ICT Infrastructural Factors That Influence the Adoption of E-Learning in Public Secondary Schools in Kenya

Munyi Felister Wanyaga[1], John W. Kamau[2], Dr. Joyce Gikandi[3]

[1.2.3]Mount Kenya University

Abstract: *E-learning is Learning that is supported by use of electronic technology aided by computers. Emphasis on teacher centred teaching could be changed to student centred with the emergence of using E-learning technologies in schools thus creating an environment that is interactive and interesting for learning. A pedagogical shift has been facilitated by E-learning entailing an interaction between learners and Teachers in education. Despite the various studies conducted on E-learning, adoption of E-learning technologies in public secondary schools in Kenya is far from being realized. This begs into the question as to how ICT infrastructural factors influences the adoption of E-learning in secondary schools. This study filled this gap by analyzing ICT infrastructure as the key factor influencing E-learning adoption in public secondary schools in Kenya. A broad understanding of this factor is important to the policy makers who can embrace it to enhance the adoption of E-learning and suppress the barriers of its adoption. A cross sectional descriptive survey was carried out using both qualitative and quantitative methods and a census done on 8 public secondary schools in Kiambu County. Data was collected using both questionnaires and semi-structured interview guide. The study established that most schools had low investment in ICT infrastructure due to high costs of computer hardware, software and related accessories. The adoption of E-learning implementations has resulted in the need for development of new skills and competencies among Teachers as most Teachers who have been teaching in traditional methods are not technologically literate and sometimes may even resist because of the worry about losing their jobs if E-learning is implemented, because of their inadequate skills. The study recommends that there is need for schools to have E-learning infrastructure included in the financial plans to cater for maintenance and expansion of the ICT infrastructure . (297words)*

Keywords: E-learning adoption, ICT infrastructure, Public secondary schools.

1. Introduction

E-learning refers to the purposeful use of electronic systems in support of learning process. It is supported by electronic hardware and software either online (synchronous) or offline (asynchronous, (Allen, 2003; Garrison and Anderson, 2003). It can be delivered as self-paced or instructor-led, either individually or on a small or large group basis and can be used as a hybrid to the face-to-face format, or exclusively in open and distance learning (ODL), offered through electronic media such as CD-ROMs, mobile phones, Television, Video Conferencing (VC), e-mail, interactive TV and satellite among others. Different kinds of online learning can be enumerated as: Web supplemented; Web dependent; Mixed mode which involves online discussions, assessment, online project/collaborative work replacing part of face-to-face teaching/learning and Fully online, (Garrison and Anderson, 2003). E-learning is of great significance in education because it raises the quality of education and makes teaching and learning an active process connected to real life in a networked society when used appropriately (Zaman, Shamim & Clement, 2011). Various studies indicate that E-learning technologies use and adoption can enhance collaborative lifelong learning actively, heighten motivation of students, provide better information accessibility, deepen understanding and sharing of the working resources, help creative communication and students thinking (Khan, Hasan & Clement, 2012). Put differently, the way learning and teaching is done in schools seem to be changed by ICT.

Students ICT capabilities appear to be the emphasis instead of other subjects skills and application of ICT knowledge. Keengwe, & Onchwari, (2011) notes that adoption and use of E-learning tools in learning and teaching by Teachers is lackluckster in spite of improved and substantial E-learning infrastructure (computer labs, connection to Internet, availability of educational software, etc.) and rapid growth in access of E-learning materials. It seems that their attention towards E-learning and skills remain a challenge for their adoption and use of the technology efficiently in the classroom.

A high investment in Information Communication and Technology (ICT) leads to a general efficiency of capital and labor use as it is evident in Australia and United States (Pilat, 2003). Socio-economic development can be enabled by proper ICT infrastructure. Examples from the developed world where significant investment in ICT had major impacts includes increasing the United States Gross Domestic Product (GDP) by 7.8%, 8.0% in the United Kingdom (UK), 8.3% in Singapore and 8.4% in Australia, all such developments are linked with improved productivity, competitiveness and citizen engagement (Bhavnagar, 2005).

