UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

FRAMEWORK FOR USING ICT TO EXTEND ACCESS TO BASIC EDUCATION IN ALTERNATIVE PROVISION OF BASIC EDUCATION INSTITUTIONS IN KENYA

BY ZAMZAM S. NAWATE

A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN INFORMATION SYSTEMS OF THE UNIVERSITY OF NAIROBI

DECEMBER 2017

DECLARATION

This research project is my original work and had never been presented for any award in any university. Where the work of other authors has been used, relevant quotations have been made.

Signature _____ Date _____

ZAMZAM S. NAWATE SHIKANGA

P56/66510/2010

Supervisor's Approval

This work has been submitted as part of the fulfillment of the requirements for the award of Master of Science in Information Systems degree at the University of Nairobi with my approval as the Supervisor

Signature _____ Date _____

Dr. Elisha Opiyo

School of Computing and Informatics

University of Nairobi

DEDICATION

I dedicate this research project report to my late husband, Segun Madamidola Akinyode, a great educationist, who during his lifetime encouraged me to follow my passion for transforming the lives of many through knowledge acquisition in the smartest way possible.

ACKNOWLEDGEMENTS

I thank the Almighty for the divine intervention and massive provisions in all areas of my life and particularly during this course work period.

Great appreciation to my dear children, Juma, Zahra and Reanna for bearing with my situation the entire period. In addition, I send my gratitude to my siblings, special mention, Zurah, Zainabu and Mwanaisha, for the constant support they gave me both financially and morally. I would not forget to mention my Mama Rukia Naliaka. I thank them for their love and interminable prayers for my educational needs.

Many thanks to go to the Kibera community for cooperation and sharing the necessary information for the purpose of my research.

I also would like to pay special attributes to my supervisor Dr. Elisha Opiyo, for the professional support he accorded me without which I would not have embarked on completing this research work. He dedicated himself to ensure that I not only finish but gain both knowledge and success in this particular work.

ABSTRACT

Many studies have been conducted in the area of use of ICT in education and as a result many models, educational solutions and learning apparatus developed but still the number of children out of school in disadvantaged areas still lingers. Further studies need to be done on the best framework for use when incorporating ICT to basic education accessible to all. The study involved identifying the key enablers of the framework and show explicitly the relationships between the independent variable and the dependent variable under the moderation of moderating variables of Teacher's Attitude and Values, Supportive Community and funding model. Multiple regression analysis was used to test the relationship. The study conclusion demonstrated that technology enhanced education system and a Learning Environment namely a secure physical location and sufficient physical infrastructure, psychosocial, and effective education management system have a significant influence on expanding access to education in alternative provision of basic education institutions.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Access to basic education by everyone was declared as a basic human right (United Nations, 1956). Since then governments have been making great strides towards the achievement of that Millennium Development Goal 4 goal (United Nations MDGs) but, for many children, especially those in developing countries, this minimum right still remains a dream. According to UNESCO's *World Education Report* (2015), there are about 30 million school-aged children in sub-Saharan Africa that are out of school. The report further reveals that Inequality in education has increased, with the poorest and most disadvantaged bearing the heaviest burden. The report reveals that the world's poorest children a high likelihood not to go to school than the world's richest children, and also more likely not to complete primary school. Frequent internal and inter-border wars remains a steep barrier to education, in addition to physical access, fees and other monetary costs, poor quality of public schools, poor nutrition and health, gender and cultural values. Overall, the poor quality of learning at primary level still has millions of children leaving school without basic skills (Bunyi, G.W., 2013, UNESCO, 2015).

In Kenya, Article 43 and 53 its constitution (2010), recognizes that every person has a right to free and compulsory education. Further, the government, through it the Basic Education Act 2013, section 39 (c), the government gave the Cabinet Secretary of education the mandate to ensure that marginalized, vulnerable or disadvantaged children are not discriminated against or prevented from pursuing and completing their basic education (Kaimenyi, J.T., 2015). In response, the Ministry of Education Science and Technology (MoEST, 2009) developed a Policy on Marginalized and Vulnerable Children; National HIV and AIDS Policy; Policy Framework for Nomadic Education in Kenya and Policy framework on the Provision of Alternative Basic Education and Training (APBET) 2010, to supplement basic education and training to the disadvantaged group. According to the Ministry of Education Science and Technology of Kenya, APBET institutions encompasses Adult and Continuing

Education Centres; Non-Formal Education Learning Centres; Vocational Training Centres; and Alternative Basic Education Programmes (Non Formal Schools (NFS), Mobile Schools, Night Schools and Home Schools). It is on this principle that these framework for using ICT to extend access to basic education for the disadvantaged children is based.

To facilitate the above, in a National ICT Policy aimed at improving the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services and cascaded into the National Educational ICT Policy was launched. One of the objectives in the policy states in part "…the use of ICT in schools, colleges, universities and other educational institutions in the country so as to improve quality of teaching and learning". As such, the government, in 2013, embarked on digital literacy programme project aimed at aligning integration of ICT into teaching and learning for standard one pupils in primary schools with the aim to improvement of ICT infrastructure in schools, development of digital content, capacity building of the teachers and procurement of ICT devices.

Although the required legal framework in place as stated above, research reveals that there still lacks the understanding of the principles behind the proper use of ICT in extending access to education. In order to integrate technology in education, Squires and McDougall states that, the three-way interaction between learners, teachers, and ICT in use needs to be considered, while regarding the wider context in which teachers and learners work (Squires &McDougall, 1994). In it is on this basis that the researcher intends to identify the key enablers for the achievement of education for all.

1.2 Statement of the problem

In a Ministerial Sessional Paper of No. 14 of 2012, it was revealed that, even after the introduction of Free Primary Education (2003), there are still remain school-aged children within some Kenyan communities who have remained unreached because of various economic, cultural, social, geographical, environmental, and political reasons (Mathooko, M., 2009).

The marginalized, hard-to-reach and vulnerable groups are characterized by both high and low population concentrations, unplanned settlement, high mobility, religious/cultural obligations for the pastoralists, high levels of poverty and lack of monetary resources. In addition, schools and related facilities being far apart or overcrowded, insecurity, inadequate, few teachers, limited teaching and learning resources, poor infrastructure persist.

Children from the informal settlements, arid and semi-arid areas are unable to access the formal schools outside the settlements because of long distances, insecurity, poor health, gender and cultural values. Therefore, some form of informal schools (NFS) have been established in these areas to mitigate the gap in education to the school going age children. Even though the constitution of Kenya dictates that all school aged children should have access to free education (Wango, G.M., 2011). Children in this NFS are required to make some form of monetary contribution towards sustainability of the learning initiatives, this has complicated the matter further for those from poor households that survive on less than a dollar per day (UNESCO, 2015). The challenge is therefore how to extend access to education to informal schools that are majorly found in the marginalized areas for the disadvantaged children in Kenya. .

Considering the challenges of establishing and sustainability of more public schools in the marginalized areas, it is evidence that diverse and innovative education strategies are required to address issues affecting the disadvantaged children who rely heavy of Alternative Provision of Basic Education Training institutes (APBET. This study will, therefore, endeavor to answer the question: “what key elements should an ICT enabled education system have in order to expand access to basic education for disadvantaged children in Kenya?”

1.3 The Purpose of the study

The main purpose of this study is to identify the key components of an all-inclusive education model, using Kibera as a case study and then develop a framework for using ICT to make education accessible to Alternative Provision of Basic Education and Training institutions in Kenya.

1.4 Objective of the study

1. To identify the key elements of an ICT enabled Alternative Provision of Basic Education Training that will expand access to basic education for disadvantaged children.
2. To show the relationship between the identified key elements above and the access to basic education outcome.

1.5 Research question

The study seeks to answer four (4) Critical questions as regards the use of ICT to extend access to education to the disadvantaged

i. How can ICT extend access to education to disadvantaged children?
ii. What should education strategist consider when choosing ICT for education and training environment in order to realize the potential effectiveness of the technology?
iii. How does the way in information presented to students affect their learning ability?
iv. What factors increase the likelihood of effective use of ICT in the schooling system and improved school attendance?

1.6 Research assumptions

- That the Government adopted the following polices that informed the researcher on need of this research: Gender in Education Policy (2007); National ECDE Policy in Kenya; Special Needs Education Policy; Policy on Marginalized and Vulnerable Children; National HIV and AIDS Policy; Policy Framework for Nomadic Education in Kenya; Policy framework on the

Provision of Alternative Basic Education and Training (APBET) 2010; Sessional Paper Number 6 of 1988 on cost sharing; and Roles of stakeholders in education (2009).

