

**FACTORS INFLUENCING ADOPTION OF INFORMATION AND
COMMUNICATION TECHNOLOGY AMONG PUBLIC PRIMARY SCHOOL
TEACHERS FOR PROFESSIONAL TEACHER DEVELOPMENT: A CASE OF
NGOLIBA DIVISION, THIKA EAST SUB-COUNTY, KIAMBU COUNTY, KENYA**

BY

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THE REQUIREMENTS FOR THE AWARD OF MASTER IN DISTANCE
EDUCATION DEGREE OF THE UNIVERSITY OF NAIROBI**

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DECLARATION

I certify that this project report is my original work. All material that is not my work has been acknowledged. Further, I certify that the work has not been submitted and approved for the award of a degree by this or any other university.

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DEDICATION

To my family, Patience, George and Lydia, whose support was invaluable to my pursuit of education

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ABSTRACT

The purpose of the study was to describe the factors influencing adoption of information communication technology among primary school teachers for professional teacher development: a case of Ngoliba Division, Thika East Sub-County, Kiambu County, Kenya. The specific objectives were to determine the extent to which access to ICT by public primary school teachers in the district influences their adoption ICT in professional development, to establish how competence in ICT influences and teachers' adoption of ICT for professional development, to assess how leadership support influences the teachers' adoption of ICT in professional development and to determine the influence of teachers' personal characteristics on ICT adoption. This study used a mixed method design- both qualitative and quantitative methods and instruments-to measure and analyzes data. The study was carried out in Ngoliba Division, Thika East Sub-County, Kiambu County, Kenya. The target population was 214 teachers and 16 head teachers. In order to come up with a representative sample, representative samples were made in all schools through random sampling. All head teachers were views were collected using an interview schedule. The total number of teachers' questionnaires was 107, representing about 50% of the target population. Primary data was collected by means of questionnaires. This instrument was both semi-structured, that is, open-ended questions to elicit qualitative responses, and closed-ended questions to collect quantitative data. Secondary data to supplement the primary data was collected from the Thika East Sub-County headquarters in Kilimambogo. The data included the information on the District Education's efforts to implement the government ICT policy e.g. through workshops and other means of in-service training of teachers, lists of primary schools in the area, and the numbers of teachers in each school. Descriptive statistics was used in the analysis to give a summary of the analogous variables attained from the questionnaires administered. Descriptive measures, frequency distribution tables and percentages after data cleaning and classification was conducted, tabulated and also summarized were used in presenting the findings. Inferential measures were also used to test the significance of the independent variables and also determine their correlation to the dependent one, ICT adoption for TPD. The analysis of the data was done using SPSS Version 22. The measures used were simple and multiple regression, ANOVA and Chi-square. Although all the independent variables were found to be significant, the main inferences that were made included that the most influential factors were Leadership Support and Educational and Professional Qualification. In order to adopt a workable remedy, there is need to encourage head teachers to provide ICT support, give TPD added premiums to provide teachers' incentives to seek it, and accelerate ICT training with a view to making the technology more readily support teaching and learning. Other recommendations included further studies to assess teachers' inadequacies in ICT, the supply of in-service as well as pre-service skills in ICT when it comes to areas like networking, pedagogy, technical matters and social issues.

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The many advantages of the use of ICT in education cannot be overstated. Blanskat, Blamire, and Kefala (2006) conducted a study in national, international, and European schools with the aim of trying to measure the impact of ICT on students' performance. Their findings were that ICT has a positive impact on students' performance in primary schools. ICT allow for higher quality lessons through collaboration with teachers in planning (Ofsted, (2002). Students can also develop skills in writing (Lewin, et al, (2000). ICT encourages students' independent learning (Passey, 1999). In addition, many students find ICT- enhanced settings more stimulating and therefore much better than traditional classroom environments (Pedretti and Mayer-Smith (1998). It is therefore evident that ICT is recognized to have cross-curricular competencies for students and teachers alike. Indeed, in 2014, the Internet for example, celebrated its 45th birthday. Computers, only initially used by the military, and then by higher education institutions, have become familiar tools used daily by individuals across continents. The number of Internet users in the world in 1995 was approximately 16 million. In 2011, it was over 2 billion, according the International Telecommunications Union, 2011 and in 2014, 2.9 billion, that is 40.4 % of the world population compared to the 0.3% 12 years earlier. In the 21st century therefore, global knowledge, a dream only few decades earlier, has become a reality.

Despite this phenomenal growth, many parts of Africa have lagged behind the rest of the world in the use of this technology. In a speech at the University of Nairobi in 2006, Barack Obama, then a Democratic Senator, criticized African countries' adoption of technology. He gave the example of South Korea which 40 years earlier, was economically at par with

Kenya. In 2006, and maybe even now, its economy was 40 times that of Kenya! (Obama, B.- "A Honest Government-A Hopeful Future"- University of Nairobi. August 28, 2006). The purpose behind this is obviously is that in South Korea advances have been executed in all circles of life. In 1998, the quantity of Internet clients was just 7 for each 100 South Koreans. The nation lingered behind other OECD nations in PC possession. Extraordinarily, by 2005, only 7 years after the fact, South Korea built up a propelled data foundation. Every one of the 144 noteworthy urban communities and each of the 10,400 state funded schools were carefully associated. This permitted 93% of S. Korean family units to get to the Web (Oh-Seok, Hyun, 2013). In Kenya, even in the agrarian division, which is the financial backbone of the nation, innovation has discovered little entrance. Obviously that monetary development has been moderately languid. The training part has not fared any better. Mungai, M. (2010) citing Kiptalam et al (2010), watched that a noteworthy test confronting African nations has been to PCs with a proportion of one PC for each 150 understudies against contrasted with 1:15 in created nations.

For any implementation of technology to be effective, the first key step to take is to integrate it into the education sector. Educational curricula, from primary school to tertiary institutions, are implemented by teachers. With regard to ICT, important as they may be in the field of education, the unfortunate reality is that teachers have, for a variety of reasons, failed to keep pace with the development. Chenevez (2,000) explains that "... it is no easy task to prepare today's students for tomorrow's technological challenges when teachers are out of date".

In line with the Millennium Development Goals (MDGs) adopted by world leaders in 2,000, Kenya aims achieve 50% adult literacy by 2015 (Kinuthia, W., 2009). Though literacy among youth of between 15 and 24 in Kenya is one of the highest in Africa at 83.1% for males and 81.6% for females (UNICEF, 2013), to achieve the literacy level it aims for all by 2015 is indeed a daunting task. This coupled with the Free Primary Education (FPE) programme has

resulted in huge enrolments in schools, creating a big shortage of trained teachers and overcrowding in public primary schools.

It is therefore critical that many teachers are trained to implement FPE and ultimately attain Universal Primary Education (UPE) (Wanjohi, A.M.,2013). To do this cost-effectively, ICT, if properly used, can be useful. They can afford a distance education for many teachers even as they continue working (ICT Strategy for Training and Education, 2006). Primary school teachers' professional development is a matter that concerns every one of them. However, there are problems that need to be overcome. They centre on teachers' readiness to adopt ICT. Research in this area therefore needs to be carried out before embarking on ICT, which are initially costly because they are capital intensive. The country needs to be sure what the state on the ground is before coming up with the most appropriate means to use to overcome impediments to the implementation of integration of ICT in education.

1.2. Statement of the problem

Worldwide, the education sector has tended to lag behind the business sector in ICT adoption (Jarvenpaa, 1995). Indeed, according to Gubalhar (2007), though there has been massive investment in set up for the information technology, information technology equipment and training people to develop professionally to improve education in many parts of the world, its adoption in education has been limited. This happens despite the enormous flexibility and opportunities in professional development that ICT offers in pre-service and in-service training in connecting teachers to the global community, as Jung, I. (2005) shows. Since most primary schools are understaffed, the Teachers' Service Commission (T.S.C) cannot afford them study leave (Aketch, B. Simatwa, E., (2010). Those who are not trained and those who wish to further their education would therefore have to seek alternative means.

Currently, ICT plays an important role in self-paced learning (Roberts, 2003), network training (Gonzalez), and online discussion (Gonzalez 2010). ICT, because of its versatility,

convenience and cost-efficiency, would therefore be quite suitable to all stakeholders: the employers, the teachers themselves and their learners. Even if all policy and infrastructural matters were to be handled to create an enabling environment, there would still be the critical matter of teachers' adoption and readiness to adopt ICT. Mingaine, L. (2013) argues that ICT implementation is a complex, multi-faceted process involving the capabilities of teachers, the willingness of the various schools, long-term financing and curriculum restructuring. Consequently, the challenges which limit adoption need to be understood and dealt with.

In many parts of the world, primary school teachers are dealing with a 'digital' or 'net' generation, that is, children who have been born into a breath-taking world of computer-based technologies which have become commonplace (Karl et al,2012). It therefore, on that count only, makes it imperative for teachers to adopt ICT. Further, Trilling and Fadel (as cited in Karl et al, 2012) discuss the powerful forces which converge and lead to new ways of learning in the 21st century. The forces are knowledge work (the need for knowledge for successful business); thinking tools; digital lifestyles (solving everyday problems using computer-based technology); and learning research (studies on how people learn). These four drives simultaneously create the need for new ways of learning, and also supply tools, environments and guiding principles to support new learning practices.

Finally, and equally importantly, the 'net generation' may use technology without necessarily learning important skills or analyzing the complexities of what they get from technology. They therefore need teachers to help them gain important lessons technology so liberally supplies. Teachers themselves must consequently, be ready to adopt ICT, both to facilitate teaching and learning, and to guide their learners through the abundant 'maze' of information (Baurlein, M. 2008). This study therefore aims to find out what on the one hand, enables, and

on the other, hinders, the adoption of ICT among public primary school teachers. This would be important to policy implementers if they are to better adoption of ICT. With properly educated teachers the education goals such as free primary education to increase access to all and universal primary education would be more easily achieved. A practical beginning point of fully integrating ICT in education would be to have primary school teachers adopt them for their professional development.

1.3. Purpose of the study

This study sought to describe the factors influencing adoption of information communication technology among primary school teachers for teacher professional development: a case of Ngoliba Sub-County, Thika East Sub-County, Kiambu County, Kenya.

1.4. Objectives

The study will be guided by the following objectives:

- i. To determine the extent to which access to ICT by public primary school teachers in the sub-county influences their adoption ICT for Teacher Professional Development (TPD).
- ii. To establish how technical competence in ICT influences and teachers' adoption of ICT for TPD.
- iii. To assess how leadership support influences the teachers' adoption of ICT for TPD.
- iv. To determine the influence of teachers' personal characteristics on ICT adoption for TPD.

1.5. Research questions

- i. How does access to ICT influence primary school teachers' willingness to adopt the technology for Teacher Professional Development(TPD)?
- ii. How does competence in ICT determine the use and adoption of ICT for general purposes and TPD?
- iii. How does leadership support influence the teachers' willingness to adopt ICT professional TPD?
- iv. How do learners' personal characteristics such as age, gender and educational background influence adoption and/or willingness to adopt ICT for TPD?

1.6. Significance of the study

This study would be important for three reasons. The first is that it would show the level of adoption of ICT for TPD by primary school teachers in the division. The second is to establish what services, technical and infrastructural, would be needed if ICT would be used in training and professional development of teachers.

Lastly, it would evaluate the possibility of using ICT for training purposes and general teacher professional development. In short, it would guide policy makers on what structures the government needs to put in place to surmount potential ICT users' challenges and what strengths to take advantage of to establish e-learning training and career development programmes.

1.7. Delimitation of the study

Though ICT can be, and perhaps are, used by other learners such as high school leavers or even teachers, police and military officers, and civil servants, this study will restrict itself to the population of public primary school teachers in Ngoliba Division, Thika East Sub-County. There are 16 public primary schools in the district staffed by approximately 214 teachers.

It would also delimit itself to studying the adoption of ICT by the teachers for their professional development. Their general practices of usage of ICT will only serve as indicators of level of training and as measures of the potential of using them for professional development.

These restrictions are important first because then the study becomes manageable. Secondly, each group has its own uniqueness and studying more than one at the same time would require better resourced means. Thirdly, primary school teachers form the biggest block of potential ICT users. Finally, the group's position in education would be the foundation of any serious efforts of using e-learning to train staff and develop educational competencies.

1.8. Limitations of the study

The first limitation was the unwillingness of the respondents to give out information in a truthful manner. Secondly, some may not respond to the questionnaires at all. Thirdly, as some areas are difficult to access it would mean that the researcher would need more funding than initially budgeted for or anticipated.