ICTs have the potential to improve delivery and access to education and health and creation of job opportunities. This increases effectiveness and accountability of government, business and non-profit making organizations which in totality contributes a conducive environment of socio-economic development (Morawaczynski &Ngwenyama, 2007) .

Faster rate of growth in economy can be achieved through use of ICT as a major factor driving economic policies of worldwide economies.

Examples that show how perverse ICT has become with vast implications on the growth of economy at the macro and national levels include elements such as rapid diffusion of digital platforms like mobile telephony, broadband networks and Internet (Morawaczynski & Ngwenyama, 2007). Education is one of the areas where use of electronic technology provides tangible benefits. Use of technology in and for education is now seen worldwide both as a necessity and an opportunity (UNESCO, 2009). It plays a great role in the three fundamental aspects of education policy that is access, quality and cost.

ICTs increase access to education through distance learning. They provide new and innovative means to bring educational opportunities to a greater number of people of all ages, especially those who have historically been excluded such as the population living in rural areas, women facing social barriers and students with disabilities (UNESCO, 2009). The use of ICT in education promotes E-learning. E-learning is the amalgamation of modern technology into the classrooms which can sometimes include learning that is completely independent of mediation (Voogt & Knezek, 2008). It involves use of Interactive multimedia, Internet based learning (online), Computer mediated learning and campus portal access to institutional processes and resources (Taylor, 2001).

2. Status of E- Learning in Education in Africa

In education sector, ICT role has been realized by countries in Africa. Education ministers meeting at first African ministerial roundtable on ICT for education, training and development in Nairobi June 2007 emphasized the role of ICT in promoting development especially in rural areas (Farrell et al, 2007) . Farrell (2007) summed the state of infrastructure in Africa regarding to access to ICT infrastructure as lacking, upscale and below par.

His study revealed the average of African University has bandwidth capacity equivalents to a broadband residential connection available in Europe and pay 50 times more for their bandwidth than their educational counterparts in the rest of the world. The survey revealed that access to ICT in schools is poor; computer laboratories are ill equipped with an average of computer to student ratio as 1:40 and low Internet connectivity.

In particular Sub-Saharan Africa is missing out of the boons of ICT and therefore its population is missing out on better education. (Shafika, Irene and Thomas, 2006). There are several initiatives in Africa to promote use of electronic technology in education.

One of the initiatives is Nepad's E-schools project, a multicounty, multi stakeholders continental initiative to impart ICT skills to Young Africans and improve the provision of education in schools. The goal of Nepads E-initiative is to have all schools implementing use of ICT in 10 years.

The other initiative is African Virtual University (AVU) which is among the first projects of e-learning to be implemented in higher learning institutions in Africa. Continuing and tertiary education access in universities of Africa is what AVU calls for expansion by exploiting academic resources globally and training academicians for material preparation for development in universities of Africa (Nafukho 2005).

A study by Awoleye and Siyanbola (2007) to assess the readiness of students in Nigerian universities for E-learning adoption revealed that about 80% of students have access to computer systems, 91% have access to Internet and communicate via the Email while 96.6% of the Teachers have access to computers and use Internet. These studies have mostly considered universities with little attention on other education sub-systems. This study seeks to fill the gap by looking at E- learning in teacher training colleges. In Zimbabwe, lecturers in universities have plodding up take of E-learning because of deficit in awareness of preparedness and facilities of E-learning to some extent (Lockias and Daga, 2008).The results also showed that insufficient infrastructure in universities hampered the preparedness of universities to use E-learning.

3. Research Hypothesis

This study collected and analyzed data to test the following hypothesis:

H_{01}: ICT infrastructure has no influence in adoption of E-learning technologies in public secondary schools in Thika West district, Kiambu County

4. Conceptual Framework for the Study

ICT infrastructural factors collectively influence the adoption of E-learning. some of these factors include the cost of hardware and software, internet connectivity and the actual implementation of E-learning in public secondary schools.
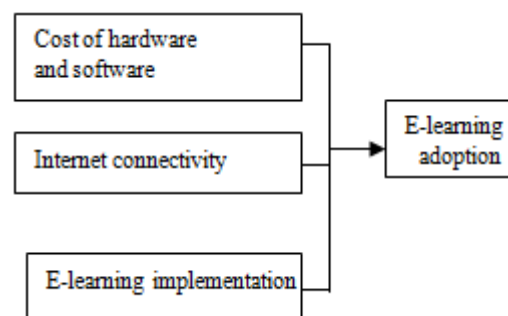
5. Methodology