- All public primary schools in the country will eventually be given funds to purchase ICTs for teaching and learning
- The findings from the study using Kibera as a case are representative of the whole country
- Willingness of the sample population to give feedback

1.7 Expected Contributions

The main contribution of the framework is to ensure standardized access, equity, quality and relevance of basic education to all despite the differences arising from the child's socioeconomic background or geographical location (Kaimenyi, J.T., 2015).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

ICT in education has been a dream for many governments across the world as a panacea to the achievement of education for all. Policies, infrastructure, as well has mobile connectivity has been put in place, Kenya not being left behind. The rapid development of ICT has facilitated education in all disciplines, hence its popularity among educators and students for various reasons such as convenience and equal opportunity. In this section, a review and highlight of works carried out by other researchers is done to try and establish gaps in ICT and equity in education. To achieve this, the literature review was undertaken under the following headings:

- Education development in Kenya
- Examples of innovative use of ICT in education across the world
- Review of existing ICT in Education Frameworks
- Conceptualization of the proposed framework

2.2 Education development System in Kenya

Education as human right is enshrined in both the Constitution of Kenya (2010) and the Kenyan law (Education Act, 2013). The government, recognizes education a panacea to developing responsible citizens and in promoting individual and collective wellbeing (Odhiambo, F. and Omoro, N., 2015). Since independence, UNESCO annual statistics reveals that Kenya is making impressive progress in education in both in terms of physical infrastructure and human capacity (UNESCO, 2015).. Between 1963 and 1983, under British-based 7-4-2-3 education structure, Kenya recorded an increase in primary education enrollment from 891,533 to 4.3 million pupils (UNESCO, 2011). In 2003, the government introduced free primary education, which so a further increase in enrollment from 5.9 million in 2002 to 8.2 million in 2007, the education structure then was that of American-based 8-4-4 (UNESCO, 2009). In addition, a further 300,000 school-aged children were enrolled in non-formal learning centres, APBET for primary education (UNESCO, 2011).

In terms of the physical Infrastructural, the total number of primary schools increased from 18,901 in 2001 to 20,229 in 2006 (UNESCO, 2008). During the same period, enrolment increased from 6.06 million to 7.63 million expressed as 107.4% gross enrolment ration (GER). There were about 179,667 primary school teachers in public primary schools as at August 2008 (Ministry of Education, 2008). Despite all the good progress illustrated, the ministry of education reports that even FPE over 1.5 million eligible children are still out of school. The arid and semi-arid (ASAL) regions of Kenya rank lowest over 50% children having never attended school (Africa Educational Trust, 2014). In slums, because they were unplanned, there are few public primary schools making many of the poorest children not to benefit from the free education. Instead, these children attend low-fee private primary schools where the quality of education is poor (Odhiambo, F. and Omoro, N., 2015).

2.3 ICTs in education

The government of Kenya, like others worldwide, view ICT programmes as one that shall transform schools from physical location to virtual hence extending boundaries of classroom to beyond the fixed time and space of a traditional schooling system (Kamindo, C.M., 2008). By adopting ICT in education, the government aims to improve quality, teachers' skills, and diversity of students and overall school management for lifetime learning (Wango, G.M., 2011).

Between 2005 and 2010, the government took lead in developing a National ICT Strategy for Education and Training (2006), establishment of a public private sector partnership framework for resource mobilization for ICT in education, increase access to ICT facilities and training on basic ICT literacy, implementation of e-schools project, develop digital content and establishment of an ICT integration team to coordinate and harmonize the implementation of ICT across the learning institutions. All these, with all that challenges that came with, is prove that the government is committed to integrating ICT in education to close the gap of inequality of opportunity in education.

Mixed mode of delivery have also been provided using ICT within the country, but limited to institutions of higher education – University of Nairobi and Kenya University. The government adopted the Kamange Report (2) of 2008 which recommended development of regulatory and legal framework for all institutions that envisage establishment of open universities/institutions in Kenya.

2.4 Examples of innovative use of ICT in education across the world

Though the ultimate outcome result of any education system the quality, accessible and equitable education, each school use different methodologies and approaches depending on resources at hand, to achieve a common outcome.. Some may offer basic services while others offer more sophisticated assistance (Klein, J., 2010). Few remarkable innovations of how ICTs is being used to offer education in Africa include:

In Institutes of Higher Education examples include University of Nairobi, Centre of Open and Distance Learning (CODL), at College of Education and External Studies (CEES), the Kenyatta University's Digital School Of Virtual & Open Learning (DSVOL) The Malawi College of Distance Education (MCDE) established study centres, The Wawasan Open University (WOU), Malaysia, The Botswana College of Distance and Open Learning (BOCODOL) ,The Open University of Tanzania (OUT), the African Medical and Research Foundation (AMREF), The African Virtual University (AVU), The National Institute of Open Schooling (NIOS), Indira Gandhi National Open University (IGNOU). All these innovations provide a good ground of best practices that that can be borrowed for implementation of the same for basic education

For elementary Schools Connectivity, the KENET school connectivity initiative (SCI) stands out (SCI). The Schools Connectivity Initiative (SCI) was launched in 2014 to coordinate the various commercial, educational and government organizations Internet access and promote the use of ICT in Kenyan schools. This aim of the initiative was towards building a sustainable National School Network across the country for quality of education at all levels and to increase access to education by transforming teaching,

learning and administration of schools in Kenya by leveraging ICTs (Technology Broadband & Education, 2013).

The above initiative has seen 141 schools (public and primary and secondary) being connected to KENET network and the Internet under the tripartite partnership agreement of WGL, Nairobi County Government and KENET. Up to 6,000 schools have been mapped up to neighborhood of KENET nodes and as of February 29, 2016, KENET had connected three secondary schools under this category using last mile Wi-Fi radio links from neighboring universities. This included Kisii School to Kisii University, Kisii County, Alliance Boys and Alliance Girls High Schools to Presbyterian University of Eastern Africa in Kiambu County.

The Communications Authority of Kenya (CA) through the Universal Service Fund (USF) intends to connect a selected set of schools in every county in an effort to bridge the national Internet access gap as highlighted in the Access Gap Study (Dymond A. & Oestmann S., 2015). It is estimated that up to 500 schools in different counties could be connected per year. Airtel is reported to have connected up to 190 schools to the Internet, mainly by providing a 3G router with a Wi-Fi access point to each of the schools (Airtel Internet for Schools).

2.5 Review of existing ICT in education frameworks

To develop the proposed framework, a literature review of existing frameworks ICT in education was undertaken as regards the use of ICT in schools, Curriculum and its impact on performance of students.

Research revealed existence of different frameworks that conceptualize the integration of ICT in teaching/learning - pedagogy. For example, Mioduser et al. (2003), Richards, C., 2006 and Graham, C.R., 2011 illustrated the factors involved in successful implementation of ICT technological pedagogy, curriculum components were illustrated by Van den Akker, (2003), learner-centric ecology of resources (Luckin, 2008), and social infrastructure (Bielaczyc, 2006).

The analysis of frameworks related to usage of ICT for learning in schools revealed the factors which affect the implementation of ICT in educational settings National Framework for Rural and Remote Education (2001) developed by the MCEETYA UNESCO ICT Competency Framework for Teachers, ICT4E, . There are also international studies such as SITESM2 (Kozma, 2003; Pelgrum, 2001) and SITES2006 (Plomp, Pelgrum, & Law, 2007).

On impact of ICT on student performance, the analysis of literature of research work by Burns & Ungerleider, 2003; Cox, 2008; Cox & Abbot, 2004; Cox & Marshall, 2007; Cox & Webb, 2004; Lai, 2008; Trucano, 2005) revealed varied effects of ICT on learnability, considerations for undertaking monitoring and impact assessments (Agodini et al., 2003; Light, 2008; Penuel, 2005; Wagner et al., 2005), reviews of programmes and cases (Bakia et al., 2009; Balanskat, Blamire, & Kefala, 2006; Culp et al., 2003), meta-analysis research (Kulik, 2003; Liao & Hao, 2008; Waxman, Lin, & Michko, 2003), studies based on large scale research design (Barrera-Osorio & Linden, 2009; Campuzano, Dynarski, Agodini, & Rall, 2009; Dynarski et al., 2007) and research methodologies about this topic (Batchelor & Norrish, 2005; Cox, 2008; Marshall & Cox, 2008; Pilkington, 2008; Reeves, 2008). Education Management Information System based on UNESCO OPEN EMIS (UNESCO, 2011)

Furthermore, it was revealed that how information is passed across does not necessarily change the message (Thurlow, Lengel, & Tomic, 2004), the method of delivery and incorporation of ICT can change the way the information is absorbed and how much of the information is retained (Gitlin, 2002). The combination of technological tools, pedagogy and innovativeness allows teachers to humanize the world for his/her students (Klein, 2010). However, too much emphasis on the ICT, rather than on the actual information, can be detrimental to a child's development, hence an emphasis on importance of the role of the teacher.

