or whiteboard. Videoconferencing allows the exchange of voice, graphics and moving images. Videoconferencing technology uses either a satellite link or television network. Web-based conferencing involves the transmission of text, and graphic, audio and visual media via the Internet which requires the use of a computer with a browser (Rama, 2002).

Richmond (2002) identified three general approaches to the instructional use of computers and the Internet: learning about computers and the Internet, in which technological literacy is the end goal; learning with computers and the Internet in which the technology facilitates learning across the curriculum; and learning through computers and the Internet, integrating technological skills development with curriculum applications. According to Pelgrum and Law (2003), computers started to become popular in educational policy making in the early 1980s when relatively cheap microcomputers became available for the consumer market. There were high expectations that introduction of microcomputers would make education more effective and motivating In recent years, a lot of focus is on how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings.

## 2.3 Benefits of ICT in Education

Many research studies have revealed the benefits and gains that can be achieved by students, teachers and administrators by adopting and integrating ICT in their activities (Jhurree, 2005). Tele-networking Incorporated (1998) identified seven trends that occur in schools when ICT is introduced as part of a reform agenda: there are higher levels of control by learners over their learning; learning situations become more realistic and authentic; student interest and motivation are very significantly boosted; successful online classrooms combine ICT with an appropriate, usually constructivist pedagogy; online

learning communities challenge locally established curriculum; the education of educators is extended to include just in time learning and collaborative learning; and educators use online technology as a driving element of further educational reform.

A study by Dunbar and Toomey (1999) on the capacity of ICT to improve learning and teaching found out that ICT plays a key role in engaging young people in learning process of complex tasks. The use of ICT combined with effective teaching enhanced literacy and numeracy (Clarkson, Dunbar and Toomey, 1999). Yelland (1999) in his study found out that ICT in education help in the development of other significant outcomes like higher order thinking skills. Jimenez (2000) found that "Technology applied to education can show all of its potential as a means to facilitate key and qualitative change in the teaching-learning process..."

According to Kozma and Anderson (2002), adoption of ICT is transforming schools and classrooms by bringing in new curricula based on real world problems, providing tools to enhance learning, giving students and teachers more opportunities for feedback and reflection, and building local and global communities that include students, teachers, parents, practicing scientists, and other interested parties. Moore (2001) noted that ICT, properly utilized, promises the ultimate democratization of education by increasing access and transcending traditional physical and spatial constraints. ICT brings to millions of people of all ages, ethnic groups, and socio-economic levels unprecedented educational opportunities. ICT can affect the pace at which the learning gap is bridged in developing countries, both domestically and in relation to other nations. The great challenge is to harness the advantages of those technologies, in order to improve the delivery and quality of

educational services, as well as to accelerate the rate at which knowledge is distributed and learning chances and outcomes are equalised throughout society (Wagner & Kozma, 2003).

Kozma (2005) addresses the questions of how ICTs can be applied to support education change and how its application in education in turn support sustained economic development and social transformation by suggesting the following four types of approaches in general; ICTs are used to improve the delivery of and access to education. This approach can improve education on the margin by increasing the efficiency, by which instruction is distributed, but it need not involve fundamental change; ICT are the focus of learning. By learning ICT skills, students become better prepared for work that increasingly involves the use of ICT; ICT can be used to improve student understanding, increase the quality of education, and thereby increase the impact of education on the economy; Knowledge creation, technology, technological innovativeness, and knowledge sharing can contribute to the transformation of the education system and to sustained economic growth and social development.

Papert (1997) identifies the following positive effects that ICT in education would have on students; Enhanced motivation and creativity when confronted by the new learning environments, a greater disposition to research and problem-solving focused on real social situations, more comprehensive assimilation of knowledge in the interdisciplinary ICT environment, systematic encouragement of collaborative work between individuals and groups, ability to generate knowledge, capacity to cope with rapidly changing, complex, and uncertain environments; new skills and abilities fostered through technological literacy.

## 2.4 ICT Adoption

Rogers (2003) defines adoption as the decision to make full use of an innovation as the best course of action available. He differentiates the adoption process from the diffusion process by stating that adoption process pertains to an individual, whereas the diffusion process occurs within a society as a group process. Rogers (2003) defines innovation adoption process as 'mental process through which an individual passes from first knowledge of an innovation to a decision to adopt or reject and to confirmation of this decision.

Rogers (2003) breaks the adoption process down into five stages; the knowledge stage where the adoption become aware of an innovation through different sources available in the social system; the persuasion stage where the adoption becomes interested in the innovation of MIS and develops mental acceptance, or makes a decision to reject the innovation; the decision stage where the adopter engages in activities that lead to a choice to adopt or reject the MIS innovation. It is the feasibility stage where the adapter assesses the benefit of MIS application and its anticipated future situation, then decides whether or not to implement it; the implementation stage where the adopter makes full use and applies the new MIS application on a small or full scale in order to determine its utility in his/her own situation: the confirmation stage where the adopter seeks support for the innovation decision that had already been made at the previous stages and uses the new MIS continuously, full scale, and applies any improvement for upgrades.

## 2.5 Factors that influence ICT adoption

Among the factors influencing ICT adoption in schools include ICT adoption planning, the teacher, availability of resources, time, technical support, management support, organizational support and community support. Successful adoption of ICT into the

classroom warrants careful planning and depends largely on how well policy makers understand and appreciate the dynamics of such integration (Jhurree, 2005). ICT if properly integrated, have the potential to enhance the teaching and learning process (Hepp, 2004; Kozma & Wagner, 2003; Commission of the European Communities, 2001; UNESCO, 2003; Pelgrum & Law, 2003). The ICT adoption plan should be based on real school needs and one that is realistic, achievable, and effective. The plan should be produced, not for the sole purpose of putting technology in the classroom but to reflect the real needs of schools in order to make effective technology deployment and to produce enhanced learning environments (Levine, 1998).

Teachers' characteristics such as individual's educational level, age, gender, educational experience, experience with the computer for educational purposes and financial position can influence the adoption of an innovation (Rogers 1995, Schiller 2003). The benefits of ICT may soon recede without skilled application by the teacher. The crucial element remains the way in which the technology is incorporated into pedagogical patterns and this in turn depends upon the impact it has on the epistemologies and personal theories of the teachers deploying the technology in their classrooms (Gregoire, 1996). Many studies to investigate why teachers do not use computers in their teaching have identified the following as the main inhibitors: Lack of teaching experience with ICT, lack of on-site support for teachers using technology, lack of help when using computers, lack of ICT specialist teachers to teach students computer skills, lack of computer availability, lack of time required to successfully integrate technology into the curriculum and lack of financial support.(Rosen & Weil, 1995; Winnans & Brown, 1992; Dupagne & Krendl 1992; Hadley & Sheingold 1993).

Olson (1981) suggested that the computer offers teachers ways to enhance what and how they teach, but at the same time threatens those very practices by calling them into question. The presence of the computer says something about what the teacher values, symbolises the teacher's interest in modern trends and his capacity to cope with the latest teaching technologies. However, the computer also threatens illusions which teachers have about what they are doing (Solomon, 1986; Watson, 1987). Teachers must have opportunities to study, observe, reflect, and discuss their practice, including their use of ICT, in order to develop a sound pedagogy that incorporates technology (Kearsley & Lynch, 1992). Professional development of teachers sits at the heart of any successful technology and education program. The successful use of technology in the classroom depends to a large extent on the teachers' attitudes toward these tools (Lawton & Gerschner, 1982).

Mumtaz (2000) noted that many scholars proposed lack of funds to obtain the necessary hardware and software as one of the reasons teachers did not use technology in their classes. Therefore, efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers. Using up-to-date hardware and software resources is a key feature to adoption and diffusion of technology (Gulbahar, 2005). It is globally felt that computer access has often been one of the most important obstacles to technology adoption and integration worldwide (Pelgrum, 2001).

Lack of time is a factor that hinders technology integration in schools. This barrier becomes manifest in two ways namely release time and scheduled time (Mumtaz, 2000). Even though some of the teachers had a genuine need to use computers with their students, there was no available time to do it. Bauer and Kenton (2005) carried out a study about technology integration in the schools and found that teachers who were highly educated and

skilled with technology were innovative and adept at overcoming obstacles, although that they did not integrate technology on a consistent basis as both a teaching and learning tool due to other factors such as need for extra planning time for technology lessons..

A study by Preston (2000) found that lack of technical support was a key inhibitor to the use of ICT by teachers in the classroom. Recurring faults and the expectation of faults occurring during teaching sessions have reduced teachers' confidence and caused teachers to avoid using technology (Bradley & Russell, 1997). Lack of technical support is very stressful for the teacher, which may affect the teacher's willingness in the adoption of ICT (Tong & Trinidad, 2005).

Leadership is an important element in establishing technology as a part of school culture (Anderson & Dexter, 2000). Baylor and Ritchie (2002) describe leadership as a critical predictor of ICT integration, since it focuses on promoting the use of ICT at a strategic and action level. Projects receiving the principal's support were more likely to succeed, since the principal's involvement indicates that the project is being taken seriously, and it helps in recruiting both material resources and psychological support (Marsh, 2001; Berman & McLaughlin, 1977).

Appointing an ICT coordinator or head of the ICT department in each school helps to assure administrative and pedagogical support for the teachers. The role of the ICT coordinator or head of department should be to advise teachers on ICT solutions to their teaching or learning problems, help teachers to acquire ICT resources, and conduct training needs assessment of teachers' ICT-related capacities and advise them on their professional development (Bangkok, 2004).

