

Investigation of Information Communication Technology in Kenyan Primary Education Sector

¹Sanja Michael Mutong'wa, ²Mneria Esau, ³Evans Ogoti Ogenda (PhD),
⁴Evans Tenge, ⁵Bernard Nasiuma (PhD)

^{1,4}School Of Informatics and Innovative Systems, Faculty of Information Technology, Jaramogi Oginga Odinga University of Science and Technology University (JUOOST), Kenya

²School of Business Mt Kenya University -Eldoret campus, Kenya

³Head of academics, The Catholic University of Eastern Africa-Gaba

⁵School of Human Resource Moi University, Kenya

ABSTRACT

ICT in place offers primary education a good child initiative, the opportunity to attract world-class educationist hence provides a very effective and efficient learning environment. The objective is to analyze and answer the following: Why should ICT be implemented in Lower Primary?, what major challenges does ICT implementation face in lower primary schools and how is ICT significant to the Boy/Girl Child?, what is the role of 'Teacher' and 'Pupil'? , How does its implementation influence lower primary education standards? The main focus of this research is to investigate the information communication technology in Kenyan primary education sector - its indicators in terms of achievements and service delivery - challenges facing the implementation of ICT tools and programmes in Primary schools will be discussed. Neglect in educational development, specifically using best tools has added to the inequalities that the youth face in society, due to inadequate educational facilities, resources and manpower. The research utilized multiple case study method-scopes of ten (10) different countries across the world in comparison with Kenya, the ICT policies, infrastructure and their role in Education promotion will be analyzed to obtain an understanding of ICT implementation in Primary Education.

Keywords: *Information Technologies (IT), County, Education Sector, ICT (Information Communication Technology), EC (European Commission), Counties. Primary schools*

1. INTRODUCTION

DEFINITIONS: "ICT stand for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." "ICT implies the technology which consists of electronic devices and associated human interactive materials that enable the user to employ them for a wide range of teaching - learning processes in addition to personal use." (Rabah,2009)

These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony. "ICT is that technology which uses the information to meet human need or purposes including processing and exchanging." "Information and communications technology (ICT) in education is the processing of information and its communications facilities and features that variously support teaching, learning and a range of activities in education." (Rabah, 2009)

The European Commission (EC) enumerates such technologies "to include well known telecommunication services such as telephony mobile telephony and fax. Applications include video-conferencing, tele working, distance learning, management information systems, and stocktaking. Networks may comprise of copper or fiber optic cable, wireless or cellular mobile links, and satellite links. (Wafula .K & Ocholla .D, 2007).

Software programs are the lifeblood of all these components, the sets of instructions behind everything from operating systems to the Internet." The EC sums it up adequately by stating that "ICTs are enabling and facilitating technologies. Individuals, community groups, business or government departments with access to affordable communications and computers can use them to save time and money and improve the quality of their work or home lives", Sanja,(2013)

While the common use of ICTs tends to refer to the newer technologies of phone and internet, the term ICT is best used to also include the more traditional communication media such as radio and television. Digital convergence is gradually bringing devices to the market that includes the traditional media (phones with radio, media centers with computing capability and television) which will increasingly blur the distinction between old and new ICTs. (Wafula .K & Ocholla .D, 2007)

Technologies can be said to include a broad array ranging from old technologies such as radio and TV to new ones such as cellula. ICTs can also help in the achievement of the vision 2030 Goals in Kenya through three basic processes: enhancing livelihoods, improved efficiency in the delivery of services, and allowing local stakeholders a voice in the planning process. ICT advances brought about by the private sector can also complement initiatives undertaken by government or development-cooperation agencies to promote lower primary education, (Sanja, 2013).

