

**FACTORS AFFECTING INFORMATION AND
COMMUNICATION TECHNOLOGY IMPLEMENTATION IN
SECONDARY SCHOOLS IN NAIROBI**

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BY

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DECLARATION

This management project is my original work and has not been submitted for a degree in any other University.

Signed George Omolo

Date 6TH November 2003

George Omolo

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

Signed Joel K. Lelei

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DEDICATION

**This research paper is dedicated to my family and my late grandmother,
Phylista O. Ogam of whom I am particularly proud**

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I am however responsible for any shortcomings of this research study.

ABSTRACT

This study investigated factors influencing the implementation of ICT in both public and private secondary schools in Kenya.

The study sought to find out the current ICT status, factors and their relative importance in ICT implementation in Kenyan secondary schools. The study was concerned with the level of ICT implementation in these schools in terms of the availability of computers, ICT teachers, classrooms, infrastructure, security, curriculum, governing policy, electricity, telecommunication, hardware, software and any other factors that may directly help in ICT implementation. To find more on current status, a questionnaire was designed with questions that relate to current availability of both physical and economic factors necessary for the implementation of ICT in schools.

The research findings indicate that the level of ICT implementation in schools is very low. On current ICT implementation status, it was revealed that most schools did not have computers, adequate classrooms, adequate funds, proper infrastructure and qualified staff to undertake the ICT implementation in schools. Due to curriculum overload and lack of government ICT policy in schools, most schools are slow in implementing ICT in their schools.

Some of the factors that were seen to strongly influence ICT implementation in schools were availability of funds, electricity, telecommunication, classroom space, adequate

computers, trained ICT teachers, security, government policy, software, Internet Service Providers and involvement of stakeholders.

The findings on relative importance of factors determining ICT implementation demonstrate uniform support by schools for a number of measures to be taken to improve ICT implementation in schools. Chief among these would be to provide funds for the purchase of computers, provision of software and hardware, improvement of security, training of ICT personnel for teaching and maintenance of equipment, consultation amongst key stakeholders and improvement of physical infrastructure.

The study shows that ICT implementation is concentrated in high cost schools and the reason for this is mainly because they have both sufficient physical and economic resources. This study reveals that a host of other factors also influence the implementation process. These are lack of ICT trained teachers and the lack of software and hardware vendors. The other serious problem is lack of clear government policy on ICT in schools. To help schools implement ICT initiatives, there is need for a collaborative support among stakeholders. These support include provision of sufficient funds, supply of adequate computers, provision of Internet facilities, training of ICT teachers and posting them to schools, supervision by education officials, development of curriculum and consultation of all stakeholders.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The need to implement Information and Communication Technology (ICT) in schools is based on the philosophy that sustainable improvement in peoples well being depends on their ability to produce and disseminate knowledge needed for a country's development (Ellwood,1996; Dixon,1995).

ICT is found in all sectors of the workplace in developed countries, and it is becoming increasingly used in the developing world. Children of today, at the very least, need to become aware of the potential of new technologies in all aspects of their lives. The benefits for learning are increasingly being demonstrated and teachers' roles in this information age ought to be both expanding and changing to embrace these resources and to harness their potential for the future of children in developing countries. There is therefore need to explore ICT implementation in secondary schools as the largest impact is likely to be felt here.

Although Information and Technology is generally used to refer to the use of computers (hardware, software and networking) and other media of communication such as audio and video cassettes, television, radio, telephone and mobile phones. for the sake of this study, the research will mainly focus on the use of computers and the

internet connection for learning. In any case digital divide convergence is bringing all the technologies together through the Internet.

Information and Commination Technologies can support learning in a number of ways (Reidlinger,1995). It can facilitate communication, increase access to information, provide greater access to learning for students with special educational needs, model and simulate a range of scientific phenomena, and generally motivate students, develop problem solving capabilities and aid deeper understanding. For students with special educational needs, the computer can provide access to learning in new ways and which for many were previously inaccessible.

However for all this to work teachers need to be aware of the potential of ICT for learning and be experienced in the use of the technology for teaching. The amount of knowledge available and the breadth and depth of it are far beyond the realms of most teachers, as is their control of learners' access to it. The teacher's role within an ICT-rich environment must necessarily change to help students learn in the best way they can by recognizing different learners' needs, and support students in to making choices about how and where they access new knowledge. To ensure that teachers use the technology in appropriate ways, the different roles a computer can play in the classroom need to be considered together with how the teacher develops teaching strategies that support each role. These need government support in terms of physical, material and capital resources.

Successful implementation of ICT in secondary schools will be achieved through several ways:

- (a) There is need for creative, capable people: Skilled teachers who embrace and apply ICT, using sound pedagogues, in order to improve student learning and a community with strong ICT capabilities.
- (b) There is a need for supportive ICT infrastructure that facilitates access to all learners and ensures efficient business practice.
- (c) Access to, and the development and application of, online resources and services that support continuous learning improvement.
- (d) Enabling policies and strategies that facilitate the uptake and usage of ICT within schools and,
- (e) Evaluation and implementation of best practice: A strong culture of assessing the effectiveness of ICT use and online content and implementing changes on the basis of shared best practice.

This research study considers the ways of ICT implementation in Kenyans secondary schools.

1.2 OVERVIEW OF ICT SITUATION IN KENYAN SCHOOLS

By African standards, Kenya is doing reasonably well with regard to the use of Internet services. According to Makau (1991), the main Internet Service Providers (ISPs) in Kenya include Form-Net Africa, Africa Online, Interconnect, SwiftKenya, NairobiNet, the African Regional Centre for Computing (ARCC), Environmental Liaison Centre, Thorn Tree and Fast Forward. These ISPs mainly provide Internet services to businesses, companies, learning institution, NGOs and individuals.

The education sector has however not been a major beneficiary of these services even though going by the sheer numbers of those operating in the Kenyan school system, this sector could easily turn to be the biggest consumer of the Internet services. Ochuodho (1996), notes that there is a clear demand for internet services across all the Kenyan school levels even though only 200 Kenyan schools are connected to internet through the ARCC, a pattern which is repeated in other ISPs. Most of the schools connected are mainly high cost schools based in Nairobi, IDRC Report (1996).

At the secondary school level, Internet services are used by an average number of mainly high cost schools such as Aga Khan High School, Braeburn High School and Starehe Boys High School. Starehe and Braeburn High Schools are further linked to schools in North and South America as well Europe.

A range of software and web resources has been developed and is available to schools and considerable production of online learning materials has been undertaken locally. The uptake of professional learning courses in the use of ICT has been strong but the integration of ICT into teaching and learning is acknowledged to be a long-term goal that will require a strong commitment over a period of time.

There are four driving motives for the use of ICT in Kenyan schools:

Improving outcomes: There is considerable evidence that the judicious use of ICT has the potential to transform teaching and learning and improve student learning outcomes, as well as improving the efficiency and effectiveness of educational delivery and school organization and management. In addition, ICT provides potential ways for students to overcome barriers to their learning, and allows students some flexibility to manage and pace their learning. Computer usage is likely to be positively perceived by students and have the potential to enhance student confidence, motivation and concentration. Disenfranchised students may become more motivated when using a medium that is an essential element of communication for their generation. Teachers' administrative tasks such as assessment and monitoring can also be undertaken more efficiently.

Ensuring equitable access: ICT can facilitate access to learning regardless of learners' personal circumstances or location. Rural students can be linked to the global community, reducing the effects of isolation. Students with disabilities can be

assisted. Students can access learning from home, Online Access Centres, libraries, and Youth Centres.

Developing required skills: Information and communication technologies enable students to develop the skills they need to live and work in the information age and continue their involvement in learning beyond formal schooling. It is imperative that students leave formal schooling with the knowledge and understandings that will enable them to be confident, skilled and critical users of available technologies in both vocational and non-vocational aspects of their lives.

A changing workforce: It is important for the economic future of Kenya that both basic and advanced ICT skills exist in the emerging workforce. Traditional sources of employment in Kenya that relied upon many people who did unskilled work are quickly disappearing. The skill requirements for the workforce have changed and skills in information and communications technology have become essential. An ICT literate workforce will attract investment that creates jobs. For these reasons there has been a great deal of focus on ICT development in Kenyan schools and colleges in the past few years involving considerable budget commitment. Examples of progress and indications of future need are highlighted:

The basic technical foundations for effective ICT use have been established. However, with increased ICT usage, infrastructure shortfalls, such as inadequate access to bandwidth have also been highlighted. Whereas ICT is beneficial and something has

been done in Kenya with respect to it in schools, something still remains undone. While much progress has been made, without a clear policy direction and cohesive framework for planning the use of ICT in schools and without a clear processes for accountability, it is difficult to ensure maximum outcomes from the considerable investment of time, money and effort that has been expended. This research study aims at addressing the need for a clear strategic ICT implementation policy direction and explicit targets to guide the rapid ICT growth and development in schools.

In Kenya, according to Makau (1991), heavy emphasis on examination by Kenya schools curriculum greatly limited the possibility of introducing computer studies in schools. This study did not however focus on any other factors beside curriculum, which influence implementation of ICTs in schools.

A study conducted in South Africa suggests that implementation of ICTs in schools is constrained by lack of advanced technical skills, inefficient coordination and communication between school networks and lack of a single voice and mandate with which to bargain with the central government, Marquard (1996).

To adopt ICT, schools need to acquire the necessary hardware and software, train the teachers to adopt to the changes taking place in IT environment, and restructure the education practice. To put all these in place requires time, and availability or absence of any of these resources can act as an opportunity or constraint to implementation.

1.3 STATEMENT OF THE PROBLEM

ICT is revolutionizing the traditional procedures involved in education delivery and many schools are enthusiastic about adopting it. The obvious reason for such enthusiasm is the realization of the beneficial effects of ICT, which include speed and efficiency in content delivery in schools. In spite of this enthusiasm, not many have implemented ICT in Kenya. Indeed only high cost schools have tried to implement ICT in their schools. *What factors then hinder the implementation of ICTs in schools?*

In Kenya, ICT implementation in learning institutions has been discouraging. However, Ochuodho (1996), reports that use of ICT is limited to private schools as opposed to public schools. There is need to correct this situation because ICT is significant to all categories of students in this age of technological advancement.

However, what needs to be known is how schools are fairing with ICT implementation. Ochuodho (1996) notes that of the few Kenyan schools connected to the Internet through the African Regional Center for Computing (ARCC), most of them are mainly high cost schools within Nairobi. This observation points to the fact that there is an implementation gap in public schools. *The main question addressed in this study is; why are schools slow in implementing ICTs in Kenya?* Little is known of the status of ICT implementation in Kenyan schools. The researcher knows of no study that has sought to determine the status of ICT implementation in Kenyan Schools.

The study focuses on secondary schools since they already have an optional syllabus on computer studies and perhaps more important also is the fact that secondary schools have the potential in creating a population that is prepared for the information society and job market. *The study now seeks to determine factors that influence implementation of ICT in these schools.*

The only problem is that the readiness of such schools to implement the ICT programme is unknown. Whereas there are standard requirements necessary for ICT implementation, the availability or accessibility of the same also remains unknown. Most of the studies done on ICTs in schools have been carried out outside Kenya. Currently, there is very little published literature on the above subject in Kenya and hence the need to carry out the study.

To adopt factors necessary in the implementation of ICT in schools, their knowledge and their relative importance needs to be known. The study should therefore seek to know the relative importance of these factors in relation to the Kenyan schools.

1.4 OBJECTIVES OF THE STUDY

The objectives of this study were as follows:

1. To determine the current status of ICT implementation in secondary schools in Kenya.
2. To establish factors affecting ICT implementation in secondary schools in Kenya.

3. To determine the relative importance of the factors affecting ICT implementation in secondary schools in Kenya.

1.5 IMPORTANCE OF THE STUDY

The findings of the study benefited a number of persons:

(1). Learning institutions

The study provides information to schools in respect of current status of ICT and how they can draw upon this to redefine their ICT implementation strategies and thus help in charting the way forward for ICT implementation in their schools.

The research has attempted to lessen the digital divide by exploring access mechanisms to poor schools. In particular, implementations of ICT in schools that include empirical evidence about the effects of the processes and outcomes of these efforts are examined. The result of this study will help the school administrators in planning for ICT initiatives.

(2). Government

This research should be able to fill the “information gap” that exists in respect of ICT curricula and management in education institutions, and examine obstacles to the process of implementing ICT in Kenyan schools.

(3). Researchers

The information gathered from this study provides useful reference point for further research. It may also assist in bridging the digital divide in secondary schools for which access to adequate ICT infrastructure has previously been limited. The projects are developed from a partnership between schools, businesses, and Government. The general goals to be achieved will enhance the educational achievement of the students particularly in ICT courses, help overcome the barriers of access, ability, and attitude, and work in partnership with all stakeholders in implementing ICT in schools.

(4). ICT investors

ICT investors in this country are likely to benefit from findings of this study in formulating strategy for future operations. By knowing the status and factors about the market potential of ICT in schools, they will know where to direct their funds and development efforts.