To overcome the first challenge, the researcher would have to determine the reliability of the questionnaire. One method would be to use the internal consistency technique. To test, the re-test method of a pilot group will be used to test the validity and reliability of the instruments. To overcome the second one, the researcher would have to increase the sample sizes and eliminate any barriers that would decrease the return rate, such as by making the

questionnaires easy to answer in one sitting. To overcome the challenges of access of some areas, the researcher would have to include such contingencies in the budget.

1.9. Assumptions of the study

The first assumption is that the sample closely represents the population. The second is that the instruments used to collect the data are valid and reliable. The third assumption is that there is a certain level of adoption of ICT in the sample and hence in the population.

1.10 Definitions of significant Terms used in the study

Access: Availability of ICT facilities to teachers for Teacher Professional Development

Adoption: Regular use of ICT for general purposes and professional development by individuals

Distance Education: Learning and teaching where learners and teachers are separated by distance and/or time; gap bridged by technology

e-learning: The use of electronic technology to facilitate distance education

ICT: Information and Communication Technologies

Leadership Support: Sustained ICT backing by Head teachers, Ministry of Education and other educational administration stakeholders to public primary school teachers for TPD

Personal Characteristics: Teachers' unique personal attributes such as age, gender, educational background, and attitudes towards ICT that could determine adoption of ICT for TPD

Teacher Professional Development (TPD): Comprehensive, sustained and intensive efforts to improve teachers' and administrators' effectiveness in raising student achievement and teachers' growth

Technical and Infrastructural Services: Technical Services refers to support for maintenance and repair of technological equipment e.g. computers; infrastructural services refer the support offered to technological equipment by government and corporations to enhance connectivity

Technical Competence: Skills and ability to effectively use ICT resulting from training

Technology: Scientific knowledge and equipment used to satisfy practical needs.

1.11. Organization of the study

This study seeks to study the factors that influence of adoption of ICT among primary school teachers in Ngoliba Division, Thika East, Kiambu County for Teacher Professional Development. The statement of the problem has been highlighted and the research questions derived from the objectives of the study. The significance of the study has been shown, limitations, assumptions and delimitations of the study listed. Related literature will be reviewed and the research design and research analysis described.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

Much has been written on the determinants of adoption of ICT in Teacher Professional Development. A review such literature is therefore important to provide insights on the subject and to establish what gaps in knowledge there may be. So, in the first part of this review, what other scholars have found out on a number of factors influencing adoption of ICT worldwide will be examined. This will be followed by a review of primary literature in the same area. Some of the enabling factors, that is, those that promote adoption of ICT especially in Kenya, will then be looked into. Thirdly, the challenges which some scholars have concluded influence teachers' adoption of ICT in their professional development will be reviewed. This will be followed by the theoretical framework on which this study will be based. Finally, a conceptual framework will be drawn to visually represent the emergent picture of ideas.

2.2. General universal enabling factors of innovations

Certain conditions make it easy for technologies to be adopted. Ely (a. 1990, b.1990.), in research in Chile, Peru, and Indonesia listed eight such conditions. The first one is that potential adopters have to be dissatisfied with the status quo. They therefore feel the necessity for change. This will obviously be tied to a leadership which highlights the need hence advocating for remedies. The second one is expertise. This means that certain skills and knowledge are required by the user. These will be linked to resources, rewards, incentives, leadership and commitment. Expertise is largely determined by the third condition: resources.

These include funding, hardware, software, technical support and infrastructure. Commitment, leadership, rewards and incentives were thought to be necessary for resources to be effective.

The fourth condition they listed is time. By this they meant the prioritized allocation to make an innovation work. This was found to be linked to participation, commitment, leadership, rewards, and incentives. The last four conditions have been linked to the first four but were found to be prerequisites in their own right. They are rewards and incentives, commitment, participation, and leadership. Leadership however deserves some emphasis. Ely notes that leaders have to be competent and supportive of the project and larger organisation. This was corroborated by Wilson, Hamilton, Teslow and Cyr (1994), and Wilson and Peterson (1995) in The Peakview Project. In 1993, Peakview Elementary School Colorado started using computers instead of textbooks. Wilson and group found that educators and understudies grasped innovation and incorporated it effectively. The conditions for this achievement were that there was a strong foremost, a full-time co-ordinator, plentiful innovation and broad educator preparing.

2.2.1. Enabling and constraining factors in Kenya

Farrell (2007), in a survey on the Kenyan situation, makes the following conclusion regarding factors influencing ICT adoption and diffusion: “What rises up out of these investigations is that components are basically the same in both created and creating economies, despite the fact that they vary regarding significance relying upon which side of the 'advanced separation' they are seen from. What separate the rate of reception is not the variables affecting everything yet rather how much they have been created or are available in the nation.”

According to this report, Kenya has many enabling factors. The first and most fundamental is its policy framework contained in a modern ICT in Education Strategy and Implementation Plan. It is implanted in the ICT arrangement created through a procedure with partners. It has

costing appraisals and timetables with measured results and indicated lead organizations. The approach is actualized utilizing backing initiative. The service shows solid sense of duty regarding the significance of ICT in training.

Different components incorporate sex value; foundation and human asset limit; and community oriented systems (Kenya is very much served through The Kenya ICT Trust Fund, K.E.I., and N.I.C.E.). Financial assets from benefactors and the private division are directed through the ICT Trust Foundation while content improvement is under route in a community way among a few colleges (Avoir).

Also, the overview presumed that there is a solid conviction that fuse of ICT is basic at all levels of instruction, extending from the political to the understudy level. This finding is however not entirely steady with the conclusion came to by Wanjala, Khaemba and Mukwa (2011). These last discoveries were that instructors found the utilization of PCs "dehumanizing, segregating, and inclined to blunder and perhaps an infringement of the privilege to security". The investigation additionally noticed that educators who started utilizing PCs in their instructing, at first, felt the innovation to be excessively tedious.

At long last, it was discovered that the service perceives that appropriation of ICT should be founded on the aggregate cost of possession. Manageability procedures were in this manner being produced at neighbourhood levels through group inclusion and administration arrangement. On the other hand, the investigation demonstrated that however sexual orientation value is underlined in the ICT approach, by and by the circumstance is not agreeable. While female investment rates at essential level were at standard with those of their male partners, they declined at the optional level, and dropped significantly advance at the tertiary level.

2.2.2. Common reasons for failure of innovations

Latham (1998) investigated why innovations sometimes fail. The first reason was disenchantment and disillusionment. When projects proved more difficult than expected thus causing too much disruption and taking too much time, teachers became despondent. This supports what Ely (1990 a.1990 b.) had found out about the necessity for expertise to facilitate the success of innovations. Other reasons include innovation supporters leaving or becoming unavailable; people lacking training; and funding running out. They may also fail due to inadequate supervision and support from management. If the programmes lack accountability, they may collapse. Finally, the study concluded that when the promoters adopt a “take-it-or leave” attitude the projects may fail.

2.3. The influence of access on adoption of ICT for TPD

Physical access to ICT has been considered as a major factor influencing adoption of ICT by teachers. Consequently, physical access has attracted a great deal of research interest. Access in this study will be taken to mean availability of hardware and software, proximity to cybercafés, and connectivity to electric power and to the Internet. Buabeng Andoh (2012) concluded that if teachers cannot access computers, updated hardware and software, they obviously will not use them. Similar conclusions had been reached by reached by Plomb, Anderson, & Quale (2002). Studies by Foxey, P et al (2002) had also revealed that access has been regarded as a major barrier to adoption of ICTs.

In Kenya, Farrell (2007) found out that lack access, caused by inadequate national infrastructure, seriously constrains use of ICT in schools especially in rural areas. Unreliable access to the Internet due lack of bandwidth is a further constraint. Ojwang (2012), in a research based on Kisumu County, found out that e-learning was seriously constrained by inadequate infrastructure like electricity and computers. The problem was further compounded by power outages, unreliable internet connectivity and insufficient e-learning. The studies have enabled governments to implement policies aimed at providing ICT access

to all. It is hoped that access would guarantee use. There is evidence however that this it is not sufficient. There are additional barriers that hinder ICT use. For example, according to Local Futures Group (2001), although London was found to have the highest Internet access in the world, only 45% of all households were connected.

The net effect of access in any economy is its importance to the social and economic growth. One of the best measures of that impact is the Networked Readiness Index (N.R.I.). The index, a measure on scale of 1 for the worst and 7 for the best, is a comprehensive assessment of how prepared an economy is to apply ICT to increase productivity. It sheds light on how far respective countries have developed ICT infrastructure and indicates the extent to which ICT impacts on social and economic growth in these countries. According to the World Economic Forum 2014, compared to other parts of the world, many African countries have tended to lag behind in networked readiness, as will be shown in the following table:

Table 1: Sample of 20 out of 148 countries showing comparative ranking of Networked Readiness Index in 2013 and 2014

Country	Rank in 2014	Rank in 2013	Economy value (N.R.I)
Argentina	100	99	3.53
Algeria	129	131	2.98
Burundi	147	144	2.31
Chad	148	142	2.22
Egypt	90	80	3.71
Finland	1	1	6.04
Gabon	128	121	2.98
Ghana	96	95	3.65
Kenya	92	92	3.71
Nicaragua	124	125	3.08
Nigeria	112	113	3.31
Puerto Rico	41	36	4.54
Qatar	23	23	5.22
Singapore	2	2	5.97
South Africa	70	70	3.98
Sweden	3	3	5.93
Tanzania	125	127	3.04
Uganda	115	110	3.25
U.S.A.	7	9	5.61
Venezuela	106	108	3.39

Source: 2014 World

Economic Forum

Evidently therefore, though Kenya is not the worst rated, a lot still needs to be done in making ICT affordable to increase access to individuals, and to provide requisite infrastructure to facilitate usage.

2.4. The influence of technical competence on adoption of ICT for TPD

Studies in five European nations by Peralta and Costa (2007) demonstrated that instructors' fitness in utilizing ICT affected the utilization of the innovation in educating. This affirms what Berner (2003), Na (1993) and Summers (1990) as referred to in Bornar (2010) had closed. Identified with capability, is the thing that numerous researchers call 'self-adequacy'. Citing Bandura (1997), Buateng-Andoh (2011) characterizes as 'self-viability' as a confidence in one's own particular capacities to play out an activity to accomplish an objective. The certainty must be believed to be the consequence of specialized skill. Dedicate and Knezek (2006) demonstrate that certainty by educators to utilize PCs affected their compelling use.

Technical knowhow also has an effect on teachers' attitude towards computers. Oteawi (2002) as cited in Bordbar (2010) posits that there is evidence to show that teachers who showed negative and neutral attitudes towards integration of ICTs in education had low levels of ICT competence. In the studies by Peralta and Costa (2007), teachers with more experience with computers showed greater confidence in their ability to use computers. There was also great correlation between competence and perceptions of using computers in the classroom especially when compared to the children's perceived competence.

Wanjala, Khaemba and Mukwa (2011), in their study on ICT integration in secondary schools in Bungoma, Kenya, showed that the lack of professional development which would create familiarity with use of computers made teachers uncomfortable with using them in classroom settings. Similar findings have been reported by Buabeng-Andoh (2012), Sandholt and Reilly (2004), and Muller and his colleagues (2008).

Nyambane and Nzuki (2014) quote several scholars who have shown that computer competence is critical in ICT integration. For instance, they cite Newhouse (2002) to have discovered that educators who needed PC information and aptitudes were not eager about changes and coordination of supplementary realizing which go with utilizing PCs in instructing. Besides, they cite Jones (2004), who detailed instructors' fitness straightforwardly, impacts certainty and states of mind towards utilizing PCs in the classroom. The conclusion that can be drawn is that ICT ability is a key factor in reconciliation of ICT in learning. It is both a hindrance in its own privilege and may compound different factors too.

2.5. The influence of leadership support on adoption of ICT for TPD

ICT implementation requires strong leadership support. According to Nyambane & Nzuki (2014), various studies have shown several levels of leadership such as principal, administrative and technology leadership. Their review quotes various scholars who have shown various aspects to illustrate the importance of leadership. Yuen, Law & Chan (2003) in a study in Hong Kong found out that the school principal is the key change agent. A similar conclusion was arrived at by Wong & Li (2008). The study revealed that leadership promotion collaboration and experimentation and teachers' dedication to students centred-learning influenced ICT transformation. Ng (2008), in the review by Nyambane & Nzuki (2014), in a study of transformative leadership with 80 Singaporean secondary schools showed that transformational leadership which promotes acceptance of goals and provides support, intellectual stimulation and being an appropriate model could have influenced integration of ICT. Similarly, Afshari et al (2009) in their study in Tehran showed a strong correlation between the school head's level of transformational leadership and computer competence.