<http://www.cisjournal.org>

The aim focus of this research is to analyze the need for implementation of ICT in lower and its indicators in terms of achievements and service delivery. It will draw recommendations on priority issues and future trends for policy makers in terms of ICT implementation in Primary Education. The research will draw on information gathered during the process of mapping and dialogue/discussion to present analysis and make recommendations about priority issues related to ICT implementation in Education to benefit a Boy/girl child. It will also outline challenges facing the implementation of ICT tools in Primary schools, programmes and activities, and will identify the emerging trends and technologies that will shape ICT tools in the education sector, Heeks (2006).

The analysis will be presented on an international and regional level as well as on a country and four country level according to the research phase that will be carried out and established. The paper will synthesize guidelines and good practices in broad terms for using ICT tools in the education sector; and will focus on the cost-effectiveness, Validation and management factors of ICT tools that support activities i.e. the communication tools, internet, and its better monitoring of Education related modalities. (Wafula .K & Ocholla .D, 2007)

The main objective of our research intends to analyze : ICT implementation in Lower Primary, the major challenges faced during ICT implementation in lower primary schools and its ICT significant to the Boy/Girl Child?, what is the role of 'Teacher' and 'Pupil'? , How does its implementation influence lower primary education standards?. The main focus of this research is to investigation the information communication technology in Kenyan primary education sector - its indicators in terms of achievements and service delivery - challenges facing the implementation of ICT tools and programmes in Primary schools will be discussed.

1.1 Why Implement Ict in Lower Primary Education

According to Frost & Pierson (1998), —Pupils learn best by beginning with concrete experience and then move progressively to reflection and abstract understanding (p.40). This leads us towards the project-based concept, as it employs this gradual transition of students from simple to more complicated tasks, through real-life experiences. By engaging in projects, Pupils combine learning with practical experience and learning within social context (Stables, 2000). With competence of technology we can signify the stage at which Pupils learn how to utilize technological means. One of the most important concepts of the learning process at this stage is what Draper, Brown, et al (1994) have defined as —task grasp, that is the task that actually is regulating a learner's behavior. Another factor that influences pupils' learning is students' capabilities at a particular age. According to Shield (2000), —the learning task should be tailored to the students' capabilities rather than the pupils

having to fit in the software designer's generalized understanding of how learning should take place (Andaloro & Bellmonte, 1998, as cited in Shield , 2000, p. 9). Technology tries to facilitate the process towards the solution of current problems and current problems are the cause for having the process of improving technology initiated. According to Schultz (2000), this interrelationship of technology to human way of thinking also reflects the cognitive abilities of the individuals, Heeks (2006)

ICT if implemented can help in the achievement of the Millennium Development Goals through three basic Processes: enhancing livelihoods, improved efficiency in the delivery of services (in primary schools), and allowing stakeholders (Board of governors, parents- Board) a voice in the planning process. Heeks (2006) ICT advances brought about by the private sector can also complement initiatives undertaken by government or development-cooperation agencies. Two factors will be vital in allowing these benefits to unfold: the development of capacity in ICT use; and the generation of suitable content, established not by the ICT sector but by the lead sector in question – health, education, governance. Another factor that influences students 'learning is students 'capabilities at a particular age. Heeks (2006)

According to Shield (2000), the learning task should be tailored to the students 'capabilities rather than the students having to fit in the software designer's generalized understanding of how learning should take place. This means that in order for the learning process to smoothly lead to the desired learning outcome, teachers should be very helpful when employing texts, reference sources, multimedia and communication tools (Shield, 2000), as they have to adopt them to pupils' learning capabilities.

Reports from World Bank (2002) stipulate that poverty, and not ICTs, is the primary bottleneck to ICT development initiatives in most developing countries. ICTs act as an amplifier for such underlying processes, and what makes development function well, can be made to function better using ICTs. Needless to say, ICTs are dependent on national policy, the regulation of broadcasting licenses, and on the ensuing skills required to use and manage this industry, Heeks (2006)

The first important element identified by Khalil is to create an environment where teachers are motivated intrinsically, which is in agreement with the discoveries of Cooper (2000), and Rubenson and Runco (1992). The second factor listed is giving teachers access to relevant information, which allows them to submerge themselves into appropriate data and information. This feeds into the element of individual knowledge, which has generally been positively correlated with creative outcomes. Individual knowledge, and specifically a degree of ICT knowledge, is important for creative development because this knowledge allows Teachers to develop and apply

<http://www.cisjournal.org>

context-specific ideas within the Schools, enter prices and organizational environment (Cooper, 2000).

