ICT Use and Connectivity: A Case for Southern and Eastern Africa Educational Institutions

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Introduction

In its quest to achieve the United Nations Millennium Goals, Africa considers ICT as one of the major components to help in their achievement. ICTs have been integrated for several decades (Bhurton, 1999) in different settings in Africa, but less has been documented in terms of use and connectivity in educational institutions. Considering the advances, initiatives and projects in ICT that have been undertaken in many educational institutions in Africa, ICT use and connectivity is still seen as a big barrier to their success. ICT integration focuses on its use in the provision of different services and how easy reach out to the rest of the world can easily be achieved. Some of the services that are benefiting from ICT use and connectivity include education, agriculture, communication and business. There are still significant differences between use and connectivity amongst the different service sectors, areas (urban/rural) and people. The reasons for having such significant differences are dependent on several factors. On several occasions use and connectivity of ICTs has been looked at as something imported from somewhere into Africa. With non-availability of minimum infrastructure, power and resources to acquire ICTs, many people in Africa still believe that ICT integration is being imposed onto them than being something that has been introduced to help in improving service provision. Adam & Wood (1999) note that to undertake an assessment of ICT use it should be based users’ iterative and adaptive behaviour and how they are able to cope with the problems of ICT in the local context. Therefore it is very difficult to conclusively determine the effective use and connectivity of Africans due to their diverse cultures, behaviours and traditions.
It should be noted that different regions and service sectors in Africa have benefited from ICT use and connectivity in the past decade. The information era has been significantly less to the educational sector in Africa because of unfavourable conditions for deploying ICTs. This is clearly witnessed in undeveloped infrastructure and the illiteracy that pertain to the African continent. Potter et al. (1999) note that ICT contributes to empowerment and poverty reduction. It has also been noted by the World Bank Report (2002) that ICT promotes economic growth and increases opportunities for poor people. The G-8 and United Nations have also advocated for the implementation of ICT in all developing countries services such as education. There are lots of projects funded by the United Nations, the World Bank and other funding organizations that focus on ICT integration within Africa (Hawkins, 2005; Steiner et al., 2005) though implemented in an uncoordinated manner. In Uganda, several ICT-related educational projects such as NEPAD e-Schools, Cyber School Technology Solutions, Rural Communications Development Fund, School Net Uganda, Connect-ED, Hall in the Wall, Curriculum Net, U-Connect, Global Teenager Programme, NUFFIC I & II, Rockefeller Projects have been undertaken. However, these project activities are uncoordinated and have led to so much duplication and unsuitable projects across Africa. One of the reasons for such a practice is that several funding bodies target communities within Africa that have no minimum infrastructure, resources, capacity and even the knowledge to exploit fully what is developed for them. Many of these projects also do not have sustainable plans and do not develop effective human capacity for the community projects. Several authors have also indicated that ICT initiatives on the African continent are often frustrated by barriers such as lack of robust telecommunications infrastructure with sufficient reliable bandwidth for Internet connections, high costs, lack of financial resources, inadequate equipment, and low levels of computing, technology and literacy skills, as well as cultural and behavioural attitudes (Bourgouin, 2002; Cullen, 2001; Anckar & Walden, 2001 and Wong & Kwan, 2001).

Africa needs innovative technological features that can process information and transmit it for the purpose of learning and educational development (UNESCO, 2004). This is only possible through the use of ICTs and the appropriate connectivity capable of undertaking the activities of the teachers in their absence. Hamel (2003) has also emphasized the importance of Africanization of knowledge and knowledge tools such as ICTs like the Internet. Adapting ICTs in relation to the existing culture and traditions can help change the perception that these tools are just imported into but not part of Africa. Mooij (2007) observed that integrating ICT in an educational context means combining all technologies that can process information and transmitting it for purposes of learning and educational development. This
use of ICTs includes all internet connectivity, TV, Computers, Radios and Video Conferencing use for the purpose of teaching and learning. Soeftestad (2001) argued that ICT can help leverage the situation for the disadvantaged poor by delivering the right knowledge on their doorstep at the right time. In Africa today, we realize great improvement in ICT connectivity and many poor people are reaping from this by undertaking cheap or free life-long learning. It is now a common practice to see Digital TV stations, Radios and Video Conferencing facilities delivering teaching and learning to students within their own homes. This chapter utilizes research findings from Panaf Observatory to describe ICT use and Connectivity within the Southern and Eastern Africa Educational Institutions.