Indeed, many researchers have established that though infrastructure is important in ICT integration, the key driver of adoption is in fact leadership. It is leadership that provides the necessary vision, technical support and requisite culture, creating technological inertia that is difficult to stop. Becker (1993) notes this important role of leadership. Rieber and Welliver (1998) also recognize this. Salvano (1992) was of the view that failure or success of ICT integration depends on leadership. Dede (1992) agrees with Lockard, Abrams & Mary in that leaders' influence decisions, make decisions, and model behaviour.

2.6. The influence of attitudes on adoption of ICT for TPD

As indicated by Hew and Brush (2007); Keangwe and Onchwari, if states of mind are certain they can give helpful understanding about selection of ICT into educating and learning forms. Demici (2009) led a review on mentalities towards utilization of Geographic Information Systems in Turkey. In spite of such a hindrance as absence of programming and equipment, educators' uplifting state of mind was a huge determinant in effective joining of GIS in Geography lessons. In a comparable vein, Teo (2008) found that among enjoying, saw handiness, and behavioral expectation to utilize, instructors' states of mind towards PCs were generally noteworthy. Thus, as of now said, Wanjala, Khaemba, and Mukwa (2011) likewise reasoned that dispositions were critical variables. They discovered that however instructors did not feel that their employments were debilitated by PCs, still they felt PCs to be excessively meddlesome into people groups' protection and furthermore 'inclined to mistake.' Neil Butcher Associates (2011) in studies conducted in the United States, United Kingdom, and Australia showed that anxiety and lack of confidence made teachers feel that their technology skills lagged behind those of their students whom they regard as 'digital natives'. The fear is, however, uncalled for as the use of ICT by the youth does not necessarily translate into digital literacies adequate for educational and professional purposes. Wanjala,

Khaemba & Mukwa (2011) also found out that few teachers were willing to use ICT in their teaching. They therefore needed additional motivation and incentives to overcome the fear.

2.7. Influence of Personal Characteristics on adoption of ICT for TPD

Personal characteristics have been shown to influence adoption in a significant way. The following ones have been shown to influence ICT adoption.

2.7.1. Gender

Gender particularly has attracted a lot of research attention. Many researchers have found gender to be a predictor of ICT adoption. Stereotypic attitudes, and access, accountable to reasons of gender have been found to influence adoption. Shapka and Ferrari (2003) for example noted that more males than females were interested in ICTs. In another study, Volman and Eck (2001) found females to be more anxious and less confident in using computers for teaching and learning. Volman & van Eck, Kay, and Wozney et al (as cited in Buabeng-Andoh, 2012), male teachers used more ICT in their teaching than their female counterparts. Similarly, Karsenti, et al, (2009) showed that a similar situation prevailed in Ghana. The same study however revealed that the situation in Kenya is different. Female teachers had more ICT access than their male counterparts. The explanation for this is that there were more female teachers in urban and peri-urban areas. The areas are better equipped with ICT hence the more access by female teachers than their male counterparts, who are more likely to be in disadvantaged schools in remote areas.

2.7.2. Age

Younger people have been known to be more responsive to change than older ones. With regard to ICT adoption particularly, older teachers have tended to show anxiety, lack of confidence and competence, and even fear. Neil Butcher Associates (2011) showed that many teachers felt intimidated by their students' computer skills and in fact regard them as 'digital

natives'. However, Nyambane and Nzuki (2014) quote many studies which do not paint a clear picture on the relationship between teaching experience and teachers' use of computers in the classroom. For example, Lau and Sim (2008), in research conducted in Malaysia found older teachers richer in integrating computers than younger ones.

Reasons advanced for this were that new teachers focus more on how to use ICT instead of familiarizing themselves with the curriculum and school management than with ICT integration in teaching. In contrast, Zidon, S & Miller (2002) found little relationship between teaching experience and use of computers. This the technology in teaching, and were also more concerned, in their formative years in teaching, with contradicted what Rosen, L. D. & Maguire (1990) had concluded that experience did not eliminate phobia and so experienced teachers still showed anxiety and discomfort in using computers. This is more consistent with what Clermont and Sciatic (2005), in their study of ICT adoption among Canadian workers where it was noted that older workers had less ICT skills. There was therefore a 'generation gap' among workers and that their ICT skills decreased with an increase in age.

2.7.3. The influence of teachers' attitudes on adoption of ICT for TPD

As indicated by Hew and Brush (2007); Keangwe and Onchwari, if states of mind are sure they can give valuable knowledge about selection of ICT into educating and learning forms. Demici (2009) directed an overview on states of mind towards utilization of Geographic Information Systems in Turkey. In spite of such a boundary as absence of programming and equipment, educators' uplifting state of mind was a critical determinant in effective combination of GIS in Geography lessons. In a comparable vein, Teo (2008) found that among loving, saw handiness, and behavioral expectation to utilize, educators' states of mind towards PCs were generally huge. Correspondingly, as of now said, Wanjala, Khaemba, and

Mukwa (2011) likewise presumed that states of mind were imperative elements. They discovered that however instructors did not imagine that their employments were undermined by PCs, still they felt PCs to be excessively meddlesome into people groups' security and furthermore 'inclined to blunder.'

Neil Butcher Associates (2011) in studies conducted in the United States, United Kingdom, and Australia showed that anxiety and lack of confidence made teachers feel that their technology skills lagged behind those of their students whom they regard as 'digital natives'. The fear is, however, uncalled for as the use of ICT by the youth does not necessarily translate into digital literacies adequate for educational and professional purposes. Wanjala, Khaemba & Mukwa (2011) also found out that few teachers were willing to use ICT in their teaching. They therefore needed additional motivation and incentives to overcome the fear.

2.8. Theoretical framework

Theories of adoption and diffusion have been shown to explain factors influencing adoption and the process of diffusion of the technology:

2.8.1. Theories of adoption and diffusion

The most widely quoted theories of adoption and diffusion of innovations are by Everett Rogers, who studied the phenomena extensively. His ground-breaking work, *Diffusion of Innovations* (1962) is indeed one of the most widely quoted books in the social sciences. Rogers thought that in terms of adoption of new technologies, people can be categorized into five groups. These are innovators, who comprise 2.5% of the population, early adopters (13.5%), early majority (34%), late majority (34%), and the laggards (16%). When graphically plotted, the groups make a mathematically based Bell shape. This is known as the Individual Innovativeness theory.

Table 2: Rogers' Individual Innovativeness Theory

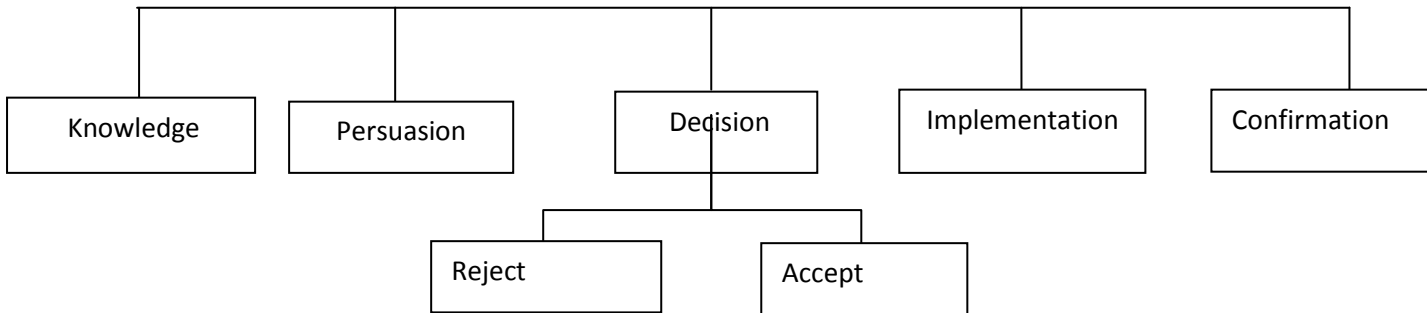
Innovators	Early adopters	Early Majority	Late majority	Laggards
2.5%	13.5%	34%	34%	16%

In terms of market share, the Diffusion of Innovations curve is typically S-shaped. This means that, initially, an innovation is accepted very slowly, and then its adoption increases before levelling off. By then, only a small percentage of laggards has not adopted it. (Rogers, 1983, 1995). This is Rogers' Rate of Adoption theory.

Another widely quoted theory by Rogers is the Innovation Decision Process theory. According to Rogers, as shown in Figure 3 on P.3, diffusion is a process with five distinct stages. They begin with Knowledge, when a potential adopter learns about the innovation. Then there is Persuasion, when one gets interested in the innovation by weighing its merits. This is followed by the Decision stage when the adopter embraces the innovation. If not persuaded, the adopter will reject it. The next stage is Implementation during which time the individual employs the innovation. The last one is Confirmation when the decision on whether to continue using it is made.

Figure 2.1. Rogers' Model of Decision Innovation Making Process

Five Stages in the Decision Innovation Process



Yet another one of Rogers' theories is the Perceived Attributes theory. A potential adopter is guided on whether to adopt an innovation or not by five attributes. They are triability; observability; relative advantage; complexity; and, compatibility.

For mnemonic purposes, these features have at times been given the acronym STORC. S stands for whether an innovation is simple enough to be understood, maintained and used. T refers to whether it can be tried on a limited basis. O means that it is best when it is observable to others and can be explained to them. R is for relative advantage, that is, is it better than others? C is for Compatibility meaning that potential adopters wish to be sure that it is consistent with their experiences and values. Wilson, B., Sherry, L., Dobrovolny, J., Batty, M. and Rider add a sixth attribute: Support. The significance of this addition will become evident later when considering Burkmann's User-Oriented Instructional Development theory and also when looking at the usefulness of the Concerns-Based Adoption model of professional development.

Different scholars have found some these attributes more significant than others. Wyne (1974) and Holloway (1977) each found relative advantage and compatibility significant determinants of adopters of instructional technology. Many though have concluded that it is important to understand the perceptions of an innovation since they impact on the rate of

adoption. Such studies include Watson (2006), Grouf and Monza (2008), Parker, Bianchi and Cheah (2008), and Ajayi (2009).

2.8.2. Instructional Technology Theory

According to Surry (1997), diffusion theories can be grouped into two: deterministic and instrumentalist. Determinists look at technology as the driving force behind change. They are either utopian or dystopian. Utopian determinists believe technology is positive and with time will solve most or all problems of humanity. Some of the better known determinists include Marshall McLuhan and Alvin Toffler. Another is Karl Marx but some scholars such as Misa (1994) question the exact nature of his philosophy. Conversely, dystopian determinists believe technology is innately evil or dehumanizing and will inevitably lead to moral, intellectual or physical destruction of humankind. A well-known theorist who holds this view is Jacques Eilus (1994). An even more dramatic one is George Orwell (1949) in his classic novel 1984.

Between the two extreme philosophies lie instrumentalists. They believe that technology is under human control and as such can either be beneficial or destructive. (Surry, 1997). Examples include Daniel Chandler, Paul Levinson and Donald Mackenzie. They take technology to be a tool which is controlled by humans for either positive or negative purposes. They also think that the growth of technology is evolutionary, occurring gradually over time, and not revolutionary, happening in a series of leaps. (Levinson,1996).

Surry goes ahead to sub-divide IT-related research into two resulting in four areas. Two of them are deterministic and developer-based, while the other two are instrumentalist, and adopter-based. Developer theories are either System Change (macro) or Product Utilization. The former focuses on maximizing efficiency, effectiveness and elegance of an innovation. The developer is primary driver of change. It is assumed that making a product superior technologically will ensure adoption since they will replace inferior ones. Examples of such

top-down efforts are the Goals 2000 (Merlinger,1995) and Instructional Development (ID) models. (Andrews and Goodison,1991).

The developer-based (deterministic) theories have however been challenged. There is wide consensus in adoption and diffusion literature that technological superiority alone does not guarantee acceptance of an innovation. Some scholars even doubt whether superiority is even a necessary condition in the first place, at least at the beginning of the process. (Mackenzie, 1996). But Surry (1997) is less critical and offers a more practical approach to the matter. He concludes thus: “Instructional technologies’ greatest challenge is not developing effective products, but developing effective products that people want to use.”