Neglect in educational development, specifically using best tools has added to the inequalities that the youth face in society, due to inadequate educational facilities, resources and manpower (Sanja.M, 2013). which are much less in rural areas, citing example of western region of Kenya: Manani, Mungakha, Sirisia, Misikhu, Chwela, Machakha, Bukokholo, Lwakhakha, Teso, Malakisi, Magng'i, Namutokholo, mayekwe, Tulienge, wamono, cheptaisi and Chemasiri (Sanja.M, 2013).

Additionally, authors such as (Sanja, 2013) point out that the youth have less income, education, time, mobility, and face cultural constraints that restrict their access to the use of, Telephony or general technology application. He further argues that some groups of Boy/Girl Child (i.e. from semi-arid regions: west Pokot, Turkan, Isiolo, Sumburu-And Moyale) are more disadvantaged than youth from urban areas (Nairobi, Kisumu, Eldoret, Nakuru, Mombasa) more literate or their parents are wealthier than youths from urban, Heeks (2006)

The debate surrounding ICT policy is still wanting in many developing countries, as there is a lack of enthusiasm on the part of decision-makers to embark on ICT projects specifically in Kenyan education curriculum. In Malaysian government, Investment technology with "corporate-wide integration, corporate restructuring and technological innovation policies" among public and private sectors. During the 1997 economic crisis ICT growth made the country to achieving higher in Malaysia in order to greater economic growth, Heeks (2006)

1.2 Current ICT Related Challenges

The implementation and use of an ICT requires the cooperation of a large spectrum of professionals, ranging from ministry of education. Practitioners, such as trained teacher, its operator and laboratory technicians to groups that provide non-teaching services, such as administrative and IT departments. Heeks (2006) suggested that in this context, three different rationalities may collide, namely technical, managerial and medical. Technical rationality is associated with IT professionals and IT suppliers, who share a technical worldview on which they base their system designs, Heeks (2006)

The United Nations agencies are also actively promoting the application of ICT by providing advisory service and experts' views in building up of a National Information Infrastructure (NII), and also facilitating access to a Global Information Infrastructure. In any major policy initiative that induces a major social change or transformation, the state normally is expected to play the role of the initiator, mediator, facilitator and arbitrator. The Indian state has played a major role in the context of ICT for development from the early 1980s at various

levels. The approach paper to Tenth Five-year Plan (Government of India, 2001) has been prepared against a backdrop of high expectations arising from the recent performance of GDP growth.

1.3 Role of Teacher on ICT Implementation

The role of the teachers is, for a given group of students, to provide educational technology activities of an appropriate level of difficulty based on their cognitive abilities (age, fast vs. slow learners), that are expressed in a variety of ways (i.e.: multimedia, the Internet, etc.), in order to adjust the curriculum to a variety of learning styles (visual, audio, by-doing) expressed through project-based activities based on the active learning approach. Additionally, teachers have to provide a plethora of learning strategies in order for the students to learn how to select the one that is most appropriate for their desired learning outcome. Based on Stables (1997), what is most important in this process is for the children to express and to develop their own ideas. Teachers are there to facilitate this process and to identify where the learning blockage occurs, in order to facilitate the learning process, Based on Stables (1997)