### Review of literature

ICT use and connectivity within educational institutions which was the focus of this chapter is one of the ways that has been cited as lagging behind on the African continent. We realized from the research that despite the donor funding that is made to African Educational Institutions, there are diverging results related to ICT use and Connectivity. Results clearly showed that the biggest percentage of ICT use and connectivity within educational institutions is still below the required levels. The computer-educators/computer-student ratio are still high especially in the lower educational institutions of learning. The number of computers, including the connectivity, within the educational institutions, especially at lower levels is very low. It is also apparent that connectivity varies from educational institutional type (primary, secondary and tertiary). It was found that the majority of the educational institutions favoured Broad band as the connection type and Wireless was the lowest connection type.

### Strategies and future plans

In order to streamline ICT use and Connectivity within educational institutions, governments needs to clearly outline strategies that have to be followed without fail. Here are some of the proposed strategies that could be adopted:

- Within national ICT policies, the required computer-educator and computer-student ratio should be clearly indicated. This will help in monitoring and streamlining ICT implementation within the individual nations.
- All donor-funded ICT projects should be monitored centrally to make sure the implementation is done in the most appropriate way. They should
also be recorded and noted so that quick follow-up on effective projects is easily done.

- More incentives to ICT use and connectivity should be introduced in the different countries depending on the available circumstances. For example, tax exemptions on the importation of ICT for educational purposes should be stressed across Africa.

- Educational institutions within the individual countries need to cooperate in acquiring connectivity. They could buy the bandwidth in bulk and share among them than buying individually from expensive service providers.

- Educational institutions should encourage their staff and students to acquire ICTs via established loan schemes. With such schemes it is easier to equip the educational institutions with enough computers which are not entirely the property of the institution.

- Individual schools should devise or borrow innovative ideas on how they could acquire more ICTs. This could be done through savings every term that directly target the purchase of ICTs for the institutions.

- Develop a national strategy on computer administrator training so that the educational institutions can obtain the right people other than depending on experience. This can easily be done when there is a stipulated curriculum for computer administrators.

Governments should improvise and acquire educational licenses for the institutions so that there is no abuse of the proprietary licenses for the different software applications. Such schemes are offered by the software companies but need to be agreed upon.

**Research framework**

The data being considered in this chapter was collected using questionnaires from two East African (Uganda and Kenya) and Southern African (Zambia and Mozambique) countries. In each African country, 10 schools which comprising urban, rural, mixed, single, primary, secondary and teacher training institutions were considered. Researchers also used focus group discussions and interviews which highlighted more information which was not readily offered in the questionnaires. It is apparent that the schools considered in the research were selected at random but needed to adhere to the research criteria. From each country, data related to the general practice of each country was collected and this included ICT use and connectivity within the educational institutions.
Participants

The participants in the research from whom data was collected included students, managers, teachers, computer lab technicians and policy makers. These were randomly selected from the institutions visited during the research. The focus group discussions comprised all types of people that were present during the time of the research.

Methodology

The chapter utilizes both qualitative and quantitative techniques to generate results out of the data collected and stored within the Panaf observatory. It is apparent that data on different ICT indicators was collected by the researchers, uploaded into an online observatory and can be accessible freely by anyone across the world. The methodology used is as shown below.

Research Design

The collected data, which was entered within the repository, was downloaded as Excel files and then utilized during the analysis process. Several analytical methods were used including graphical, correlations and t-test analysis to cater for both qualitative and quantitative form of questions. Literature from both textbooks and journals was also used to help in proposer interpretation of the findings. It was apparent that most of the analysis was undertaken as a comparison of both the Southern and Eastern African educational institutions.