Acceptance of a new technology in a society depends on how well the proposed innovation fits the existing culture (Hodas, 1993). School culture can be defined as the basic assumptions, norms and values, and cultural artefacts that are shared by school members (Maslowski, 2001). To achieve long term goal of fully integrating use of ICT into all aspects of the school system will require a cultural shift in the way schools approach ICT (Otto & Albion, 2002). ICT reforms must be suited to the school's learning environment, the available infrastructures and to the culture and nature of the school's community. According to Bangkok (2004), parents' involvement in change management activities within a school's ICT master plan occurs more quickly. Granger and Morbey (2002) in their study found out that successful adoption of ICT by teachers required not only computers but commitment and community, with the last two being closely interlinked.

## 2.6 Challenges of ICT adoption

There is generally lack of information regarding the potential benefits of ICTs hence the low level of adoption in the educational sector. According to Garr (2003), many organizations in developing countries do not even know of the existence of MIS, they have not yet reached the awareness of the innovation process stage and thus face many adoption problems.There are hardly any studies evaluating the actual effectiveness of ICTs (Alexander, 1999; Healy, 1998; Melamed, 1999), hence a general lack of information regarding the contributions of ICT in organizations. In Green's (2002) survey of the role of computing and information technology in US higher education, most senior academic and information technology officials agreed that the single most important ICT issue confronting their campuses was "helping faculty integrate technology into their instruction." The educational system wishes to use ICT within the existing organizational framework. They are slow to implement changes in their

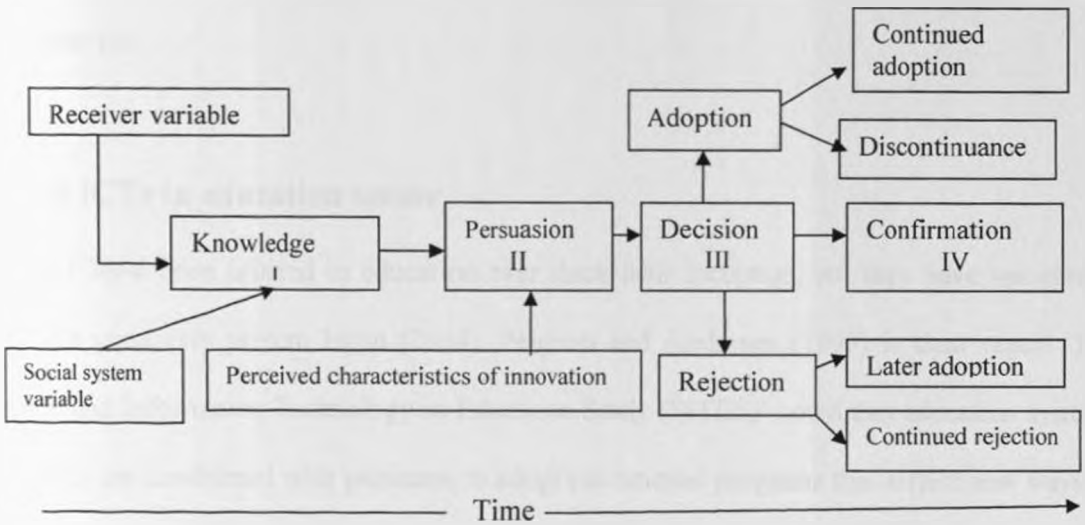
organizational structures, systems and cultures that are requisite for ICT adoption to have an impact.

Technology cannot demonstrate its potential if the organizational structures within which it is implemented do not change as well. The tendency is to "tame" and "domesticate" this otherwise revolutionary tool. In such a state of affair, ICT's effectiveness and innovativeness can no longer be expressed, and no changes in learning outcomes can surface (Roschelle & Pea, 1999; Archer, 1998; Oppenheimer, 1997; Peacock & Beard, 1997, Dahl & Farman, 1996; Bangert-Drowns, 1993). When the system doesn't change, ICT may lead to no change or even to a change for the worse. However, it should be noted that ICTs adoption is very dynamic and many changes have taken place since these studies. A case in point is the inclusion of mobile phone technology in ICTs especially in Kenya.

## 2.7 Theories and models of ICT adoption

Various theories and models have been used to study ICT adoption and implementation. Pedersen (2003) suggest that studies on ICT adoption can generally take three possible approaches: a diffusion approach developed by Rogers (1983), an adoption approach and a domestication approach. Rogers (2003) defines diffusion of Innovation as the "process by which an innovation is communicated through certain channels over time among members of a social network". This theory comprises four elements namely the innovation itself, diffusion through the social networks or the communication channels used to spread information about the innovation, time and nature of the group to which it is introduced (Rogers, 1995).

According to this theory, information filters through the networks and depending on the nature of the networks and the roles of its opinion leaders, new innovations are either adopted or rejected. Opinion leaders influence an audience through personal contact while intermediaries such as change agents also contribute to the process of diffusion. The diffusion of innovation model is illustrated as follows;




Rogers' Diffusion of Innovation model (Source: Rogers, 1995)

The individual innovativeness theory is based on who adopts the innovation and when. According to Rogers (1995), there are five categories of adopters: innovators who are the risk-takers and pioneers and play the role of leading the way; the early adopters who embrace the innovation early and help spread the word about the innovation to others. Early majority who get persuaded to adopt by the innovators and early adopters, and may deliberate for some time before completely adopting the new idea; and finally the late majority who approach innovation with caution and wait to make sure that adoption is in their best interests. Rogers (1995) asserts that an adopter's experience with one innovation influences that individual's perception of the next innovation in a technology cluster to diffuse through the individual's system.

Technology Acceptance Model (TAM) is also used to explain adoption of innovation by individuals. The main purpose of TAM is to explain the determinants of end computer acceptance and to explain a broad range of end user behavior across computing technology, while also being both economically and theoretically justified (Davis, 1996). TAM assesses use of IT based on the influence of two main variables, namely (1) perceived ease of use and perceived usefulness (2) user's attitude, behavioral intention and actual system usage behavior.

## 2.8 ICTs in education sector

ICT have been utilized in education ever since their inception, but they have not always been massively present Hepp (2004). Pelgrum and Anderson (1999) in their report 'The Second Information Technology in Education Study (SITES)' noted that education systems today are confronted with pressures to adopt educational programs that reflect new ways of learning aimed at preparing citizens for the Information society. In particular, the editors emphasize the ability of ICT based education to help students achieve competitiveness in the new global economy and support life-long, flexible learning.

Bennet (1999) notes, "The only important field that computers have failed to change significantly is education". Despite the huge expenditure, wide experimentation and research, and discursive enthusiasm, educational technology has failed to show substantial benefits to the field (Gentry & Csete ,1995; Bennet, 1999; Salomon, 2000). The impact of ICT in education has not been as extensive as in other fields such as medicine, tourism, travel, business, law, banking, engineering and architecture. Globally, a number of people have attempted to explore this lack of activity and influence (Soloway & Prior, 1996; Collis, 2002). Some factors have been identified to contribute to this lack of activity and

influence, including lack of funding to support the purchase of the technology, a lack of training among established teaching practitioners, a lack of motivation among teachers to adopt ICT as teaching tools (Starr, 2001). However, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in adoption of ICT in education (Pelgrum, W.J., Law N., 2003).

To allow the potential of ICT to be fully expressed many important parameters of the learning environment should be changed. However, when such an organizational change does take place, it is difficult to isolate the unique impact of ICT from the influences of the entire change process (Scardamalia, Bereiter, Brett, Burtis, Calhoun & Smith, 1992). ICT adoption is critical in improving the general performance of students in schools. A review of studies on the use of technology in education consistently found that students in rich environments experienced positive effects on performance in all subject areas (Look, 2005). Use of interactive multimedia software, for example, motivates students and leads to improved performance (Becta, 2003).

Changes in curricula to competency and performance-based has been supported and encouraged by emerging instructional technologies (Stephenson, 2001). This new curricula has changed the role of teachers in the teaching-learning process from merely being content experts to coaches and mentors. The use of ICT by students, within different schools, is a new resource for learning and a necessary condition for a policy of equity in education to be enforced (Pelgrum & Anderson, 1999)

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.0 Research Design

A sample survey of descriptive type was undertaken in this research. Descriptive study can be used to understand the characteristics of organization that follow certain common practices. In this case it helped the researcher to understand the variables in the schools that determined the types of ICT they had adopted, factors that influenced ICT adoption and the benefits they had derived as a result of adopting various ICTs. Survey technique was use in this study as it allowed for generalization and hence representativeness. According to Sekaran, (2006), study of a sample rather than the entire population is also sometimes likely to produce more reliable results because of reduced fatigue and fewer errors resulting in data collection.

## 3.1 Population of study

The population in this study comprised of 175 public secondary schools drawn from six districts which form Kisumu County. The distribution of the schools per district was as follows;

| District | Population |
|---|---|
| Kisumu East | 40 |
| Kisumu West | 35 |
| Kisumu North | 17 |
| Nyakach | 49 |
| Muhoroni | 20 |
| Nyando | 14 |
| **Total** | **175** |

**Table 3.1: Number of schools per District in Kisumu County**

The units of study were the public secondary schools in Kisumu County. Respondents in this study were mainly members of teaching staff drawn from ICT/Computer department,

Examinations department and in cases where they were not available, teachers from other departments in the schools were the respondents. The choice of Examination and ICT/Computer departments was on the basis of their potential use of ICT or their applications in their daily duties in the school and therefore the members of these departments were in a better position to respond adequately on the ICT types, factors that influenced adoption of ICT and the benefits members of the schools were deriving by using the ICT they had adopted.