(5). Development partners

The project provides a platform for local research to generate knowledge and experiences on the basis of which the several potential partners interested in the promoting of the use of internet technologies in education could base their operations in Kenya and the wider Eastern Africa sub-region

Thus the project provides valuable cohesion and direction to those who have expressed the need for such activities for some time in Kenya and the Eastern Africa sub-region.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents literature review of ICT implementation in schools. Most of the literature available on ICT in schools is mainly on research that has been done in developed countries particularly in USA, Canada, Britain and Australia. There is a bit of research literature carried out in South Africa. Some of the literatures reviewed for the purpose of this study are mainly from the Internet and published journals. For the Kenyan situation, literature is drawn from few published books, national dailies, published journals and MBA research papers.

2.2 ICT AND EDUCATION

Introduction of ICT teaching in schools has changed the traditional way of teaching. Some of the areas where ICT education has been used include the following:

ICT (Information and communication technologies): Generally used to refer to the hardware, software and skills in using a computer as well as incorporating the notion of the networking of computers and subsequent improved communications. Hardware ranges from the basic box to add-ons such as printers, scanners, CD-ROM and so forth. Software includes productivity software, such as word processors, spreadsheets, databases, graphics and presentation packages as well as specialist packages and content. Networking allows more effective use of computers, widening the range of

software available through central server repositories and allowing communication within and between sites.

Online learning: The acquisition of knowledge and skills through mediated information and instruction, which occurs through online tools such as the Internet and email.

School supported teacher remote online learning: Online learning where the teacher is geographically distanced from their students, but where students are still learning and being supported within a school environment.

Online Teacher: A teacher working remote from their students, linked by ICT.

Informal Learning: Learning which occurs outside traditional school hours or environments and may be significantly bolstered by access to the Internet.

2.3 GROWTH OF ICT EDUCATION

The information and communication technologies is no longer a preserve of the industrialized countries. Third world countries have also embraced it. Most Third World countries have inevitably been linked to the West through the Internet. Mainly because of their various links with the West as manifested in the fields of economics, politics and social life, such links allow the privileged few of the Third World to keep abreast with important socio-economic and political happenings outside of their immediate environment. Needless to stress, such an explosion of information has both negative and positive implications (Ellwood, 1996; Dixon, 1995).

Education networking generally provides teachers with useful teaching and learning tools. Through such networks educational stakeholders are linked through their computers and are able to share relevant information. For pupils, some of the acknowledged benefits of internet access include the ability to gather information electronically; collaborate with peers and colleagues in other locations; access materials stored in other sites; participate in meetings and conferences electronically; interact through the E-mail with a broad cross-section of experts; share information with other connected students and teachers; and to engage on a continuous skill and knowledge upgrading (Reidlinger and Weir, 1995).

Established school networks such as the Canadian Schoolnet have already made major strides in promoting educational development by electronically linking more than 4000 primary and secondary schools. Schoolnet Canada offers teachers and students a broad variety of educational services and resources including access to a wide cross-section of scientific experts; innovative teaching projects; question and answer sessions on a number of subjects; information on careers; summaries of newspaper reports; etc. (Canada Schoolnet brochure, 1996)

All is however not well particularly for the Third World where computers are prohibitively expensive for most schools and are difficult to maintain due to a lack of adequate resources and professional maintenance personnel; relevant basic infrastructure may be lacking; and because much of the knowledge currently being

shared through the Internet is foreign. These and other disadvantages may however be outweighed by the benefits which those able to be connected can share. In South Africa for example, a number of provincial networking organizations formed by schools themselves are making the initiative to gain access to the internet in the most cost-effective way. Already, three school-networking organizations exist with the largest one being based in the wealthy Western Cape province. (Stephen Marquard, IDRC). 130 of mostly former white schools are connected to this network. As is probably expected, the various South African schoolnets' effectiveness has been constrained by a number of factors chief among them being a lack of advanced technical skills within both the network organizations as well as the provincial educational offices; inefficient communication and co-ordination between the school networks and the fact that these networks lack a single voice and mandate with which to bargain with the central government. (Marquard, *ibid*).

For the wealthier schools, funding is not a problem as parents are able to meet much of the costs related to the capital and maintenance expenses. Funding is however the biggest obstacle to the development of these networks in the poor black township schools (Dlikijla, Isilimelela Comprehensive School). It is to be hoped that the implementation of official government policy as outlined in the policy document entitled **“Technology Enhanced Learning Investigation in South Africa: a Discussion Document”** (Republic of South Africa, 1996) will go a long way in helping alleviate funding difficulties. However there is need for some measure of

cautious optimism as the gap between policy pronouncements and actual reality can be quite wide.

2.4 DEVELOPMENT OF ICT EDUCATION

There is constant reference by government and schools in developed countries to the belief that there is lack of research-based evidence to support the positive effects of information and communications technology (ICT). However a recent review and a critique of more than 100 research studies on evidence of learning and the learning potential of educational software (Mumtaz, 2000) found evidence that:

Using the Internet has far-reaching effects. As well as facilitating communication, it develops skills of searching, interpreting and organizing information often defined as "network literacy". Communication through email improves students, writing skills as they take more care in grammar, spelling, punctuation and conveying meaning to an audience which is not their teacher:

Firstly, ICT enables pupils with reading difficulties curriculum and raises the status of visual and aural literacies to the level of literacy acquisition through text.

Secondly, TICT makes the invisible visible. Dynamic images and animation aid understanding of abstract concepts and enables visualization of processes either too small or too fast to be seen in real life;

Thirdly, ICT support differentiation providing enrichment and extension for able pupils, and support and motivation for weaker pupils. Additionally it allows independent learning at an individual pace, facilitates repetition and can improve teacher/pupil interaction, and better "pupil contact". Lastly, ICT provides motivation and variety, generating enthusiasm, interest and involvement, maintaining attention and enjoyment, and supports the development of novel ways to present difficult ideas. Thinking skills and problem solving strategies are enhanced when using ICT, and challenging tasks and a responsive environment enhances students' sense of competence.

The impact of globalization on the world economy need not be over emphasized. The degree of flow of information, knowledge, goods and services is increasingly being facilitated by efficient and effective means of communication. In order to tap from the benefits of liberalization, it is paramount for students, employees and citizens to keep abreast with new knowledge, systems, production technologies and so on. This benefit can only be tapped through the acquisition of ICT knowledge. Many governments have therefore placed emphasis on the acquisition of such skills through institutions such as schools. However, there seem to be some impediments that have negated the implementation of this noble programme.

Innovations in communications technology, in addition to driving economic globalization, have also transformed the media world and the spread of information, with important consequences for national as well as global governance. This began

with radio broadcasting in the 1940s and has since been extended through television and satellite transmission to give even those in remote places immediate access to sound and images from a wider world. In some countries, new communications systems have even brought people news of domestic events that is not available locally. Direct-dial international telephone and fax services have swelled the Trans-border flow of news and other messages.

Another important development has been the sharing of information through links between computers around the world. Exposure through the media to foreign cultures and life-styles can be both stimulating and destabilizing; it can inspire both appreciation and envy. Concern that the dominance of transnational media could result in cultural homogenization and could damage indigenous cultures is not limited to non-Western countries. Many people are worried that media images will strengthen the consumerist ethos in societies in the early stages of development. There are questions about distortion and imbalance as the world's news is filtered predominantly through Western prisms, and dissatisfaction that information flows from and within the developing world are inadequate. Apprehension about concentration in media ownership is linked to worries that this sector's power to shape the agenda of political action may not be matched by a sense of responsibility. These varied concerns have given rise to the suggestion that civil society itself should try to provide a measure of global public service broadcasting not linked to commercial interests.

The wider access to information has been healthy for democracy, which gains from a

better- informed citizenry, as well as beneficial for development, scientific and professional collaboration, and many other activities. The wide linkages now facilitated can also help pull the world's people closer together. Media images of human suffering have motivated people to express their concern and their solidarity with those in distant places by contributing to relief efforts and by demanding explanations and action from governments. The media's influence on the shaping of foreign policy is considerable in many countries. Although there has been a spectacular expansion in the reach of some communications media, serious imbalances remain in access to information and in the distribution of even the most basic technology. Two billion people more than one in three individuals in the world--still lack electricity. In 1990, Bangladesh, China, Egypt, India, Indonesia, and Nigeria together had fewer telephone connections than Canada, which has only 27 million people. These disparities are repeated in the ownership of communications satellites, the key to media globalization.

2.5 APPLICATION OF ICT IN SCHOOLS

2.5.1 Learning with ICT

All forms of learning are enhanced by ICT. There is strong evidence that talking books encourage reluctant readers and numerical skills can be improved through novel drill and practice games that take the drudgery and boredom out of reinforcement activities. There are also opportunities for students to use real data that makes tasks more authentic and realistic, rather than data that is contrived to make calculation easier. Problem solving situations readily lend themselves to ICT and students can

learn to develop skills such as being systematic, logical and deductive through engaging with carefully selected computer based tasks and scenarios.

While computers can offer learners models and simulations of real world events, there is also a need for opportunities to have some real rather than virtual experiences. Science practicals, for example, have a place in demonstrating the importance of control, accuracy, error limits, and attention to detail, as well as providing students with hands-on experience of appropriate ways of measuring, observing, and controlling variables. Unless learners experience these phenomena first hand, their understanding of the ways in which computer modeled experiments might be set up in reality will be limited. Teachers need to be on hand to support and supervise such practical activity, to set up these experiments in meaningful contexts, and to help learners relate their experiences to computer based simulations. However some activities can take longer or be more difficult with a computer. Young children have poor keyboarding skills so typing words can be time consuming until keyboarding skills and co-ordination improve. Reading long screeds of text on a computer screen is also a waste of expensive resource and is rarely as easy as reading from a printed document.

2.5.2 Role of the teacher in ICT environment

The role of the teacher is therefore important in the learning process (Selinger, in press). In another example, it has been demonstrated that children working together at a computer when given coaching by a teacher in exploratory talk, will ask each other

task-focused questions; give reasons for statements and challenges; consider more than one possible position; draw opinions from all in the group; and reach agreement before acting. It also affects teachers' views of the learning process, with the technology playing a vital role in opening the minds of teachers to new ideas about children, learning and their own role in education. The teacher's role is changed from whole class to small group instruction; from a didactic approach to coaching with individuals or pairs; from working with and questioning the most able to working with all abilities and understanding their difficulties.

Teachers need to be more adaptable; more open to alternative teaching approaches, and the use of peer teaching, and adults other than teachers - such as experts in other domains. The access to and availability of information has expanded overwhelmingly since the inception of the Internet. Few expect primary teachers in particular to be completely conversant and have in depth knowledge of all aspects of National Curriculum subjects, especially as students can read well beyond the statutory demands, and ask questions that demand knowledge and understanding far beyond current expectations. The same is also true of secondary teachers whose field of speculums within their chosen subject will not cover all they have to teach.

Information on the Internet vastly exceeds the amount of information available to students through school libraries and access to it is difficult to control. However the information on the Internet is vast and uncontrolled; it has been likened to a library where all the books have been thrown on the floor. Taking that analogy further, the

books are mixed up with romantic novels lying side by side with reference books and the works of Shakespeare; advertising leaflets lie strewn around or are inserted in books; extremist materials like that given out at railway stations are also in the pile; and there are several library catalogues, all incomplete and with many duplicates. Teachers must help their students to pick their way through the pile; to make sense of what is there and to use the materials wisely.

Access to information in libraries has always been recommended to students from an early age (study skills) and especially at post-16 level so they could read around and beyond their subject, or undertake an in-depth study. Now with the advent of communication technologies, students can not only read around their subject, they can also be exposed to micro worlds and simulations, computer generated models, video, graphics, images, audio lectures as well as electronic conversations with experts and others. Teacher control of new knowledge is weakened yet their role does not diminish; it changes to one of supporting learners to assimilate new information, to turn it into knowledge and understanding within a nurturing and supportive environment.

The role of the teacher is broadened beyond the classroom and the school. As school and home boundaries start to blur, the teacher's role will be to support learners through alternative means to traditional face to face experiences. Teachers will have to learn how to teach at a distance through virtual learning spaces: e-mail, web-based discussion forums, and computer conferencing systems. The skills of face to face

teaching will have to be translated into an electronic environment where traditional cues like tone of voice, facial expressions and body language are lost. The benefits of virtual learning spaces are vast; they can bring learners together who may never have met; learners can be exposed to new voices and to new views and they can be presented with an authentic audience for their work. In addition some teachers will have to change their views of pedagogy since the nature of electronic collaboration will not always be between learners and their teachers in schools, but also between students and between students and adults other than teachers as stated earlier, as the constraints of distance are negated through virtual space. Teachers will have to deal with blurring of the classroom boundaries and for this to happen they will need to be made aware of the possibilities that can exist and the advantages to both teaching and learning.