A descriptive survey research design was adopted in this study. This is because it is an attempt to collect data from members of the population in order to determine the current status of that population with respect to one or more variables in a particular study (Mugenda and Mugenda, 2003). The target population was drawn from all the Principals and Teachers of all the 8 public secondary schools

1062

in Kiambu County. Stratified simple random sampling which involves dividing the population into distinct non overlapping subgroups (strata) according to characteristics of roles (The strata was made up of Principals and Teachers) and then a random sample was selected within each subgroup. This was used to obtain study sample, as this ensured that a representative sample is picked from each stratum thus ensuring that the research findings were able to be generalised. To this end, the study used a sample of 50% of the target population which gave a sample size of forty eight (48) respondents consisting of principals, deputy principals and Teachers. The data collected by use of the questionnaire was first thoroughly edited and checked for completeness and comprehensibility. Quantitative data was chronologically arranged with respect to the questionnaire outline to ensure that the correct code was entered for the correct variable.

Data was then cleaned, tabulated and analyzed with the aid of Statistical Package for Social Sciences (SPSS 22.0). The study used both descriptive and inferential statistics to analyze data.

6. Sample Population

The sample frame is a complete listing of all the sampling units or elements that can adequately represent that population (Brook,2013). however, there is no such complete formal list that can adequately satisfy a researcher as sample frame (Brook 2013; Orodho, 2012). In such instances, a researcher will develop a sample frame that produces a representative sample of the population elements with the desired characteristics of attributes.

A stratified random sampling technique was used to select a total of 8 schools from 16 public secondary schools in Thika west district. From each of the sampled schools, a principal, 3 Heads of departments and 3 Teachers were purposively sampled yielding a total size of 48 subjects for the study.
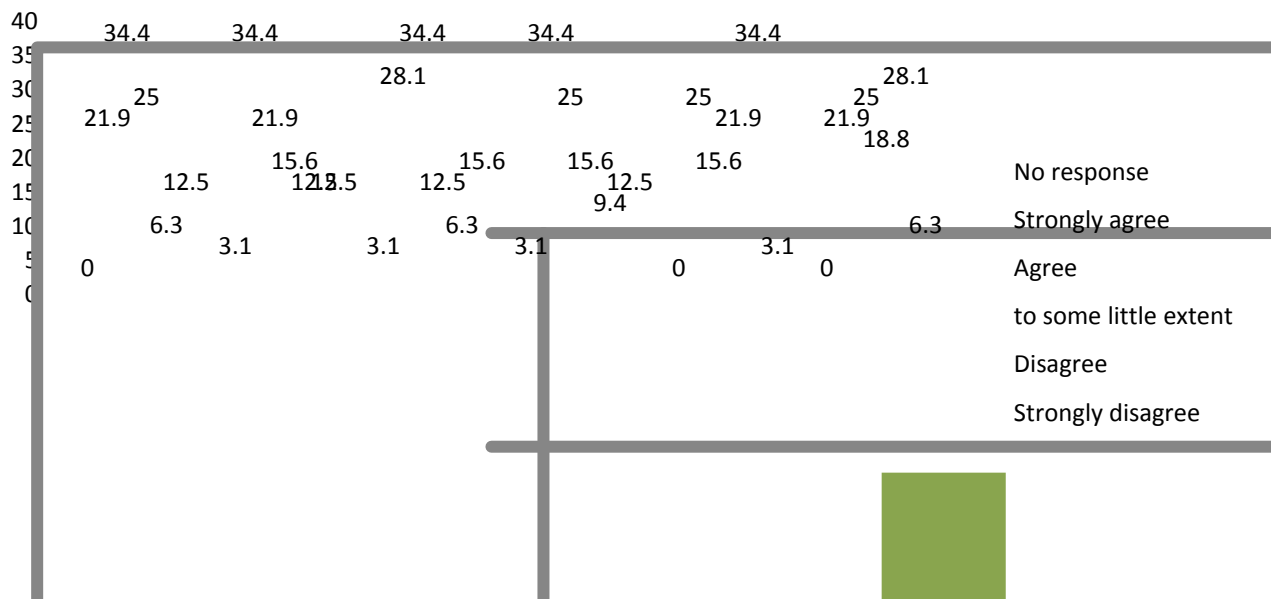
7. Discussion of Results