## 3.2 Sampling

Stratified random sampling was use in this study. The sample size was 93 schools representing 53% of the population. The Districts formed the strata with sampled schools per District distributed as follows;

| District | Population | Frequency | Valid Percent |
|---|---|---|---|
| Kisumu East | 40 | 23 | 24.73 |
| Kisumu West | 35 | 19 | 20.43 |
| Nyando | 14 | 8. | 8.60 |
| Kisumu North | 17 | 12 | 12.90 |
| Nyakach | 49 | 21 | 22.58 |
| Muhoroni | 20 | 10 | 10.75 |
| **Total** | **175** | **93** | **100.00** |

**Table 3.2: Sample representation per District**

In each of the 93 schools that formed the sample for the study, a structured questionnaire was administered to a member of staff from the departments of ICT/Computer, Examinations or other Departments where the members of the ICT/Computer and Examination were not available.

## 3.3 Data Collection

This study relied on primary data that was collected from individuals within the specified departments through self administrated questionnaires. Self administrated questionnaires are

cheap, easy to administer to a large number and can be most usable form of gathering data in survey research (Fowler, 2002). The choice of use of questionnaires in this study was because of short time available for the research and its cost effectiveness considering the vastness of the area the research covered. The questionnaire consisted of mostly closed questions focusing on types of ICT in their schools and factors that have influenced ICT adoption; and a few open ended questions that focused on the respondents understanding of ICT, the challenges they faced in ICT adoption and their suggestion on way forward.

## 3.4 Data Analysis

Descriptive summaries of quantitative data obtained through the survey instrument were made using means and standard deviations. Data analysis was done using Statistical Package for Social Sciences (SPSS). SPSS was used to run the frequencies and the associated means and standard deviations. SPSS was also used to analyse qualitative data where percentage descriptions were obtained.

# CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

## 4.1 Introduction

This chapter presents the findings, analysis and interpretation of data on types of ICTs adopted, factors influencing their adoption and benefits derived as a result of their adoption in public secondary schools in Kisumu County, Kenya. The data was collected using structured questionnaires with the researcher visiting a total of 71 schools in four days while the data on the other 22 schools were obtained through phone interview. The response rate was 53.1% which is an adequate response rate for statistical reporting, according to Mugenda and Mugenda (1999). Descriptive statistics was used to analyze the data with the mean, standard deviation calculated for likert scales and percentages and frequencies calculated for open ended questions and nominal scales. The data processed into information was presented in tables with explanations given in prose

## 4.2 Data analysis and discussion

### 4.2.1 Demographic information

The district of the respondents as they indicated in their response is summarized as follows;

| District | Frequency | Valid Percent |
|---|---|---|
| Kisumu East | 23 | 24.73 |
| Kisumu West | 19 | 20.43 |
| Nyando | 8 | 8.60 |
| Kisumu North | 12 | 12.90 |
| Nyakach | 21 | 22.58 |
| Muhoroni | 10 | 10.75 |
| Total | 93 | 100.00 |

**Table 4.1: Distribution of the respondents per district**

From the table, most of the respondents were from Kisumu East and Nyakach Districts which also have the highest population of schools in Kisumu County, 40 and 49 schools respectively.

The study achieved its intention to have proportionate representation of the population in the sample based on the population of the schools in the districts.

The respondents were asked to indicate their departments and as summarized in the table below, majority of the respondents who were using ICTs in Public secondary schools were from the examination department. Even the most school authorities referred the researcher to members of the examination department for any information on ICTs in their schools. The respondents confirmed that computer related ICTs available in their schools were used by the examination department mainly to produce and analyze results. There was no respondent from accounts department because they are subordinates and were therefore not allowed to give information on behalf of the schools. It was also evident that most schools did not have computer/ICT departments in their school hence the low response rate from these departments.

| | Frequency | Valid Percent |
|---|---|---|
| Accounts | 0 | 0 |
| Examinations | 52 | 55.9 |
| ICT/Computer | 10 | 10.8 |
| Others | 31 | 33.3 |
| Total | 93 | 100.0 |

**Table 4.1: Distribution of the respondents per department**

The respondents were asked if they had come across the acronym ICT with 96.6% responding yes while only 3.4% saying no. This was an indication that there was some general awareness regarding ICTs.

| | | Frequency | Valid Percent |
|---|---|---|---|
| Valid | Yes | 85 | 96.6 |
| | No | 3 | 3.4 |
| | Total | 88 | 100.0 |

Despite a higher percentage having come across the acronym ICT, it was evident from their responses that they were not sure what ICT was in full. The most common incorrect response

given by the respondents for ICT in full was Information Communication Technology. The summary of the results were as follows;

| | | Frequency | Valid percent |
|---|---|---|---|
| Valid | Correct | 12 | 13.6 |
| | Incorrect | 59 | 67.0 |
| | Not sure | 17 | 19.3 |
| | Total | 88 | 100.0 |

## 4.3 Types of ICTs adopted in public secondary schools

The next part of the questionnaire required the respondents to indicate whether their schools had adopted various types if ICTs and their responses for the types of ICTs identified for them were as summarised for each item in the tables below:

*Whether the school has adopted Radio*

The findings indicated that 65% had adopted radio against 34.4% that had not and it was mainly used for entertainment by both staff and students. None of the respondents indicated that their school tuned to educational programs aired on radio stations.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 59 | 65.6 |
| No | 31 | 34.4 |
| Total | 90 | 100.0 |
| Total | 93 | |

*Whether the school has adopted TV*

69.9% indicated their schools had adopted television while 30.1% had not. It was noticeable that TV was popular than Radio in most schools. It was mainly used for entertainment purposes and there was no awareness among the respondents regarding educational programmes on television.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 65 | 69.9 |
| No | 26 | 30.1 |
| Total | 91 | 100.0 |
| Total | 93 | |

*Whether the school has adopted video*

Only 53.3% had adopted videos while 46.7% had not. Most respondents indicated that they had educational videos and was mainly used by language teachers to teach set books. Even schools that did not own videos hired videos for teaching purposes.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 49 | 53.3 |
| No | 43 | 46.7 |
| Total | 92 | 100.0 |
| Total | 93 | |

*Whether the school has adopted telephone*

The percentage of schools with telephone stood at 30.4% against 69.6% that did not have telephone. The respondents remarked that telephone was not necessary in this era of mobile phones. They reported technical faults and obsoleteness as reason for not adopting telephone.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 28 | 30.4 |
| No | 74 | 69.6 |
| Total | 92 | 100.0 |
| Total | 93 | |

*Whether the school has adopted DSTV*

Only 7.5% of the respondents indicated that their schools had adopted this technology against 92.5% that had not. The challenge cited by most respondents for their schools not adopting this technology was because of its cost. Many respondents were not aware of educational programs like 'Learn' on DSTV and thought it was only for entertainment.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 07 | 7.5 |
| No | 84 | 92.5 |
| Total | 91 | 100.0 |
| Total | 93 | |

*Whether the school has adopted mobile phone*

This technology registered the highest percentage for Yes, standing at 98.9% while only 1.1% responded No. It was evident that this technology was the most popular in Public secondary schools in Kisumu County. Mobile technology use was widely used for both internal and external communication, money transfers and accessing internet services.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 91 | 98.9 |
| | No | 1 | 1.1 |
| | Total | 92 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted desktop computer*

61.8% of the respondents indicated Yes while 38.2% indicated that their schools had not adopted desktop computers. It also emerged that most desktops the schools had were donations by government or other donors, and some were obsolete or in poor working condition.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 56 | 61.8 |
| | No | 35 | 38.2 |
| | Total | 91 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted laptop computer*

Only 15.6% indicated their schools had acquired laptop computer. 84.4 % indicated No. It also emerged that the laptops were donations by the government, and where the schools had purchased one, it was controlled by the administration.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 14 | 15.6 |
| | No | 76 | 84.4 |
| | Total | 90 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted internet*

26.4% responded Yes while 73.6% responded No. Most of the respondents who said yes indicated that they were mainly relying on Modems and personal mobile phones for internet connection. They indicated the main challenge for schools to adopt internet technology was the cost of maintenance.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 24 | 26.4 |
| | No | 67 | 73.6 |
| | Total | 91 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted email*

Respondents who said yes formed 60.4% of the sample while 39.6% said No. What emerged however was that most email accounts were not active, and there was no one directly responsible for them.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 55 | 60.4 |
| | No | 36 | 39.6 |
| | Total | 91 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted website*

Only 7 respondents representing 7.8% indicated yes to this question, with 92.2% indicating No. Majority of the schools that indicated they had a website were from Kisumu east and North which form part of Kisumu Town. The respondents thought it was costly to have a school website.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 7 | 7.8 |
| | No | 83 | 92.2 |
| | Total | 90 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted Networking technology*

Most respondents had difficulties to respond to this question except those who had skills in ICTs. The researcher had to explain before they could respond. 18.9% indicated Yes while 81.1% indicated No. Most schools that had networking technology were beneficiaries of government sponsored computer projects.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 9 | 18.9 |
| | No | 83 | 81.1 |
| | Total | 92 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted intercom*

This was the most unadopted technology with only 1 representing 1.1% responding Yes while 98.9% responded No. It emerged that most respondents had no idea what it was all about. They thought it was not necessary with availability of mobile phones.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 1 | 1.1 |
| | No | 91 | 98.9 |
| | Total | 92 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted printer*

72.8% of the respondents indicated that their schools had adopted printers while 27.2% were still relying on duplicating machines and commercial printing, especially schools that lacked electricity.

| | | Frequency | Valid percent |
|---|---|---|---|
| | Yes | 67 | 72.8 |
| | No | 25 | 27.2 |
| | | 92 | 100.0 |
| Total | | 93 | |

*Whether the school has adopted flashdisk*

Only 7 respondents representing 7.7 % indicted that their schools had not adopted flasdisk while 92.3% indicated they had adopted it. It also emerged that individual members of staff owned flash disks and the ones owned by the school was for storage of examination records and administrative documents. School administrators were generally reluctant to buy flash disks for individual staff members.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 84 | 92.3 |
| No | 7 | 7.7 |
| Total | 91 | 100.0 |
| Total | 93 | |