2.6 Theoretical framework of the study

The proposed Framework for Using ICT to Extend Access to Education builds on the principles and intent of four frames of reference, in chronological order, on the incorporation of information technologies and communications in education systems. The first one is the National Framework for Rural and Remote Education (2001) developed by the MCEETYA, second was presented by the UNESCO Office in Bangkok (2003), the third by the World Bank (2006) and later by the Inter-American Development Bank (2009). These frameworks were designed to enable education planners make decisions for implementing ICT based educational initiatives necessary in this digital age. Subsequently the indicators that accompanied each of these models provided the foundation for this research in the social context of the disadvantaged children in the society. Booth and Ainscow (2011, 3rd edition) summarizes inclusion in education to involve supporting everyone while making them have the sense of belonging, increasing participation for both children and adults in educational activities, relationships and communities of local schools, reducing exclusion, discrimination, barriers to education access, linking education to modern trends, acknowledging the right of children to quality and equitable education anywhere, fostering mutually sustaining relationships between schools and surrounding communities, recognizing that inclusion in education is one aspect of inclusion in society among others.

From the theoretical frameworks studied, most researchers agree that curriculum, school and external participation are the key enablers for integration of ICT in education. In this research project, the researcher compressed the three enablers to two namely technologically enhanced education system, and learning environment with moderating variables namely teacher's attitude and values, supportive community and funding model as critical enablers to extending access to education.

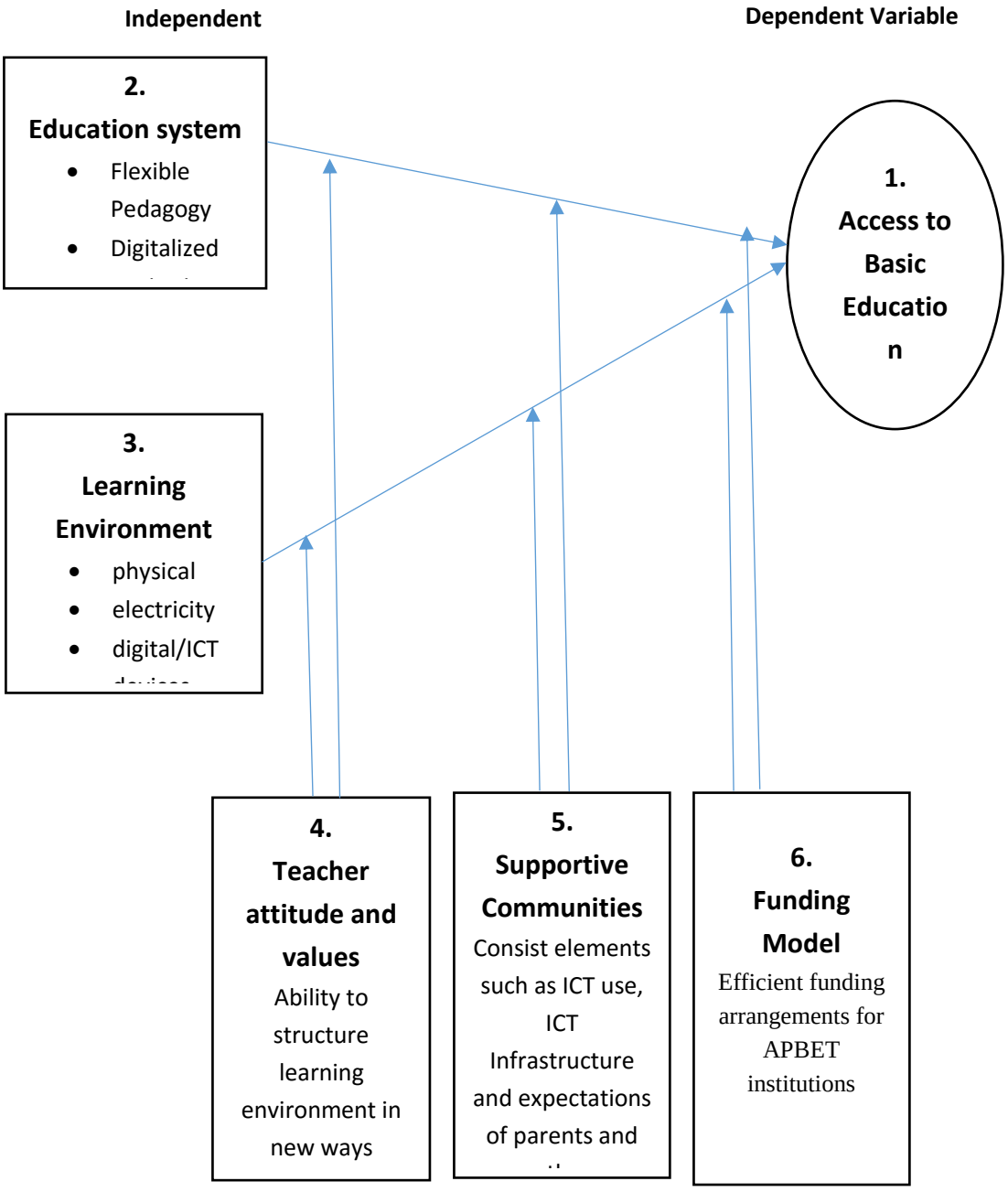
2.6 Summary of the literature review

To conclude, in Kenya as elsewhere, literature review reveals that ICT as an effective tool for making education accessible to the marginalized if well implemented and all key enablers considered. Literature reveals that the technology to be adopted should be able to central in both the delivery and content of education to cab a further digital divide. Collaborative planning of all the education stakeholders in planning and implementation is essential in order to achieve an all-inclusive education system (Odhiambo, F. and Omoro, N., 2015),

The literature review has also revealed that there lacks a concrete ICT framework for using ICT for equitable access to education to the disadvantaged n Kenya. Most of the studies reviewed were undertaken in countries that are developed or that started integrating ICT in their education much earlier than Kenya. Until the year 2010, Technology integration in education was only a policy on paper. By 2010 the ministry embarked on a pilot program of integrating ICT in secondary school education in five schools in every 210 constituencies that existed by then. The researcher, therefore, embarks on developing a framework for using ICT to extend access to basic education for disadvantaged, using Kibera, Nairobi, as a case study.

2.8Conceptual framework

The conceptual framework displaying the relationship of the variable is as shown in the diagram below.



First, the framework is intended to extend access to an inclusive education using ICT for the disadvantaged (1). The two main approaches that can influence achievement of inclusive education and as revealed by the literature are technologically enhanced education system (flexible pedagogy, digitalized content) (2), learning environment (3).

Undergirding usage of ICT's to expand access to education, are three moderating variables namely Teacher's attitude and values, supportive communities and inclusion. A scan of literature further reveals that expanded access to education will involve implementation both in school and in society at large. It has been shown that teachers' positive attitudes (4) towards using of ICT depends strongly on their experience. Teachers' attitudes can be influenced by teacher education, the availability of support within the classroom, class size and overall workload are all (Buabeng-Andoh, C., 2012). In addition to teachers, who are on weekly basis with the students for long hours, family members and communities (5) can be important resources for learning when informed, stimulated, entrusted and prepared in effective ways (Nguyen, T.X.T., 2010). In order to achieve education for all, there needs to be a workable funding model for schools in the government funding kitty (Wango, G.M., 2011).for capital development, continuous maintenance and upgrades of ICT devices to ensure continuous learning.

CHAPTER THREE:METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in the study taking into account the issues of the research design, location of the study, the target population, sampling techniques and size, study instruments, pretesting of the instruments, data collection techniques and data analysis. Lastly the ethical aspect was considered in the study as stated by Mugenda and Mugenda, 1999

3.2 Research Design

The researcher adopted cross-sectional research design, utilizing both quantitative and qualitative research methods. This research design was chosen because it is not time bound, reliance on existing differences rather than change after an intervention and the respondents were located in one area. According to Polit, Beck and Hungler (2001) this design is suitable where the data collection is done at one particular point in time. In addition cross sectional design is easy and quick in obtaining data that is amendable to statistical manipulation (Cooper & Schindler, 2001).