Table 1: Response rate

Response category	Frequency	Percentage
Responded	40	83.33
Did not respond	8	16.66
Total	48	100

The study above shows the total number of the respondents who responded and those who did not respond. The total questionnaires that were distributed to the field were 48, and out of these questionnaires, 40 questionnaires were returned duly answered which represent 83.33% of the total questionnaires that were administered to the field, while 8 questionnaires which represent 16.66% were not returned. From the table above it can be concluded that the response rate was good.

Table 2: Gender of respondents

	Frequency	Percent	Valid percent
Male	14	35	35
Female	26	65	65
Total	40	100	100

According to the above study the total number of males who responded was 14 representing 35% of total respondents while females were 65%. From Table 2 of the study it can be concluded that the majority of respondents were females.

Table 4: Respondent category

	Frequency	*Percentage*	*Valid percentage*
Principal	6	12.5	12.5
Deputy principal	8	16.6	16.6
Teacher	32	66.66	66.66
Total	48	100	100

The above study shows the category of people who responded among sample category. 66.66% of teachers responded, while 29.1% responded for both principals and deputy principals. From table 4, it can be concluded that that there was a good response rate across the sample categories, hence a fairly representative response.

Figure 1.1: Cost of ICT infrastructure

Paper ID: SUB155069

1063

As indicated in the figure above majority of the respondents(34.4%) agreed or strongly agreed that the cost of computers, network components, high-end enterprise servers and e-learning software have slowed down the uptake of e-learning in their schools respectively. While 34.4 and 28.1% of the respondents disagreed that the maintenance and cost of hardware and software is a deterrent the adoption of e-learning respectively.
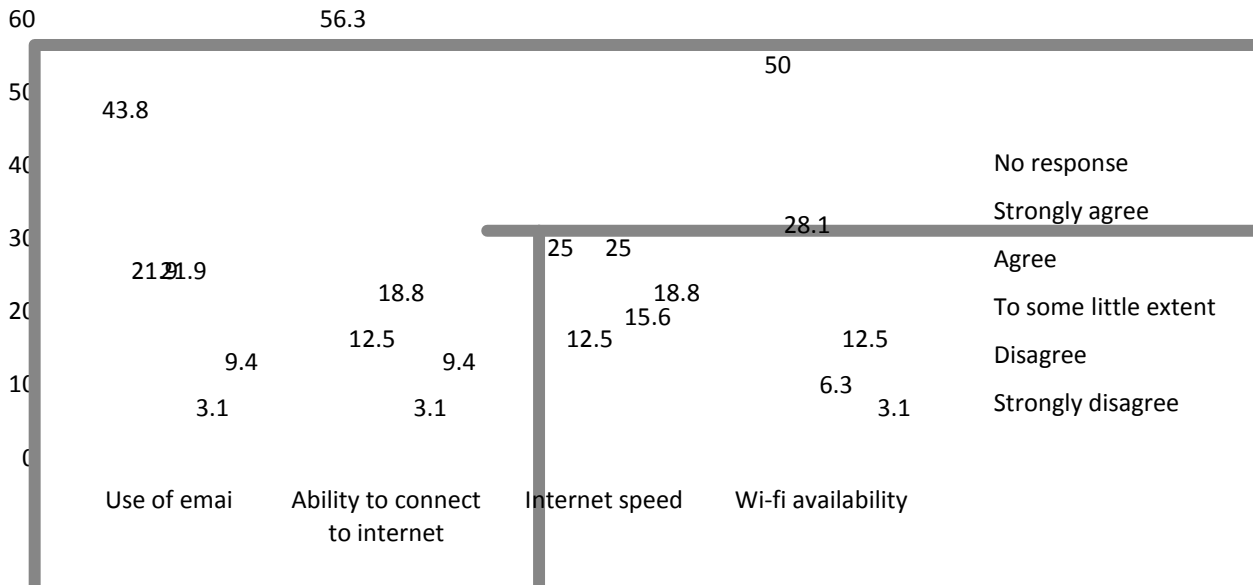