Data Collection Methods/tools

The instruments used for data collection included questionnaires that were targeting students, managers and teachers. The questions within the instruments were both open and closed. Some of the questions developed were meant for focus discussion groups and these were used also in the mini interviews that were carried out. The questions were categorized under certain topics (ICT indicators) and each had sub topics. Once the data was collected it was uploaded within an electronic repository that can be ubiquitously accessed. The repository was developed to have the ability to query the information and have access to particular information of interest.

Presentations and discussion of findings

The results presented in this chapter relate to the comparison of ICT use and Connectivity for the Southern and Eastern African Educational Institutions. Several
indicators were considered during the research and these included: number of computers within the institutions, number of computers within the institutions available to educators, number of computers within the institutions available to the students, number of computers within the institutions that are connected to the internet.

**Number of Institutions with Computers and their Use**

The analysis that was made on the number of institutions that had computers for use for several services indicated the majority of the institutions considered had very few computers. It was noted that the teacher training institutions had the most computers, followed by secondary schools and lastly the primary schools. This is an indication that ICTs are generally not taken very seriously in the lower institutions of learning. It is apparent that among the teacher training institutions of learning considered, on average Uganda, Mozambique and Kenya respectively, had the highest number of computers. Considering the number of computers within the secondary schools it was found that on average Uganda, Zambia, Mozambique and Kenya respectively had the highest number of computers. In the primary institutions of learning, it was found that Kenya, Uganda and Zambia respectively had the highest number of computers (see Figure 1).

**Figure 1: Number of Computers in the Institutions**

It was also noted that the average ratio of computers to educators lowered as the educational levels lowered in the Southern and Eastern African Institutions. The average ratio in Teachers Training Institutions was 2.61, in secondary schools was 0.75 and in primary schools it was 0.474. These results indicate that the lower
institutions’ use of ICTs is below the required standards and more efforts are required to change the status. Despite having the computers within the institutions, not all were meant to be used by the educators. It was further found that the average ratio of available computers for educators reduced further as you went lower down the level of learning (Teacher Training – 0.612, Secondary Schools – 0.522 and Primary Schools – 0.255). It is apparent that the average computer use by the educators in both Southern and Eastern Educational Institutions is below the desired standards.

In respect to computer use by students, the research found out that there was a very big computer–student ratio in majority of the institutions investigated as shown in Figure 2. It was noted that computer-student ratio was lowest in the higher institutions of learning and least in Uganda. Uganda had the lowest computer-student ratio in the higher institutions of learning amongst the countries considered in the research. The secondary and primary schools had high computer-student ratio and these were more significant in both Uganda and Mozambique. It is also apparent that Southern African states considered in the research had the highest computer-student ratio as compared to their counterparts in the Eastern Africa region.

**Figure 2: Ratio of Computer to Student within Educational Institutions**

**Connectivity within the Institutions**
Investigation undertaken on the connectivity (use of the internet) within the Southern and Eastern African Educational Institutions noted several pertinent issues that are of interest to policy makers. The research first considered the type of connectivity that existed amongst the educational institutions and the following were the results. Figure 3 describes that, on average, Broad band (52%), Dial Up (24%), VSAT (19%) and Wireless (5%) connection types had been utilized within the institutions. The majority of the institutions utilized Broad band and utilized the Wireless connection least. A big percentage still depended on the Dial Up connection, a pretty old technology as compared to the Broad band connection. Therefore, technology absorption within several educational institutions was very slow. It was also found that some schools depended on the expensive VSAT connection type which is not dully sustainable by the institutions. The institutions that utilized the VSAT seemed to have funding from donor organizations.