3.3 Population

The study area was limited to Kibera a sub county of Nairobi Area, Kenya, and neighborhood of the city of Nairobi approximately 6 kilometers' from the city Centre. Kibera is the largest slum in Nairobi, and the largest urban slum in Africa (UN Habitat, 2013). According to 2009 Kenya Population and Housing Census reports, Kibera's population is estimated to be 170,070 (KNBS, 2009).

Kibera is divided into a five administrative wards namely, sarang'ombe with a population of 28,182, Woodley/Kenyatta Golf course with a population of 35,355, Makina with a population of 25,242, Laini Saba with a population of 28,182, and Lindi with a population of 35,158 (KNBS, 2009).

3.3.1 Target Population

The target population for this study consisted school Head Teachers, Teachers, and parents in selected public and private primary schools in Kibera, Nairobi.

Head Teachers were chosen because they are pivotal to planning, implementing and evaluating ICT integration in their respective schools. Teachers play a key role in content delivery and based placed in providing relevant information about the use of ICT in teaching and learning. Parents are also important respondents in this research because they and their children are the sole beneficiaries of the outcome of accessible education, in addition play a great role in the Monitoring and evaluation of the entire education system. The Table 1 shows the target population

Table 3.1: Target Population

Category of Correspondents	Total Target Population
Head Teachers/Total No. of schools	144
Teachers	1354
Parents/Household	1800
Local Administrators/Ward	5
TOTAL	**3,303**

Source: Kibera Map and Kenya National Bureau of Statistics census report, 2009

3.4 Sample Size and sampling procedure

The study used Fishers (1961) formula to determine the sample size since the target population is below 10,000 respondents as illustrated in the table below.

3.4.1 Sampling Techniques

Stratified random sampling was used to identify the different population groups of respondents. The distribution of the four groups is as shown below:

Table 3.2: Sampling Techniques

Description	**Target**	**Sample size**	**Percentage %**
Head teachers	144	15	4
Teachers	1354	141	41
Parents	1800	187	54
Local Administrators	5	1	1
Total sample size	**3303**	344	**100**

3.5 Research Instruments

The study used a structured questionnaire and interview schedule as a research instruments for data collection. According to Riess and Bloomquist (1985) the questionnaire and interview offer considerable advantage in administration, they present stimulus potentially to large number of people simultaneously and provide the investigation with an easy accumulation of data, an interview is ideal especially when the number is small. There was questionnaire for the teachers and the parent. 3.4.1 Questionnaire.

3.5.1 Validity of the instrument.

According to Gay (1976) validity is established by expert judgment the instrument will be validated in two ways; the researcher went through the instruments to verify whether they met the set objectives as well as consulting the class lecturers. The instruments were also confirmed their validity in the piloting stage Orodho (2010). In constructing the instruments the researcher worked closely with the supervisor so as to help in validation of the instruments.

3.5.2 Reliability of the instrument/pilot study

This was established through piloting whereby one similar institution was used to determine the reliability of the instruments. The researcher administered the questionnaires herself. This enabled the researcher to correct the ambiguities that would arise with the instruments. That was done twice in a week, Orodho (2010). The questionnaire was pre-tested in the piloting stage to test the reliability. With the help of the supervisor the researcher went through the instruments before data collection process.

The researcher proceeded to collect data. Before collecting data, the researcher got permission from the college and booked an advance appointment with each head of the involved institution. It’s through the head teachers that the researcher was able to access the school parent as well as the teachers.

3.7 Data analysis

The received questionnaires were checked against the distribution list to determine the response rate. And also checked to establish whether they were correctly filled. Editing (examining raw data to detect error, omissions etc.) was done where necessary. The questionnaires were thereafter coded, classified and tabulated. The SPSS version 23 was used to analyze the data**.** The researcher used quantitative analysis after collection of data from the field. The relationship between the variables was tested using moderated multiple regression.

3.8 Ethical Consideration

The researcher obtained formal consent from any subject used in the study and ensured that all subjects participated voluntarily. The researcher fully explained the objectives of the research in advance and debriefed the subjects afterwards. Researcher accepted individual responsibility for the conduct and consequences of this research and maintained openness and honesty in dealing with research subjects.

3.9 Operational Definition of Variable

Types of variable	Indicators	Measurements	Scale	Type of Analysis	Tools of Analysis
Independent - Technology enhanced education system	Flexible pedagogy	Existence of flexible modes of content delivery	Ordinal	Quantitative	Percentage
		Skills and knowledge of the teachers	Ordinal	Quantitative	Percentage
	Digitalized Content	Availability of software for instructional purposes	Ordinal	Quantitative	Percentage
Learning Environment	Availability of Electricity	Presence of electricity	Ordinal	Quantitative	Percentage
	Availability of dedicated computing devices for pupils	Existence of digital/ICT tools for teaching and learning	Ordinal	Quantitative	Percentage
	Availability of Internet	Presence of internet connectivity	Ordinal	Quantitative	Percentage
Teachers attitude and values	No. of teachers who are ICT literate	Number of teachers trained	Nominal	Quantitative	Percentage
	Skills and knowledge of teachers	Level of interest in teachers	Ordinal	Quantitative	Percentage
Supportive community	Level of ICT awareness	Description of digital awareness of the community	Ordinal	Quantitative	Percentage
Funding Model	No of donors/sponsors	Description of financial assistance	Nominal	Quantitative	Percentage

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the output of data analysis as per the research objectives which were to define the key elements that must be present in an ICT enabled schooling system, in terms of the key enablers needed to achieve expanded access to education, to clearly outline the relationships between the expected accessible education, the educational system and learning environment supported by ICT backbone ,and teachers' attitude and values, supportive communities (which ICT use and ICT infrastructure) and funding model to facilitate the achievement of Education For All (EFA), and to establish a model for partnership and collaboration between the government and private education providers (APBET).

A cross sectional research design was used to look at the key result areas. The study targeted respondents in primary schools in Kibera constituency Nairobi County that is students through their parents, teachers, and school principals in selected public and private primary schools in Kibera, Nairobi. 344 parts of questionnaires were distributed and 297 were returned. This represented an 86.33% response rate which was considered adequate for analysis**.** The head teachers were asked to respond to the statement indicating the level of knowledge, skills and access to computer devices on a five-point Likert scale (1 – Strongly Disagree 5 –Strongly Agree) and their perception on challenges faced adoption of the ICT technology in their work environment. The findings were presented in four sections; information about the school, Use of ICT in the school, Challenges of using ICT, ICT related skills / Expertise. The other group of respondents were parents and teachers, where parents were asked to respond to statement indicating level of knowledge of the end user, "the student" on use of computer. The findings were presented in three sections; perception of the parent of use of digital / analog technology, child interest / activities and future education trends. Whereas teachers were asked to respond to statement indicating the benefits, beliefs and practice of ICT on a five-point Likert scale (1 – Strongly Disagree

5 –Strongly Agree) and their perception on challenges faced adoption of the ICT technology in their work environment

4.2 Pilot Test

The first step in the data analysis was to test the reliability and validity of data collection tool using a pilot study involving 15 respondents.

4.2.1 Reliability

Using SPSS version 23, a reliability analysis was done and an overall Cronbach's Alpha of 0.796 was obtained as shown in Table 4.1

Table 4.1: Questionnaire reliability Statistics

Cronbach's Alpha	No of Items
0.796	12

Source: Research

4.2.1 Validity

Content validity was achieved by borrowing from previous models (e.g. Newman, 2002) and seeking response from the respondents on the content of the measuring instruments. When producing the final version of the questionnaire, the remarks and recommendations of these respondents were taken into account where necessary.

Face validity was achieved by administering the questionnaire to two lower primary teachers, and two upper primary teachers with an aim of checking whether the questions were clear and in line with our research questions addressed by the research framework. Based on the reviewer's comments, necessary changes were made before the questionnaires were administered.

Construct validity was determined through correlation analysis. This was done in order to establish the degree to which two measures of the same concept correlated with each other. The results of correlation analysis for the item-total correlation for many items in most constructs were within the acceptable range (above 0.3) implying good validity of the instrument being tested.