*Whether the school has adopted modem*

Only 12 respondents representing 13.6% indicted that their schools had adopted modem while 86.4% indicated No. it also emerged that individual members of staff owned modems. The challenge identified was that servicing the modems owned by the school was expensive because its use could not be restricted for school use only.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 12 | 13.6 |
| No | 79 | 86.4 |
| Total | 91 | 100.0 |
| Total | 93 | |

*Whether the school has adopted CD/DVD*

A good percentage of the respondents (76.6%) indicated that their schools had adopted CD and DVD. Only 24.3% indicated they had not. It however emerged that most CDs and DVDs were for entertainment purpose. Very few respondents indicated that the CDs and DVDs were for instructional purpose.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 69 | 76.7 |
| No | 21 | 24.3 |
| Total | 90 | 100.0 |
| Total | 79 | |

*Whether the school has adopted MIS applications*

Most respondents faced difficulties responding to this question. The researcher had to explain what it meant before they could respond. It emerged that only 14.9% of the respondents indicated that their schools had adopted MIS applications especially for analysis of their examination results.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 13 | 14.9 |
| No | 74 | 85.1 |
| Total | 87 | 100.0 |
| Total | 93 | |

*Whether the school has adopted fax technology.*

Only one respondent representing 1.1% indicated that their school owned a fax machine.machine.98.9% (88 respondents) indicated their schools di not have a fax machine.

| | Frequency | Valid percent |
|---|---|---|
| Yes | 01 | 1.1 |
| No | 88 | 98.9 |
| Total | 89 | 100.0 |
| Total | 93 | |

*Whether the school has adopted LCD projector*

Most respondents were not aware what LCD was of and sought clarification from the researcher. 93% of the respondents indicated that their schools had not adopted LCD technology while the 7% that yes to this question indicated that it was part of the computer package donated by the government

| | Frequency | Valid percent |
|---|---|---|
| Yes | 06 | 7.0 |
| No | 80 | 93.0 |
| Total | 86 | 100.0 |
| Total | 93 | |

## 4.4 Factors influencing ICT adoption in public secondary schools

In the next part of the questionnaire, the respondents were to indicate the extent to which 29 items identified from review of literature on ICT adoption in school influenced ICT adoption in their school. The respondents responded to these items using the following anchored scale: 1= Very Great Extent, 2= Great extent, 3= Moderate extent, 4=Small extent, 5= Very Small extent. The respondents were asked to circle the relevant number. The means and standard deviations for the items were calculated using SPSS and found to be as represented in the table below;

| Item | N | MEAN | SD |
|---|---|---|---|
| Lack of ICT implementation plan | 91 | 2.23 | 1.432 |
| Non involvement of stakeholders | 93 | 2.61 | 1.572 |
| Unrealistic ICT plan influencing | 89 | 3.7 | 1.402 |
| Poor attitude on ICT influencing | 93 | 3.74 | 1.418 |
| Lack of ICT skills influencing | 93 | 2.78 | 1.457 |
| Lack of technical support influencing | 93 | 2.5 | 1.428 |
| Phobia of technology influencing | 93 | 3.76 | 1.404 |
| Age | 93 | 3.92 | 1.23 |
| Gender | 93 | 4.12 | 1.006 |
| Training level | 93 | 3.09 | 1.489 |
| Financial status | 93 | 2.53 | 1.604 |
| Lack of finance | 90 | 2.18 | 1.517 |
| Access to ICT | 91 | 2.84 | 1.605 |
| Availability of electricity | 87 | 3.63 | 1.624 |
| Lack of preparation time | 91 | 3.09 | 1.52 |
| Rigid time table | 87 | 2.79 | 1.508 |
| Lack of time | 90 | 2.79 | 1.559 |
| Lack of technician | 93 | 2.38 | 1.583 |
| Fear of fault during lesson | 93 | 3.54 | 1.331 |
| Poor state of ICT | 89 | 3.72 | 2.744 |

| | | | |
|---|---|---|---|
| Low confidence in ICT | 91 | 3.19 | 1.591 |
| Principal's support | 92 | 3.01 | 1.573 |
| Principal's involvement | 93 | 2.78 | 1.558 |
| PTA/BOG support | 93 | 2.51 | 1.535 |
| ICT training support programs | 91 | 2.46 | 1.543 |
| ICT perception | 92 | 3.25 | 1.54 |
| School culture | 93 | 3.33 | 1.55 |
| Community culture | 92 | 3.72 | 1.568 |
| Religious factors | 93 | 4.35 | 1.188 |

N=93. Scale interpretation ranges for the mean: 1 = Very Great Extent (1.00-1.49), 2= Great extent (1.50-2.49), 3= Moderate extent (2.50-3.49), 4=Small extent (3.50-4.49), 5= Very Small extent ((4.50-5.00). From the values in the table, none of the items influenced ICT adoption to a very great extent according to the respondents. Lack of ICT implementation plan (mean=2.23, SD=1.432), lack of finances (mean=2.18, SD=1.517), lack of technician (mean=2.38, SD=1.583) and ICT training programs (mean=2.46, SD=1.543) were identified by the respondents as factors influencing ICT adoption in public secondary schools in Kisumu county to a great extent.

Factors which emerged as influencing ICT adoption among public secondary schools to a moderate extent according to the descriptive statistics presented in the table above include non involvement of stakeholders in ICT adoption plan, lack of ICT skills, lack of technical support, level of training, financial status, accessibility to ICT, lack of enough preparation time, rigid timetables, inadequate time allocation, low confidence with ICT, principal's support, principal's involvement, PTA/BOG support, ICT perception of the school and the school culture.

The following factors had a mean ranging between 3.50-4.49 hence they influenced ICT adoption in public secondary schools in Kisumu County to a small extent; unrealistic ICT plan, poor attitude toward ICT, phobia for technology, age, gender, availability of electricity,

fear of fault during lesson, poor state of ICT and community culture. Only religious factor gave descriptive statistics value (mean=4.35, SD=1.188) that indicated that it influenced ICT adoption to a very small extent.

There was an open ended question which required the respondents to identify ICT adoption challenges their schools were experiencing and suggest a way to overcome them. Most of the challenges identified were as indicated on the table above. Those that appeared unique included frequent power outages, few facilities compared to student population, lack of appropriate ICT rooms, lack of ICT/Computer teachers, understaffing hence high workload, obsolete technology, poor ICT infrastructure and network, inability to control and restrict undesirable sites, high cost of internet charges, lack of technical skill and lack of clear policy and supervision of ICT integration in school. The ways they suggested to overcome these challenges will form part of my conclusion and recommendation as a way forward for successful adoption of ICTs in public secondary schools in Kenya.

## 4.5 Benefits of ICT adoption in public secondary schools

The last part of the questionnaire sought information on benefits derived as a result of adopting ICT in public secondary schools. The respondents were to respond to 16 items using anchored scale: 1= Very Great Extent, 2= Great extent, 3= Moderate extent, 4=Small extent, 5= Very Small extent. N=93. Scale interpretation ranges for the mean: 1 = Very Great Extent (1.00-1.49), 2= Great extent (1.50-2.49), 3= Moderate extent (2.50-3.49), 4=Small extent (3.50-4.49), 5= Very Small extent ((4.50-5.00).

The means and standard deviations for the items are as summarized in the table below. From the descriptive statistics values, none of the items on the table was done using ICTs adopted

by the schools to a very great extent. Entry of data, data processing, analysis, printing and retrieval of information was done to a great extent using ICTs adopted in the respondent's schools.

| Item | N | MEAN | SD |
|---|---|---|---|
| Extent of use of ICT in collecting data | 93 | 3.41 | 1.507 |
| Extent of use of ICT in storing data | 92 | 2.49 | 1.419 |
| Extent of use of ICT in processing data | 93 | 2.41 | 1.387 |
| Extent of use of ICT in analyzing data | 93 | 2.49 | 1.483 |
| Extent of use of ICT in managing data | 91 | 2.83 | 1.603 |
| Extent of use of ICT in internal communications | 92 | 3.53 | 1.398 |
| Extent of use of ICT in external communications | 93 | 3.26 | 1.248 |
| Extent of use of ICT in data transmission | 90 | 3.83 | 1.226 |
| Extent of use of ICT in collaboration | 89 | 3.97 | 1.177 |
| Extent of use of ICT In printing | 92 | 2.45 | 1.561 |
| Extent of use of ICT in information presentation | 93 | 3.24 | 1.345 |
| Extent of use of ICT in information retrieval | 93 | 2.7 | 1.442 |
| Extent of use of ICT in information security | 93 | 2.89 | 1.502 |
| Extent of use of ICT in research | 93 | 4.09 | 1.243 |
| Extent of use of ICT in teaching | 92 | 4.09 | 1.18 |
| Extent of use of ICT in entertainment | 90 | 3.07 | 1.378 |

Collection of data, management of data, external communication, presentation of information and securing information/information privacy and entertainment done using ICTs adopted in respondent's schools to a moderate extent. Internal communication, data transmission, collaboration/information sharing and entertainment were done using ICT adopted in the schools only to a small extent. None of the items was done to a very small extent.

# CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

## 5.1 Summary of Key findings

The objective of the study was to determine the types of ICTs adopted, the factors influencing ICT adoption and benefits of ICTs adopted by public secondary schools in Kisumu County, Kenya. There were 21 ICT items that find wide application in the secondary school to facilitate their day to day activities. The study found out that radio, television, video mobile phone, desktop computer, email printers, flash disk, CD and DVD were the ICT items adopted by most schools in Kisumu County, Kenya, with over 50% of the respondents indicating they have been adopted in their school. Among the least adopted Information and Communication Technologies included DSTV, Website, Intercom, Scanner, fax Machine and the LCD projector.