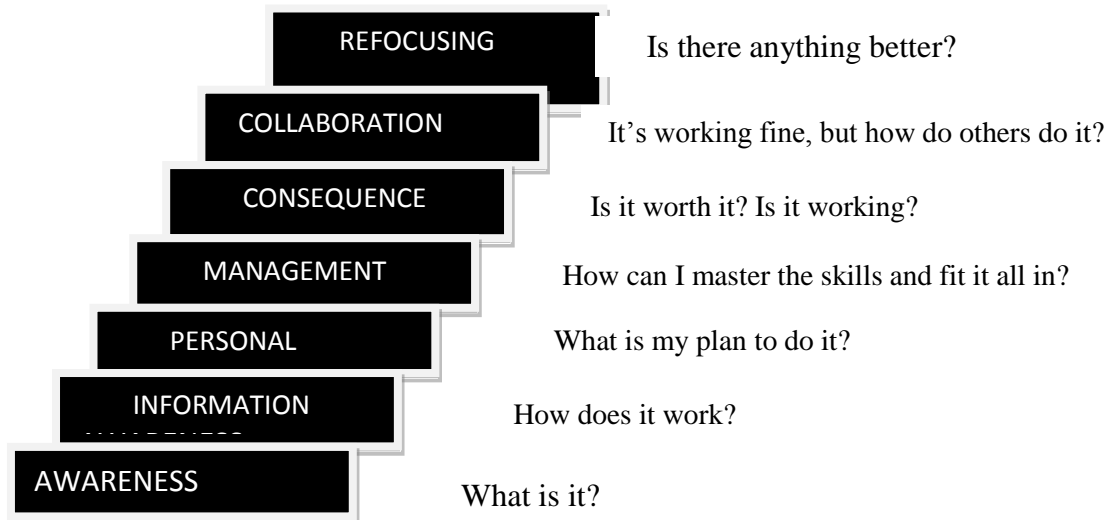
This means that the challenge needs a solution. The answer would be to adopt a more instrumentalist approach hence the Adopter-Based Theory. These theories focus on the end-user, who will ultimately implement the innovation, as the primary driver of change. They reject the assumption that change is brought about by the superiority of the products. The theories, at the macro-level, focus on the social, political, and professional environment in which the innovation will be used. At the micro-level, they consider the needs and opinions of potential adopters and characteristics of the adoption site. (Surry,1997).

Among the first Adopter-Based theorists Surry agrees with is Burkman (1987). In his theory of User-Oriented Instructional Development, Burkman recommends a five stage process of promoting adoption: Identify the potential adopter; Measure relevant adopter perceptions; Design and develop a user-friendly product; Inform the potential adopter; and Provide post-adoption support.

2.8.3. The Concerns –Based Adoption Model (CBAM)

Adoption of an innovation necessarily requires change which in turn means that the adopters go through a series of issues they get concerned about. At first, their concerns are about awareness of the new technology. Next they will turn to the technology itself and how to master using it. Eventually, they get concerned about its impact, the ways others use it, and whether there are better, more effective ones. Hull and Hord (1987); Hord Rutherford, Huling-Austin, and Hall (1987); Loucks-Housley and Stiegebauer, (1991) recognize that this applies to anyone experiencing change: policy makers, teachers, or students. One of the means of effecting the change is the Concerns-Based Adoption Model (CBAM)

The model has seven stages:



Adapted from Sweeny, B., (2008) The CBAM: A Model of the People Development Process, Best Practices Resources, 26W 413 Grand Ave. Wheaton, IL 60187 630-669-2605.

2.8.4. The ACOT Model

In the 80s and 90s, Apple Inc. used the Apple Classroom of Tomorrow (ACOT) in a number of American schools. The programme was meant to have computers replace textbooks. The enterprise at that point dispatched scientists to watch impacts of the innovation on the learning procedure. The exploration group, Sherry and her associates (2000) discovered that educators experienced five advancement stages. During the Entry Phase, teachers struggled with the technology. They however recovered from the shock in the Adoption Phase and the technology began being integrated. Next they went through the Adaptation Phase.

Though the traditional methods were still in use then, they were supported by computer activities. The next stage was the Appropriation Phase. Having more confidence, they could now use innovative teaching strategies such as team teaching, inter-disciplinary project-based instruction and self-paced learning. The last stage was the Invention Phase. It was actually more of a mindset than a phase; they could now experiment and knowledge was held as something children must construct and less as that which they needed transferred to them.

2.8.5. Application of Diffusion Theory

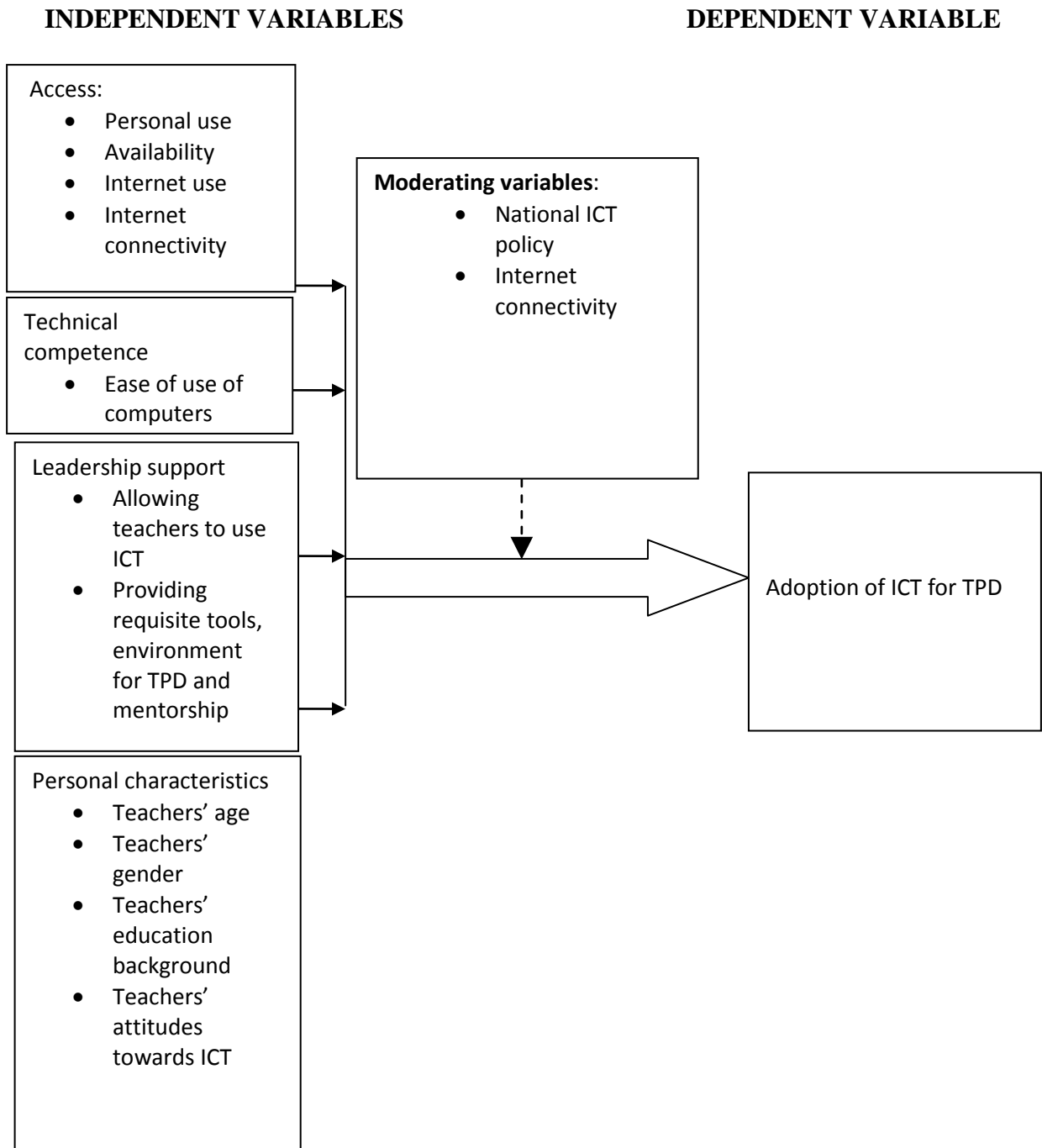
These two models above - the CBAM and ACOT- concern themselves more with the process of adoption rather than with the determinants of the acceptance of innovations. They are nevertheless important for they are very practical since the process of integration of technology is critical if any innovation is to cut a niche in a competitive social and economic setting. Different professionals have used the theory of adoption to increase adoption of innovations and practices in their fields. Instructional technologists, realising that their products have often suffered from slow uptake, have begun turning to the theory of diffusion to promote the technologies. (Surry,1997).

Surry, citing vigorously from Rogers, distinguishes four central point affecting the dissemination procedure. They are, the development itself; the way of correspondence of data about it; time; and, the nature of the social framework into which it is being presented. The investigation additionally noticed that educators who started utilizing PCs in their instructing, at first, felt the innovation to be excessively tedious. At last, it was discovered that the service perceives that selection of ICT should be founded on the aggregate cost of proprietorship. Supportability techniques were consequently being produced at nearby levels through group contribution and administration arrangement. On the other hand, the examination demonstrated that however sexual orientation value is accentuated in the ICT strategy, by and by the circumstance is not tasteful. While female support rates at essential level were at standard with those of their male partners, they declined at the auxiliary level, and dropped much further at the tertiary levels.

2.9. Conceptual framework

The following framework shows the relationship between the variables. The conceptual framework shows how the access, teachers, technical competence, leadership support, and personal characteristics, ICT in professional development which are the independent variables influence teachers' adaption of ICT in professional development. Other variables, ICT policy and internet connectivity, act as moderating variables and also influence teachers' adoption of ICT. Lastly, teachers' attitudes are shown to influence their adoption of ICT in professional development.

Figure 2.2. Conceptual framework on factors influencing adoption of ICTs by primary school teachers in Ngoliba Division, Thika East Sub-County in Kiambu County, Kenya.



2.10. Summary

From the literature on this subject, it is obvious that adoption of ICT by teachers is influenced by many factors. The factors in most parts of the world are the same but the degree to which each influences adoption differs with regions. The impediments and facilitating conditions in degree from place to place. The necessity adoption of ICT for TPD by teachers is however something all studies agree on.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

In this chapter, the methods and instruments this study used were described, the location stated, research design specified and methods of data collection and analysis discussed.

3.2. Research Design and Methodology

This study used a mixed method design- both qualitative and quantitative methods and instruments-to measure and analyse data. Correlation research tools were used to measure the relationship between the dependent variable, that is adoption, and the independent variable such as personal characteristics or moderating variables, for example the national ICT policy and Internet connectivity. The indicator of one of the personal characteristics, Attitudes, were assigned ordinal scores (using the Likert scales) while Gender was assigned nominal scores and the dependent variable, adoption, scored using the interval or ratio scales hence the need for a mixed method design. The qualitative approach was used to measure and describe variables which are subjective by nature, for example attitudes towards ICT and the effects on adoption, a dependent variable, which was measured quantitatively. The descriptive design has been used successfully in studies such as Ombati (2000), Ngatia (2007) and Ojwang (2012).

3.3. Target population

The study was carried out in Ngoliba Division, Thika East District, Kiambu County, Kenya. The target population was 214 teachers and 16 head teachers. Most of them came from the

locality. Though female teachers were noted to be more than their male counterparts, male head teachers are more than female ones. A majority are P1 teachers though there is a sizeable number who have diplomas and bachelors' degrees. The study area was convenient to the researcher who has recently been working in a school in the middle of the district and therefore is familiar with it and so creating a rapport with the target population was not challenging. Furthermore, since the researcher resides near the area, it was both convenient and inexpensive to carry out the study.

3.4. Sampling procedure

In order to come up with a representative sample, all the schools were studied and representative samples taken from each through random sampling. The reason for doing the survey in all the schools rather than sampling the schools was that the focus of the study was more on individual teachers' rather than the schools' adoption ICT for TPD. In fact, any differences between the schools would become evident in such a study. Self-administered questionnaires were given to half of all teachers in each school. Equal numbers of male and female teachers were expected to fill in the questionnaires. All head teachers were expected to fill a questionnaire for school heads. The total number of teachers' questionnaires was 107, representing about 50% of the target population.