The classroom can become a metaphor for any learning space in which one or more knowledgeable others support the learner. Traditional modes of teaching and learning take place in a group or in a one-to-one situation in the same place, at the same time, in the classroom or lecture theatre, or in a teacher's study. The introduction of distance learning has enabled the learner to work alone or with others on a set of materials but without the opportunity to easily or quickly question the teacher or author of the materials about the content. Electronic communication can be through text, video and audio graphics and each occupies a new learning space: different place, same time, individual or group in an online chat, or more commonly in the context of this paper, different place, different time, group (conference) or individual (e-mail).

The learning spaces are not mutually exclusive: the opportunities afforded by previous forms of distance learning are now enhanced through the additional spaces provided by new technologies and similarly face to face teaching can also be supported and extended.

When designing any learning experience teachers will need to consider what is it they wish to achieve and then consider the most appropriate approaches to achieving their goals for the learners in question. Whether the technology chosen is face-to-face lessons, print-based distance learning or Web-based activities what is important is that they design the experience to make appropriate use of the characteristics of the chosen technology.

2.6 ROLE OF ICT IN SCHOOLS

Crook (1996) explores a number of orientations to the technology or 'frameworks for change' that each serve as ' a focal point for arguments about the revolutionary potential of computers for teaching'.

2.6.1 Computer as tutor

One orientation is 'computer as tutor'; and he compares this with the transmission model of teaching or the 'stuffing in' of knowledge. Take for example Integrated Learning Systems (ILS) that are increasingly gaining popularity for teaching literacy and numerics. This software coaches students in basic skills, assessing their performance on items and taking them to a higher level if they are succeeding or to more reinforcement if not. Often it is shortcomings in current educational practices

that are cited as justification for using this technology. ILS is probably the most researched application of computers to teaching in the UK, yet there is very little evidence to suggest the improvements in learning are substantial, and certainly do not justify the extensive investment that schools are making. However the systems can be shown to be of use when they are combined with teacher input, when pupils work collaboratively, and when work undertaken away from the machines is directly linked. Mcfarlane (1997) states that 'research supports the view that teachers play a key role in ILS'; their role in making the systems effective is crucial. ICT can also change teachers' views of teaching and learning: Underwood et al (1996) reported that teachers saw an ILS as a support tool for diagnosing weaknesses in pupil's understanding, and that an ILS proved to be a tool rather than a substitute for teachers.

An understanding of students' learning and of appropriate pedagogues is needed to make informed judgements about how best to employ ILS; for which students it is most appropriate; and what related work will be needed to ensure the best possible learning gains are achieved. Facts learnt out of context need to be placed in a range of contexts so that students understand how to make use of their new knowledge. The teacher's role is to help students learn to make links between new knowledge and existing knowledge if new knowledge is to be of any value (Skemp, 1976).

2.6.2 Computer as pupil

The next framework for change that Crook suggests is 'computer as pupil' and cites Papert's contribution to thinking in this area. 'The idea is to regard the computer as a tool which the learner may come to control - or 'teach' to do things' (Crook, 1996:80).

Papert comments that some children experience learning French in USA schools, yet if they had been brought up in France this would not have been a problem; they would have learnt to speak French fluently. Therefore, as Crook points out, if one wants to learn French one goes to a French speaking country. The idea then is that students immerse themselves in micro-worlds. Logo is one such mathematical world in which children teach the machine to perform various functions - the computer acts as a pupil with the child as teacher. However the immersion in a micro-world is not enough, some structures may need to be imposed on learners, to ensure that the meaning of what they are doing is clear. There has to be some purpose and motivation for engaging in the activity. Learners need their achievements to be located in broader frameworks of knowledge.

This framework does not make teachers redundant, it merely changes their role in which learners are encouraged to engage in purposeful and creative exploration - one that Papert (1993) describes as 'constructionist'. The goal of a constructionist teacher would be to teach 'in such a way as to produce the most learning for the least teaching.

2.6.3 Computer as resource

Crooks' third framework is the 'computer as resource' and cites the definition of Taylor and Laurillard (1995) as 'open access, self-directed learning from a large information source'. Learners in their interaction with the computer are active, and knowledge is discovered and negotiated. Computers can present information in ways in which teachers are unable; they can present information in multimedia formats allowing users

to select and experience new knowledge in text, graphics, sounds or video; make use of hyperlink to link concepts together. It allows the learner to make choices about the medium through which they learn and present them with a wide range of hitherto unimaginable resources. However turning these experiences into meaningful knowledge and understanding relies on the support or 'scaffolding' of another. This other is usually a teacher who has some understanding of the learners' preferred learning styles and can help them make appropriate choices and decisions, can teach the learner to question the validity of new knowledge and help them to assimilate it into existing schema. However, it can also be a peer or group of peers; it could be another adult.

2.7 ICT AND SPECIAL EDUCATIONAL NEEDS

ICT has become an invaluable tool for children with special educational needs. The British Educational Technology and Communications Agency (BECTA) have an inclusion web site (BECTA, 2000), which provides a good deal of information about how ICT can support pupils with a range of special educational needs.

Too often the novelty value of new technologies leads us to neglect the older technologies like radio, television and audio and videocassettes, or even film loops and slides. These still have an important place within educational environments. The use of radio in the developing world has been shown to have a powerful effect (Skuse, 2000) in education through radio soaps, for example. The OLSET programme in South

Africa has shown how radio can be used successfully to teach young children English and to model new pedagogy for outcomes-based education.

Finding innovative ways to combine old and new technology, exploiting the potential of both, and making decisions about the best medium to convey information and improve learning are of paramount importance in countries where resources are scarce. Technology must not be used for technology's sake.

2.8 SUMMARY

An overview of the literature shows that, there are several factors that influence ICT implementation in schools. These include income, availability of facilities, (David Evan, Mohamed, 1989); computer prices, attitude (Ssewanyana, 1999); access, choice, Knowledge of Board of Governors, socio-economic status (Atkinson 1995); ICT time and asset, (Rajul Pandya-Lorch, Ben Fred, John McCom, 1993 and availability of credits and savings (Manohar S, and Ahou D, 1994). Although Sen (1981) include machine prices, income, personnel availability and environmental safety, his study concentrated on computer hardware and software acquisition.

Other researchers have concentrated on lack usage of ICT amongst school going children in less developed countries with little emphasis on the underlying causes (Young and Jasper, 1995). However, most of these are rather general to the ICT implementation sector and very few are specific to the Kenya case. None of these studies are focused neither have detailed regional case studies been carried out. This

study will overcome this weakness by studying what determines ICT implementation and the relative importance of these factors in determining ICT implementation. Manohar S, and Ahou D, (1994) carried out a study in developing countries but failed to bring out the relative importance of each of the identified ICT implementation determining factors. Studies by Guyer (1987) identified some of the important factors that affect ICT implementation. Likewise, little attempt has been made to show the statistical significance of each of these factors in determining ICT implementation. This study seeks to fill this gap by incorporating most of the major factors affecting ICT.

In 1998, the Information Technology Advisory Group (ITAG) commissioned a survey of schools about Information and Communication Technology (ICT). This survey built on the research work previously carried out by the Telecom Education Foundation (TEF) between 1993 and 1996.

What emerges from this review is that ICT implementation differs across schools and mainly depends on whether a school has adequate infrastructure or not. These include use of networks, Internet access and usage, ICT planning and funding in schools, professional development for teachers and development of formal policies for acquisition of hardware/ software in schools.

Most of the studies undertaken by previous researchers have been concentrated in developed countries with very little studies being done in developing countries including Kenya. Hence this study helps in bridging the research gap in ICT implementation in Kenyan schools.

CHAPTER THREE

3.0 RESEARCH DESIGN AND METHODOLOGY

INTRODUCTION

This chapter sets out the various stages that were necessary in carrying out this study and thereby achieving its objective. In view of the research objective, the following key points were highlighted and the study sought to achieve the following:

- (1) To determine current status of ICT implementation in Kenyan schools
- (2) To determine factors affecting ICT implementation in Kenyan schools.
- (3) To determine relative importance of factors affecting ICT implementation in Kenyan schools.

3.1 POPULATION OF STUDY

The population of study was drawn from 250 secondary schools in Nairobi (Ministry of Education 2001). These included both public and private secondary schools. Nairobi was considered because of its rich variety of schools and its got relatively better ICT infrastructure. The result of study would give a good picture of ICT implementation in Kenyan schools. The study targeted about a hundred (100) schools.

3.2 SAMPLING PLAN

A stratified random sample of secondary schools in Nairobi was used. The stratification was based on whether the school was a private or public school. Further, for each of the stratum, schools were sampled on the basis of whether they have

implemented ICT or not. Snowball sampling was used to determine which schools have or have not implemented ICT. Known schools with ICT programme were asked to provide names of other schools which also implement in their schools. From their response, a database was formed of schools which have and those that do not have an ICT programme.

3.3 RESEARCH INSTRUMENT

For each school the following questionnaires were filled

Firstly, there was a questionnaire on current status on ICT implementation. This was concerned with information and communication technology equipment and usage (answered by a staff member who had a good knowledge of computing and telecommunications). This questionnaire helped in seeking answers on current status of ICT implementation which was objective one of the study

Secondly, there was a questionnaire on the factors determining ICT implementation in Kenyan schools. This was concerned with infrastructure and other factors necessary in the implementation of ICT in school. (answered by a staff member who had a good knowledge of ICT). This helped in addressing objective two of the study.

Lastly, there was a questionnaire on the relative importance of factors affecting ICT implementation in Kenyan schools. This addressed the relative importance of factors

such as funds, infrastructure, personnel, professional development, ICT usage, ICT planning and management etc. This helped in addressing objective three of the study.

3.4 DATA COLLECTION

The study used primary data collected by the use of questionnaires. The questionnaires were administered to respondents in 100 secondary schools of which 60 were public and 40 were private schools.

The "**drop and pick later**" method of data collection was employed. This method was considered appropriate because of time factor and to encourage more response from the respondents who had to make time for filling the questionnaires.

Head of schools and teachers who were in charge of computers and the Internet or any knowledgeable teacher in selected schools filled the questionnaires.

In the distribution and collection of questionnaires, four research assistants were used. The research assistants were trained to check for the accuracy and completeness in filling of questionnaires.

3.5 DATA ANALYSIS

The techniques used to analyze and interpret the data collected were descriptive statistics e.g. cross tabulation. The statistics were used to generate frequency tables and proportions or percentage, and graphs. To test on the current status of ICT

implementation in schools, frequency tables and descriptive statistics were used. To determine factors that affect ICT implementation in Kenyan schools, frequency tables, graphs and descriptive tables were used. To determine the relative importance of factors affecting the ICT implementation in schools, frequency and descriptive tables were used. The above analysis were used to help in identifying the relative importance of factors such as funds, classroom availability, infrastructure, government policy and many others in the implementation of ICT in Kenyan schools.

Further analysis, involved an in-depth study with respect to demographic comparison of private and public schools to get richer findings was undertaken using Chi- square and other techniques such as SPSS as the data required.

CHAPTER FOUR

4.0 RESEARCH FINDINGS

4.1 INTRODUCTION

This chapter presents the research findings. The results presented in the sections that follow are based on the three research objectives focused on by the study and these are:

- (a) To determine the current status of ICT implementation in secondary schools in Kenya.
- (b) To establish factors affecting ICT implementation in secondary schools in Kenya.
- (c) To determine the relative importance of the factors affecting ICT implementation in secondary schools in Kenya.

The analysis of the data was done using proportions and percentages and the findings were presented using graphs and tables. The analysis began by answering questions related to research objective one which basically addressed the issue of the current status of ICT implementation in secondary schools in Nairobi. This was followed by an analysis of the various factors that determine ICT implementation in schools and lastly determination of relative importance of factors affecting ICT implementation was considered.

A total of 110 questionnaires were distributed to secondary schools in Nairobi. Forty-five (45) of these questionnaires were administered to respondents in private schools while sixty-five (65) questionnaires were administered to respondents in public

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Schools. Of the 45 questionnaires distributed to private schools, forty (40) were returned fully completed. This constituted a response rate of 90% of the sample target. For the public schools, sixty-five (65) questionnaires distributed, sixty (60) were returned fully completed. This constituted a response rate of 92%.

4.2. FINDINGS ON THE CURRENT STATUS OF ICT IMPLEMENTATION IN SCHOOLS

4.2.1 Demographic Composition

The demographic composition considered in the respondent schools included the gender and boarding status, student population, and whether the schools were public or day.

Table 4.1 - Gender Status

| Gender | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Boys | 25 | 42% | 2 | 5% | 27 | 27% |
| Girls | 21 | 35% | 6 | 15% | 26 | 26% |
| Mixed | 11 | 18% | 30 | 75% | 42 | 42% |
| Not indicated | 3 | 5% | 2 | 5% | 5 | 5% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

The Table 4.1 indicates that from a gender perspective, the data collected show that of the 60 public schools interviewed, 25 or 42% were boys schools while 21 or 35% were girls schools. Out of the sample of 40 private schools, 2 or 5% were boy schools and 6 or 15% belonged to the girls school category. The percentage of public mixed school

was 11 or 18% and that of private mixed schools was 30 or 75%. It therefore means that a majority of private schools in the study are co-educational. We can conclude therefore that a combination of boys and girls in schools is advantageous because it creates equal opportunity and room for healthy competition between the students hence improving the quality of performance in all subjects.