4.2 Demographic Characteristics of Respondents

This section contains the responses pertaining to the respondents' demographic features. This was meant to establish the suitability of the respondents for the study. The section captures; level of education, type of school, financial level and the sub location of the respondent.67% of the respondents were Parents, 20% of the respondents were teachers, while 5% of the respondents were head teachers who were found to have a wide understanding the issues related to adoption of ICT in their respective work environment.

Local administrators were also considered as they are privy to the much-needed information on the extent various user have in use of ICT and how far the technology concept has covered their respective administrative units.

The respondents provided the details about their academic levels for purposes of understanding their level of understanding of ICT / use of the technology and matters pertaining to challenges encountered in use of computer devices and ICT in general. It was found out that (6%) of the respondents (Head Teachers) work in primary school which were public schools, 93% were from private schools, 1% did not indicate on the type of school though articulated they are primary school head teachers. While on parents there were varied response on level of their children in terms of education level, where 45% indicated their children are in class 6 to 7 level, 30% in class 8 level, whereas 15% are between class 4 and 5 level. From the analysis it can be concluded that most of the respondents are parents representing children interest and therefore could comprehend and respond to the research. It was important to establish the type of school the respondent works/ attended as it plays a critical role in establishing the perception of the respondent, their accessibility to the computer service and skills possess by the respondent regarding ICT use. The respondents were asked to indicate their position in their respective organization and for parents their funding model in a bid to capture the respondent financial capability, where for teachers, 65% indicated there are upper class teachers. 95% of the respondents (parents) indicated that they get funding from sponsors and cited one source as constituent development fund CDF as school funding model.

4.3 Regression Analysis

The study sought to investigate the multiple linear regression was used to investigate the relationship between access to basic education and the independent variables - technologically enhanced education system and learning environment. Moderated regression analysis was used to test the interaction effect of the moderating variables - teachers' attitude and values, supportive communities and funding model to facilitate expanded access to basic education.

4.3.1 Testing for Direct Effect using Regression Analysis

From Table 4.2, the findings revealed a significant relationship between access to basic education and the two independent variable namely technologically enhanced education system and learning environment. A regression analysis shows the interactions of the variables as access to basic education (y) =1.518093 -0.05184 technologically enhanced Education System -0.01711 Learning environment for parents and (y) =1.518093 -0.05184 technologically enhanced Education System -0.01711 Learning environment for parents while on teachers, table 4.3, the model appears as follows access to basic education (y) =1.628355 -0.29185technologically enhanced education system + 0.069838 learning environment.

Table 4.2: Regression Model Summary Output for Parents

Regression Statistics	
Multiple R	0.720032
R Square	0.518446
Adjusted R Square	0.50584
Standard Error	0.628164
Observations	187

Table 4.3: Anova Test Between Independent and Dependant Variables for Parents

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	81.14081	16.22816	41.12658	1.34E-28
Residual	191	75.3668	0.394591		
Total	196	156.5076			

Table 4.4: Multiple Regression Co-Efficient for Parents

Model	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Intercept	1.518093	0.176092	8.621047	2.51E-15
Education System	-0.05184	0.055863	-0.92803	0.0354
Learning Environment	-0.01711	0.077367	-0.22118	0.0082

- Dependent Variable: Access to Basic Education

Table 4.4 show that the two independent variables (technologically enhanced education system and learning environment) had a significant relationship with access to basic education when tested at 95% confidence level (sig < 0.05) From the regression model, table 4.2 the coefficient of determinant (R Square) which indicated the model fit revealed a relationship explains the 51.84% of variation in accessibility to basic education. A total of 187 respondents (parents were used in this analysis).

On the relationship that exist between variable 2, technologically enhanced education system in regards to access to basic education, it was observed that a unit increase in improvement of the education system will led to 0.05 unit decrease to access to basic education with a sig value of 0.0350. At a sig value of 0.0500, this finding refuted the findings of Buabeng-Andoh, C., and 2012 who indicated a positive relationship between access to basic education and teacher's attitude. This negative relationship might be attributed to the digital divide in the marginalized areas.

On the other hand on learning environment in relation to access to basic education, there existed a weak influence, with a coefficient of (-0.01711) with a sig value of 0.0080 when tested at 5% sig value. In that, a unit increase in learning environment (i.e. the physical location, electricity and digital device), will lead to o.01711 unit decrease in access to basic education. Though the findings were negative and refuting Booth, T., Ainscow, M., Black-Hawkins, K., Vaughan, M. and Shaw, L., 2002, who illustrate positive impact of learning environment to access to basic education. This can be attributed to electricity and ICT devices within the area of study.

Table 4.5: Regression model summary output for teachers

Regression Statistics	
Multiple R	0.676032
R Square	0.45702
Adjusted R Square	0.42751
Standard Error	0.487117
Observations	137

From the analysis in table 4.5, it can be clearly observed that the 2 independent variables that had a relationship explains the 67.60% of variation in accessibility to basic education. And R squared (45.70). A total of 137 teachers were used in this analysis.

Table 4.6: Anova Test Between Independent and Dependent Variables for Teachers

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	18.37405	3.67481	15.48704	4.95E-11
Residual	92	21.83003	0.237283		
Total	97	40.20408			

The F statistic of 15.48 was significant at 5% level of significance, Table 4.6.

Therefore, the independent variable have some impact on access to education.

Table 4.7: Multiple Regression Co-Efficient Output for Teachers

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.628355	0.189727	8.582639	2.18E-13
Technologically enhanced Education system	-0.29185	0.061969	-4.70957	0.0200
Learning Environment	0.069838	0.131091	0.532743	0.0500

- Dependent variable: Access to basic education

As shown in table 4.6 above, the two independent variables reveal varying coefficients (-0.29185 and 0.069838) with the p-value of all the t-tests significant at 5% hence have a positive effect on access to education outcome though weak.

4.3.2 Testing for Moderation Effects parents

Here the results of the moderators are discussed. The statistics that describe the moderating effect include the multiple R-square (R2), Significance levels and the Beta values. These values are presented for each product term that represents a moderating effect. With respect to the properties of interaction constructs, R2 measures the predictive power of the model on facilitating conditions. Beta values measures the strength of the relationship.

a. The Moderating Effects of Teacher Attitude and values (PARENTS)

Table 4.8: Moderating Effect of Teachers Attitude and Values

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.07961	0.8786	0.3031	1.7598	.0114
Technologically enhanced education system	0.05662	0.1191	0.8013	3.5457	.0201
Learning Environment	0.01195	0.1190	0.1984	1.1022	.3510
TEES_Mod_TAV	-0.2341	0.0121	-1.2881	-2.0825	.0306
LE_Mod_TAV	0.3320	0.1185	1.3030	2.0702	.0108

- Dependent Variable: Access to basic education

Where TEES_Mod_TAV = the moderating term Teachers Attitude on TEES

LE_Mod_TAV = the moderating term Teachers Attitude on LE

TEES = technologically enhanced education system

LE = Learning Environment

Table 4.9: Model Summary – Teachers Attitude for Parents

Regression Statistics	
Multiple R	0.876032
R Square	0.65702
Adjusted R Square	0.62751
Standard Error	0.387117

Table 4.9 above reveals a statistical significance interaction effect on the relationship between teachers attribute and access to education and between learning environment and access to education.

b. The Moderating Effects of Supportive Community (PARENTS)

Table 4.10: Moderating effect of supportive community

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.07961	0.8786	0.3031	1.7598	.0114
Technologically enhanced education system	0.05662	0.1191	0.8013	3.5457	.0201
Learning Environment	0.01195	0.1190	0.1984	1.1022	.3510
TEES_Mod_SC	-0.2341	0.0121	-1.2881	-2.0825	.0306
LE_Mod_SC	0.3320	0.1185	1.3030	2.0702	.0108

- Dependent Variable: Access to basic education

Where TEES_Mod_SC = the moderating term Supportive Community on TEES

LE_Mod_SC = the moderating term Supportive Community on LE

TEES = technologically enhanced education system

LE = Learning Environment

The above findings show supportive community as a moderating effect contributed to significant impact on access to education.