Figure 1.2: Connectivity to the Internet

As shown in the figure above 43.8% of the respondents strongly agreed that the use of email for educational purposes was appropriate, 56.3% of the respondents strongly agreed that connecting to the internet enabled them access e-learning resources, 25% strongly agreed and still another 25% of the respondents agreed to some little extent that the speed of internet connection in their school was very fast. 50% of the respondents indicated that they had Wi-Fi connection in addition to the cabled internet.

FIGURE 1.3
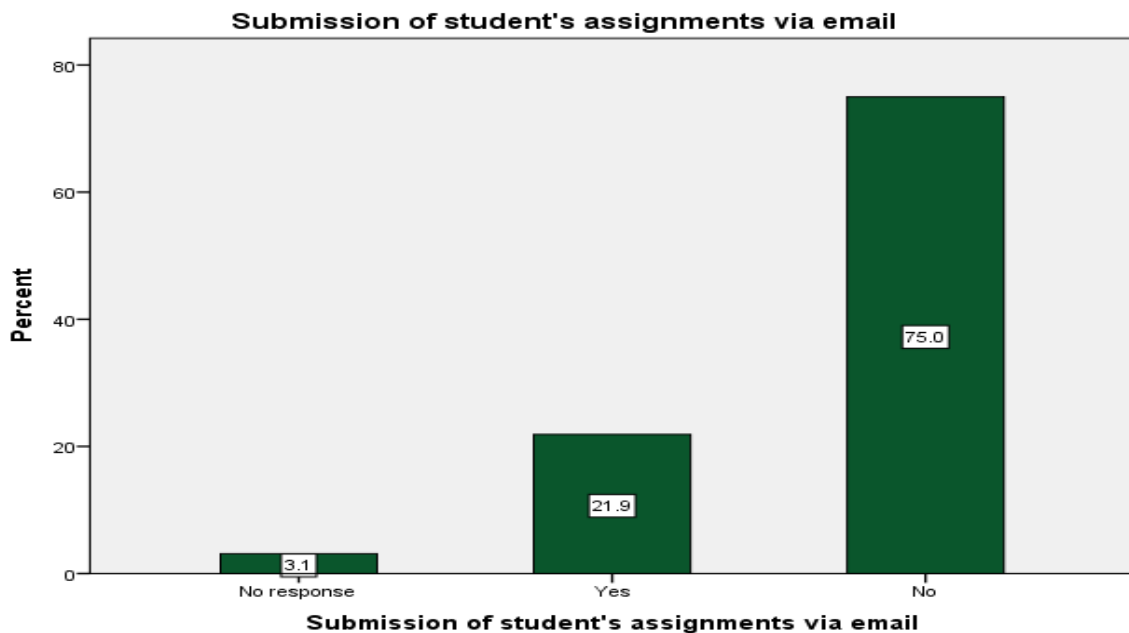
Figures 1.3 and 1.4: Submission of assignment through emails and its effectiveness