Table 4.2 - Boarding Status

| | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Day | 22 | 37% | 22 | 55% | 44 | 44% |
| Boarding | 35 | 58% | 9 | 22% | 44 | 44% |
| Both | 2 | 3% | 8 | 20% | 10 | 10% |
| Not indicated | 1 | 2% | 1 | 3% | 2 | 2% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

From Table 4.2, findings on the boarding status show that 22 or 37% of the 60 public schools interviewed were day schools while 35 or 58% were boarding schools and about 2 or 3% belonged to both boarding and day category. The respondent schools that did not indicate their boarding status were only 2%.

Of the interviewed 40 schools in the private sector, 9 or 22% were boarding while 22 or 55% were day schools. The percentage of public mixed boarding cum day schools and private mixed boarding cum day schools were 3% and 20% respectively. This

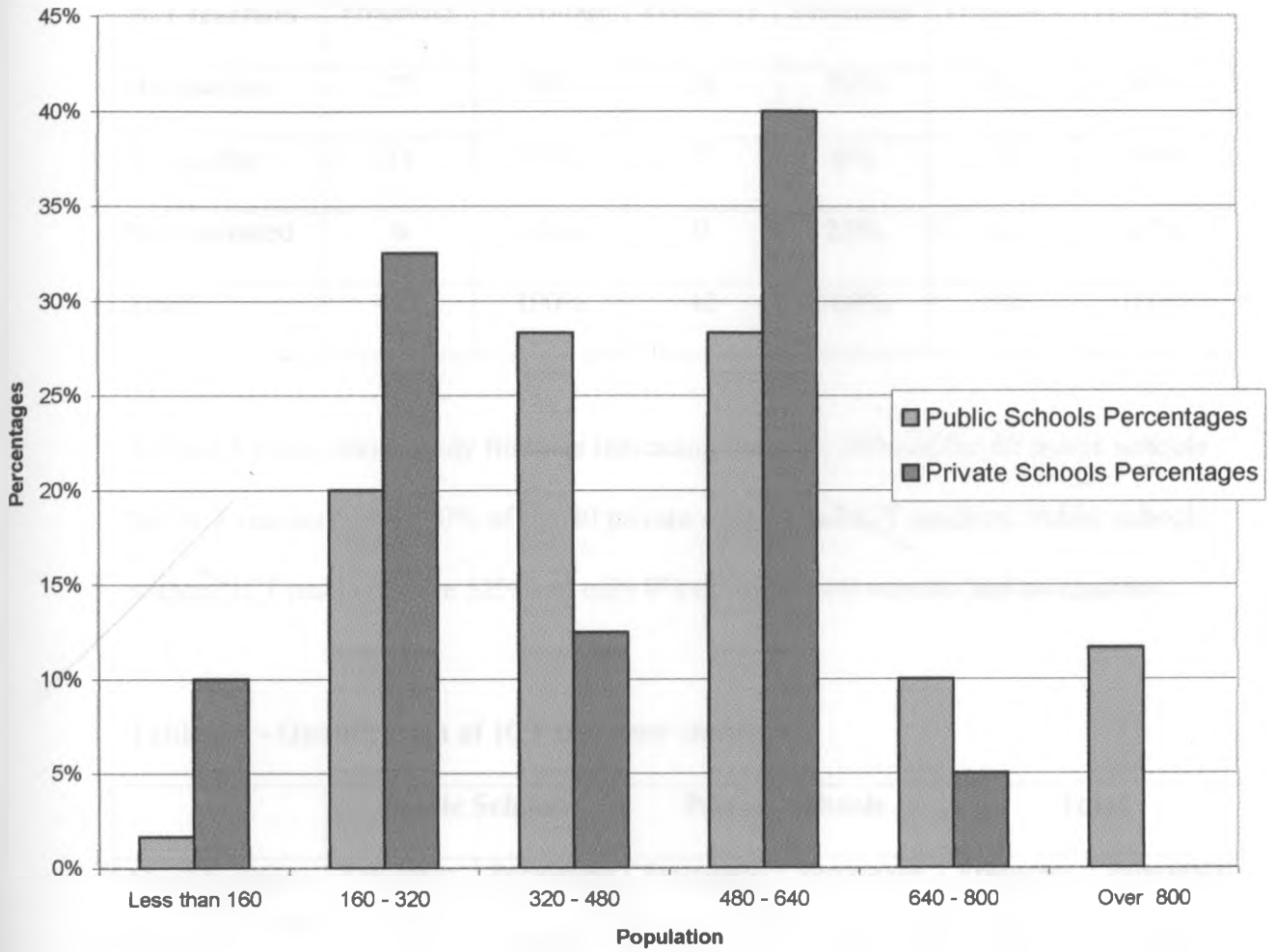
shows that generally that for the public schools considered in the study, there were less mixed boarding public schools compared to the private one.

Table 4.3 - Student Population

| Population | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Less than 160 | 0 | 0% | 3 | 8% | 3 | 3% |
| 160 - 320 | 12 | 20% | 13 | 32% | 25 | 25% |
| 320 - 480 | 17 | 28% | 5 | 12% | 22 | 22% |
| 480 - 640 | 17 | 28% | 16 | 40% | 33 | 33% |
| 640 - 800 | 6 | 10% | 2 | 5% | 8 | 8% |
| Over 800 | 7 | 12% | 0 | 0% | 7 | 7% |
| Not indicated | 1 | 2% | 1 | 3% | 2 | 2% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

As presented in Table 4.3, the study findings revealed that the population of a majority 56% (i.e. 28%+ 28%) of 60 public schools had student population of between 320-480 and 480-640 students. In the private schools, out of 40 schools, 16 or (40%) of schools had student population of between 480 and 640. This means that public schools generally have more students than private schools.

Figure 4.1 Student Population in schools



From the Figure 4.1 above, the Y- axis shows the percentages from 0 to 60% and the X- axis shows the student population category which ranges from schools with less than 160 students and those that have more than 800 students.

4.2.2 Findings on ICT teachers' status

Table 4.4 - Availability of ICT teachers

| ICT teachers | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Has teacher | 23 | 38% | 28 | 70% | 51 | 51% |
| No teacher | 31 | 52% | 3 | 8% | 34 | 34% |
| Not indicated | 6 | 10% | 9 | 22% | 15 | 15% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

Table 4.4 above show study findings indicating that only 38% of the 60 public schools had ICT teachers while 70% of the 40 private schools had ICT teachers. Public schools without ICT teachers were 52% and only 8% of the private schools had no teachers.

Table 4.5 - Qualification of ICT teachers' status

| Qualification | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| None | 29 | 49% | 1 | 2% | 30 | 30% |
| Certificate | 2 | 3% | 5 | 13% | 7 | 7% |
| Diploma | 15 | 25% | 12 | 30% | 27 | 27% |
| Degree | 14 | 23% | 22 | 55% | 36 | 36% |
| Not indicated | 0 | 0% | 0 | 0% | 0 | 0% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

Table 4.5 shows that both categories of schools reported different qualification status of ICT teacher(s). Of the ICT teachers in 60 public schools, 15 or 25% of schools had ICT teachers with diploma qualification, 14 or 23% of schools had ICT teachers with degree qualification and 3% had other qualifications. In 40 private schools, 12 or 30% of the ICT teachers had a diploma qualification, 22 or 55% of schools had ICT teachers with degree qualification and 13% had other qualifications. This finding shows that private schools have more qualified ICT graduate teachers.

Table 4.6 - Availability of Computers

| Computers | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Has Computers | 21 | 35% | 34 | 85% | 55 | 55% |
| No computers | 34 | 57% | 3 | 7.5% | 37 | 37% |
| Not indicated | 5 | 10% | 3 | 7.5% | 8 | 8% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

From Table 4.6 above, findings showed that of the 40 private schools 85% or 34 schools were well endowed with computer facilities for teaching compared to 60 public schools that had an average 35% or 21 schools. The number of students undertaking computer studies were indicated as 32% out a sample of 60 public schools while 63% of students in private schools were learning computer subjects. Overall, the number of computers available for teaching in both categories of schools was higher

but the actual number of students taking computer studies was smaller. The reason for this discrepancy was that some schools had computers which were not used for teaching.

Table 4.7 - Number of computers per school

| Computers | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| None | 34 | 57% | 3 | 8% | 37 | 37% |
| Less than 5 | 3 | 5% | 3 | 8% | 6 | 6% |
| 5 - 10 | 9 | 15% | 4 | 10% | 13 | 13% |
| 10 - 15 | 4 | 7% | 6 | 15% | 10 | 10% |
| 15 - 20 | 6 | 10% | 5 | 13% | 11 | 11% |
| Over 20 | 3 | 5% | 18 | 45% | 21 | 21% |
| Not indicated | 1 | 1% | 1 | 1% | 2 | 2% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

Table 4.7 above shows that 57% or 34 of 60 public schools had no computers while only 8% or 3 of 40 private schools had no computers. The percentage of private schools with over 20 computers was 45% or 18 compared to 5% or 3 in public schools. This reveals that private schools have adequate computers for teaching.

4.2.3 Plan for recruitment of ICT teachers

On the ICT teacher recruitment program by public schools, only a paltry 2% of 60 schools had the intention to employ new ICT teachers and retrain existing teachers in ICT. Those who indicated that they would use other means of implementing ICT education in their schools were 3%. For the 40 private schools, an average of 5% were the schools that indicated their willingness to retrain or recruit new ICT staff.

Table 4.8 - Use of Computer Lab by students for learning purposes per week

| Computers lab visits | Public Schools | | Private Schools | | Total | |
|----------------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Never | 35 | 58% | 4 | 10% | 39 | 39% |
| Once | 1 | 2% | 1 | 3% | 2 | 2% |
| Twice | 5 | 8% | 5 | 12% | 10 | 10% |
| Thrice | 13 | 22% | 13 | 32% | 26 | 26% |
| Over thrice | 5 | 8% | 16 | 40% | 21 | 21% |
| Not indicated | 1 | 2% | 1 | 3% | 2 | 2% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

As shown in table 4.8, the frequency of computer laboratory visits by students in public schools was much lower than for students in private schools. About 35 or 58% of students in 60 public secondary schools interviewed never had a chance to visit the

lab. per week. Only a minority of 30% (22% and 8%) visited the labs more than twice a week. Observations made for the private schools reveal 72% (32% and 40%) of the students visit the lab more than twice a week which shows the importance attached to the subject.

4.2.4 Computer Hardware Maintenance

Table 4.9 - Frequency of hardware maintenance by schools

| Maintenance | Public Schools | | Private Schools | | Total | |
|-----------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Very Frequently | 1 | 2% | 11 | 28% | 12 | 12% |
| Frequently | 13 | 21% | 11 | 28% | 24 | 24% |
| Sometimes | 10 | 17% | 8 | 20% | 18 | 18% |
| Seldom | 0 | 0% | 1 | 3% | 1 | 1% |
| Not at all | 34 | 57% | 3 | 7% | 37 | 37% |
| Not indicated | 2 | 3% | 6 | 14% | 8 | 8% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

As shown in Table 4.9 above, 57% or 34 of the 60 public schools reported that they do not have maintenance for their computers while for the 40 private schools maintenance was no done only 10% (3% and 7%). This shows that the maintenance of computers in private schools is more frequent.

4.2.5 Internet Connectivity

Table 4.10 - Internet Connectivity Status

| Internet | Public Schools | | Private Schools | | Total | |
|---------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Connected | 12 | 20% | 31 | 77% | 43 | 43% |
| No connection | 41 | 68% | 7 | 18% | 48 | 48% |
| Not indicated | 7 | 12% | 2 | 5% | 9 | 9% |
| Total | 60 | 100% | 40 | 100% | 100 | 100% |

From Table 4.10 on Internet connectivity, it was observed that 41 or 68% of 60 public schools do not have this facility compared to only 7 or 18% of 40 private schools. This phenomenon could easily be linked to the availability of funds and better ICT infrastructure in private schools. Private schools reported that the level of ISP reliability was 10% while only 5% of 60 public schools agreed that ISPs were reliable. Following up on these observations, it was found out that the frequency of use of the Internet across schools differed widely. On average public secondary school students only used the facility 13% of a given time whereas private school students had access to the Internet 63% of the same time. School -teachers from both public and private schools had a relatively lower degree of Internet access, that is, 12% and 60% respectively compared to the students.