The schools that have adopted ICT have derived benefits including collection of data, data storage, data processing, analysis of data, management of data external communication, printing, presentation of information, retrieval of information, enhanced data and information security and entertainment at moderate and great extents. It is evident that low adoption of ICT items such as internet, website, modem and fax by the schools, data transmission, collaboration/information sharing and research has only been realized to a small extent.

The findings also indicate that the status of ICT adoption in the public secondary schools in Kisumu County and nationally is still very low and urgent intervention is required to expedite it. It also emerged that lack of ICT implementation plan, lack of finances, lack of technicians and ICT training programs were the main factors hindering ICT adoption in public secondary schools in Kisumu County. It was noted from the study that teacher factors such as attitude,

phobia for technology, age and gender affected ICT adoption to a small extent. This is a good indicator since the teachers have been in the past a very major barriers to technology adoption in school.

The study also found out that availability of electricity affected ICT adoption to a small extent. This indicates that many secondary schools have electricity and thus ICT adoption will be facilitated since most ICTs require electricity to function effectively. Teachers also seem to have overcome fear of encountering faults while adopting ICTs for instruction since it affects ICT adoption to a small extent. Many cultures have also embraced technology and are no longer affecting ICT adoption to a considerable extent as they use to be.

In general, this study indicates that the factors that used to affect ICT adoption to great and very great extents such as the teacher factors, accessibility to ICT, availability of electricity, poor state if ICT and organizational culture have been improved and there remains only a few areas that need to be focused on for ICT adoption in public secondary schools to be effective.

## 5.2 Conclusion

According to the National ICT Policy promulgated by the Ministry of Information and Communication in January 2006, the government committed to 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. It has emerged from this research that ICTs have been adopted to some extent and schools that have adopted technology are deriving considerable benefits from them. The efforts the government is making towards making schools adopt technology have started to bear fruits, but more need to be done to address challenges that have remained thorny, including: lack of finances, lack of ICT implementation plan and lack of technical personnel. The government should also ensure the

electricity which is the basic infrastructure for ICT adoption is made available to all public schools. It also emerged that the ICTs adopted in public secondary schools were not used for teaching and learning to a great extent. This calls for guidelines to be developed on how ICTs can be adopted and used for teaching and learning purposes. Teachers should also make use of mobile phone technology to realize ICT benefits derived by using internet technology especially for research, sharing of information and collaboration at cheaper costs compared to computer.

## 5.3 Recommendations

Based on the findings of this research project, public schools still have a long way to realize the objective of implementing ICT policy. The government needs to review this policy and develop a more effective one by identifying and sealing the loopholes that may be barring the realization of effective ICT adoption in the public secondary schools. The school management and administration should also come out strongly to support government initiatives of trying to implement ICT in public schools. They should make provisions in their budgets to purchase ICT equipment for use in school. The principals should show interest in adopting ICT and should also support teacher initiatives in adopting ICTs in school so as to motivate and encourage them. Support can be through purchasing software materials for teaching, providing airtime for modems so that teachers can do research in internet, sponsoring teachers for in-service trainings and employing technicians to help the teachers when they face difficulties with technology.

There is need to train more ICT skilled personnel to alleviate shortages of skilled staff who are very necessary to facilitate ICT adoption in public secondary schools. The government should also employ more teachers so that teacher have fewer teaching loads that would

enable them have adequate time to plan for ICTs adoption in their teaching. Timetables should be made flexible to cater for ICTs adoption in teaching and learning. This is because ICT adoption require more preparation time to ensure technical problems are not encountered during lessons. The teachers should also embrace technology in their teaching to develop positive attitude towards technology among students. They need to understand their role in ICT adoption in secondary schools and they should therefore take the initiative to acquire the necessary skills required for ICt adoption.

The government should ensure that all public secondary schools have electricity or generators all ICTs require electricity. This can be achieved through funds such as constituency development fund (CDF), where members of CDF committees should make ICTs adoption in schools a priority in their constituency development agenda. Appropriate buildings for ICTs should be constructed ensuring adequate provision for security of the equipment. With increased number of students enrolled in secondary schools as a result of free primary education, it is inevitable that the government plans adequately for provision of more ICT resources. The government can solicit for donor support on behalf of schools so that the public secondary schools cater for as many students as possible in the provision of ICT skills. Communication infrastructure should be enhanced so as to improve on network problems especially where telephone lines are not available.

The government to develop a clear and effective policy on ICT adoption in public secondary schools. It is also necessary that the government and the school management involves all the stakeholders in planning and implementing ICT adoption in schools. This would ensure all the stake holders are involved in decision making and therefore would be willing to support ICT implementation programs initiated by the schools. For example if parents are involved in

planning for ICTs implementation, they would support such programs financially if only they understood how their children would benefit. There is need to identify the challenges particular institutions face in adopting technologies and to help them overcome them. Public secondary schools over depended on the government and donors even for very basic ICTs like computer. They must plan to acquire ICTs in appreciation of the fact that it is inevitable to integrate technology in the daily operations of the school.

## 5.4 Suggestions for further research

The study recommends that further research be undertaken on the role parents in influencing ICT adoption in public secondary schools. This is because very few studies have focused on them and yet they are the major source of funds for the public school, and lack of funds remains a major factor influencing ICT adoption especially in public schools, unlike the private schools. There is also a growing potential in using mobile phone for educational purpose, for example mobile internet for educational research, collaboration and sharing of information. More research needs to be done in this area to harness this potential.

## 5.5 Limitation of the study

The study relied on 53% of the population which might have lowered the accuracy of the findings. Some data obtained through telephone interview could have varied from what the respondent would have given if he had the questionnaire. The research focused on many ICTs and could be limited on benefits derived from particular ICTs like mobile phone.

## References


Adeya, N. C. (2002) *"ICTs and Poverty: A Literature Review"* [Internet] UNESCO. Available from: < http://www.idrc.ca/en/ev-24718-201-1-DO_TOPIC.html >

Anderson, R. E. & Dexter, S. L. (2000). *School technology leadership: Incidence and Impact*. Centre for Research on Information Technology and Organizations. Irvine URL:http://www.crito.uci.edu/tlc/findings/report_6/report_6.pdf

Archer, J. (1998). *The link to higher scores*. Education Week, October 1, 10-21.

Batchelor S, Nocrish P (2005). *Framework for Assessment of ICT PilotProjects: Beyond Monitoring and t Applied Research*. Washington:InforDev.

Bangkok, U. (2004). *Inegrating ICTs into Education*. Retrieved from ICT in Education: http://www.unescobkk.org/index.php?id=1793

Barak, M. ( 2004). Instructional principles for fostering learning with ICT: teachers' perspectives as learners and instructors. *Education Information Technology*, 11:121-135, DOI 10.1007/s11134-006-7362-9.

Bauer, J., & Kenton, J. (2005). Technology integration in the schools: Why it isn't happening. *Journal of Technology & Teacher Education*, 13, 519-526.

Baylor, A. L., & Ritchie, D. (2002). *What factors facilitate teacher skill, teacher morale, and perceived student learning in technology using classrooms*? Computers & Education 39, 395–414.

Becta (2003). *What the Research says about using ICT in Maths*. British Educational Communications and Technology Agency. Available from http://www.becta.org.uk/page_documents/research/wtrs_maths.pdf

Bosch, A.,"*Interactive Radio Instruction for Mathematics: Applications and Adaptations from Around the World*"; available from http://www.techknowlogia.org/TKL_active_pages2/CurrentArticles/main.asp?FileType=HTML&ArticleID=255.

Berman, P. & McLaughlin, M. (1977). *Federal Programs Supporting Educational Change*. Rand Corporation, Santa Monica, CA.

Bennett, F. (1999*). Computers as Tutors: Solving the crisis in education*. Sarasota, FL: Faben.

Bradley, g., Russell, g. 1997. *Computer experience, school support and computer anxieties.Educational Psychology*. 17 (3), pp.267-284. Available from http://www.educat.huberlin. de/mv/forschung/zero.htm

Bruno, G., et al (2003). *The ICT service industry in North America and the role of partnership in Morocco*, JGITM, 7(3), 5-26.

Clarkson, P. Dunbar, A. and Toomey, R. (1999). *Whole School Reform and the Use of ICT: An Evaluation of the Navigator Schools Project.* Melbourne: Department of Education, Employment and Training.

Cradler, J. (1997). *Summary of Current Research and Evaluation Findings on Technology in Education.* CA: Far West Laboratory.

Dahl, K. L. & Farman, N. (1996). Technology and writing. In K. L. Dahl * N. Farman (Eds.), *Children's writing: Perspectives from research. Chicago, IL*: National reading Conference.

Danowitz, A.K., Nassef, Y. and Goodman, S.E. (1995). *Cyberspace across the Sahara: computing in North Africa.* Communications of the ACM, 38 (12).

Davis, F. (1996). A Critical assessment of potential measurement biases in the Technology Acceptance Model; three experiments, *International Journal of Human Computer studies*, 45(1), pp14-45.

Department of Training and Youth Affairs (2001, May).Information and Communication Technology for Teaching and Learning. *Schooling issues digest*. Available at http://www.detya.gov.au/schools/publications/index.htm

Davis, G.B. & M.H. Olson. (1985) *Management Information Systems: Conceptual Foundations,Structure, and Development*. New York: McGraw-Hill.