As shown above, 75% of the respondents indicated that their students did not submit their assignments through email. And as indicated below, of those who had assignments being submitted through email, only 12.5% were effective, while 78.1% did not respond.
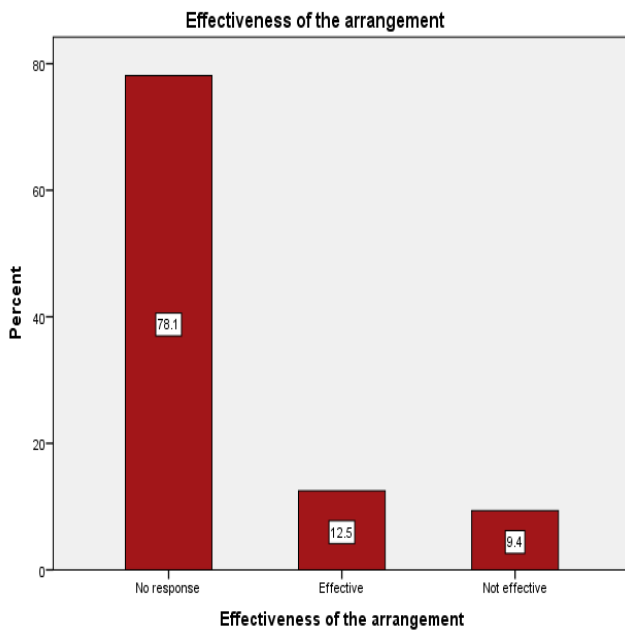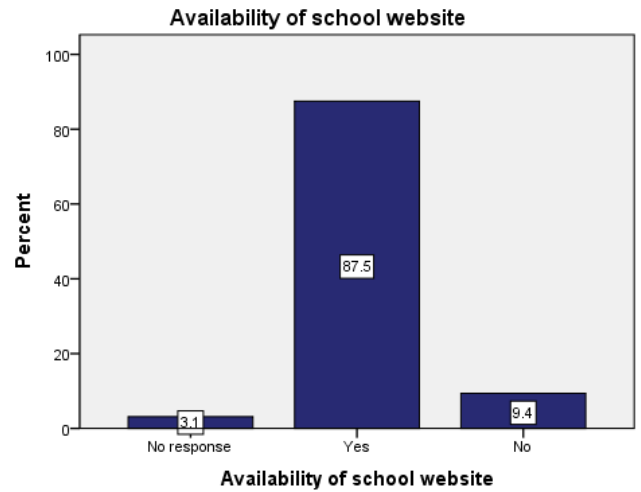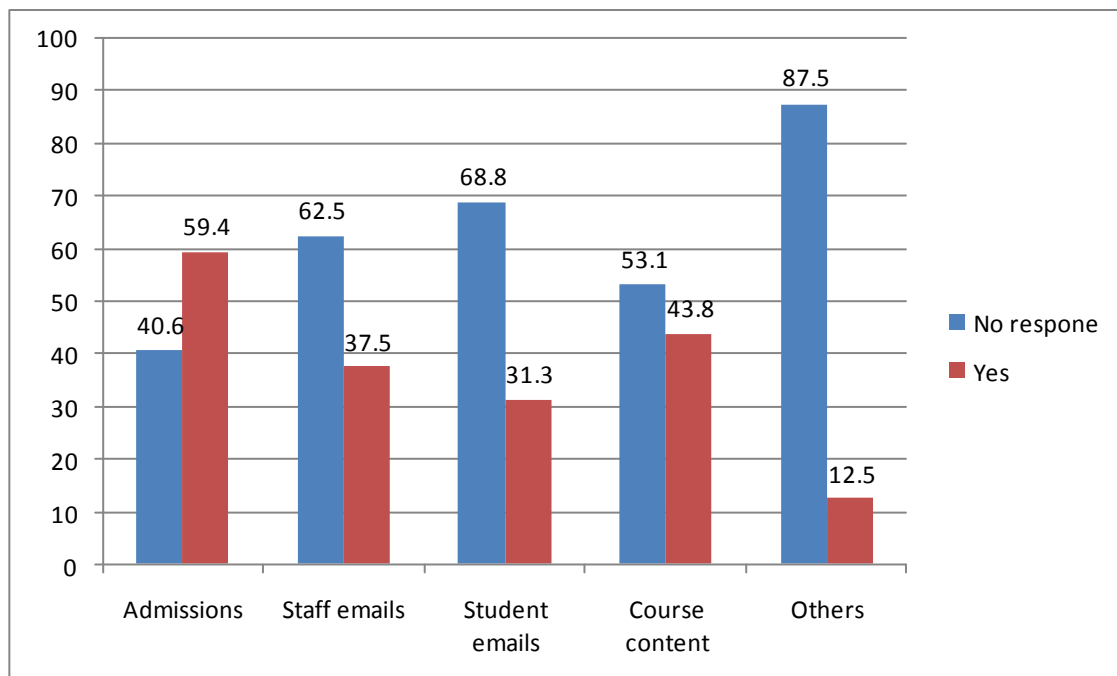
Figure 1.4

Figure 1.5

Figure 1.6
Figure 1.5 and 1.6: Availability of school website

As shown in the figures above, 87.5% of respondents indicated that their schools had websites, of those, 59.4%, 37.5%, 31.3%, 43.8% indicated that the the information posted on the websites was on admissions, staff emails, student emails and course content. While 12.5% of the respondents indicated that other type of information was posted such as school motto, vision, and previous academic performance.