Table 4.11 Reasons for lack of Internet connection in schools

| Factors | Public Schools | | Public Schools <i>private</i> | | Total | |
|-------------------------------|----------------|------|----------------------------------|------|-----------|------|
| | Frequency | Mean | Frequency | Mean | Frequency | Mean |
| Lack of funds | 60 | 4.68 | 40 | 4.43 | 100 | 4.60 |
| Lack of adequate computers | 60 | 4.82 | 40 | 4.14 | 100 | 4.74 |
| Lack of ICT technical support | 60 | 4.82 | 40 | 5.00 | 100 | 4.84 |
| Lack of ISP provider | 60 | 4.02 | 40 | 4.14 | 100 | 4.04 |
| Lack of telecom line | 60 | 3.72 | 40 | 4.00 | 100 | 3.95 |
| Lack of knowledge of internet | 60 | 3.48 | 40 | 4.00 | 100 | 3.94 |
| Lack of ICT hardware vendor | 60 | 3.16 | 40 | 3.71 | 100 | 3.23 |
| Lack of ICT software vendors | 60 | 3.02 | 40 | 3.00 | 100 | 3.01 |
| Lack of government ICT policy | 60 | 3.91 | 40 | 3.57 | 100 | 3.87 |
| Lack of electricity | 60 | 3.11 | 40 | 3.57 | 100 | 3.17 |

Table 4.11 and figure 4.2 clearly shows reason for lack of Internet connections in secondary schools. The rating ranges from 1-5 with 1 being less important and 5 being very important. The study found out that the most important reasons for lack of internet connection in 60 public schools was attributed to lack of the following factors: funds, adequate computers, ICT personnel and ISPs. The public schools expressed

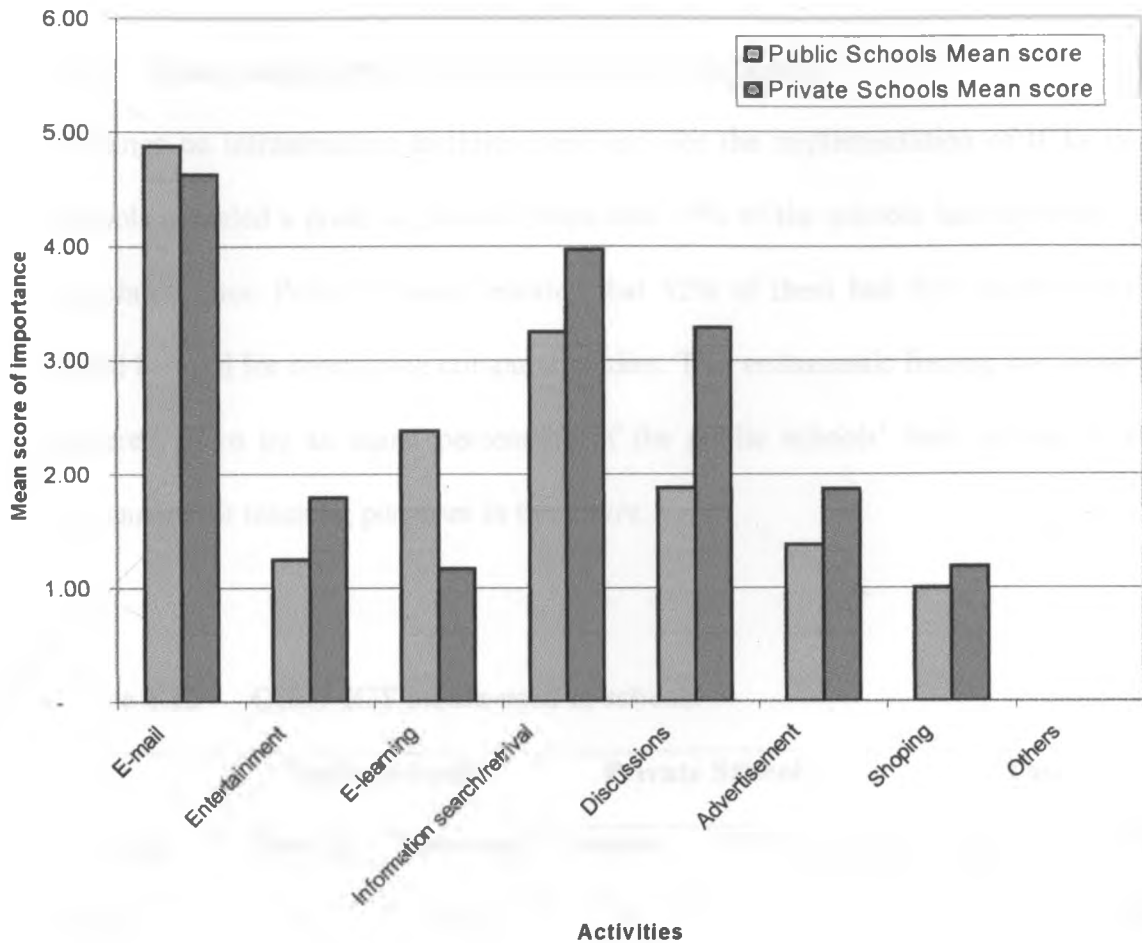
uncertainty over the effect of lack of telephones and electricity, hardware and software vendors, knowledge of the Internet and government ICT policy support on Internet Connectivity. However, the most important factors affecting connectivity were lack of funds, computers and ICT technical support whose mean scores were above 4 in both schools indicating the seriousness of the constraints.

Private schools felt that ICT support was an important prerequisite for Internet provision in schools. They were however uncertain on whether availability of hard and software vendors coupled with government policy on ICT would have a great effect on Internet connection.

4.2.6 Activities carried out through the Internet by schools

Further, the study found out that private schools considered the Internet as an important tool for accessing mails, searching and retrieving information, and discussion or chat groups. Out of a score 5, the private schools registered a mean of 3.96. Public schools reported that only mail access was an important reason for having Internet service. This shows a misplaced value by public schools on the contributions of the Internet in furthering learning.

Figure 4.2 Internet uses in schools



From the Figure 4.2 above, the Y- axis shows the mean scores from 1 to 5 where a mean score 1 means Not Important and 5 means very Important. The X- axis shows the Internet activities mainly used by the schools.

From Figure 4.2 it is shown that public schools used the Internet mostly for accessing e-mail while private schools, in addition to e-mail access, used the Internet for information search and retrieval.

4.2.7 Other infrastructure (Electricity and Telephone)

Findings on infrastructure facilities necessary for the implementation of ICTs in all schools revealed a positive picture. More than 95% of the schools had electricity and telephone lines. Public schools reported that 52% of them had free classrooms that could be used for conducting computer studies. This enthusiastic finding was however watered down by an equal percentage of the public schools' lack of plan to buy computers for teaching purposes in the future.

Table 4.12 Other ICT media used in schools

| Media | Public Schools | | Private Schools | | Total | |
|------------------------|----------------|------------|-----------------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Radio | 37 | 62% | 26 | 66% | 63 | 63% |
| Television | 15 | 24% | 30 | 75% | 45 | 45% |
| Video | 6 | 10% | 30 | 75% | 36 | 36% |
| Others - Projectors | 1 | 2% | 5 | 13% | 6 | 6% |

As shown in Table 4.12 above, 62% of 60 public schools used the radio as an alternative ICT media. This could explain why most of them do not have computers

because the radio is relatively cheaper to afford. The 40 private schools however, used a proportionate combination of nearly all other media such as radio (66%), TV (75%), video (75%) and projectors (13%). The table also shows that, on average, the degree of usage of the radio, TV, video and the projectors decline in that order basically due to affordability, versatility and other factors.

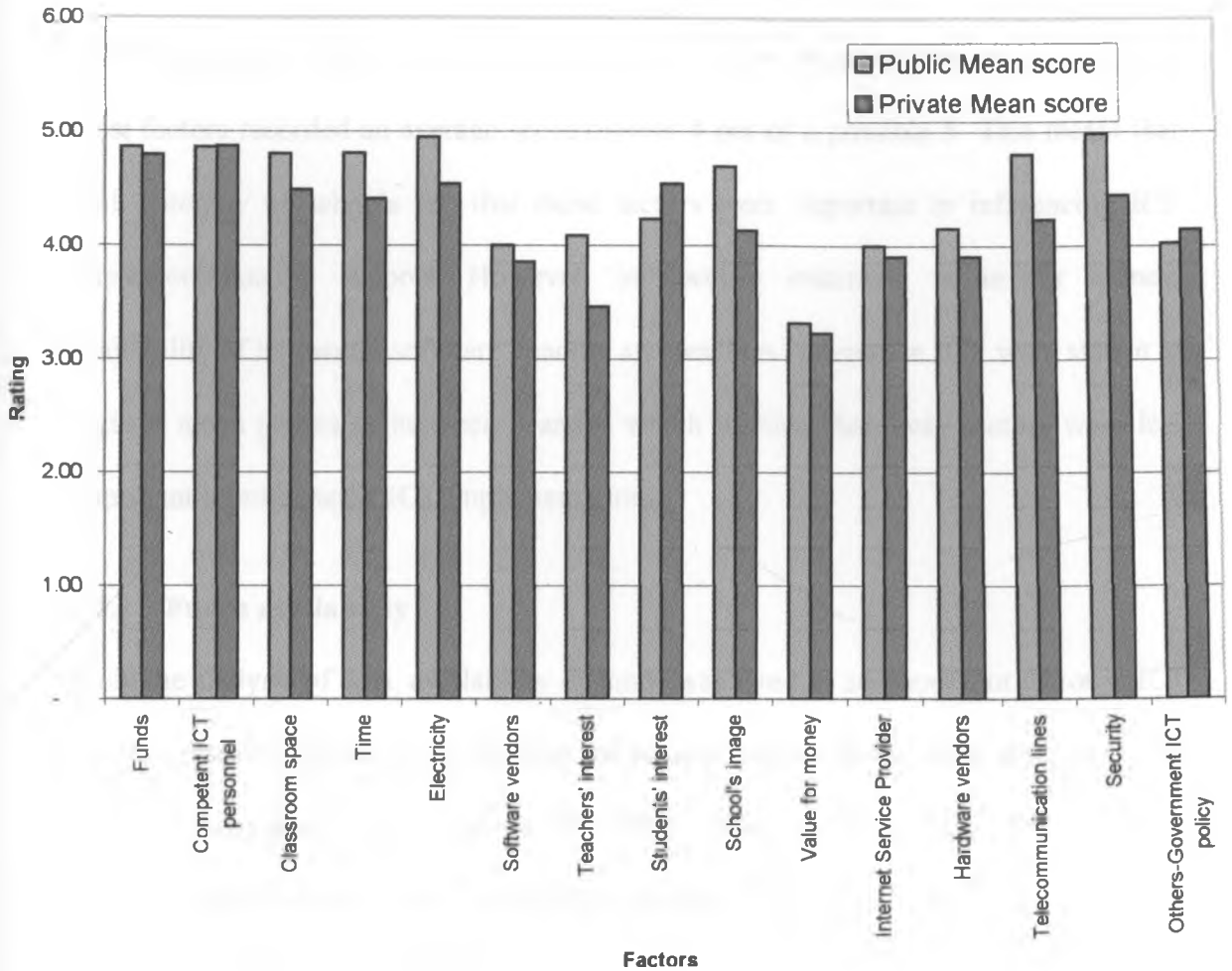
4.3 FACTORS DETERMINING ICT IMPLEMENTATION IN SCHOOLS

The research findings in this section focused on factors affecting ICT implementation in Kenyan schools as illustrated in the Table 4.13 below.

Table 4.13 Factors influencing ICT implementation in schools

| Factors | Public Schools | | Private Schools | | Total | |
|--------------------|----------------|------|-----------------|------|-----------|------|
| | Frequency | Mean | Frequency | Mean | Frequency | Mean |
| Funds Availability | 60 | 4.86 | 40 | 4.79 | 100 | 4.84 |
| ICT teacher | 60 | 4.86 | 40 | 4.87 | 100 | 4.87 |
| Classroom | 60 | 4.80 | 40 | 4.49 | 100 | 4.67 |
| Time | 60 | 4.81 | 40 | 4.41 | 100 | 4.65 |
| Electricity | 60 | 4.95 | 40 | 4.54 | 100 | 4.79 |
| Software Vendors | 60 | 4.00 | 40 | 4.05 | 100 | 3.94 |
| Teachers' interest | 60 | 4.08 | 40 | 4.46 | 100 | 3.84 |
| Student interest | 60 | 4.23 | 40 | 4.54 | 100 | 4.36 |
| School's Image | 60 | 4.13 | 40 | 4.69 | 100 | 4.47 |
| Value for money | 60 | 3.32 | 40 | 3.23 | 100 | 3.29 |
| IS Providers | 60 | 4.00 | 40 | 3.90 | 100 | 3.74 |
| Hardware Vendors | 60 | 4.15 | 40 | 3.90 | 100 | 4.05 |
| Telecommunication | 60 | 4.80 | 40 | 4.23 | 100 | 4.57 |
| Security | 60 | 4.98 | 40 | 4.44 | 100 | 4.77 |
| Government Policy | 60 | 4.02 | 40 | 4.14 | 100 | 4.06 |

Figure 4.3 Factors determining ICT implementation in schools



From the Figure 4.3 above, the Y- axis shows the mean scores from 1 to 5 where a mean score 1 means Not Important and 5 means very Important factor. The X- axis shows the factors determining ICT implementation schools.