Dornisch, M. M. & Land, S. M. (2000). A conceptual framework for the construction of multiple perspectives in collaborative environments. In K. E. Sparks and M. Simonson (Eds.). *22nd Annual Proceedings of selected research and development papers presented at the National Convention of the Association for Educational Communications and Technology.*

Doharly GD (Ed) (1993). *Developing quality systems in Education.London: Routledge.European Commission (2005)* "Implementing the Education and Training 2010 Work Programme". [Internet] European Commission. Available from:< europa.eu.int/comm/education/news/what/index_en.html >

Farrell, Glen and Shafika Isaacs. 2007. *Survey of ICT and Education in Africa: A Summary Report, Based on 53 Country Surveys.* Washington, DC: *info*Dev / World Bank.Available at http://www.infodev.org/en/Publication.353.html

Fishbein, M., & Ajzein, I (1975). *Belief, Attitude, Intention, and Behaviour:an Introduction to Theory and Research.* Reading mass; London, Sydney:Addison Wesley.

Fowler, F. J.(2002). *Survey Research Methods (3rd ed. Vol1).* Thousand Oaks, Calif: Sage Publications.

Fullan, M. (1998) *Leadership for the 21st century, Breaking the Bonds of Dependency* Columbia University, New York.

Fullan, M. (2001). *The New Meaning of Educational Change*, 3rd edition. Teachers College, Columbia University, New York.

Fullan, M. (2002). *Principals as Leaders in a Culture of Change, Educational Leadership*URL: http://www.michaelfullan.ca/Articles_02/03_02.htm

Garr, N. G. (2003). *IT Doesn't Matter*, Havard Business Review pp1-29.

Gentry, C., & Csete, J. (1995). *Educational Technology in the 1990s. In G. Anglin (Ed.), Instructional Technology: Past, Present and Future*. Englewood, Colorado: Libraries Unlimited, 20-33.

Gogo J.O (2002). "*The impact of cost sharing on access, equity and quality of secondary education in Rachuonyo District Kenya.*" Unpublished M.Ed. Thesis. Maseno University.

Green, K.C. 2002. *Campus Computing 2002: The 13th National Survey of Computing and Information Technology in American Higher Education.* Encino: Campus Computing.

Granger, C. A., & Morbey M. L. (2002). Factors Contributing to Teachers' Successful Implementation of IT. *Journal of Computer Assisted Learning*, 18, 480-488.

Gutierrez, L.H. & Berg, S. (2000). *Telecommunications liberation and regulatory governance: Lessons from Latin America.* Telecommunications Policy. 24, 865-884

Haddad,W. & Drexler, A. (eds.) *Technologies for Education: Potentials, Parameters, and Prospects.* Washington DC: Academy for Educational Development and Paris: (UNESCO).

Hadley, M. & Sheingold, K. (1993). Commonalities and Distinctive Patterns in Teachers' Integration of Computers. *American Journal of Education*, 101, pp. 261-315.

Hargreaves, A. (1997). *Racing with the clock: making time for teaching and learning in school reform.* New York: Teachers College Press.

Healy, J. (1998). *Failure to connect*. New York: Simon & Schoster.

Hepp, K. P., Hinostroza, S.E., Laval, M.E., Rehbein, L. F. (2004) "*Technology in*

*Schools: Education, ICT and the Knowledge Society*" [Internet] OECD. Available from: < www1.worldbank.org/education/pdf/ICT_report_oct04a.pdf

Hodas, S. (1993). Technology refusal and the organizational culture of schools. *Education Policy Analysis Archives1* (10), retrieved from http://epaa.asu.edu/epaa/v1n10.html.

IICD, (2007). *ICTs for Education: Impacts and lessons learned from IICD supported activities.* The Hague, Netherlands.

Jhurreev, V. (2005) "Technology Integration in Education in Developing Countries: Guidelines to Policy Makers". *International Education Journal* [Electronic], 6(4): 467-483 .Available from: <http://ehlt.flinders.edu.au/education/iej/articles/v6n4/jhurree/paper.pdf >

Jiménez, J. M. (2000). *Towards a school in the information society.* Proceedings of the EDEN fourth Open Classroom Conference, Barcelona, Spain. November ,19-21.

Kearsley, G., Lynch, B. (1992). Educational Leadership in the Age of Technology: the new Skills, Journal *of Research on Computing in Education*.25 (1),50–61.

Kozma, R., Anderson, R.E. (2002) "Qualitative Case Studies of Innovative Pedagogical Practices Using ICT". *Journal of Computer Assisted Learning* 18: 387-394.

Lawton, J., & Gerschner, V. T. (1982). A review of the Literature on Attitudes Towards Computers and Computerized Instruction. *Journal of Research and Development in Education*, 16(1), 50-55.

Levine, J. (1998). *"Planning Strategically for Technology Integration"* [Conference proceedings]. Association for the Advancement of Computing in Education. Available from <http://www.coe.uh.edu/insite/elec_pub/HTML1998/el_levi.htm>

Look, D. 2005. *Discussion Paper: Impact of Technology on Education*, PUSD Excellence Committee, December 2005. Available from http://pleasanton.k12.ca.us/Superintendent/Downloads/Technology.pdf

Marsh, D. D. (2001). *Educational leadership for the twenty-first century: Integrating three essential perspectives.*

Maslowski, R. (2001). *School Culture and School Performance: An Explorative Study into the Organizational Culture of Secondary Schools and their Effects.* Twente: Twente University Press.

McLeod R & Schell G (2004). *Management Information Systems (9th ed.).* Upper Saddler River, N.J: Prentice Hall.

Ministry of Information and Communications, (2006). *National ICT Policy*. Nairobi: Government Printers.

MOEST (2005). *Kenya Education Sector Support Programme 2005 – 2010; Delivering Quality Education and Training to all Kenyans*. Nairobi: Government Printers.

Moore. M. (2001). *Distance Education in the United States: the State of the Art.* Available: http://www.uoc.edu/web/eng/art/uoc/moore/moore.html

Muinde, F.N. (2010). *Investigation of Factors Affecting the Adoption of Information and Communication Technologies for Communication of Research Output in Research Institutions in Kenya.* Available http://hdl.handle.net/10063/1417

Nyamu Z.Ii (1986). "*A study of supervisory strategies employed by primary school headteachers in supervising Teacher Curricular instruction in Northern Division of Nairobi.*" Unpublished M.ED. Thesis, Nairobi University.

Nyirongo, K.N. (2009). *Technology Adoption and Integration: A Descriptive Study of a Higher Education Institution in a Developing Nation.* Unpublished Phd Thesis.

Olson, M. H (1982). New Information Technology and Organisational Culture, *MIS Quarterly,* 6(5) pp77-96.

Oppenheimer, T. (1997). The computer delusion. *Atlantic Monthly*, 280, 45-65.

Otto, T. L. & Albion, P. R. *Principals' confidence toward teaching with ICT: a critical element in leading appropriate change*. Australian Computers in Education Conference 2002.

Papert, S. (1987). Computer Criticism vs. Technocentric Thinking. Educational Researcher,16(1), 22-30.

Peacock, M. & Beard, R. (1997). *Almost an invincible repugnance? Word processors and pupil writers.* Educational Review, 49, 283-294.

Pedersen, P.E. (2003). *Adoption of mobile Internet services: An exploratory study of mobile commerce early adopters.* Retrieved from http://ikt.hia.no/perep/earlyadopt_paper.pdf

Pelgrum, W. J. & Anderson, R. E. (Eds.). (1999). *ICT and the emerging paradigm from lifelong learning: A worldwide Educational assessment of Infrastructure, goals and practices. Enschede,* The Netherlands: Printpartners Ipskamp.

Pelgrum, W.J. (2001). *Obstacles to the Integration of ICT in Education: Results from a Worldwide Educational Assessment*. Computers & Education 37, 163-178.

Pelgrum, W. J., Law, N. (2003). *ICT in Education around the World: Trends, Problems and Prospects*. UNESCO- International Institute for Educational Planning.[Internet]

retrieved
:<http://www.worldcatlibraries.org/wcpa/ow/02d077080fcf3210a19afeb4da09e526.html >

Preston, C., Cox, M., and Cox, K. 2000. *Teachers as Innovators in learning: what motivates teachers to use ICT.* http://www.mirandanet.ac.uk/pubs/tes_art.htm

Rama, RaoV."Audio (2002). *Teleconferencing—A Technological Prescription for Interactive Learning*"; available from http://www.clrec.org/rama

Richmond, Ron (2002). *Integration of Technology in the Classroom: An Instructional Perspective.* SSTA Research Centre Report #97-02; available from http://www.ssta.sk.ca/ research/technology/97-02.htm#BIBLIOGRAPHY.

Rogers, E.M. (1993). *Diffusion of innovations (5th edition).* The Free Press. New York.

Rogers, E.M. (1995). *Diffusion of innovations (5th edition).* The Free Press. New York.

Rogers, E.M. (2003). *Diffusion of innovations (5th edition).* The Free Press. New York.

Rosen, L. D. & Weil, M. M. (1995). *Computer Availability, Computer Experience, and Technophobia among Public School Teachers.* Computers in Human Behavior, 11, pp. 9-31.

Roschelle, J., & Pea, R.D. (1999). *Trajectories from today's WWW to a powerful infrastructure*. Educational Researcher, 28 (5), 22-25.

Salomon, G. (2002). Technology and pedagogy: why don't we see the promised revolution? *Educational technology,42* (1), 71-75.

Scardamalia, M., Bereiter, C., Brett, C., Burtis, P. J., Calhoun, C., & Smith Lea, N. (1992). *Educational applications of networked communal database*. Interactive learning environments, 2, 45-71.

Schiller J. (2003). *The Elementary School Principal as a Change Facilitator in ICT Integration.*
URL:http://technologysource.org/article/elementary_school_principal_as_a_change_facilitator_in_ict_integration/

Shibanda, G.G. and Musisi-Edebe, I. (2000). *Managing and developing the strategy for Africa's information in global computerization.* Library management, 2195), 228-234.