8. Conclusion and Recommendations

The study established that most schools have low investment in ICT infrastructure due to high costs of computer hardware, software and related accessories. The adoption of E-learning implementations has resulted in the need for development of new skills and competencies among Teachers as most Teachers who have been teaching in traditional methods are not technologically literate and sometimes may even resist because of the worry about losing their jobs if E-learning is implemented, because of their inadequate skills. The study recommends that there is need for schools to have E-learning infrastructure included in the financial plans to cater for maintenance and expansion of the ICT infrastructure.

References

[1] Anouk, J,.Bart ,C .& Nyaga, M .(2005). *Integrating ICT in Teacher Training*: *Reflections on practice and policy implications*; case of KTTC Retrieved from http:www.idrc.ca/en/ev-93060 html

[2] Awoleye ,B. & Siyanbola, C. (2007) .An assessment of students preparedness for E- Learning adoption in Nigerian universities. Retrieved from http://ijl.cgpublisher.com/product/pub.30/prod. 1334

[3] Bhatnagar ,S. (2005). *ICT Investment in developing countries. An impact assessment study, Information Technology in Developing countries*, Newsletter of the IFIP working group 9.4.15 1-8 Retrieved from http://www.ejisdc.org/ojs2/index.php/ejedisc/article/view/524/264

[4] Brook,.S.E (2013). Selecting a sample. Educational Research. 250.

[5] Becta Review ,(2007) .*Emerging technologies for learning*, UK Becta 2007 Retrieved march 8, 2009 from http://partners.becta.org.uk/upload-dir/uploads/page documents/research/emerging technologies 07.pdf .

[6] Checkpoint ,(2008) .*Kenya launches e-learning in schools* Retrieved from http://www.checkpoint.elearning.com/article/4892.html.

[7] Commission of European Communities, (2008) .*The use of ICT to support innovation and lifelong learning for all*- a progress report Retrieved from http://ec.europa.eu/education/lifelong learning/programme/doc/sec2629.pdf

[8] Cortright ,J .(2001). *New growth theory, technology and learning*. A practitioner's Guide Retrieved from http://www.eda.gov/PDF/1G3LR-cortright .pdf 66

[9] Economic Intelligence unit (2008) *E- learning rankings, maintaining momentum*. retrieved from http://a330.g.akamainet/7/330/25828. Elena, L. (2008). .New policy on ICT use in education Retrieved March 15, 2009 from http://www.checkpoint.elearning.com/article/5168.html.

[10] Farrell ,G. (2007). *ICT in education in Kenya* Retrieved from http://www.infodev.org/en/publication.409 html.

[11] Farrell, G. &Shafika, I. (2007) .– *survey of ICT and education in Africa*. Summary report based on 53 countries. WashingtonDc.Infodev Retrieved from http:www.info dev.org/lent publication.353 html.

[12] Ford,M. D. (2007). Technologizing Africa, on the busy bumpy information highway.*Computer and composition* Retrieved from http://ijedict.dec.uwi.edu/viewarticlephp?id=740=html.

[13] Fourier, M .& Alt ,H. (2002) .*Challenges to Sustaining and Enhancing Quality of Teaching and Learning in south African universities*. Quality in higher education. Retrieved from http://ijedict.dec.uwi/viewarticlephp?id=470

[14] Gay, l.R (1992) .Education Research: competencies for Analysis and Application 3rd edition Paris merin Publishing Company.

[15] Gitonga ,M .(2009). *SEACOM launches fiber optic in Mombasa*. Daily nation 7th March. P.20 67 Good, C.V (1992) .Essentials of Education research, methodology and design. New York: Meredith Corporation.