**Figure 3: Percentage of Connection Type within Educational Institution Types**

<table>
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<tr>
<th>% Connection type within the Institutions</th>
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<tr>
<td>% of Connection Type, Broad Band, 11, 52%</td>
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<tr>
<td>% of Connection Type, Wireless, 1, 5%</td>
</tr>
<tr>
<td>% of Connection Type, Dial Up, 5, 24%</td>
</tr>
<tr>
<td>% of Connection Type, VSAT, 4, 19%</td>
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Despite having all the different types of connection within the educational institutions, it was found out that not all computers had connectivity. It was found out that, on average, 89.32% Teacher Training Institutions’ computers, 66.54% Secondary School Institutions’ computers and 16.38% Primary School Institutions’ computers had connectivity. The results indicated that connectivity within Primary Schools was still very low and it was only Zambia and Ugandan Primary School computers that had connectivity.
The research further investigated what country’s utilizes the specific connection type most and the result could indicate which country educational institutions absorbed ICT quicker than others. Figure 4 indicates that Mozambique, Uganda, Zambia and Kenya respectively had the majority of institutions with the Broad band connection type. Kenya, Zambia, Uganda and Mozambique respectively had the majority of institutions with the Dial Up connection type. Uganda, Mozambique, Kenya and Zambia respectively had the majority of institutions with the VSAT connection type. From the results, it was found that among the institutions investigated, only Kenya utilized the Wireless connection type. The results clearly indicated that despite being the same geographical bearing, ICT absorption within the educational institutions and country varied widely. There are several reasons attributed to such absorption and one is related to the donor funding that the individual countries and institutions receive.

**Figure 4: Percentage of Connection Type per Country**

Availability of Computer Administrators

In order to have a well maintained computer infrastructure within an educational institution, there is need to have a computer administrator. From the research undertaken within the selected educational institutions from both Eastern and Southern Africa, it was found out that the majority of the institutions had employed computer administrators. It was found out that 7/9 primary schools, 18/20 secondary schools and 5/5 teacher training institutions had employed computer administrators. These computer administrators were mandated with the role of computer maintenance, network maintenance, software maintenance,
trouble shooting, hardware and software installation. It was also found out that the majority of the computer administrators also acted as computer teachers in the lower level educational institutions. These people had not trained as computer administrators or teachers but undertook the role because of the experience they had acquired from other places. The computer administrators also acted as the custodians for the computer labs and therefore were responsible for securing the lab infrastructure. The other role undertaken by the computer administrators was to develop a time table for the use of the computer labs.

Software Applications in Use

Having computers without any software applications makes them useless to the users. The research set out to find out what type of software applications are used by the educational institutions participating in the research. The results from the research indicated that all the educational institutions that possessed computers were running Windows operating system but of different versions. One secondary school (Nabisunsa) and one teacher training institution in Uganda were found to be using a Linux operating system which could not be found in any other institution that participated in this study. The primary level educational institutions were mostly running versions of Windows below Windows XP. It was also found that the software applications that were in use included Microsoft Package, Adobe (Reader, Publisher), Edubuntu, Dreamweaver, Anti-Virus, Encarta Encyclopedia, MS QuickBooks, Photo Shop, Corel Draw, Foto Impact, SPSS and Netcen School Solutions (Time Tabler).

The majority of the software applications that were being used in the educational institutions were outdated and no updates were being made on a regular basis. It was also found that most of the software was proprietary but the institutions had acquired them through other means. Due to the fact that most of the software applications were not licensed, updates were not possible and this increased the attack of viruses on many institutional computers.

Conclusions and Recommendations

ICT use and connectivity has been found to be of great importance to all educational institutions investigated within the research. ICT use and connectivity was of less importance as you went down the level of education. It was found out that the majority of the educational institutions investigated had lowly integrated ICTs
for teaching and learning. Connectivity was still a major barrier to many of the institutions, most especially the lower levels of education. Absorption of technology was still a problem in many of the educational institutions because many of them were depending on old types of technology and software. It was also found out that the majority of the educational institutions did not employ trained ICT administrators but depended on teachers who just had experience to use ICTs.

Several strategies were formulated out of the research which included: improvising more incentives to increase on the integration of ICTs; establishing bulk purchase of ICTs including connectivity; ICT educational projects being monitored and documented; institutions being innovative in acquiring ICTs, among others. When such strategies are taken into consideration, educational institutions and governments will go a long way in the integration of ICTs for teaching and learning.

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