An analysis of the Table 4.13 and figure 4.3 indicates that both schools were in agreement that the listed factors had great bearing on ICT implementation program in their schools. The rating of these factors ranged from 1-5 with 1 being less important and 5 being very important. This is evident from the mean grades shown whereby most factors recorded an average score of over 4 out of a possible 5. This meant that both category of schools felt that these factors were important in influencing ICT implementation in schools. However, in specific instances, value for money, availability of hardware/ software vendors and teachers' interest in ICT were shown to register mean grades of between 3 and 4 which implies that these factors were less important in influencing ICT implementation.

4.3.1 Funds availability

From the analysis of data, availability of funds was rated as an important factor in ICT implementation in schools. Both public and private schools had a mean score of over 4 out of a maximum of 5 respectively. Most public schools have been slow in implementing ICT compared to the private schools, which are more willing because they are well endowed with funds.

4.3.2 ICT Teacher

The mean score for the public schools on the above was 4.87 and for the private schools it was 4.84. This means that competent ICT personnel are an important determining factor in ICT implementation in schools. Public schools that largely depend on the Teachers Service Commission (TSC) for posting teachers lack competent or qualified teachers compared to private schools.

4.3.3 Classroom Space

Both public and private schools rated classroom space as an important factor (mean grade above 4). Classroom space is needed for housing of computer labs.

4.3.4 Time

Time availability is essential for the implementation of ICT in schools. When teachers and students have more workload, they have less time to implement ICT.

Availability of time was also rated as an important factor with public schools having a 4.8 mean score and private schools having 4.41 mean score. Public schools have a congested curriculum and hence lack of time to implement ICT studies.

4.3.5 Electricity

Electricity is necessary for the powering of computers and was therefore rated as an important factor by both public and private schools as shown in the mean grade 4.95 and 4.54 respectively. Electricity is viewed in terms of its availability, connection and stability and its affordability.

4.3.6 Software Vendors

In order to have effective ICT in schools, reliable software vendors are key. It was therefore noted that both public and private schools rated it as an important factor. However, private schools which have necessary resources to order these from abroad or download it from the Internet, gave it a mean score of 4.05 (important). Software are

also is viewed in terms of its availability, reliability, after sales service and credit offers and its affordability.

4.3.7 Teachers' interest

Teachers are the role models of students. Teachers' interest or attitude towards ICT is of significant importance to the implementation of ICT. For these reasons, public schools rate this factor as important with a mean score of 4.08 and private schools were undecided by rating it with a mean score of 4.46. This means teachers in private schools were interested in implementing ICT in their schools.

4.3.8 Student Interest

The main end users of ICT in schools are students and therefore their interest towards its implementation is again significant. Both Public and private schools gave this factor a mean score of over 4 which means it is important. This means students were more eager to have ICT implemented in their schools

4.3.9 Schools' Image

Implementation of ICT enhances the image of a school in today's modern society. Both public and private schools had the same view on this factor and hence gave a mean score of 4.13 and 4.69 respectively. Private schools scored high here given that they have to compete for students.

4.3.10 Value for money

ICT implementation is an investment both for the school and individual students. The money spent on it therefore is not lost and this was confirmed by both public and private schools which posted a mean score were 3.32 and 3.23 respectively.

4.3.11 Internet Service Providers (ISPs)

For the Internet users, this is quite important. The more reliable an ISP is, the more efficient it is for a school to download and to send materials through the Internet. Both school categories rated this factor as important (mean score above 4).

4.3.12 Hardware Vendors

Just like the software vendors, reliable hardware vendors are important for the implementation of ICT. Hardware vendors are needed for advice and after sales services. The rating of this factor by both categories of schools was above a mean score of 4.

4.3.13 Telecommunication Lines

For Internet use and fast communication, reliable telecommunication is important. Availability of telecommunication infrastructure both in school and outside was considered to be important. Public schools rating for this factor was 4.8, and for the private schools, it was 4.3, which means that both rated it as important.

4.3.14 Security

In order to ensure safety of both equipment and other materials using ICT, their safekeeping is important. Provision of adequate security was shown to be an important factor through the mean grades depicted above

4.3.15 Government ICT policy

Government commitment and formulation of relevant ICT policies is of significant importance to overall sustenance of the ICT program. It was therefore recorded as an important factor in speeding up ICT implementation.

4.4 RELATIVE IMPORTANCE OF FACTORS AFFECTING ICT IN SCHOOLS

Several factors were rated to determine their relative importance in so far they affect ICT implementation in Kenyan schools. . The rating ranges from 1-5 with 1 being less important and 5 being very important.

The following are findings that demonstrate what schools think are measures to be taken for the improvement of ICT implementation in their schools. The measures with a mean score of 4 and above mean that the factors are considered to be important or Very important. Table 4.14 and Figure 4.4 below shows the analysis of rated responses on factors examined.

Table 4.14 Determination of relative importance of factors affecting ICT

| Factors | Public Schools | | Private Schools | | Total | |
|----------------------------------|----------------|------|-----------------|------|-----------|------|
| | Frequency | Mean | Frequency | Mean | Frequency | Mean |
| Improvement of telecommunication | 60 | 5.00 | 40 | 4.97 | 100 | 4.84 |
| Improvement security | 60 | 4.95 | 40 | 4.56 | 100 | 4.86 |
| Provision of funds | 60 | 4.93 | 40 | 4.86 | 100 | 4.88 |
| Acquisition of computers | 60 | 4.97 | 40 | 4.87 | 100 | 4.87 |
| Appropriate programs | 60 | 4.41 | 40 | 4.18 | 100 | 4.32 |
| Subscription to relevant sites | 60 | 3.83 | 40 | 4.44 | 100 | 3.94 |
| ICT technical personnel | 60 | 4.68 | 40 | 4.23 | 100 | 4.44 |
| Training of ICT teachers | 60 | 4.66 | 40 | 4.10 | 100 | 4.36 |
| Development of ICT curriculum | 60 | 4.92 | 40 | 4.82 | 100 | 4.47 |
| Government ICT policy | 60 | 4.85 | 40 | 4.33 | 100 | 4.41 |
| Provision of web page facilities | 60 | 2.88 | 40 | 2.95 | 100 | 2.74 |
| Provision Electricity | 60 | 4.34 | 40 | 4.64 | 100 | 4.46 |
| Classroom availability | 60 | 4.90 | 40 | 4.26 | 100 | 4.57 |
| Others - Time | 60 | 4.15 | 40 | 4.44 | 100 | 4.77 |

4.4.1 Provision and improvement of telecommunication

For speedy implementation of ICT, reliable and adequate telecommunication lines need to be provided to schools. This will help greatly in Internet connectivity. Public and Private schools indicated the ranking of this factor as very important i.e. means of 5 and 4.97 respectively.

4.4.2 Improving Security

The safety of ICT equipment has to be guaranteed and therefore the improvement of security is of paramount importance as shown in the rating by both public and private schools as important (4.95 and 4.56).

4.4.3 Provision of funds

Availability of funds for construction of classrooms, purchase of ICT equipment, hiring of teachers, subscriptions, insurance and other ICT related activities was considered very important for the successful implementation of ICT in schools. This again was evident from the response of both public and private schools which gave this factor a mean score of 4 and above and which means it is important.

4.4.4 Acquisition of Computers

Successful implementation of ICT in schools involves the use of computers as a media. It therefore means that acquisition of adequate and modern computers is of

paramount importance to this goal. Both categories of schools rated this factor the same i.e. 4.93 out of 5.

4.4.5 Acquisition of appropriate programs

For the hardware to function, they need software or programs as a media of communication. Appropriate and relevant software/ programs are important as shown by the rating means of 4.41. and 4.18 for public and private schools respectively.

4.4.6 Subscription to relevant sites

Successful implementation of ICT in schools requires communication through the Internet for e- learning, retrieval of information, e- mailing etc. Educational and other relevant sites were considered to be important as shown in the mean grades above.

4.4.7 ICT Technical Personnel

To deliver ICT to schools and to maintain equipment, competent ICT personnel are required. Both categories of schools rated this factor above 4 which means it is an important factor to improve on.

4.4.8 Training of teachers

Just like technical personnel staff, continuous training of ICT teachers will ensure continuity for the program and effective service delivery. Public and private schools agreed that it was important (mean score 4.66 and 4.10) to train ICT teachers to improve on ICT implementation.

4.4.9 Development of ICT curriculum

For the improvement of ICT in schools, and especially in public schools, appropriate ICT curriculum need to be developed or enforced. This factor was again rated as important with a mean score of over 4 for both categories of schools.

4.4.10 Formulation of government policy on ICT

For standardization, clear government policies on ICT implementation need to be formulated. Because of its magnitude, both schools rated this factor as important.

4.4.11 Provision of web page facilities

The availability of this facility will help schools to develop their own home web pages which they may use to host information about their schools. Although rated by both public and private as less important perhaps due to resource constraints, it is important.

4.4.12 Provision of electricity

Just as mentioned earlier, electricity is used to power ICT equipment and its availability was considered important.

4.4.13 Classroom availability

Some public schools have not implemented ICT because they lack classroom space to use as a computer lab. The availability of the same was therefore shown as important as rated by both categories of schools.

4.4.14 Time

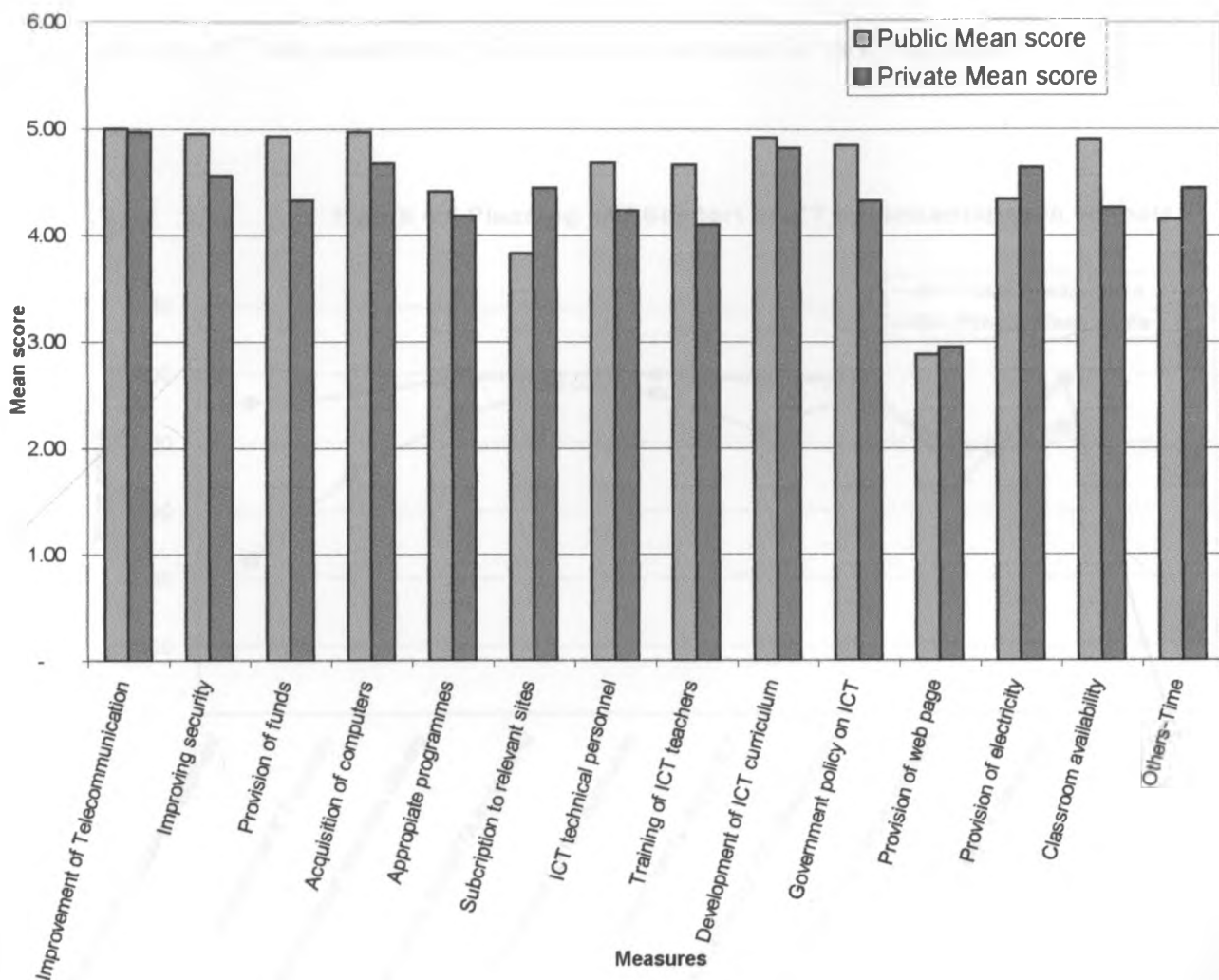
Successful implementation of ICT in schools requires adequate time. Most public schools have congested time tables because of curriculum over load. It is therefore very difficult to implement ICTs in these schools. The availability of time was therefore rated as important by both categories of schools.