Soby, M. (2000). *Innovations and changes in the Norwegian school education systems.* Proceedings of the EDEN fourth Open Classroom Conference, Barcelona, Spain, November 19-21.

Society for Information Technology and Teacher Education. (2002). *SITE position paper: statement of basic principles and suggested actions* ('Ames White Paper') [Electronic Version] from http://site.aace.org/position-paper.html

Soloway, E. & Pryor, A. (1996). *The next generation in human-computer interaction.* Communications of the ACM, 39(4), 16-18.

Starr, L. (2001). *Same time this year.* [on-line]. Available at http://www.education-world.com/a_tech/tech075.shtml

Steed, Hollingsworth & Marzek (2005). URL:http://www.uleth.ca/edu/departments/members/steed/Articles/Scaling_Digital_Divide.pdf

Stephenson, J., Ed. (2001). *Learner-managed learning- an emerging pedagogy for online learning.* Teaching and Learning Online: Pedagogies for New Technologies. London, Kogan Page.

Tearle, P. A. (2004). Theoretical and Instrumental Framework for Implementing Change in ICT in Education. Cambridge, *Journal of Education* Vol. 34, No. 3

Tearle, P. (2003). ICT Implementation: What Makes the Difference? British *Journal of Educational Technology,* 34 (5), 403-417.

TeleLearning Network Inc. (1998). *The Emerging Contribution of Online Resources and Tools to Classroom Teaching and Learning.* http://www.tact.fse.ulaval.ca/ang/html/rev98es.html

Tinio,V. (2002),"Survey of ICT Utilization in Philippine Public High Schools: Preliminary Findings". Malaysia. UNESCO. 1994. *Informatics for Secondary Education: A Curriculum for Schools,* Paris.

UNESCO (2003). *Developing and Using Indicators of ICT Use in Education.* UNESCO- International Institute for Educational Planning. [Internet] Available from:<http://portal.unesco.org/ci/en/ev.php URL_ID=12438&URL_DO=DO_TOPIC&URL_SECTION=201.html>

Wagner, D., Kozma, R. (2003) *"New Technologies for Literacy and Adult Education: A Global Perspective"* The Education for All Initiative, World Summit on the Information Society, and Leave No Child Behind. UNESCO- International Institutefor Educational Planning. [Internet] Available from: <http://www.literacyonline.org/products/wagner_kozma.pdf>

Watson, G. (2002) Models of Information Technology teacher professional development that engage teachers' hearts and minds. *Journal of Information*

*Technology for Teacher Education*, 10 (1-2), 179-191.

Winnans, C. & Brown, D. S. (1992). *Some Factors Affecting Elementary Teachers' Use of the Computer*, Computers in Education, 18, pp. 301-309.

World Bank Data base (2002). *Strategy Paper on ICT.* http://www.devdata.worldbank.org.

Yelland, N. (1999). *Reconceptualising Schooling with Technology for the 21st Century: Images and Reflections in D.D. Shade (ed) Information Technology in Childhood Education Annual*, pp 39–59. Virginia: AACE. http://www.triangle.co.uk/ciec

**Appendix 1: ICT Initiatives and Projects in the educational sector in Kenya**

| |
|---|
| **Project:** The Learning Resource Centre: Offers training in educational management and integration of ICT for school managers, lecturers, and students.<br>• *Organisation(s):* Kenya Technical Teachers College in Nairobi<br>• *Funding source:* Flemish Association for Development and Technical Assistance and UNESCO(during the first year)<br>• *Contact:* www.vvobkenya.org/sites/LRCVVOB/index.htm |
| **Project:** Provision of computers and training: A primary example of the several NGOs with similar goals that collaborate under the NICE umbrella.<br>• *Organisation(s):* Computers in Schools<br>• *Funding source:* Multiple partners and sources.<br>• *Contact:* www.cfsk.org/home.htm |
| **Project:** ICT equipment for schools: Computers purchased for 142 schools in support of the ICT in Education Strategy.<br>• *Organisation(s):* Kenya ICT Trust Fund<br>• *Funding source:* Ministry of Education<br>• *Contact:* www.education.go.ke/ICTFund.htm |
| **Project:** Development of Learning Content: digitisation of curriculum content for delivery in schools.<br>• *Organisation(s):* Kenya Institute of Education<br>• *Funding source:* Ministry of Education<br>• *Contact:* www.kie.go.ke/ |
| **Project:** Support Centres: Central and regional centres provide immediate solutions on ICT issues to schools via telephone or online inquiries.<br>• *Organisation(s):* Ministry of Education<br>• *Funding source:* Microsoft and the ICT Trust Fund<br>• *Contact:* www.education.go.ke/Speeches/MN_ICT_Strategy_2August2006.html |
| **Project:** NEPAD e-Schools Initiative: Multi-partner demo project that equipped six secondary schools with state-of-the-art ICTs and provided teacher training and learning content.<br>• *Organisation(s):* e-Africa Commission, Ministry of Education, and two consortia led by Oracle and Microsoft<br>• *Funding source:* Oracle, Microsoft, and the Ministry of Education<br>• *Contact:* www.eafricacommission.org/docs/NEPAD%20e-SCHOOLS%20DEMO%20OVERVIEW.pdf |
| **Project:** KENET Initiative: An initiative that will establish permanent high-speed Internet infrastructure in 22 institutions in the next 12 months; establish or improve node infrastructure within each strategic institution; connect 30 tertiary institutions to the backbone within two years; and expand to 600 secondary and primary schools within two years.<br>• *Organisation(s):* KENET<br>• *Funding source:* Ministry of Education, ICT Trust Fund<br>• *Contact:* www.kenet.or.ke/about/index.php?yah=mission&yeh=objectives |
| **Project:** School Broadcasting: After a successful one-year pilot, there is now a plan to revive Kenya's nationwide school broadcast service, using WorldSpace technology to broadcast educational content to 11 million students in 18.000 primary and 3,000 secondary schools by the end of 2006.<br>• *Organisation(s):* Kenya Institute of Education (KIE) and WorldSpace<br>• *Funding source:* WorldSpace Incorporated<br>• *Contact:* www.itu.int/partners/project.asp?lang=en&id=58 |
| **Project:** Free Software Licenses: Microsoft Corporation is providing free access to its operating software for schools and higher education institutions in order to reduce the cost of buying and using computers.<br>• *Organisation(s):* Microsoft and the Ministry of Education<br>• *Funding Source:* Microsoft<br>• *Contact:* ICT Director, Ministry of Education, Kenya |

**Source: Farrel (2007)**

## Appendix 2

### Public secondary schools in Kisumu County

**Kisumu East District**

1. Bishop Abiero
2. Alendu
3. St Ignatius Loyola Magadi
4. St alloys Mayenya
5. G.P Owiti Chiga
6. Orongo Mixed
7. Lela secondary School
8. The salvation Army Kibos
9. Joyland Special Sec school
10. Odienya Mixed
11. Dago Thim Secondary
12. Kisumu day
13. St Peters Kindu
14. Kisumu boys
15. Miwani Secondary
16. Nyamasaria Sec School
17. St. Peters nanga
18. Kirembe
19. Orongo Mixed
20. AIC Ogada Mixed
21. Kasagam Secondary School
22. St Anthony dago Kokore
23. Arombo Mixed
24. Kisumu Girls
25. St Marks Secondary Obambo
26. Got Nyabondo Mixed
27. Nduru Mixed
28. Withur Secondary
29. Joel Omino Secondary
30. Nyalunya Mixed
31. Muslim Secondary
32. St Theresa Girls
33. Ongeche Mixed day
34. Kobura Girls
35. Lion Secondary School
36. Wachara Mixed
37. Xaverian Secpndary
38. Otieno Oyoo
39. Kanyagwal Sec
40. St Albert Angira Secondary

**Muhoroni District**

1. Nyakoko sec
2. Achego
3. Kibigori Sec
4. Oginga Sec
5. Oduwo Sec
6. Menara Sec
7. God Abuoro Sec
8. Ogen Sec
9. Songhor Sec
10. Mariwa Sec
11. OLPS Sec
12. St Bonface Magare
13. Masara Sec
14. St Augustine Kandege
15. Omeyi Sec
16. Muhoroni Sec
17. Ngere Kagoro Sec
18. Obumba Sec
19. Ayiecho Nyatau Sec
20. Ngeny Sec

**Nyando District**

1. Awasi Sec
2. St Alex Ayuda
3. Katolo Sec
4. Oren Mixed
5. Pala Mixed
6. St Michaels Wanganga
7. Ahero Girls Sec
8. St Christopher Ayweyo
9. Bunde sec
10. Kochogo Mixed
11. St Cumulus Ogwedhi
12. St Peters Konim
13. Okanja Mixed
14. Onjiko Boys

**Kisumu West District**

1. Orando Sec
2. Lwala Kadawa Sec
3. Ohuowa Sec
4. Bishop Okok Miranga
5. Kit Mikaye Sec
6. Bishop Abiero Magwar
7. Ratta Mixed sec
8. Chulaimbo Sec
9. Sianda Mixed
10. Kawino Sec
11. Maseno School
12. St Peters Kajulu
13. Bishop Abiero
14. Alungo Mixed
15. Omoya Mixed
16. St Barnabas Girls
17. Bonde Secondary
18. St Johns Ngutu
19. Ulalo Mixed
20. Mariwa Mixed
21. Ngere Secondary
22. Mayieka Sec
23. Ndiru Sec
24. Nyawanga Mixed
25. Kadero Sunrise Sec
26. Diemo Mixed
27. Alwala Mixed
28. Kadero sunrise Sec
29. Alwala Mixed
30. Rapogi Sec
31. Reru Girls
32. St Gabriels seminary
33. Sinyolo Girls
34. Kuoyo Secondary
35. Ridore Sec School