[16] Infinedo, I(2005). *Measuring Africa's e readiness in the Global networked economy*. A nine country analysis E: / international Journal of Education and Development using ICT Vol.1 no.1 (2005). Retrieved from http://ijedict.de.uwi.edu.// view article.php?=12&layout=html

[17] Kashorda, M. Waema,T. Omosa, M. &kyalo, V. (2007) .*E- learning survey of higher Institutions in Kenya* Retrieved from http:// www.kenet.or.ke/e-readiness

[18] Kammsu ,A, Siekpe, J. &Euzy, H.(2004). *shortcomings to globalization; using internet and electronic technology in Developing countries*. The journal of developing Retrieved from http//:www.encorewiki.org/display/encore/shortcomings +Globalisation using+Internet+Technology,

[19] Kessy ,D. Kaemba, M. &Gachoka ,M .(2006). *The reasons for underuse of ICT in education in the context of Kenya, Tanzania and Zambia*. Paper presented in the 4th IEEE international workshop Technology for developing countries, Iringu, Tanzania.

[20] Kenya school NET (2003). *preparing a workforce for the evolving information economy*. A survey of ICT access and use in secondary schools. Nairobi. Kenya: Summit strategies Ltd

[21] Kombo, K. D & Tromp, L.A.D (2006) .Proposal and Thesis writing.second reprint). Pauline publications Africa. Nairobi. (GPO):Kenya

[22] Lockias ,C. &Daga ,M. (2008). *The current state of E-Learning at Universities in Zimbabwe*. International journal of Education and development in using ICT.. Vol 4 No. 2 (2000), from http://ijedit.dec uwi.edu.viewarticle.pupil.d =450.

[23] Morawaczynsnki, O. & Ngwenyama, O. (2007). *Unraveling the impact of Investment in ICT in Education and Health of development*: An analysis of archival data of five West African countries using Regression spines. Electronic journal of Information systems in developing countries, 29,5. 1- 15

[24] Miller ,J. (1999). *Entering the information Age setting priorities in SouthAfrica:* 2nd International Al shaam conference on Information Technology. Damascus . Syria.

[25] Nafukho, F.M. (2005). *the pace of e-learning in Africa's institutions of higher learning*. Published in higher education policy, 100 graduate education.USA

[26] Ndiku, L. (2003). *The problems District encountered by school personnel in the implementation of compute Uasin Gishu*. Unpublished thesis- Moi University Eldoret

[27] OECD ,(2004) .*The economic Impact of ICT measurement, evidence and Implication* Retrieved September 09, 2008 from http://www.decd.org/documents/51/10,3343. Olaniyi, S. S.(2006) .E-learning technology: The Nigeria Experience Retrieved from http://www.fig.net/pub/fig2006/paper/ts84-o3 69

[28] Orodho, J.A. (2005). *Elements of Education and Social Science Research Methods*. Masola Publishers. Nairobi.

[29] Pilat, D. (2003). Economic impact of ICT on firms and economies. Retrieved from http://www.itu.int/wsis/newsroom/background/doc/ap/pilat/.doc PISA, (2005) .Are students ready for Technology Rich world?

Author Profile

Munyi Felister Wanyaga is an IT teacher at the MaryHill Girls High School she holds a Master of Science in Information Technology and a BED-

Paper ID: SUB155069

1066

science from Mount Kenya university. She is an upcoming scholar with her research interests mainly in E-learning, Information Systems, and Computer security.

Dr J Gikandi is the head of E-learning and the director of postgraduate studies in Mount Kenya University (Nairobi Campus). She holds a PHD in E-learning. She has strong interests in E-learning and information Systems. She has widely published and presented papers in conferences mostly on areas to do with Online learning.

MR. John Wachira Kamau is a lecturer at Mount Kenya University. He holds a MSC. IT and is currently a third year PHD student at the University of South Africa (UNISA). He has strong interests in Databases, artificial intelligence, software engineering and information Systems. He has widely published and presented papers in conferences mostly on areas to do with Open Source Software adoption (OSS).