Table 4.11: Model Summary – supportive community for Parents

Regression Statistics	
Multiple R	0.876032
R Square	0.65702
Adjusted R Square	0.62751
Standard Error	0.387117

c. The Moderating Effects of Funding Model (PARENTS)

Table 4.12: Moderating effect of Funding Model

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.07961	0.8786	0.3031	1.7598	.0114
Technologically enhanced education system	0.05662	0.1191	0.8013	3.5457	.0201
Learning Environment	0.01195	0.1190	0.1984	1.1022	.3510
TEES_Mod_FM	-0.2341	0.0121	-1.2881	-2.0825	.0306
LE_Mod_FM	0.3320	0.1185	1.3030	2.0702	.0108

- Dependent Variable: Access to basic education

Where TEES_Mod_FM = the moderating term funding model on TEES

LE_Mod_FM = the moderating term funding model on LE

TEES = technologically enhanced education system

LE = Learning Environment

Table 4.13: Model Summary – Funding Model (Parents)

Regression Statistics	
Multiple R	0.876032
R Square	0.65702
Adjusted R Square	0.62751
Standard Error	0.387117

The figures indicate funding model moderating attribute has a statistical significance effect on the relationship between technologically enhanced education system and access to education and the learning environment and access to education.

4.3.3 Testing for Moderation Effects for teachers

a. The Moderating Effects of Teacher Attitude and values (Teachers)

Table 4.14: Moderating effect of Teachers Attitude and Values

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.02961	0.7786	0.6631	1.5598	0.0134
Technologically enhanced education system	-0.02662	0.1191	0.7013	3.5457	.0201
Learning Environment	0.21195	0.1190	0.1184	1.1022	0.3510
TEES_Mod_TAV	0.3441	0.0021	2.0881	2.0825	0.0306
LE_Mod_TAV	0.5320	0.1385	1.9030	2.0702	0.0108

- Dependent Variable: Access to basic education

Where TEES_Mod_TAV = the moderating term Teachers Attitude on TEES

LE_Mod_TAV = the moderating term Teachers Attitude on LE

TEES = technologically enhanced education system

LE = Learning Environment

The interaction terms have also contributed to the change of the explanatory power of the overall model (From 0.610 to 0.698) as reflected in the model summary table 15 below. This implies that teachers attitude and values in the case of teachers respondents has a statistical significance interaction effect on the relationship between Teachers Attitude and values variable and access to basic education and between the Learning environment variable and access to basic education.

Table 4.15: Model Summary – Teachers Attitude and Values for teachers

Regression Statistics	
Multiple R	0.816032
R Square	0.69702
Adjusted R Square	0.58751
Standard Error	0.397117

Table 4.15 above reveals a statistical significance interaction effect on the relationship between teachers attribute and access to education and between learning environment and access to education.

b. The Moderating Effects of Supportive Community (teachers)

Table 4.16: Moderating effect of supportive community

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.17961	0.8143	0.4123	0.5498	.2114
Technologically enhanced education system	0.15662	0.0243	0.9023	2.8457	.1901
Learning Environment	0.21195	0.0986	0.2142	1.0981	.5120
TEES_Mod_SC	0.5341	0.2121	1.1676	3.0986	.1406
LE_Mod_SC	0.1320	0.0185	1.003	1.9082	.1308

- Dependent Variable: Access to basic education

Where TEES_Mod_SC = the moderating term Supportive community on TEES

LE_Mod_SC = the moderating term supportive community Attitude on

TEES = technologically enhanced education system

LE = Learning Environment

Table 4.17 Model Summary – supportive community for teachers

Regression Statistics	
Multiple R	0.79032
R Square	0.56702
Adjusted R Square	0.872751
Standard Error	0.317117

Table 4.17 above reveals a statistical significance interaction effect on the relationship between teachers attribute and access to education and between learning environment and access to education.

b. The Moderating Effects of Funding Model (Teachers)

Table 4.18: Moderating effect of Funding Model

Model	**Unstandardized coefficients**		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	**Std. Error**			
(Intercept)	0.09961	0.84653	0.2986	1.7097	.0711
Technologically enhanced education system	0.17662	0.0797	1.0098	2.9857	.0321
Learning Environment	0.08765	1.9733	0.1984	1.0092	.3987
TEES_Mod_FM	1.9741	0.0003	1.0000	1.2825	.0546
LE_Mod_FM	0.0870	0.0365	1.2897	2.402	.2108

- Dependent Variable: Access to basic education

Where TEES_Mod_FM = the moderating term Funding Model on TEES

LE_Mod_FM = the moderating term Funding Model on LE

TEES = technologically enhanced education system

LE = Learning Environment

Table 4.19: Model Summary – Funding Model (Teachers)

Regression Statistics	
Multiple R	0.98651
R Square	0.73872
Adjusted R Square	0.82654
Standard Error	0.31252

Table 4.20: Summary Output for Head Teachers

The views of the head teachers were captured using correlations due to the fact that their sample size was less than 10. From the analysis, it was observed that there existed a positive relationship in all the independent variables.

	Technologically enhanced education system	Learning Environment
Intercept	1	
Teachers attitude and Values	0.333333	1
Supportive Communities	0.333333	0.333333
Funding Model	0	0.894427
Access to basic education	**-0.70711**	**0.581140**

A correlation analysis was done to establish the extent to which each independent variable impacted on the access to basic education (If *r* = +/-.1: Not at all, +/-.2: small extent, +/-. 3: moderate extent, +/-.4: large extent and +/-.5: very large extent). The correlation analysis resulted in the correlation coefficients, *r*, illustrated in above table.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, is a summary of the findings of the study based on the research objectives and conclusions from the findings. The research project was set out to identify the key elements of a framework for using ICT to. extend access to basic education in alternative provision of basic education institutions in Kenya and show the relationship of the identified elements and the intended outcome of the framework which was access to basic education.

5.2 Summary of the research

The study was conducted in a way that will yield result that will address the set out research objectives and offer answers the research questions as outlined below.

5.2.1 Key elements of the framework

Based on the objectives, the study established that technologically enhanced education system that included the attributes of flexible pedagogy and digitalized content and learning environment that ensure secure physical location, ICT infrastructure and devices has a direct relation to expansion of access to basic education. An expanded access to basic education will greatly depend to technologically enhanced education system that utilizes flexible pedagogy to offers the pupils control over pace, place and mode of study. Further, digitalized content that will allow the pupils to access anytime from anywhere makes education available for all.

Learning environment element offers the pupils an environment that is secure with availability of modern learning and teaching devices that motivates students to engage in learning activities in class and outside class. Some of the measures identified included availability of electricity, ICT or digital devices for both teachers and pupils and instructional software for content delivery.

5.2.2 The relationship between the key enablers

On the relationship between technologically enhanced education system and learning environment on access to basic education, a direct relationship was found to exist. This can be interpreted to mean that use of ICT in education such provision of flexible pedagogy that allows a student to learn at his/her on pace from anywhere using varied modes of learning will increase the number of students accessing basic education despite their surrounding or circumstance.

On learning environment effects on access to education, means that when the environment is conducive, student will get the means to access education anytime anywhere. This therefore calls for educationist and community to provide conducive learning that eliminates the physical barriers associated with disadvantaged children.

5.2.3 Moderating effect of Teachers Attitude and Values, Supportive Community and Funding Model

The findings of this study indicates that teachers attitude towards technology enhanced education system and learning environment, supportive community and a funding model that ensure availability of learning resources all the time have a moderating effect on the relationship between technology enhanced education system and access to basic education and that between learning environment and access to basic education.

Hence, this can be means that for effective schooling system, the planners should endeavor to develop teacher's competence on ICT to boost awareness and acceptability of ICT as a tool for teaching and learning. Efforts should be made to also create computer awareness amongst the community and the government and donors to make funding provision for capital investment on ICT in education technologies and for continuous preventive maintenance and upgrades of ICT learning infrastructure.

5.3 Recommendations

In the view of the above conclusions, this study makes the following recommendations:

i) The teachers training curriculum to be improved to incorporate ICT in education modules in both theoretical lessons and practicum

ii) The government, through local authorities, to ensure that the learning environment for basic education is conducive; provision of security, modern learning facilities and technologically enhanced

iii) Government, individual APBET institutions and community should develop policies that will improve access to basic education using ICT

5.4 Limitations of the study

The major limitations of this study were

i. Majority of the stakeholders tested for this framework were from private schools in Kibera. Generalizing the results to other developing countries or to public schools might be misleading.

ii. Time constraints, the study was undertaken during election period and examination period, hence many interruptions on interview schedule. If the time duration was longer, then a bigger sample size would have been considered, hence reduced sampling error.