**Nyakach District**

1. Nyakach Girls
2. Thurdibuoro sec
3. Nyabondo Boys
4. Agai Mixed
5. Olembo Boys
6. Magunga Sec
7. Moro Sec
8. Rakwaro Sec. School
9. Naki Sec
10. Andingo Opanga Sec
11. Nyongong'a Sec
12. St Alloys Sec school
13. Bodi Sec School
14. Guu Mixed Sec
15. Thurgem sec school
16. Sangoro sec
17. Dirubi Sec school
18. Mbugra Sec
19. Abwao Sec school
20. Miriu Sec
21. Kandaria Sec
22. Rae Girls Sec
23. Kerwa Sec School
24. Sango Buru Sec
25. Nyabola Sec School
26. Urudi Sec School
27. Sigoti Girls Sec
28. Holo Sec School
29. St Charles Lwanga Sec
30. Ragen Sec School
31. Siany Sec School
32. Bishop Okumu Sec
33. St Anthony Kajimbo
34. St Hilarious Sec School
35. Ndori R C
36. St Mary's Nyamarimba
37. Bolo Girls
38. St Peters Sec School
39. Bishop N K
40. Kabondo Sec School
41. Olwalo sec
42. Oremo Mixed
43. St patricks Obange
44. Lisana Sec
45. Mbora Mixed
46. St Cornelius Rumula Odowa
47. William Barkawarinda Sec
48. Nyadina Sec School

**Kisumu North**

1. Obambo Sec
2. Ongalo Sec
3. Bishop Okoth-Ojola
4. Tiengre Sec
5. Kisian Sec
6. Kirembe Mixed
7. Obwolo Sec
8. Kanyamedha Sec
9. Kudho Sec
10. Obede Sec
11. Bar-Union sec
12. Dago Kokore
13. Obwolo Sec School
14. Dago Kokore Sec
15. Ogada Sec School
16. Wachara Sec

**Source: Provincial Director of Education's office, Nyanza Province.**

## Appendix 3: Questionnaire

This questionnaire is designed to study Information and Communication Technology adoption among public secondary schools in Kisumu County, Kenya. Your response in this questionnaire will be will be kept confidential and used for the intended purpose only.

(Please use x mark where appropriate)

## PART A: Demographic information

**District**

☐ Kisumu East ☐ Kisumu West ☐ Nyando ☐ Kisumu North

☐ Nyakach ☐ Muhoroni

**Department**

☐ Accounts

☐ Examinations

☐ ICT/Computer

☐ Other (Specify) ----------

Have you ever come across the acronym ICT? Yes ☐ No☐

If yes, what does it stand for?

_____

## PART B: Types of ICT adopted in Public secondary schools.

1. Indicate with (x) whether your school has adopted the following ICT and ICT applications.

| Type of ICT/ICT Applications | Yes | No |
|---|---|---|
| Radio | | |
| Television | | |
| Video | | |
| Telephone | | |
| DSTV | | |
| Mobile phone | | |
| Desk top Computer | | |
| Lap Top computer | | |
| Internet | | |
| E-mail | | |
| Website | | |
| Networking (LAN,WAN) | | |
| Intercom | | |
| Printers | | |
| Flash disk | | |
| Modem | | |
| Scanner | | |
| CD/ DVD | | |
| MIS applications (TPS, AIS, HRMIS, etc) | | |
| Fax Machine | | |
| LCD Projector | | |

## Section C: Factors influencing ICT adoption in public secondary schools.

3. To what extent have the following influenced ICT adoption in your school?
   1. Very Great Extent 2. Great extent 3. Moderate extent 4. Small extent 5. Very Small extent

(Use x mark where appropriate)

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **1. Planning for ICT adoption**<br>i) Lack of ICT implementation plan<br>ii) Non involvement of Stakeholders in ICT adoption plan<br>iii). Unrealistic ICT plan | | | | | |
| **2. Teachers Factors**<br>i). Poor attitude toward ICT<br>ii). Lack of ICT skills<br>iii).Lack of technical support<br>iv).Phobia for technology<br>v). Age<br>vi).Gender<br>vii) Level of training<br>viii) Financial status | | | | | |
| **3. Availability of resources**<br>i). Lack of Finances<br>ii) Accessibility to ICT<br>iii)Availability of electricity | | | | | |
| **4. Time factor**<br>i). Lack of enough preparation time<br>ii). Rigid timetable<br>iii). Inadequate time allocation | | | | | |
| **5. Lack of technical support**<br>i). Lack of technician<br>ii). Fear of fault during lesson<br>iii). Poor state of ICT<br>iv). Lower confidence with ICT | | | | | |
| **6. Managements support**<br>i). Principal's support<br>ii). Principals involvement<br>iii).PTA/BOG support of ICT adoption<br>iv).ICT training support programs | | | | | |
| **7. Organizational culture**<br>i). ICT Perception of school community<br>ii). School culture<br>iii). Community culture<br>iv). Religious factors | | | | | |

## Section C: Factors influencing ICT adoption in public secondary schools.

3. To what extent have the following influenced ICT adoption in your school?
   1. Very Great Extent 2. Great extent 3. Moderate extent 4. Small extent 5. Very Small extent

(Use x mark where appropriate)

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **1. Planning for ICT adoption**<br>i) Lack of ICT implementation plan<br>ii) Non involvement of Stakeholders in ICT adoption plan<br>iii). Unrealistic ICT plan | | | | | |
| **2. Teachers Factors**<br>i). Poor attitude toward ICT<br>ii). Lack of ICT skills<br>iii).Lack of technical support<br>iv).Phobia for technology<br>v). Age<br>vi).Gender<br>vii) Level of training<br>viii) Financial status | | | | | |
| **3. Availability of resources**<br>i). Lack of Finances<br>ii) Accessibility to ICT<br>iii)Availability of electricity | | | | | |
| **4. Time factor**<br>i). Lack of enough preparation time<br>ii). Rigid timetable<br>iii). Inadequate time allocation | | | | | |
| **5. Lack of technical support**<br>i). Lack of technician<br>ii). Fear of fault during lesson<br>iii). Poor state of ICT<br>iv). Lower confidence with ICT | | | | | |
| **6. Managements support**<br>i). Principal's support<br>ii). Principals involvement<br>iii).PTA/BOG support of ICT adoption<br>iv).ICT training support programs | | | | | |
| **7. Organizational culture**<br>i). ICT Perception of school community<br>ii). School culture<br>iii). Community culture<br>iv). Religious factors | | | | | |

4. What are some of the ICT adoption challenges your school is experiencing and how can they be overcome?

| Challenge | suggested way to overcome |
|---|---|
| 1. ---------- | ---------- |
| 2. ---------- | ---------- |
| 3. ---------- | ---------- |
| 4. ---------- | ---------- |
| 5. ---------- | ---------- |

## PART D: Benefits of ICT adoption in secondary schools.

5. To what extent has ICT been used to do the following tasks in your school?

1. Very Great Extent 2. Great extent 3. Moderate extent 4. Small extent 5. Very Small extent

(Please circle the relevant number in the grid based on the response key above)

| | | | | | |
|---|---|---|---|---|---|
| Collect data | 1 | 2 | 3 | 4 | 5 |
| Enter/Store data | 1 | 2 | 3 | 4 | 5 |
| Process data | 1 | 2 | 3 | 4 | 5 |
| Analyze Data | 1 | 2 | 3 | 4 | 5 |
| Management of data(Finances, Examination etc) | 1 | 2 | 3 | 4 | 5 |
| Internal communication | 1 | 2 | 3 | 4 | 5 |
| External communication | 1 | 2 | 3 | 4 | 5 |
| Data transmission | 1 | 2 | 3 | 4 | 5 |
| Collaboration/sharing information | 1 | 2 | 3 | 4 | 5 |
| Printing | 1 | 2 | 3 | 4 | 5 |
| Presentation of information | 1 | 2 | 3 | 4 | 5 |
| Retrieval of information | 1 | 2 | 3 | 4 | 5 |
| Securing information/information privacy | 1 | 2 | 3 | 4 | 5 |
| Research | 1 | 2 | 3 | 4 | 5 |
| Teaching | 1 | 2 | 3 | 4 | 5 |
| Entertainment (Music,videos, games) | 1 | 2 | 3 | 4 | 5 |

# MINISTRY OF EDUCATION

*Telegrams: "schooling", Kisumu*
*Telephone: Kisumu 2024599*
*Fax: 057-2023884*
*Email:nyanzapde@gmail.com*
*When replying please quote*

*Ref:* 442938

*PROVINCIAL DIRECTOR OF EDUCATION,*
*NYANZA PROVINCE*
*RE-INSURANCE PLAZA-3RD FLOOR.*
*P.O. BOX 5 75*
*KISUMU*

Date: 6th October 2011

**The Principal**

**..... School**

**RE: OKEWA JAMES JUMA – TSC – 442938**

The above named student is in the Master of Business Administration Degree Program at University of Nairobi. As part of requirements for the course, he is expected to carry out a study on Information and Communication Technology Adoption amongst Public Secondary Schools in Kisumu County, Kenya.

He has identified your school for that purpose. This is to kindly request your assistance to enable him complete the study.

The exercise is strictly for academic purposes and a copy of the final paper will be availed to your school on request.

Your assistance will be greatly appreciated.

Thanking you in advance.

Mhalitsa.

**MARY ATALITSA**
**FOR: PROVINCIAL DIRECTOR OF EDUCATION**
**NYANZA PROVINCE**