3.5. Methods of Data collection

Firstly, primary data was collected by means of questionnaires. This instrument was both semi-structured, that is, open-ended questions to elicit qualitative responses, and closed-ended questions to collect quantitative data. Teachers' questionnaires were divided into 7 sections. Each section had questions intended to measure each of the 7 variables, that is, 4 independent variables, 2 intervening variables and 1 dependent variable. It is hoped that the correlation between the independent variables, which form the basis of the basis of the

research objectives, and the dependent variable, that is, adoption of ICT for professional development was thus captured from the responses in the questionnaires. The researcher took these questionnaires in person to each the schools in the area of study and collected them a week later. In the intervening period, the researcher was in communication by phone with each school head to facilitate a satisfactory return rate.

The second instrument was an interview schedule for all head teachers. Leadership, as will become evident later, is so central that it requires such an instrument to elicit such accurate data as can only be collected in a way that requires additional information that can only be collected using follow-up questions. Hence the need of using interviews instead of questionnaires for head teachers. Secondary data to supplement the primary data was collected from the Thika East District headquarters in Kilimambogo. The data included the information on the District Education's efforts to implement the government ICT policy e.g. through workshops and other means of in-service training of teachers, lists of primary schools in the area, and the numbers of teachers in each school. Some of the information was collected from official documents while most was collected by the researcher through interviews of the District Education officers.

3.6. Validity

The validity of an instrument refers to mainly three aspects. The first is construct validity, which means the extent to which an instrument measures what it purports to. The second is content validity, an examination of how comprehensive a measure is, that is, if it adequately covers all areas in order to accurately measure a variable. The third is the criterion-related validity, which refers to the impartiality and relevance of an instrument. To determine the validity of the instruments, the researcher engaged the supervisor and other experts in the department for valuable advice, guidance and discussion.

3.7. Reliability

Reliability tests whether if an instrument is used by a different person or at a different time it would yield the same results. In short, it tests the stability and consistency of the instrument. To test it the test-retest method was used. The instrument was administered to a pilot group first and then scored manually. After 7 days, it was then re-administered to the same group and again scored manually. A correlation coefficient was then computed using the formula.

$$r = \frac{E_{xy} - (\sum x)(\sum y)}{N} \div \frac{\left[\frac{\sqrt{\sum x^2}(\sum)}{N} \right] \left[\frac{\sum y^2 - (\sum y)^2}{N} \right]}{N}$$

- Where
- r = Reliability
 - x = First test
 - Y = Second test
 - $\sum xy$ = Sum of the gross Product of the value of each variable
 - $(\sum x) (\sum y)$ = Product of the sum of x and of y
 - \sum = sum of value refers to Mugenda & Mugenda (1999)

A coefficient of more than 0.84 was got, which was higher than the 0.8 considered satisfactory. If it had been lower than 0.8, the instrument would have been revised.

3.8. Data Analysis

Descriptive and inferential statistical tools were used in the analysis to give a summary of the analogous variables attained from the questionnaires administered. Descriptive measures, frequency distribution tables and percentages after data cleaning and classification was

conducted, tabulated and also summarized were used for presenting the findings. Inferential statistical methods were also used to make the useful meaning of the information and data, and therefore make it possible to draw conclusions which can be used for scholarly deductions, policy decisions, and pedagogical practices.

Table 3: Operationalization table

OBJECTIVE	INDEPENDENT VARIABLE	INDICATOR	MEASUREMENT	MEASURING SCALE	TYPE OF ANALYSIS	TOOLS OF ANALYSIS
To determine the extent to which access influences the adoption of ICT in the division influences professional development	Access to ICT	Frequency of personal use	Ownership of PC	Nominal	Descriptive and Inferential statistics	Proportion and inference
		Availability of ICT in school	Number of School computers, radio, TV	Ratio	Descriptive and Inferential statistics	Proportion and inference
		Frequency of the use of the Internet	Proximity to cyber café	Ratio	Descriptive and Inferential statistics	Proportion and inference
		Internet connectivity	Strength of broadband signal	Ordinal	Descriptive and Inferential statistics	Proportion and inference
To establish determine how technical competence influences teachers' adoption of ICT in professional development	Technical competence	Ease of working with computers	Level training	Ordinal	Descriptive and Inferential statistics	Proportion and inference

To assess how leadership support affects adoption of ICT in professional development	Leadership support	Readiness to allow teachers to use ICT	<ul style="list-style-type: none"> • Frequency of head teacher to organize in-house teacher training. • Frequency of head teacher to allow to attend ICT-related workshops • Provision of ICT for teachers' use 	<ul style="list-style-type: none"> • Ratio • Ratio Ratio	Descriptive and inferential statistics	Proportion and inference
To determine the influence of personal characteristics on ICT in professional development	Personal characteristics	<ul style="list-style-type: none"> • Teachers' Age • Teachers' gender • Teachers' educational background 	<ul style="list-style-type: none"> • Years of age • Male or female • Highest educational grade 	Ratio Nominal Ordinal	Descriptive and inferential Statistics Descriptive and inferential statistics	Proportion and inference Proportion and inference
To assess teachers' attitudes towards ICT	Teachers' attitudes	Perception of importance of ICT in teaching and	<ul style="list-style-type: none"> • Degree of importance • Degree of 	Ordinal	Descriptive and inferential Statistics	Proportion and inference

<p>in professional development</p> <p>To determine the extent to which Internet connectivity influences adoption of ICT in teachers' professional development</p>	<p>Internet connectivity</p> <p>Adoption of ICTs</p>	<p>learning</p> <p>Strength of Internet signals</p>	<p>ease or difficulty of use</p> <p>Ease or difficulty of use of the Internet</p>	<p>Ordinal</p>	<p>Descriptive and inferential statistics</p>	<p>Proportion and inference</p>
<p>To establish extent to which teachers have adopted ICT in professional development</p>		<p>Frequency of use of ICT</p>	<p>Number of times teachers use ICTs in:</p> <ul style="list-style-type: none"> • Lesson preparation • Classroom instruction • Pursuit of further learning 	<p>Ratio</p>	<p>Descriptive and inferential statistics</p>	<p>Proportion and inference</p>

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Introduction

In this chapter, descriptive presentation, inferential analysis and interpretation of findings of the study as set in the research objectives and methodology are done. The study findings are presented on factors influencing adoption of information communication technology among primary school teachers for professional teacher development: a case of Ngoliba Division, Thika East District, Kiambu County, Kenya.

4.2. Response Rate

The data collection instruments, questionnaires were sent to 107 teachers out of the 71 questionnaires were sent back fully completed making a response rate of 66.3%. This was in line with Mugenda and Mugenda (2003) who suggested that for generalization a response rate of 50% is adequate for analysis and reporting, 60% is good and a response rate of 70% and over is excellent. This response rate was accredited to the data collection procedure, where the researcher in person administered questionnaires and reminded the respondents to fill in the questionnaires and picked the filled completed questionnaires later on.

4.3. Demographic information

The study sought to ascertain the background information of the respondents involved in the study. The background information points at the respondents' suitability in answering the questions.

4.3.1. Respondents' Gender

The respondents were requested to indicate their gender. The findings are shown in the table below

Table 4: Respondents' Gender

Gender	Frequency	Percentage
Male	19	27%
Female	52	73%
Total	71	100%

Source: Field Data (2016)

From the findings above majority (73.2%) were females while 26.8% were males. This shows that most of the teachers in schools at Ngoliba Division were females.

4.3.2. Age of the Respondents

The respondents were requested to indicate their age. The findings were shown in the table below

Table 5: Age of the Respondents

Age bracket	Frequency	Percentage
Less than 30 years	1	1%
31-40 years	18	25%
41-50 years	42	59%
51-60 years	10	15%
Total	71	100

Source: Field Data (2016)

From the findings majority (59%) of the respondents indicated they were aged between 41-50 years, 25% indicated 31-40 years, 14% indicated 51-60 years, while 2% indicated below 30

years. This shows that teacher in schools in Ngoliba Division were old enough hence had adequate knowledge on factors influencing adoption of information communication technology among primary school teachers for professional teacher development.

4.3.3. Highest Level of Academic Qualification

The respondents were requested to indicate their highest level of academic qualification. The findings were shown in the following table:

Table 6: Respondents' Highest Level of Academic Qualification

Level of education	Frequency	Percentage
Untrained KCSE/EACE Certificate	0	0%
P1	25	35%
Diploma	21	30%
B.A/B.SC	3	4%
P.G.D.E/B.ED	20	28%
Masters	2	3%
PhD	0	0%
Total	71	100%

Source: Field Data (2016)

From the findings above 35% had P1 level of education, 30% had diploma, 28% had P.G.D. E/ B. ED, 4% had B.A. /B.SC, while 3% had Masters. This shows that the respondents were educated and had knowledge on factors influencing adoption of information communication technology among primary school teachers for professional teacher development.

4.3.4. Duration of Working in the School

The respondents were requested to indicate the length of time they had worked in the school.

The findings were shown in the following table:

Table 7: Duration of Working in the School

Duration	Frequency	Percentage
Less than 5 years	43	61%
6-10 years	18	25%
11-15 years	7	10%
16-20 years	2	3%
More than 20 years	1	1%
Total	71	100

Source: Field Data (2016)

From the findings above majority (61%) of the respondents had worked in the school for less than 5 years, 25% indicated 6-10 years, 10% indicated 11-15 years, 3% indicated 16-20 years, while 1% indicated more than 20 years. This depicts that majority of the respondents may not have worked in the school for long to understand how information communication technology may be adopted.

4.3.5. Duration of Working in the School and other Schools

The respondents were requested to indicate the length of time they had worked in the school and other schools. The findings were shown in the following table:

Table 8: Duration of Working in the School and others

Duration	Frequency	Percentage
Less than 5 years	4	6%
5-10 years	20	28%
11-20 years	18	25%
21-30 years	25	35%
31-40 years	4	6%
Total	71	100

Source: Field Data (2016)

From the findings above 35% of the respondents had worked in the school and others for duration between 21-30 years, 28% indicated 5-10 years, 25% indicated 11-20 years, while 6% indicated 31-40 years and less than 5 years respectively. This depicts that most of the respondents have worked in the school and other schools hence had experience on how adoption of information communication technology may be adopted.

4.4. Access to ICT

This section will present findings on the access of information communication and technology. The findings are presented in subsequent sections.

4.4.1. Owning a Personal Computer

The respondents were requested to indicate whether they own a personal computer. The findings were shown in the following table:

Table 9: Respondents' Ownership Personal Computers

Response	Frequency	Percentage
Yes	19	28%
No	51	72%
Total	71	100

Source: Field Data (2016)

From the findings majority (72%) of the respondents indicated that they do not own a personal computer while 28% indicated they own one. This shows that most of the respondents did not have a computer hence may therefore not be aware of how computers may work and how they can be adopted in teaching and learning.

4.4.2 Schools' Possession of ICT Facilities

The respondents were requested to indicate whether their schools possessed various ICT facilities. The findings were shown in the following table:

Table 10: Schools' Possession of ICT Facilities

Gadgets	Frequency		Percentage	
	Yes	No	Yes	No
Electric power	65	6	92%	8%
Computer (s)	7	64	10%	90%
Radio	37	34	52%	48%
T. V set	0	71	0%	71%
CD/DVD player	0	71	0%	71%

Source: Field Data (2016)

From the findings majority (92%) of the respondents indicated that they had electric power, followed by 52% who indicated they had a radio, while 10% indicated they had computers. This depicted that the schools had electric power which was a requirement in the adoption of information communication technology.

4.4.3. Use of Cyber Café

The respondents were requested to indicate how often they use a cyber café. The findings are shown in the following table:

Table 11: Respondents' Use of Cyber Cafés

Response	Frequency	Percentage
Never	11	15%
Rarely	48	68%
Many times	11	15%
Not sure	1	2%
Total	71	100%

Source: Field Data (2016)

From the findings majority (68%) of the indicated that they rarely use cyber café, 15% indicated they use it many times and never use it respectively, while 2% indicated that they are not sure whether they use it. This depicts that the respondents do not use cyber café and thus did not have the skills on how to use ICT.

4.4.4. Strength of the Internet Signal

The respondents were requested to indicate how strong the internet signal in their school is.

The findings are shown in the following table:

Table 12: Strength of the Internet Signal

Strength of the signal	Frequency	Percentage
No signal	17	23%
Weak	15	21%
Fairly strong	18	25%
Strong	7	10%
Not sure	15	21%
Total	71	100

Source: Field Data (2016)

From the findings 25% of the respondents indicated that the signal was fairly strong, 24% indicated there was no signal, 21% indicated weak and not sure respectively, while 10% indicated the signal was strong. This shows that the internet signal was fairly strong.