Table 4.15 Rating of relative importance of factors affecting ICT

| Factors | All Schools | |
|----------------------------------|-------------|------|
| | Frequency | Mean |
| Provision of funds | 100 | 4.88 |
| Acquisition of computers | 100 | 4.87 |
| Improvement security | 100 | 4.86 |
| Improvement of telecommunication | 100 | 4.84 |
| Others - Time | 100 | 4.77 |
| Classroom availability | 100 | 4.57 |
| Development of ICT curriculum | 100 | 4.47 |
| Provision Electricity | 100 | 4.46 |
| ICT technical personnel | 100 | 4.44 |
| Government ICT policy | 100 | 4.41 |
| Training of ICT teachers | 100 | 4.36 |
| Appropriate programs | 100 | 4.32 |
| Subscription to relevant sites | 100 | 3.94 |
| Provision of web page facilities | 100 | 2.74 |

Figure 4.15 above, shows the overall summary of factors and their relative importance in ICT implementation in school. The factors are arranged in descending order with the most important at the top and least important at the bottom of the table 4.15.

Figure 4.4 Rating of measures for improvement of ICT implementation in schools

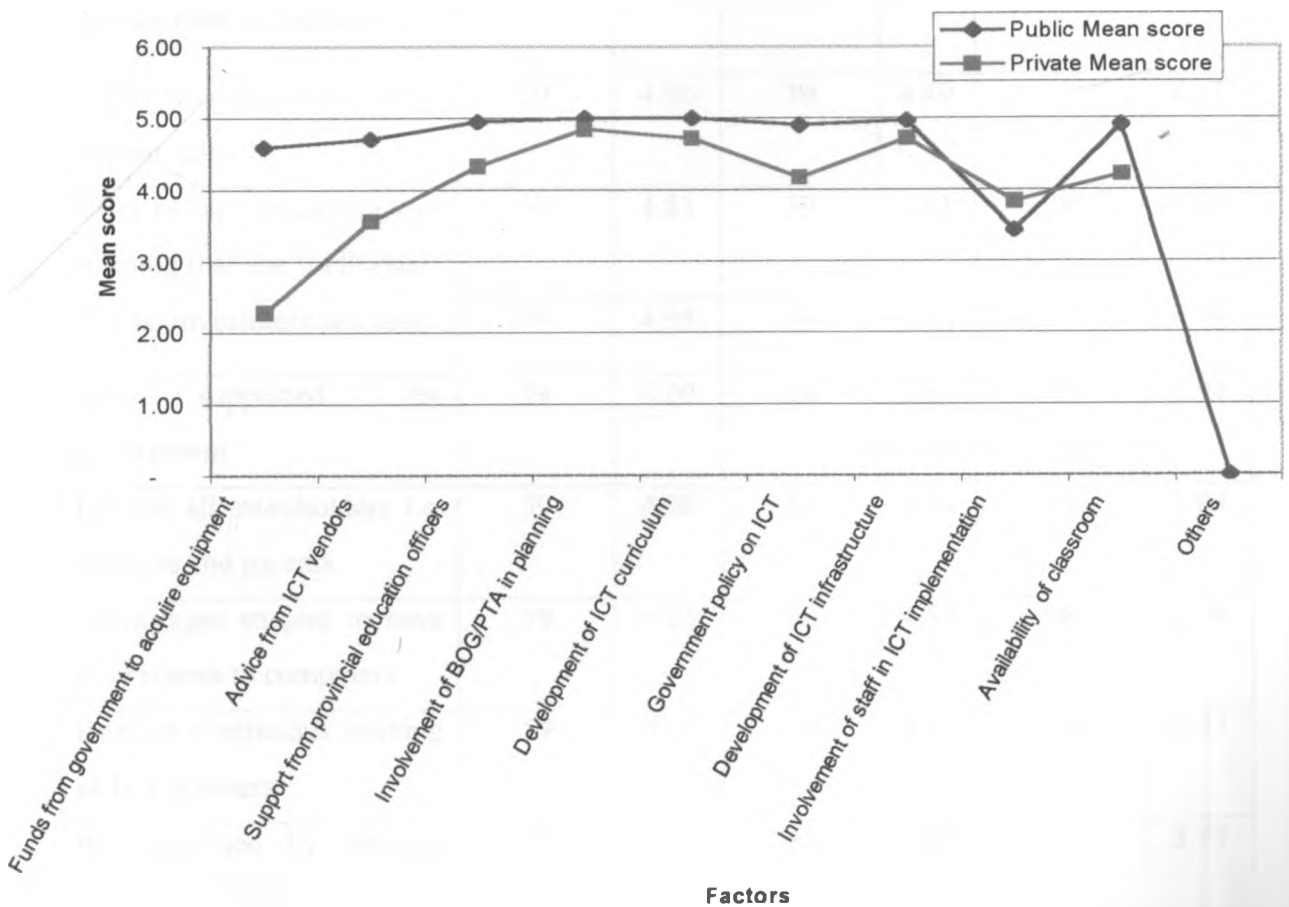


From the Figure 4.4 above, the Y- axis shows the mean scores from 1 to 5 where a mean score 1 means Not Important and 5 means very Important measures. The X- axis shows the measures to be taken so as to improve ICT implementation schools.

4.5 PLANNING AND SUPPORT OF ICT IMPLEMENTATION IN SCHOOLS

On the considerations necessary for the facilitation of planning and support of ICT implementation in schools, both private and public schools rated the following factors as important: Support from provincial education officers, involvement of stakeholders in ICT implementation, development of ICT curriculum, streamlining government policy on ICT and construction of additional classrooms for this programme.

Figure 4.5 Planning and Support of ICT implementation in schools



From the Figure 4.5 above, the Y- axis shows the mean scores from 1 to 5 where a mean score 1 means Not Important and 5 means very Important factor. The X- axis shows the factors necessary for planning and support of ICT implementation schools.

Table 4.16 Contribution of ICT in education

| Factors | Public Schools | | Private Schools | | Total | |
|---|----------------|------|-----------------|------|-----------|------|
| | Frequency | Mean | Frequency | Mean | Frequency | Mean |
| Motivates learning | 59 | 4.86 | 39 | 4.79 | 98 | 4.84 |
| Lead to personal and career development of students | 59 | 4.86 | 39 | 4.87 | 98 | 4.87 |
| Create a competence edge in their schools | 59 | 4.80 | 39 | 4.49 | 98 | 4.67 |
| Offer better methodology of learning than the traditional | 59 | 4.81 | 39 | 4.41 | 98 | 4.65 |
| ICT is investment not cost | 59 | 4.95 | 39 | 4.54 | 98 | 4.79 |
| Be supported by government | 59 | 4.00 | 39 | 3.85 | 98 | 3.94 |
| Involve all stakeholders i.e. teachers and parents | 59 | 4.08 | 39 | 3.46 | 98 | 3.84 |
| Encourages student to have easy access to computers | 59 | 4.23 | 39 | 4.54 | 98 | 4.36 |
| Require continuous training of ICT teachers | 59 | 4.69 | 39 | 4.13 | 98 | 4.47 |
| Be supported by school's top management | 59 | 3.32 | 39 | 3.23 | 98 | 3.29 |
| Students must be motivated to learn ICT | 59 | 4.00 | 39 | 3.90 | 98 | 3.74 |

Regarding the rating of the contributions that are likely to yield from implementing ICT in schools, both public and private schools strongly agreed that ICT adoption would improve the following as shown on table 4.16 above:

- Motivate learning
- Lead to personal and career development of students
- Create a competence edge in their schools
- Offer a superior methodology of learning than the traditional classroom learning
- ICT is an investment and not cost
- Be supported by government and school management
- Involve all stakeholders i.e. teachers and parents
- Encourages student to have easy access to computers
- Require continuous training of ICT teachers and,
- Students must be motivated to learn ICT.

The 60 Schools in the public sector shared most of these sentiments except for two cases where they expressed uncertainty, that is on whether or not ICT would create a competitive edge for schools and also motivate learning.

4.6 SUMMARY OF FINDINGS

This chapter provides a summary of the research findings by focusing on the general demographic factors surrounding the schools and how these contribute to the current ICT implementation status. Most public schools are either girls or boys while private schools are mostly co-educational.

Whereas almost both categories of schools have over 90% access to telephone and electricity supplies which are the basic requirements for an ICT project, over 50% of the public schools were not committed to using computers. Both public and private schools provided a proportionately higher frequency (i.e. 62% and 66% respectively) of the use of radio as an alternative ICT media because of its comparatively lower cost. Evidently, apart from several factors influencing ICT implementation, lack of funds was an over riding set back that needed prompt action by all stakeholders.

There were mixed responses from public and private schools regarding the rating of activities for which the Internet added value. Most of the findings indicated that the Internet was used mainly by students for accessing E- mail was the only important value of the Internet.

It was also apparent from the findings that both public and private schools do not understand the importance of software and hardware vendors. They also reported ignorance of government policy on Internet activities.

Both public and private schools were, however, of one resolve regarding the critical factors that are necessary for ICT implementation, measures to be taken to improve service delivery, planning and the support of ICT education.

CHAPTER FIVE

5.0 SUMMARY AND CONCLUSIONS

This chapter presents a summary of the results, conclusions, limitations and recommendations. The summary is presented herein as follows.

5.1 SUMMARY

The research findings indicate that the level of ICT implementation in schools is very low. On current ICT implementation status, it was revealed that most schools did not have computers, adequate classrooms, adequate funds, proper infrastructure and qualified staff to undertake the ICT implementation in schools. Due to curriculum overload and lack of government ICT policy in schools, most schools are slow in implementing ICT in their schools.

Some of the factors that were seen to strongly influence ICT implementation in schools were availability of funds, electricity, telecommunication, classroom space, adequate computers, trained ICT teachers, security, government policy, software, Internet Service Providers and involvement of stakeholders.

However, we can not lay all the blame on schools and the government for not doing enough. The major constraint hindering the implementation of ICT in schools is lack of sufficient funds. A considerable number of schools have classroom space and other

infrastructure requirements but they can not afford to buy computers and hire Internet services

The findings on relative importance of factors affecting ICT implementation demonstrate an equivocal support for a number of measures to be taken to improve ICT implementation in schools. Chief among these would be to provide funds for the purchase of computers, provision of software and hardware, improvement of security, training of ICT personnel for teaching and maintenance of equipment, consultation amongst key stakeholders and improvement of physical infrastructure.

5.2 CONCLUSIONS

The findings of the study indicates that implementation of ICT in Kenyan schools is quiet low. From the findings above, it can be concluded that ICT implementation in schools is more concentrated in private than in public schools. This is simply because private schools are better endowed with sufficient physical as well as economic resources necessary for the implementation of ICT in schools.

The results seem to suggest that most schools are not ready to implement ICT in their schools because of various factors.

5.3 LIMITATIONS

There were no major limitations on the study except the decline by some schools from responding to certain questions citing reasons such as confidentiality. It is possible that their participation would have resulted in more significant findings.

There was also the problem of time shortage. This resulted in some questionnaires not being properly filled.

Lastly, given the fact that ICT implementation in schools is a new field in Kenyan schools, there was no enough reference materials or literature. This prevented a higher level research.

5.4 SUGGESTIONS FOR FURTHER REASEARCH

There is little literature on ICT implementations in schools at the moment and so another study similar to this one could be carried out narrowing it down to clearly bring out the potential for implementation of ICT with respect to public and private schools. The study could also be broadened to include the primary schools and other learning institutions. To enhance the results and enrich the conclusions of such a study it would be worthwhile to also include some sections of the rural schools. The impact of specific factors such as funds, infrastructure, security, hardware and software, ISPs and ICT personnel could be studied.

The findings reveal that the current status on ICT implementation in schools is quite low especially in public schools. Further research needs to be conducted to narrow down on reasons for these discrepancies.

Further research also needs to be conducted on factors and their relative importance in ICT implementation in schools before results can be generalized.

APPENDIX

APPENDIX I: LETTER TO RESPONDENTS

OMOLLO, GEORGE
D61/P/7950/97
MBA student,
Faculty of Commerce,
University of Nairobi,
P.O. Box 30197,
Nairobi.

August 29, 2003.