5.5 Suggestion for further research

The study observed that there were gaps in areas related to teacher development programmes this arose from the respondent who were interviewed and indicated that there is lack of effective teacher training curriculum. This is an implication that a further studies need to be conducted on …Effectiveness of teaching pedagogies in basic education

REFERENCES

Anderson, J. (2010). Transforming education: UNESCO Bangkok

Baines et al (1999). Learning to teach using ICT in the secondary school: Oxford University Press

Bleese& Cohen (1990). Coping with computers – an ethnographic study of primary classroom

Bonnet (1997). Readiness in adoption of ICTs in teaching

Booth, T., Ainscow, M., Black-Hawkins, K., Vaughan, M. and Shaw, L., 2002. Index for inclusion. *Bristol: Centre for Studies on Inclusive Education*.

Bork, A. (1981). Learning with computers: Oxford University Press.

Buabeng-Andoh, C., 2012. Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, *8*(1), p.136.

Bunyi, G.W., 2013. The quest for quality education: the case of curriculum innovations in Kenya. *European Journal of Training and Development*, *37*(7), pp.678-691.

Carroll, J.M. and Swatman, P.A., 2000. Structured-case: a methodological framework for building theory in information systems research. *European Journal of Information Systems*, *9*(4), pp.235-242.

Cassell, C. and Symon, G., 1994. Qualitative research in work contexts. *Qualitative methods in organizational research: A practical guide*, pp.1-13.

Chatur, M (2009). Technology Acceptance Model: Origins, Developments and Future Directions

Crawford, R. (1997). Managing Information Technology in secondary schools: Oxford University Press

Creswell, J.W., 2009. Qualitative procedures. Research design: Qualitative, quantitative, and mixed methods approaches, pp.173-202.

De Villiers, M.R., 2005, July. Three approaches as pillars for interpretive information systems research: development research, action research and grounded theory. In *Proceedings of the 2005 annual research conference of the South African institute of computer scientists and information technologists on IT research in developing countries* (pp. 142-151). South African Institute for Computer Scientists and Information Technologists.

Denzin, N.K., 2001. The reflexive interview and a performative social science. *Qualitative research*, *1*(1), pp.23-46.

Cooper & Schindler, 2001

Fluck, A.C., (2003). Integration or Transformation?

Gakuu(2006). Analysis of the factors and perceptions that influence lecturers readiness to adopt distance education and the use of ICT in teaching: the case of UoN

Gathano, J. (2009). Investigation of factors influencing use of ICT in teaching and learning in secondary schools in Thika District

Gay, L. (1992), Educational Research: Hawkridge, D (1985). New Information Technology in Education

Graham, C.R., 2011. Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, *57*(3), pp.1953-1960.

Graham, C.R., 2011. Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, *57*(3), pp.1953-1960.

Hooper, S., &Rieber, L.P. (1995). Teaching with Technology

Kaimenyi, J.T., 2015. Reforms in the Education Sector in Kenya.

Kamindo, C.M., 2008. *Instructional supervision in an era of change: policy and practice in primary education in Kenya* (Doctoral dissertation, Durham University).

Keiyoro, P. (2010). Factors influencing the effective use of ICT in teaching and learning science curriculum in Kenya secondary schools: The case of cyber and NEPAD e-schools.

Kinuthia, W., 2009. Educational development in Kenya and the role of information and communication technology. *International Journal of Education and Development using ICT*, *5*(2).

Klein, J., 2010. How to fix our schools: A manifesto by Joel Klein, Michelle Rhee and other education leaders. The Washington Post, 10.

Kumar, R. (2008). Convergence of ICT with Education: World Academy of Science, Engineering and Technology, pp 567 - 558

Littlte, J. & Pegler, C. (2007). Preparing for blended e-learning

Luckin, R., 2008. The learner centric ecology of resources: A framework for using technology to scaffold learning. *Computers & Education*, *50*(2), pp.449-462.

Maina, P.N (2005). A framework for implementation of ICT in Kenyan high schools, focusing on sustainability

Marshall, C. and Gretchen, B., 1999. Rossman.(1995). Designing qualitative research.

Mathooko, M., 2009. Actualizing free primary education in Kenya for sustainable development. The Journal of Pan African Studies, 2(8), pp.151-159.

McFarlane (1999). Information Technology and Authentic Learning:

Merriam, S.B., 2002. Introduction to qualitative research. *Qualitative research in practice: Examples for discussion and analysis*, *1*, pp.1-17.

Ministry of Education Science and Technology, GoK (2008). ICT in Education Option Paper Draft

Ministry of Information & Communication, (2006) National Information & Communications Technology (ICT) Policy.

Mugenda, O.M., 1999. Research methods: Quantitative and qualitative approaches. African Centre for Technology Studies.

Mugenda,O and Mugenda, A, (2003), Research methods

Musumba, I. (2007). Impact of management attitude on the integration of ICT in higher education instruction, a study of Makerere university and Kyambogo university. 73

Muthoni, P.M. (2005). A framework for integrating ICT in the teaching process in secondary schools in Kenya

Nangue, C.R., (2011). Guidelines for successful integration of ICT in schools in Cameroon.

Nguyen, T.X.T., 2010. Deconstructing Education for All: discourse, power and the politics of inclusion. *International Journal of Inclusive Education*, *14*(4), pp.341-355.

O'Hara, S. &McMahon, M. (2003). National Educational Technology Standards for Students: Multidisciplinary Units for Grades 68.

O"sheer. T & Self.J (1988). Learning and teaching with computers: Oxford University Press Pegler, C. & Littlejohn.A (2007). Preparing for blended learning: Oxford University Press

Odhiambo, F. and Omoro, N., 2015. Reconsidering Education for All at a time of Change: Influence of Economic Factors on access to Secondary Education in Narok County, Kenya. *International Journal for Innovation Education and Research*, *3*(12).

Omwenga, E. (2003). Modeling and Analyzing a computer mediated learning infrastructure

Orodho,J. (2005). Elements of Educational & Social Research Methods

Petty, G. (2004). Teacher Today

Richards, C., 2006. Towards an integrated framework for designing effective ICT-supported learning environments: The challenge to better link technology and pedagogy. *Technology, Pedagogy and Education*, *15*(2), pp.239-255.

Saunders et al (2009): Research methods for business students, fifth edition: Prentice Hall

Smith, J.A. ed., 2007. *Qualitative psychology: A practical guide to research methods*. Sage.

Swarts, P. &Wachira, E. M. (2010).Tanzania ICT in education: situational analysis, Global e-School and Communities Initiative.

Tubin, D., Mioduser, D., Nachmias, R. and Forkosh-Baruch, A., 2003. Domains and levels of pedagogical innovation in schools using ICT: Ten innovative schools in Israel. *Education and information technologies*, *8*(2), pp.177-145.

Tubin, D., Mioduser, D., Nachmias, R. and Forkosh-Baruch, A., 2003. Domains and levels of pedagogical innovation in schools using ICT: Ten innovative schools in Israel. *Education and information technologies*, *8*(2), pp.127-145.

Tudevdagva, U. and Hardt, W., 2013. Distance learning from Asia to the Europe. International Summerworkshop Computer Science 2013, 17, p.56.

Tudevdagva, U., Hardt, W. and Ymchmaa, A., 2013. E-education bridge between Europe and Asia-Tele Lecture. Proceedings of the e-CASE & e-Tech 2013, pp.98-105.

United Nations Educational, Scientific and Cultural Organization (UNESCO), 2011. UNESCO ICT competency framework for teachers.

Un-Habitat, 2013 Sanitation – vacutug | Participating countries"

Van den Akker, J., 2004. Curriculum perspectives: An introduction. In *Curriculum landscapes and trends* (pp. 1-10). Springer Netherlands.

Voogt, J. and Roblin, N.P., 2012. A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 44*(3), pp.299-321.

Wai-Kong et al (2009-2010). Capacity Building for ICT Integration in Education: Digital Review of Asia Pacific pp 71-72

Wango, G.M., 2011. Kenya New Constitution and Education: Education in Kenya Under the New Constitution.

Weller, M (2003). Delivering Learning on the Net

Ysseldyke, J., Krentz, J., Elliott, J., Thurlow, M., Erickson, R. and Moore, M., 1998. NCEO Framework for Educational Accountability.