4.5. Level of Training Using Computers

The respondents were requested to indicate their level of training at using computers and the proficiency at using them. The findings are shown in the table below:

Table 13: Respondents' Level of Training Using Computers

Statement	Poor	Fair	Good	Excellent	Not sure
Level of training	12.7%	45.1%	23.9%	1.4%	16.9%
Ability to use computers for personal purposes	15.5%	36.6%	25.4%	5.6%	16.9%
Ability to use computers in the classroom	16.9%	25.4%	8.5%	0.0%	49.3%
Ability to use the computers in the office/ staff room	19.7%	23.9%	8.5%	0.0%	47.9%

Source: Field Data (2016)

From the findings the respondents indicated they were fairly trained in the use of computers (45.1%) and 36.6% indicated they were fairly trained in the ability to use computers for personal purposes. In addition, 49.3% of the respondents indicated that they were not sure on the ability to use computers in the classroom, and that 47.9% indicated they were not sure of ability to use the computers in the office/ staff room. This depicts that the respondents were fairly trained in the use of computers.

4.6. Attendance of ICT Training

This section presents findings on the attendance and no attendance of the various training on ICT. The findings are presented in subsequent sections.

4.6.1. ICT training organized by the Head Teacher

The respondents were requested to indicate their attendance of the ICT training organized by the head teacher in the school. The findings are shown below:

Table 14: ICT training organized by the Head Teacher

Response	Frequency	Percentage
Never	51	71.8%
Once	18	25.4%
2-5 times	2	2.82%
Over 5 times	0	0.00%
Total	71	100

Source: Field Data (2016)

From the findings majority (71.8%) of the respondents indicated they never attended the ICT training organized by the head teacher in the school, 25.4% indicated they attended once, while 2.82% indicated they attended for 2-5 times. this depicts that majority of the respondents never attended the ICT training organized by the head teacher in the school.

4.6.2. ICT related workshop outside the School

The respondents were requested to indicate whether they attended ICT workshop outside the school. The findings are shown in the following table:

Table 15: Respondents' Attendance of ICT- related workshop outside the School

Response	Frequency	Percentage
Never	30	42.3%
Once	29	40.8%
2-5 times	11	15.5%
Over 5 times	1	1.4%
Total	71	100

Source: Field Data (2016)

From the findings most (42.3%) of the respondents indicated they never attended the ICT training outside the school, 40.8% indicated they attended once, 15.5% indicated they attended for 2-5 times while 1.4% indicated they attended the workshop over 5 times. This depicts that most of the respondents never attended the ICT training organized outside the school.

4.6.3. Provision of ICT

The respondents were requested to indicate how often the head teacher provided ICT. The findings are shown in the following table:

Table 16: Head Teachers' Provision of ICT Facilities

Response	Frequency	Percentage
Never	36	50.7%
Few times	25	35.2%
On demand	7	9.9%
Many times	3	4.2%
Total	71	100

Source: Field Data (2016)

From the findings majority (50.7%) of the respondents indicated they were never provided with ICT by the head teacher, 35.2% indicated few times, 9.9% indicated it was on demand while 4.2% indicated many times. This shows that slightly over half of the respondents were never provided with ICT by the head teacher.

4.6.4. Head Teachers' Encouragement of the use of ICT

The respondents were requested to indicate how often the head teacher encourages them on the use of ICT in teaching. The findings were shown in the following table:

Table 17: Encouragement on the use of ICT

Response	Frequency	Percentage
Never	31	43.7%
Occasionally	29	40.8%
Quite often	9	12.7%
Many times	2	2.8%
Total	71	100

Source: Field Data (2016)

From the findings most (43.7%) of the respondents indicated they were never encouraged to use ICT by their head teachers in teaching, 40.8% indicated occasionally, 12.7% indicated

quite often while 2.8% indicated many times. This shows that most of the respondents were never were never encouraged on the use of ICT in teaching.

4.7. Benefits of Using Computers in Teaching and Learning

This section provides findings on the benefits of using computers in teaching and learning. The findings are presented in subsequent sections

4.7.1. Extent of Agreement on Benefits of Computer Use

The respondents were requested to indicate the extent to which they agreed on the benefits of using computers in teaching and learning in schools. The findings are shown in the following table:

Table 18. Benefits of Using Computers in Teaching and Learning

Statement	SA	A	D	SD	NS
Engaging academic activities in videos, graphics, and texts	54.9%	26.8%	1.4%	4.2%	12.7%
Interactive learning material such as self-assessment tests	42.2%	47.9%	0.00%	4.2%	5.6%
Increased independence of learners	50.7%	33.8%	2.8%	8.5%	4.2%
Access to varied up to date academic material and information	57.7%	26.8%	4.2%	1.4%	9.9%
Ease of communication for feedback	52.1%	35.2%	1.4%	4.2%	7.8%

Source: Field Data (2016)

From the findings the respondents strongly agreed that computers enable access to varied up to date academic material and information (57.7%), followed by engaging academic activities in videos, graphics, and texts (54.9%), ease of communication for feedback (52.1%), and increased independence of learners (50.7%). The respondents further agreed that computers

provide interactive learning material such as self-assessment tests (47.9%). This depicts that computers enable access to varied up to date academic material and information.

4.7.2. Immediate Importance of the Computer Use

The respondents were requested to indicate the immediate importance of the computer use in teaching and learning. The findings were as shown in the following table:

Table 19: Immediate Importance of the Computer Use

Immediate Benefit	Percentage	
	Yes	No
Ease of storage, retrieval and processing of information	94.4%	5.6%
Making instructions easier and faster	91.5%	8.5%
Making instruction more standardized	90.1%	9.9%
Enabling inhibited (e.g. shy) learners participate in learning with less fear	84.5%	15.5%
Enabling one teacher to handle many learners at the same time	77.5%	22.5%

Source: Field Data (2016)

From the findings the respondents indicated that ease of storage, retrieval and processing of information was an immediate importance of the computer use in teaching and learning (94.4%), followed by making instructions easier and faster (91.5%), making instruction more standardized (90.1%), enabling inhibited (e.g. shy) learners participate in learning with less fear (84.5%), and enabling one teacher to handle many learners at the same time (77.5%). This shows that ease of storage, retrieval and processing of information by use of computers was perceived to be of immediate importance in teaching and learning.

4.7.3. Extent of Agreement on Dangers of Using Computers

The respondents were requested to indicate their extent of agreement on dangers of using computers in teaching and learning in schools. The findings were shown in the following table:

Table 20: Extent of Agreement on Dangers of Using Computers

Statement	SA	A	D	SD	NS
Immoral sexual images	71.8%	14.0%	2.8%	7.2%	4.2%
Online predators such as adults with evil intentions	57.7%	25.8%	4.8%	11.7%	4.0%
Distractive games, music, images and videos	67.6%	22.5%	5.6%	5.3%	0.00%
Loss of privacy by giving other private information online	53.5%	36.6%	5.6%	4.3%	0.00%
Overdependence on computers even for simple calculations	69%	22.5%	2.8%	4.2%	1.5%

Source: Field Data (2016)

From the findings the respondents strongly agreed that dangers of using a computer is that it exposes learners to immoral sexual images (71.8%), makes them over- dependent on computers even for simple calculations (69%), exposes the young learners to distractive games, music, images and videos (67.6%), exposes them to online predators such as adults with evil intentions (57.7%), and that it exposes the young learners to loss of privacy by giving other private information online (53.5%). This shows that exposing learners to immoral sexual images was perceived to the biggest danger of using computers in education.

4.7.4. Immediate potential dangers of the Computer Use

The respondents were requested to indicate the immediate potential dangers of the Computer use in teaching and learning. The findings were as shown in the following table:

Table 21: Immediate potential dangers of the Computer Use

Immediate potential dangers	Percentage	
	Yes	No
Cyber bullying such as online abuses, threats or harassment	59.2%	40.8%
Addiction to social media	78.9%	21.1%
Technologically enhanced academic dishonesty such as cheating in exams	74.6%	25.4%
Reduced face to face social interaction	84.5%	15.5%
Different levels of computer literacy among learners	78.9%	21.1%

Source: Field Data (2016)

From the findings the respondents indicated that reduced face to face social interaction was an immediate danger of the computer use in teaching and learning (84.5%), followed by different levels of computer literacy among learners (78.9%), addiction to social media (78.9%), technologically enhanced academic dishonesty such as cheating in exams (74.6%), and cyber bullying such as online abuses, threats or harassment (59.2%). This shows that reduced face to face social interaction was perceived to be biggest immediate danger of the computer use in teaching and learning.

4.8. Strength of Internet/Phone Signal

The respondents were requested to indicate how strong signals are for phone/internet connection in the school. The findings were shown in the following table:

Table 22: Strength of Internet/Phone Signal

Strength of the signal	Frequency	Percentage
Very weak	8	11.3%
Weak	15	21.2%
Strong	38	53.5%
Very strong	5	7%
Not sure	5	7%
Total	71	100

From the findings majority (53.5%) of the respondents indicated that the signal was strong, 21.2% indicated the signal was weak, 11.3% indicated very weak and 7% indicated very strong and not sure respectively. This shows that the phone/internet connection in the school was strong.

4.9. Purpose for ICT use

The respondents were requested to indicate how often they use ICT for the various purposes.

The findings were indicated in the following table:

Table 23: Purpose for ICT use

Statement	Never	Someti mes	Often	All the time
Lesson preparation	87.4%	8.4%	1.4%	2.8%
Preparation of exams	78.9%	11.3%	1.4%	8.4%
Classroom instruction	88.7%	7.0%	0.0%	4.3%
Store and access information	53.5%	35.2%	8.5%	2.8%
Search for information to strengthen my profession	29.5%	36.6%	25.4%	8.5%
Pursuit of further education	32.4%	31.0%	22.5%	14.1%
Communication using emails with friends, family and colleagues	31.0%	23.9%	26.8%	18.3%
Entertainment through games, music and videos	33.8%	19.7%	33.7%	12.8%

Source: Field Data (2016)

From the findings the respondents indicated that they never use ICT for classroom instruction (88.7%), Lesson preparation (87.4%), Preparation of exams (78.9%), and Store and access information (53.5%). In addition, the respondents indicated that they used ICT sometimes to search for information to strengthen their profession (36.6%), those who never used ICT for Pursuit of further education (32.4%), Communication using emails with friends, family and colleagues (31.0%), and Entertainment through games, music and videos (33.8%). This shows that most respondents never used ICT for classroom instruction.

4.10. Regular use of computers

The respondents were requested to indicate where they regularly use computers. The findings were as shown in the following table:

Table 24: Regular Use of Computers

Place of use of computers	Percentage	
	Yes	No
Staffroom/office	70.4%	29.6%
Computer lab	18.3%	81.7%
Library	16.9%	83.1%
Cyber café	66.2%	33.8%
Home	49.3%	50.7%
Friend's house	31.0%	69.0%

Source: Field Data (2016)

From the findings the respondents indicated they regularly use computers in the staffroom (70.4%), followed by cyber café (66.2%), home (49.3%), friend's house (31.0%), computer lab (18.3%), and library (16.9%). This shows that the respondents use computers most regularly in the staffroom.

4.11. Inferential analysis

To make the data usable and informative, it was subjected to inferential analysis using SPSS tools.

The first of those tools, was the simple linear regression analysis. The extent of the general association between the independent variables, namely access, competence at using computers, leadership support and personal characteristics, on the one hand, and the dependent variable, that is, adoption of ICT for TPD among public primary school teachers in Ngoliba Division in Kiambu County, was tested. The results were as shown in the following table:

Table: 25: Simple Linear Regression Analysis-Proportion of Explained Variance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.985 ^a	.971	.962	1.19966

- a. Predictors: (Constant), Engaging in academic activities videos, graphics and text, Head teacher provides ICT, Availability of computers, Gender, Leadership organize training, use of cyber, Teachers attend workshops, Age, Ability to use PC, Ability to use in class, Qualification, Head teach encouragement on use of ICT, Owning PC, Level of training, Ability to use in office, Signal strength

Source: Field Data 2016 analyzed by SPSS Version 22

From R^2 value of .962, we deduce that 96.2% of the variance is explained by the identified factors.