Dear Sir/Madam

RE: REQUEST FOR RESEARCH DATA:

I am a postgraduate student in the faculty of commerce, University of Nairobi and pursuing a course leading to a Master of Business Administration (MBA). In partial fulfillment of the course, I am conducting a Management Research Project titled:

"Factors affecting ICT implementation in Kenyan Secondary Schools"

You are one of those selected to inform part of the study. I kindly request you to assist in completing the attached questionnaire the soonest possible and to the best of your knowledge. The questionnaire is in three parts. Section A is generally for current ICT implementation. Section B describes the equipment and physical infrastructure. Section C focuses on the factors determining ICT implementation in schools, usage of ICT i.e. use of computers for school activities, the types of school activities performed electronically, motives for involvement with ICT initiatives, and the most important impacts of ICT on school performance. It also focuses on the extent of ICT implementation, specific resources required for ICT implementation, the types of advice needed, the sources of assistance utilized, the major difficulties involved, and the measures required to improve the uptake of ICTs.

The information you give is purely for academic purposes and will therefore be treated in strict confidence. A copy of the final report will be made available to you upon request.

Your assistance and co-operation will highly be appreciated.

Thank you,

George Omolo
MBA Student

Mr. Lelei
Supervisor

APPENDIX II: DATA COLLECTION INSTRUMENT

FACTORS AFFECTING INFORMATION AND COMMUNICATION TECHNOLOGY IMPLEMENTATION IN SECONDARY SCHOOLS IN NAIROBI QUESTIONNAIRE

Section A: CURRENT ICT IMPLEMENTATION STATUS

This section captures the current status of ICT implementation in schools. Please provide appropriate responses in spaces provided.

1. Name of School _____ (Optional)

2. Which of the following best describes your school? (please tick)

- | | | | | | |
|----------|--------------------------|--------|--------------------------|-------|--------------------------|
| Girls | <input type="checkbox"/> | Boys | <input type="checkbox"/> | Mixed | <input type="checkbox"/> |
| Boarding | <input type="checkbox"/> | Day | <input type="checkbox"/> | Both | <input type="checkbox"/> |
| Private | <input type="checkbox"/> | Public | <input type="checkbox"/> | Both | <input type="checkbox"/> |

3. Indicate the numbers of students in your school as provided (tick one)

- | | |
|---------------|--------------------------|
| Less than 160 | <input type="checkbox"/> |
| 160 - 320 | <input type="checkbox"/> |
| 320 - 480 | <input type="checkbox"/> |
| 480 - 640 | <input type="checkbox"/> |
| 640 - 800 | <input type="checkbox"/> |
| Over 800 | <input type="checkbox"/> |

4. Indicate the numbers of streams you have for each class (please tick)

| | 1 | 2 | 3 | 4 | 5 | Over 5 |
|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Form One | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Form Two | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Form Three | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Form Four | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Form Five | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Form Six | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others Specify | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. Do you have a qualified computer teacher? Yes No (tick one)
 If YES, give qualification and number

| Qualification | Number |
|------------------------------|----------------------|
| Diploma <input type="text"/> | <input type="text"/> |
| Degree <input type="text"/> | <input type="text"/> |
| Others <input type="text"/> | <input type="text"/> |

Specify _____

6. Is your school planning to: (please tick)
- | | | |
|-----------------------------------|------------------------------|-----------------------------|
| Employ ICT teacher | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Re-train existing teachers in ICT | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Others | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
- Specify _____

7. Do you have computers for teaching in your school? Yes No (tick one)
 If YES, go to Q8 and NO, go to Q16

8. Please indicate the number of computers you have for teaching students as provided below (tick one)

| | |
|-------------------|----------------------|
| None | <input type="text"/> |
| Less 5 computers | <input type="text"/> |
| 5 - 10 computers | <input type="text"/> |
| 10 - 15 computers | <input type="text"/> |
| 15 - 20 computers | <input type="text"/> |
| Over 20 computers | <input type="text"/> |

9. Are there students taking computer courses in your school? Yes No (tick one)

10. If YES to Q7, how often do the students on average use the lab per week? (tick one)

| | |
|--------|----------------------|
| Never | <input type="text"/> |
| Once | <input type="text"/> |
| Twice | <input type="text"/> |
| Thrice | <input type="text"/> |
| Others | <input type="text"/> |

Specify _____

11. If YES to Q7 above, how often are the computers maintained?

| | |
|-----------------|----------------------|
| Very frequently | <input type="text"/> |
| Frequently | <input type="text"/> |
| Sometimes | <input type="text"/> |
| Seldom | <input type="text"/> |
| Not at all | <input type="text"/> |

12. If YES to Q7, is the school connencted to the Internet? Yes No (tick one)

13. If YES to Q12, how reliable is your Internet Service Provider? (tick one)

- Very reliable
- Reliable
- Uncertain
- Unreliable
- Very Unreliable

14. If YES Q12, how frequently do your students / teachers use the Internet?

- | | Students | Teachers |
|---------|--------------------------|--------------------------|
| Never | <input type="checkbox"/> | <input type="checkbox"/> |
| Monthly | <input type="checkbox"/> | <input type="checkbox"/> |
| Weekly | <input type="checkbox"/> | <input type="checkbox"/> |
| Daily | <input type="checkbox"/> | <input type="checkbox"/> |

15. If YES to Q12 above, please rate the importance of the following activities for which you use the Internet in your school.

| | Not important | Less important | Uncertain | Important | Very Important |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Email | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Entertainment/ Leisure | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E - learning | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Information search and retrieval | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Discussion/chat groups | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Advertisement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Shopping | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Specify | <hr/> | | | | |

16. If NO. to Q7 , does your school have free classroom that can be used as a computer lab?

Yes No (tick one)

17. If NO. to Q7 above, is your School planning to buy computers for teaching purposes?

Yes No (tick one)

18. If NO. to Q7 above, what media of ICT does your school use?(please tick)

| | ICT Media | Number |
|-------|--------------------------|--------------------------|
| Radio | <input type="checkbox"/> | <input type="checkbox"/> |
| TV | <input type="checkbox"/> | <input type="checkbox"/> |
| Video | <input type="checkbox"/> | <input type="checkbox"/> |

Specify _____

19. If NO to Q12 above, please rate the reasons for lack of Internet connectivity?

| | Not important | Less important | Uncertain | Important | Very Important |
|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Lack of funds | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of adequate computers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of ICT technical support | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of Internet Service Provider | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of telecommunication lines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of knowledge of Internet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of ICT hardware vendors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of ICT software vendors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of government ICT policy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of electricity | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Specify _____

20. Do you have electricity supply in your school ? Yes No

21. Do you have telephone lines in your school ? Yes No

SECTION B: THE FACTORS DETERMINING ICT IMPLEMENTATION

This section focuses on the factors determining ICT implementation in schools, adoption of ICT i.e. use of computers for school and learning activities.

22. Please rate the importance of the following factors in the implementation of ICT in your school.

| | Not important | Less important | Uncertain | Important | Very Important |
|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Funds | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Competent ICT personnel | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Classroom space | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Time | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Electricity | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Software vendors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Teachers' Interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Students' Interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| School's Image | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Value for money | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Internet service providers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hardware vendors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Telephone | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Security | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others Specify | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

SECTION C: MEASURES FOR IMPROVEMENT OF ICT IMPLEMENTATION IN SCHOOLS

23. Please rate the importance of the following measures that you would want taken so as to improve the effective implementation of ICT activities in your school.

| | Not important | Less important | Uncertain | Important | Very Important |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Provision / Improvement of telecommunications | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Improving security | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Provision of funds | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Acquisition of computers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Acquisition of appropriate programmes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Subscription to relevant sites | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ICT technical personnel | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Training for ICT teacher(s) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Development of ICT curriculum | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Formulation of appropriate Government policy on ICT | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Provision of web page facilities | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Provision of electricity | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Classrooms availability | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Specify _____

24. Please rate the extent to which factors below facilitate the planning and support of ICT implementation in your school.

| | Not important | Less important | Uncertain | Important | Very Important |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fund from government to acquire ICT equipment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Advice from ICT vendors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Support from provincial education officers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Involvement of BOG/PTA in planning | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Development of ICT curriculum | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Government policy on ICT | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Development of ICT infrastructure | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Involvement of staff in ICT Planning and Implementation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Availability of classrooms | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Specify _____

25. Please indicate by selecting your level of agreement to each of the following statements with regards to ICT implementation;

Strongly Agree Agree Undecided Disagree Strongly Disagree

• ICT implementation in schools curricula will motivate learning?

• Knowledge of ICTs in schools is important for personal and career development of students.

• ICT implementation can create a competence edge in your school

• Learning through ICT offers a better methodology of learning than traditional classroom learning.

• ICT implementation in learning institutions is an investment not a cost

• ICT implementation must be strongly supported by government

• ICT implementation in schools must involve all stakeholders i.e., teachers and parents

• ICT implementation in schools encourages students to have easy access to computers

• ICT implementation in schools requires continuous training of ICT teacher(s)

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

• ICT implementation in schools must be strongly supported by school's top management

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

• Students must be motivated to learn ICT

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

APPENDIX III - LIST OF SECONDARY SCHOOLS

| | |
|--------------------|---------------------------|
| STATE HOUSE GIRLS' | ALLIANCE BOYS |
| NAIROBI SCHOOL | OFAFA JERICHO SCHOOL |
| BURU BURU GIRLS | STAREHE BOYS |
| MOI NAIROBI GIRLS | LENANA HIGH SCHOOL |
| LANGATA SECONDARY | HIGHWAY SECONDARY |
| SUNSHINE | HOSPITAL HILL SCHOOL |
| SWEDISH SCHOOL | ST. FRANCIS GIRLS' SCHOOL |
| MILIMANI | ST. GEORGES SECONDARY |
| ALLIANCE GIRLS | JAMHURI HIGH SCHOOL |
| KENYA HIGH | MARYHILLS GIRLS SCHOOL |
| LAVINGTON | WANGUNYU HIGH SCHOOL |
| LIMURU GIRL | NGARA GIRLS' |
| PARKLAND SEC. | MANGU HIGH SCHOOL |
| COMPUERA GIRLS | BANDA SENIOR SCHOOL |
| KIANDA SCHOOL | ST HANNAS SENIOR |
| BANDA SCHOOL | AGAH KAN SCHOOL |
| ST CHRISTOPHERS | STRATHMORE |
| RUIRU | MAKINI SENIOR SCHOOL |
| MASAI GIRL | CARMELITE GIRLS' |
| ST. AUSTIN | RUSINGA SCHOOL |
| LORETO VALLEY ROAD | LORETO – MSONGARI |
| LORETO – LIMURU | BRAEBURN HIGH SCHOOL |
| HILLCREST | ARYA GIRLS |
| TALA ACADEMY | LUKENYA GIRLS |
| DANDORA SEC | EASTLEIGH SEC |
| KAMITI SEC | KANGEMI SEC |
| KAYOLE SEC | KENYA MUSLIM ACADEMY |
| AQUINAS HIGH | MAINA WANJIGI SEC |
| MOI FORCES ACADEMY | MUTHURWA SEC SCHOOL |

| | |
|--------------------------|------------------------|
| MUTUINI SEC | NAIROBI MIXED SEC |
| NAKEEL SEC | NEMBU SEC |
| NILE ROAD SECONDARY | OUR LADY OF MERCY |
| PANGANI GIRLS | PARKLANDS ARYA GIRLS |
| PRECIOUS BLOOD | PUMWANI SEC |
| RUARAKA | RUTHIMITU SEC |
| ST. TERESA'S BOYS SEC | ST. TERESA'S GIRLS SEC |
| DAGORETI HIGH | HURUMA GIRLS |
| UHURU SEC | UPPER HILL SEC |
| BURU BURU HIGH | ST. MARY'S SEC |
| S.S.D SEC | RAVALS SEC |
| EMBAKASI SEC | MARY LEAKEY GIRLS |
| WANGIGE SEC | AGA KHAN ACADEMY |
| APOSTOLIC CARMEL GIRLS | ARYA BOYS SEC |
| AUGUSTANA ACADEMY | BROOKHOUSE SCHOOLS |
| C.G.H.U GIRLS SEC | CITY HIGH SCHOOL |
| DEVONSHIRE SEC | DON BOSCO SEC |
| ELKAY HIGH | FOREST VIEW ACADEMY |
| GACHIE HIGH | GATHIGA SEC |
| GERMAN SCHOOL | GREEN ACRES SCHOOL |
| GURU NANAK SEC | HURUMA MUSLIM SEC |
| INTERNATIONAL SCHOOL E.A | INTERNAT.SCH. OF KENYA |
| KANYARIRI HIGH | KARURA SDA SEC |
| KHALSA GIRLS SEC | KIHARA SEC |
| MASA SEC | MALEZI SCHOOL |
| MILLENIUM ACADEMY | NAIROBI MUSLIM ACADEMY |
| OSHWAL HIGH | PARKVIEW ACADEMY |
| PREMIER ACADEMY | RACECOURSE ROAD SEC |
| ST. CHRISTOPHER'S SEC | ST. LUCY'S KIRIRI |
| ACADEMY | LUKENYA GIRLS |

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