APPENDICES

HEAD TEACHER/MANAGER QUESTIONNAIRE: USING ICT TO EXTEND ACCESS TO EDUCATION

A. SECTION A – GENERAL INFORMATION ABOUT THE SCHOOL

	ECDE	primary	ECDE to primary
1. What is the level f education being offered at your school?	◯	◯	◯

	Public	Private
2. Is the school public or private?	◯	◯

3. How is your school funded and at what percentage?	
a. Government (Both County and National government)	%
b. Pupil fees or levies pad by the parents	%
c. Donations, sponsorships	%
d. Others	%
Total	100%

4. How many pupils are enrolled in your school?		
	Boys	Girls
4.1 Total Enrolment		
4.2 ECDE		
4.3 Primary		

5. For each type of position listed, provide the number of staff	
5.1 School management (Principal, deputy)	
5.2 Classroom teachers	
5.3 Teacher aides (support teachers in providing instruction that are non-professional)	
5,4 Professional support staff (Librarians, ICT technicians, counselors, etc)	
5.5 Other Support Staff (Secretaries, caretakers, cleaners, gardeners etc)	

6. School Facilities. For each indicate if available or not by ticking Yes or NO		
	YES	**NO**
Does your school have electricity?		
Do you have Internet?		

Using ICT to extend access to basic education

Please react to the statements on possible obstacles/challenges that may hinder effective use of ICT o support education by indicating whether you strongly agree, Agree, Disagree or strongly disagree. Please tick (√) against each statement your best opinion.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**
a. Lack of pedagogical models on how to use ICT for learning				
b. Lack of skills/expertise to integrate ICT use into curriculum				
c. School time organization (fixed lessons time, etc.)				
d. School space organization (classroom size and furniture, etc.				
e. Pressure to prepare pupils for exams and tests				
f. Insufficient number of computers for teachers' use				
g. Insufficient number of computers for students' use				
h. Outdated computers				
i. Shortage of maintenance and technical support				
j. lack of software for instructional purposes				
k. Insufficient time for teachers to prepare lessons in which computers are used				
l. Difficult to integrate computers into classroom instruction practices				
m. Internet connection not available				
n. Lack of interest/willingness of teachers to use computers				
o. Teachers' lack of knowledge/skills in using computers for teaching purposes				

p. Not enough training opportunities for teachers				
q. Insufficient plans and/ or resources to prevent theft and vandalism of computers				
r. Lack or weak infrastructure (telecommunications, electricity, etc))				
s. Lack of funds for capital development				
t. Weak partnership and collaboration with the community in planning and school management				
u. Most parents are not in favor of the use of ICT at school				
v. Most teachers are not in favor of the use of ICT at school				
w. Lack of clear benefit to use ICT for teaching				
x. Using ICT in teaching and learning not being a goal in the school strategic plan				

PARENTS QUESTIONNAIRE: USING ICT TO EXTEND ACCESS TO EDUCATION

B. SECTION A – GENERAL INFORMATION

1. Which Class is your child (Children)? **Tick the box for the class(es) your child (children) is attending**

ECDE	
Nursery	
Class 1	
Class 2	
Class 3	
Class 4	
Class 5	
Class 6	
Class 7	
Class 8	

2. Which type of school does your child attend? Public ◯ Private ◯
3. Is the school(s) within Kibera Sub-county? Yes ◯ No ◯
4. If NO above, which sub- County is the school(s)?
   _____
5. Do you pay school fees? Yes ◯ No ◯
6. If NO, who is the funder? Government ◯ Donor ◯ Other
   Specify _____

Section B: Approved National Education System

7. Please react to the statements on the education system of your child/children by indicating whether you strongly agree, Agree, Disagree or strongly disagree. Please tick (√) against each statement your best opinion.

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The school is offering education and training based on an approved national standards for basic education					
The current education system is adequate for my child development					
In my child's school, teachers use computers in teaching					
ICT can contributed both to making school work more enjoyable hence improving pupils' performance					

I would like to my child to be taught with a computer even if it is complicated					
Limitations of ICT available at school and out of school is a barrier to using ICT for educational purposes					

Section C: Learning Environment (Physical, psychosocial, community, EMIS)

8. Please react to the statements by indicating whether you strongly agree, Agree, Disagree or strongly disagree with the following factors?

Factors	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
The poverty levels in this area is a barrier to adaption of ICT for education process					
Insecurity in the area poses a challenge on the security of ICT equipment in schools					
Lack of power supply in this area makes it difficult to use ICT for education purposes					
There is a need to find ways of reaching 'hard-to-reach' parents. For example, organizing family literacy and learning programmes which address how parents/community can support children's use of ICT for school work					
Significant proportion of pupils and parents now use digital tools on day to day basis and as such there is need to develop its use in education processes and in doing so address digital divide issues					

Section D: Teachers Attitude and Values

9. Are teachers properly trained in the basic IT skills? Yes [ ] No [ ]
10. Do you think teacher's capacity determines the success of ICT in education Yes [ ] No [ ]

Section E: Supportive Community

11. Please react to the statements by indicating whether you strongly agree, Agree, Disagree or strongly disagree with the following factors?

Factors	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
The community is always involved in school planning and management					
There is need to develop models of good practice in terms of school vs community partnership in education processes, if the community are in turn to model use ICT enabled lessons across the curriculum					
There is need for establishing a community centre with ICT equipment around school sites to maximise pupils' out-of-lesson access to encourage children without home based ICT to take advantages of these opportunities to use the technology outside of school					

Section F: Funding mode

12. On a scale of 1-5, kindly rate the funding model of your child school for capital development.

Factor	**Tick**
1.Perfect	
2.Good	
3.Average	
4. Poor	
5.Very poor	

TEACHERS QUESTIONNAIRE:	USING ICT TO EXTEND ACCESS TO EDUCATION

C. SECTION A – GENERAL INFORMATION ABOUT THR TEACHER

	ECDE	**Lower primary**	**Upper primary**
7. What Class do you teach?	◯	◯	◯

	Below 25	26-35	Above 35
8. What is your age bracket?	◯	◯	◯

	Male	Female
9. Gender	◯	◯

	Yes	No
10. Have you ever undertaken a training in ICT literacy	◯	◯

D. EDUCATION SYSTEM (Learning outcome, pedagogy, content)

11. To what extent do the following aspects of teaching and learning (with or without ICT) feature when teaching? Tick one box for each row

	A lot	Sometimes	A little	None
I present, demonstrate and explain to the whole class				
I support and explain things to individual students				
Students work alone at their own pace				
Students work in groups				
Students work on exercises or tasks individually at the same time				
Students give presentations to the whole class				
Students take tests and assessments				
Students participate in assessing their work				
I teach using a computing device (PC, LCD, whiteboard camera, internet etc)				
Pupils have dedicated computing devices (Tabs/Laptops)				
Pupils have access to a shared computing device				

E. LEARNING ENVIRONMENT?

12. Please indicate how much you agree or disagree with the following statements as regards o your personal beliefs and practices on teaching and learning.

		Strongly disagree	Disagree	Agree	Strongly Agree
1	The physical and technological infrastructure of ICT is a fundamental condition for implementing changes to use ICT in education				
2	schools need to have technical assistants and coordinators to maintain systems and ensure that the infrastructure remains compatible with development trends in ICT				
3	A teaching Software needs to be chosen or developed after considering the opinions and strengths of all involved, i.e teachers, students, parents and community at large				
5	Classrooms which undergo the transition stage from being traditional to being ICT-facilitated may face many pedagogical problems, such as lack of appropriate example materials, insufficient in-class practice, overloaded curriculum content, and disordered learning sequences				
6	Effective use of ICT-based assessment may play a positive role in enhancing general practices of ICT integration.				

F. Teachers Attitude and Values

13. To what extent do you disagree or agree with each of the following statements about the use of ICT at school? Indicate whether you agree or disagree.

		Strongly disagree	Disagree	Agree	Strongly Agree
1	ICT should be used for pupils to autonomously				
2	ICT use in teaching and learning positively impacts on pupils' achievement				
3	ICT use in teaching and learning is essential to prepare students to live and work in the 21st century				
5	Lack of access to computing devices				
6	Lack of training on ICT				
7	Lack of access to ICT for pupils				

G. Supportive Community

14. Please react to the statements by indicating whether you strongly agree, Agree, Disagree or strongly disagree with the following factors?

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The community is always involved in school planning and management					
There is need to develop models of good practice in terms of school vs community partnership in education processes, if the community are in turn to model use ICT enabled lessons across the curriculum					
There is need for establishing a community centre with ICT equipment around school sites to maximise pupils' out-of-lesson access to encourage children without home based ICT to take advantages of these opportunities to use the technology outside of school					

Section F: Funding mode

15. On a scale of 1-5, kindly rate the funding model of your child school for capital development.

Factor	Tick
1.Perfect	
2.Good	
3.Average	
4. Poor	
5.Very poor	

Thank you for completing this questionnaire.

Your participation is research is very much appreciated.