There is therefore a strong enough association between the independent variables X and the dependent variable Y to warrant confidence for further inquiry using other tools to reveal the nature and extent of such association. In other words, in general terms, the influence of access; teachers' competence at using computers; leadership support; and, teachers' personal characteristics, almost entirely explain adoption of ICT for TPD by public primary school teachers in Ngoliba Division in Kiambu County. The X can therefore largely be used to predict Y when the former's influence is looked at before we get into the specific ways in which the determination is made.

To further determine the association, the data was subjected to more SPSS analysis tools for confirmation and to specifically show how each factor influences adoption. The second one of those tools was ANOVA. The main reason for using it was find out the strength of the association shown to be very high by regression. ANOVA, being a two tailed test examining the extent of scatter within a normal distribution curve, is useful because it tests whether the association between X and Y is statistically significant. Usually, when the p-value falls below 0.05, it means that there is statistical

significance between the variables being tested. The results of the study are shown in the following table:

Table: 26 ANOVA- Analysis of Significance of Variables

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	2576.143	16	161.009	111.874	.000 ^b

- a. Dependent Variable: Adoption of ICT for TPD
- b. Predictors: (Constant), Engaging in academic activities video, graphics and text, Head teacher provide ICT, Availability of computers, Gender, Leadership organize training, use of cyber, Teachers attend workshops, Age, Ability to use PC, Ability to use computers in the class, Academic Qualification, Head teachers' encouragement on use of ICT, Owning PC, Level of training, Ability to use in office, Signal strength.

Source: Field Data 2016 analyzed by SPSS Version 22

The above value of F ratio is significant at $p=0.000$ which is below 0.05 cut-off value. This means that there is the relationship between the two variables, X and Y , is statistically significant.

The third tool the data was subjected to is the chi-square analysis, X^2 . It is important to use X^2 to assess each indicator since not all may be assumed to influence adoption. X^2 has the unique ability to test each independently of the others. Like ANOVA, X^2 is a two-tailed analytical tool which shows whether each variable falls within acceptable limits, that is less than 0.05 meaning that the values being tested have negligible outliers in a normal distribution curve, which would mean the dependent variable is either influenced by other factors other than the variable of interest in this case, or is purely by chance. This therefore provides a confidence level of more than 95% almost thus almost eliminating the likelihood of its occurring by chance or other influences. Consequently, X^2 was used to assess associations between each X variable and the adoption of ICT for TPD by public primary school teachers in the division, Y . The X^2 analysis is presented in the following table:

Table 27: Summary of Pearson X² Tests

Indicators of adoption	Value	Df.	Asymp.Sig.
Gender	57.412 ^a	18	0.000
Age	142.000 ^a	54	0.000
Educational Qualification	192.717 ^a	54	0.000
Ownership of PC	61.767 ^a	18	0.000
Availability of Computers in Schools	18.490 ^a	18	0.424
Use of Cyber Cafes	107.308 ^a	36	0.000
Signal Strength	200.197 ^a	72	0.000
Level of ICT Training	198.345 ^a	72	0.000
Ability Personal Use Computers	205.739 ^a	72	0.000
Ability of Use in Classroom	113.545 ^a	72	0.001
Ability of Use in Office/Staffroom	128.440 ^a	54	0.000
Leadership	128.700 ^a	36	0.000
Attitude-Benefits	205.125 ^a	54	0.000
Attitude-Additional Benefits	128.440 ^a	54	0.000

Source: Field Data analyzed by SPSS Version 22

From the Pearson Chi-square analysis shown this table, all indicators, with the exception of one, were shown to have an association with ICT adoption for TDP. Only the Availability of Computers in the schools was shown in the table above to have no relationship with adoption of ICT for TPD. It had a X² p-value of 0.424 at 18 df which is more the 0.05 assumed to be the maximum acceptable score to show positive correlation between variables. The possible reasons for this interesting score will be discussed later in the interpretation of the data findings.

The last tool used was the multiple regression analysis. This was used to determine the correlation between the various independent variables with the dependent one. Secondly, it would show the relative strength of each independent variable with the dependent one. The results are given in the following table:

Table: 28 Ranking of Strength of Correlation produced by the Multiple Regression Analysis.

Indicators of ICT adoption for TPD	Sig.
Head Teacher provides ICT	0.001
Qualification	0.009
Signal strength	0.056
Ability to use PC	0.107
Availability of computers in schools	0.109
Teachers attend ICT workshop	0.184
Age	0.215
Head Teachers encouragement of use of ICT	0.244
Level of ICT training	0.260
Ownership of PC	0.508
Use of Cyber	0.515
Leadership organizing ICT training	0.547
Ability to use PC in class	0.601
Engaging in academic videos, graphics and texts	0.764
Ability to use Computers in office	0.876
Gender	0.954

Source: Field Data analyzed by SPSS Version 22

From table 28, it becomes apparent that only two independent variables have a strong correlation with the dependent one. These are, the Head Teachers' Provision of ICT to Teachers, with score of 0.01, and Educational and Professional Qualification, with a score of 0.09. These two have less than the cut off of $p=0.05$, meaning that they are significant. Conversely, the variable of Gender was shown to be the least significant with a score of 0.954. This means that any variance in the association between X and Y noticed between male and female teachers was almost entirely by chance.

Table 29: Indicators' means grouped under their respective Independent Variables

Indicators grouped under respective I.V.s	Sig.
ACCESS	
Availability of Computers in Schools	0.109
Signal Strength	0.056
Ownership of PC	0.508
Use of Cyber	0.515
MEAN	0.297
TECHNICAL COMPETENCE	
General Ability to Use PC	0.107
Teachers' Attendance of ICT Workshops	0.184
Level of ICT Training	0.26
Ability to Use PC in Class	0.601
Ability to Use PC in Office	0.876
MEAN	0.676
LEADERSHIP SUPPORT	
Head Teachers' Provision of ICT	0.001
Head Teachers' Encouragement of ICT use	0.244
Leadership's Organization of ICT Training	0.547
MEAN	0.396
PERSONAL CHARACTERISTICS	
Educational Qualifications	0.009
Teachers' Age	0.215
Teachers' Engagement in videos, graphics and texts	0.764
Teachers' Gender	0.954
MEAN	0.7768

Source: SPSS Version 22 Analysis of Field Data

Table 30: Ranking of significance Independent Variables

I.V.	Mean
1) ACCESS	0.207
2) LEADERSHIP SUPPORT	0.396
3) TECHNICAL COMPETENCE	0.676
4) PERSONAL CHARACTERISTICS	0.7768

Source: Table 29 showing Analysis of Field Data

Tables 29 and 30 make it apparent that the indicators, when grouped together under their respective variables and averages for each calculated, the variable that most influences adoption for TPD is Access with a mean of 0.207, followed by Leadership Support with a mean of 0.396. Technical Competence is third with a mean of 0.676 and the last one is Personal Characteristics with a mean of 0.7768.

Two things must however be emphasized. The first is that Table 30 shows only a generalized significance of each variable under consideration in this study. Although this is important in comparing the four variables ranked in terms of their significance in influencing teachers' adoption of ICT for TPD, there are, in some instances, great variations in the significance among indicators of each variable. The second observation therefore becomes pertinent. It is that when each variable is broken down into its respective indicators, some under the last one, that is Personal Characteristics, ranked more highly than those in the first: Access. An example is Educational Qualifications (0.009), a personal characteristic, which was shown to be more significant than all indicators of Access.

The import of these two observations is that the rankings of Indicators (Table 28) and Variables (Table 30) are both important in assessing the significance of factors influencing adoption of ICT for TPD among public primary schools. In making policy decisions, both must therefore be considered.

CHAPTER FIVE:

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of study findings, conclusions and recommendations on the factors influencing adoption of information communication technology among primary school teachers for professional teacher development: a case of Ngoliba Division, Thika East District, Kiambu County, Kenya.

5.2 Summary of findings

The two types of analyses the data was subjected to, the descriptive and inferential, resulted in varied findings. All the results were found to have different types of relevance to the research questions.

To the first research objective, to determine the extent access influenced adoption, it was found out that though significant, it was not the most important factor. The second, to establish how competence in ICT influences adoption, it was also found important but not the most significant factor. The third, the influence of leadership support, was found to the most significant factor influencing adoption. The last objective, the influence of personal characteristics, had a number of aspects, and though on the whole found to be significant, the only one, that is educational and professional qualifications, influenced adoption enough to qualify serious consideration. In fact, Gender was found to almost entirely insignificant.

5.3 Discussion of findings

From the descriptive analysis, the study found that most of the respondents did not have computers hence may not have been aware of how information technology works and how it

can be adopted for teaching and learning. The study also found that the schools had electric power which was a requirement in the adoption of information communication technology. In addition, the study found that a big percentage respondents use cyber cafés (68%-Rarely, and 15%-Many Times). Further, the study established that the internet signal was fairly strong. The study also found that the respondents were fairly well trained in the use of computers. The study also established that majority of the respondents never attended the ICT training organized by the head teacher in the school. Additionally, the study found that most of the respondents never attended the ICT training organized outside the school. Further the study found that most of the respondents were never provided with ICT by the head teacher. The study found that most of the respondents were never encouraged on the use of ICT in teaching. While these statistics show little adoption of ICT for TPD, they show that there is potential for adoption the more the incentive for use is personalized. Even more starkly, when the current rate of adoption is compared to what the respondents thought when asked about the Benefits of Using Computers, those who Strongly Agreed ranged between 42.2% and 57.7% while those who Strongly Disagreed ranged from 4.2% to 12.7% on a range the benefits (Table 18). Even further, when asked about the Immediate Importance of Using Computers, those who indicated Yes ranged between 82.5% and 94.4% (Table 19). This may mean that teachers have a positive attitude to adoption of computers in education but could need personal incentives to fully adopt them in teaching and learning. This contradicts study by Oteawi (2002) as cited in Bordbar (2010) which posits that there is evidence to show that teachers had negative or neutral attitudes. This personal characteristic therefore needs further exploration, since it fell outside the purview of this study.

The study found that computers enable access to varied up to date academic material and information. The study also established that ease of storage, retrieval and processing of information was an immediate importance of the computer use in teaching and learning. The

study also established that dangers of using a computer are that it exposes viewers to immoral sexual images. The study further established that reduced face to face social interaction was an immediate danger of the computer use in teaching and learning. The study also found that the phone/internet connection in the school was strong. The study further found that respondents never used ICT for classroom instruction. The study also established that the respondents use computers most regularly in the staffroom.

The descriptive analysis further, and more tellingly to the research questions, found that while the respondents used ICT for more personal purposes, they only minimally used the technology for professional ones, as shown in Table 23. Asked how often they used ICT, only less than 10% indicated they used them all the time for TPD purposes: lesson (8%) and examination preparation (8.4%), and classroom instruction (4.3%). However, when asked how often they used ICT for pursuit of further education, which can be taken as both personal and professional, the percentage of those who indicated All the Time shot up to 14.1%. When asked to indicate how often they used them for purely personal purposes, Communicating with Family, Friends and Colleagues, those who indicated All the Time shot up further to 18.3%. The inferential analysis, done using simple linear regression, showed that there was a correlation between the independent variables and the dependent one having produced a R^2 value of 0.962 (Table 25). This means that 96.2% of the indicators of the variables positively influenced the dependent variable, adoption of ICT for TPD. The confidence to examine further the extent and nature of the correlation had therefore been provided.

To corroborate this, a second inferential statistical tool was used. This was the ANOVA test which produced a value of 0.000 which was below the $p=0.005$ value of significance (Table 26). This meant that the association between the variables being tested was significant.

The third type of tools the data was subjected to were the chi-square (X^2) tests. This were used to test the significance of each indicator of the variables. The results were that all,

except one, positively influenced the adoption of ICT for TPD. This was because they all a X^2 score of less than 0.005, the cut-off point significance.

Interestingly, the exception was Availability of Computers in respective Schools. This produced a X^2 value of 0.424 at 18 df, way above the 0.005 cut-off point of significance. The explanation for this was not clear but it can only be speculated that teachers had alternatives, possibly smart phones. The other reason why teachers did not appear to use for them for TPD could be that access to them could have been unfavourable as they could have been mainly for record keeping and other administrative purposes in Head Teachers' offices. From the descriptive data, 10% of the respondents indicated they had computers in their schools. There was however no follow up question to determine the purpose of the computers meaning the instrument did not measure their availability to teachers. The other factors cannot however be discounted.

The last inferential tool that was used was the Multiple Regression Analysis. This was done to compute the comparative significance of the indicators of the variables. From the analysis, only two were found to influence adoption of ICT for TPD (Tables 40 and 41). The most influential was the Head teachers' provision of ICT facilities. Similar findings have been quoted in studies by many scholars notably Nyambane and Nzuki (2014). They quote other studies which have shown that leadership support is key is influencing adoption of ICT for TPD. They particularly noted that Ng (2008) in a study of 80 Singaporean schools showed that transformative leadership promoted acceptance goals as well as providing support, intellectual stimulation and acting as role models to influence integration of ICT. Other studies which had similar findings included Afshari et al (2008), Becker (1993) and Dede (1992). In many other studies, notably, Karsenti, T., Collins, S, Harper, Gakuu, C.M., Barry, A., & Hafkin, N. (2010), and Gakuu, C.M. & Kidombo, H.J. (2010) the role of principals and

head teachers in providing requisite facilities, administrative direction and role modelling has been found to be most critical in ICT integration.

The second most critical was found to be Educational and Professional Qualification as shown in Tables 40 and 41. This personal characteristic as a key influence in ICT adoption is in line with the findings from the descriptive analysis is shown to have both professional and personal benefits. The more the use of computers tended towards personal benefits, the better the adoption rates of ICT adoption for TPD became. This may mean that since computers are critical in pursuit of further education, their usage extended to the more professional usage such as lesson and examination preparation, and classroom instruction. A survey by Nyakowa, L.S. (2014) quoted many scholars who had come up with similar findings. For example, Pozo & Stull (2006) were found to have concluded that academic backgrounds significantly contributed to ICT adoption among teachers. Didia & Hasnat (1998) also had come up with similar findings. Dhariwal (2010), similarly found out that teachers from academically underprivileged backgrounds tended to adopt ICT less than their privileged counterparts. Adedoja, G. (2016), also found that teachers' educational qualifications could hinder or facilitate successful integration of technology in the classroom.

Lastly, from the multiple regression analysis, the indicator which was found to have the least correlation to adoption of ICT for TPD, was Gender, with a score of 0.954 meaning that any variation between male and female teachers was almost entirely by chance. This is contradicted by findings of many other studies. One such finding contradicted by this was by Karsenti et al, (2009) which revealed that had female teachers had more access and adoption rates than their male counterparts. The explanation for this was that there were more female teachers in urban and peri-urban areas where access to ICT was better while male teachers were more in the more disadvantaged remote schools. Since there was no such difference in the area of this study, the difference between male and female teachers' adoption was

therefore not inexplicable. The teachers, male and female, come from this rural area. Other studies which found significant differences between male and female teachers could however not be explained. Such included studies by Shapka & Ferrari (2003), Volman and Eck, Kay et al as cited in Buabeng-Andoh (2012).

5.4. Conclusions

The purpose of the study has largely been achieved. The objectives have also been successfully realized but some findings could not be adequately explained. The study has therefore exposed certain gaps, either due internal inadequacies or because some findings contradicted other studies. One such gap is the paradox of one aspect of the teachers' personal characteristics of respondents having a positive attitude yet not significantly adopting ICT for TPD. The next one was the finding that availability of computers in schools did not influence adoption by teachers. These gaps therefore need further studies.

Secondly, while the four independent variables were of significance, there were some of their indicators which proved far more significant than others while others did not appear to be important to the teachers' adoption of ICT for TPD. The two which had the biggest influence from the multiple regression analysis were leadership support and the personal characteristic of educational and professional qualification. If remedial measures were to be taken therefore, the main focus would have to be on these two.

Thirdly, though the main factors that influence adoption appeared to be largely favourable, adoption for TPD, such as usage in lesson and examination preparation, and classroom instruction, remained very low. As discussed before, it only rose where head teachers offered support, and also when there was a direct personal benefit to be had by the teachers from the educational and professional advancement. In other words, higher adoption resulted more from administrative and personal reasons than from professional ones. The linkage between

the personal and the professional reasons for adoption could therefore be exploited to improve ICT integration.

Lastly, from the findings was that the influence of infrastructural factors such as availability of computers, power, and internet connectivity were less significant than the human influences such as leadership support and personal benefits of adoption of the technology. This however may not mean that infrastructure ought to be completely ignored when addressing ICT adoption for TPD. Logically, it is impossible to adopt what is not physically there.

5.5. Recommendations

Based on the findings, the study made a number of recommendations. They are that stakeholders:

1. ensure teachers and head teachers have access to I.C.T. facilities;
2. enhance leadership support by empowering head teachers by provision of infrastructural resources and computing competence;
3. promote educational and professional qualifications among teachers to enhance TPD hence increasing levels of ICT adoption;
4. reward teachers with ICT competence through better remuneration to create demand for such technical knowhow;
5. MOE especially, should allocate more finances for computer acquisition in public primary schools. The access to computers is a prerequisite for ICT's successful adoption for learning and teaching. All primary schools should be provided with ICT infrastructure of high quality so that the digital divide can be bridged between those who have and those who do not have the ICT resources;

6. attempt to reduce teachers' uneasiness and anxiety when it comes to using computers in classrooms caused by their incompetence in ICT, through basic in-service and pre-service ICT training;
7. consider making ICT a core subject in the curriculum of primary schools;
8. provide teachers with computer and broadband internet connection packages at affordable payments and instalment conditions. This is because they do not have enough time to prepare for ICT related content while they are in school, and provision of such in their homes could afford adequate time for preparation;
9. employ more teachers especially those with proficiency in computers to reduce lesson workload. Heavy teaching would be detrimental to the integration of ICT into teaching and learning because teachers do not get adequate time to plan for and use the ICT facilities. This can be achieved through allocation of more funds to the Ministry of Education.

5.6 Suggestions for further studies

Based on the present study, the researcher has made the following suggestions for consideration of further studies:

- i. To explain precisely why, despite existence of positive attitudes among teachers and availability of requisite infrastructure, adoption for TPD, remains low.
- ii. To explore the adoption of ICT among the head teachers of primary schools and extend to other education levels like pre-school, primary schools, private primary schools, teacher training colleges and other higher learning institutions.
- iii. To determine if the characteristics of teachers like age, gender, academic qualifications and the period they have been teaching are best attitude predictors when it comes to ICT adoption in schools in Kenya.

- iv. To assess the correlation between adoption of ICT by educational institutions and learners' academic performance, and also between such adoption and cost effectiveness and efficiency of education in Kenya.

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APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION

University of Nairobi

P.O Box 2252-00100

Nairobi

bernardkamau0000@gmail.com

0722 312 642

Dear respondent,

REF: FACTORS INFLUENCING ADOPTION OF INFORMATION

COMMUNICATION TECHNOLOGY AMONG PRIMARY SCHOOL

TEACHERS FOR TEACHER PROFESSIONAL DEVELOPMENT: A CASE

OF NGOLIBA DIVISION, THIKA EAST

DISTRICT, KIAMBU COUNTY, KENYA

I am a Master of Distance Education student at the University of Nairobi. I am carrying out a research on “Factors Influencing Adoption of ICTs by primary school teachers: A case of Ngoliba Division, Thika East Sub-County, Kiambu County, Kenya.” I am therefore kindly requesting that you fill in this questionnaire as accurately and honestly as possible. Rest assured that your identity and response will be treated with utmost confidentiality. For this reason, do not write your name anywhere in this questionnaire. I thank you in advance for your willingness to participate in this important exercise.

Yours faithfully,

Bernard Irungu Kamau

APPENDIX 2: TEACHERS' QUESTIONNAIRE

Instructions: This questionnaire has 7 sections. Please respond to all the questions.

Section 1: Personal Information

i. Indicate your gender: Male Female

ii. Indicate your age in one of these boxes:

Less than 30 31-40 41-50 51-60

iii. Indicate your highest academic/professional qualification

Untrained K.C.S.E./E.A.C. E Certificate

P1

Diploma

B.A./ B.SC

P.G.D.E./B. ED

Masters

Ph. D

iv. Indicate how long you have worked in this school:

Less than 5 years 6-10 years 11-15 years 16-20 years More than 20 years

v. Indicate how long you have worked in this and other schools:

Less 5years 5-10 years 11-20 years 21-30 years 31-40 years

Section 2

Indicate each of the following:

i. Whether you own a personal computer

Yes

No

ii. Whether your school has the following:

Electric power

Computer(s)

Radio

T.V. set

CD/DVD player

iii. How often you use a cyber cafe:

Never

Rarely

Many times

All the time

iv. How strong the Internet signal is in your school?

No signal

Weak

Fairly strong

Strong

Section 3

Indicate how much training you have had at using computers:

None

Elementary

Fairly Good

Good

i. How would you rate yourself at using computers?

Cannot

Weak

Fairly Good

Good

Section 4

Indicate how often you have attended you have attended:

i. ICT training organized by your head teacher in your school:

Never Once 2-5 Times Over 5 Times

ii. ICT –related any workshop outside your school:

Never Once 2-5 Times Over 5 Times

ii. How often your head teacher:

a. Provide ICT e.g. computers, radios, CD/DVD players?

Never Few Times On Demand Many Times

b. Encourage you to use ICT in teaching:

Never Occasionally Quite Often Many Times

Section 5

i. How important do you think ICT is in teaching and learning?

Not important Fairly important Important Very Important

ii. To what extent do you think they are easy to use in teaching and learning?

Not Easy Fairly Easy Easy Very Easy

iii. List any negative aspects, if any, of using computers in schools:

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

Section 6

i. Indicate how strong signals are for phone /Internet connection are in your school:

Very Weak Weak Fairly Strong Strong

Section 7

i. Indicate how often you use ICT in:

	Never	Once	2-4 Times	Over 5 Times
a. Lesson Preparation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Exam Preparation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Classroom Instruction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Store and retrieve information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Search and access information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Pursuit of Further Education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Communication with friends, family & colleagues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Entertainment through games, videos & music	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other ways, if any, ICT especially computers, can be useful to you:

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

Thank you for your cooperation

APPENDIX 3: HEAD TEACHERS' INTERVIEW SCHEDULE

Please respond to all the questions:

Section A

- i. Head Teacher's Gender: Male Female
- ii. For how long have you been a Head Teacher in your current school or anywhere else?.....
- iii. For how long have you been in your current station?.....

Section B General School Information:

- i How many pupils do you have in your school?.....
- ii How many classes do you have from class 1 to class 8?.....
- iii What is the size of the smallest class?.....
- iv What is the size of the biggest?.....
- v On average, how many pupils do you have per class?.....
- vi How many teachers do you have in your school?.....

Section C Personal Head Teacher e-readiness:

- i. Do you have a personal computer?.....
- Yes No
- ii. Can your phone access internet?.....
- Yes No
- iii. How do you rate your training at using computers?.....
- Poor Average Good Excellent Not sure
- iv. Indicate how would you rate yourself in:
- a. your ability to use computers to use computers for personal purposes?.....

Poor Average Good Excellent Not sure

b. your ability to use computers for teaching purposes?.....

Poor Average Good Excellent Not sure

Section D: School e-readiness

a. How many of your teachers have had any form of digital literacy?.....

b. Is your school connected to electricity?.....

c. Does your school have any ICT equipment?.....

 If so, which and how many?.....

d. Does your school have a computer lab?.....

e. If provided with computer equipment, what security challenges would you expect to have?.....

.....
.....

Section E: Head teacher's attitude towards ICT

a) What benefits do you think computers would have to enhancing performance of your learners?.....

.....
.....

b) Do you suppose there may be any dangers of using computers in the learner of your pupils?.....

.....
.....

c) Have you personally observed any contribution ICT have made in the professional development of your staff?.....

.....
.....

Section F: Expected challenges of ICT integration

What challenges do you expect to face in the integration of ICT in your school?.....

.....
.....

Section G: Head teachers' ICT integration plans

As a head teacher, what plans would you have to expand ICT integration in your school?.....

.....
.....

THANK YOU FOR YOUR COOPERATION

APPENDIX 4: TIME FRAME FOR THE STUDY

Date	Activity	Remarks
MAY 2015	Formulation of problem and proposal writing	Done
JUNE 2015	Departmental presentation	Done
JUNE 2015	Piloting research instruments and adjusting research instruments	Done
JULY 2016	Collecting data and writing the report	Done
AUGUST 2017	Submitting final report	Done

APPENDIX 5: BUDGET

The budget for this project will be:

<u>Item</u>	<u>Amount</u>
1. Stationery	Kshs 4, 000.00
2. Piloting	Kshs 6, 000. 00
3Typing and photocopying	Kshs 5, 000.00
4. Project typing and binding	Kshs 25, 000.00
5. Data collection	Kshs 16, 000.00
Total	Kshs 56, 000.00