Generally speaking, the researcher argues that if we measure learning as the amount of information people can recall after learning has taken place, studies have shown that people can recall 20% of what they have heard, 30% of what they have seen, 50% of what they have experienced and nearly 90% of what they have heard, seen and experienced simultaneously. These percentages are certainly not rigid, as each individual has a learning style of his own. Based on this, he/she learns better by hearing (audio learners), by seeing (visual learners) or by doing (kinaesthetic learners), sanja (2013). The advantage of teaching with multimedia technology is that it covers all the learning styles at the same time, as it combines text, sound and interactivity of the user with the program. This is considered as the main advantage of teaching with technology over the traditional method of instruction, Stables (1997)

1.4 Barriers to ICT Implementation

One significant barrier to investment in ICTs in Education sector is the widely recognized fact that any resulting cost savings may not always accrue to the implementer, but may be passed on to a third party. Benefits may appear at one site and in one budget; while a large share of the cost commitments appear at another site and in another budget. In addition, there are no incentives, and may even be disincentives for care providers to be the first to adopt ICTs. This key misalignment of incentives, the extent of which depends on the way health care systems are structured and reimbursed, is a major barrier to the adoption of ICT and, more generally, to primary education transformation, Frost & Pierson (1998).

According to the World Bank (1998/99:20), this capacity for ICT production has immensely contributed to East Asian economic growth. The World Bank further asserts that the 'knowledge gap' in many developing

<http://www.cisjournal.org>

countries is a contributory factor to poverty. According to their report, there is no better way to bridge this divide than through the use of ICTs. Due to their ability to decouple or separate information from its physical repository, ICTs are excellent channels of communication.

1.5 ICT and the Private Sector

The extent to which the private sector is engaged is generally a good measure of sustainability, at least in financial terms. It is also particularly proficient at adapting to changing circumstances –particularly relevant in the ICT sector. The private sector plays an especially important role in delivering ICT-based services, both in constructing infrastructure (notably telecommunications) and in delivering services sustainably across that infrastructure. Although ICTs exhibit many characteristics in common with other infrastructure sectors, it is unique in regard to the speed of change in the industry, which means that the private sector tends to work with relatively short investment horizons, Engvall and Hesselmark (2004). In order to attract private-sector operators, the ICT sector requires transparency and effective regulation (and enforcement). Policy-making and regulatory processes should canvas and accommodate the opinion of all sectors of the ICT industry through (for example) consultation exercises. Nevertheless, international companies have demonstrated that telecommunications networks can be operated profitably. The ICT market is segmented, with different customers requiring different services (and having differing abilities to pay), which provides opportunities for local entrepreneurs to develop niche markets.

1.6 ICT to the Boy/Girl Child and Community

The effective use of ICT:

By many Private schools to integrate their learning processes research show that a demonstration of ICT application software can be a good experience for pupils to gain an understanding of key business processes and the practice of cross functional integration. To broadcast material, online facility or CD-ROM can be used as sources of information in different subjects;

To facilitate communication for pupils with special needs, to use electronic toys to develop spatial awareness and psycho-motor control; to use the Online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information to facilitate video-conferencing or other form of Tele conferencing to involve wide range of students from distant Geographic areas. , for Blended learning by combining conventional classroom learning with E-learning learning systems .In this respect, using ICT might provide a missing link that could be used as an integrating mechanism in business college curricula (Hawking, Bassett, & Foster, 2002; Johnson, 2004).

Wider learning opportunities for pupils:

Application of latest ICT in education has provided many options to the learners to opt for the course

of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use online tests. This can ensure fulfillment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs. New ICTs have fresh impact in two ways: one, they bring a major shift in the vastness, depth and the ease of use of the information and communication processes already being facilitated by the old ICTs, Frost & Pierson (1998)

According to Frost & Pierson (1998), —Pupils learn best by beginning with concrete experience and then move progressively to reflection and abstract understanding (p.40). This leads us towards the project-based concept, as it employs this gradual transition of students from simple to more complicated tasks, i.e. start with a curriculum initiated, guided and driven by ICT through real-life experiences. Among the best performing schools in Primary-private schools whose learning foundation has been laid on ICT grounds and since introduction ICT as teaching tool is done as earlier as lower Nursery- primary schools (i.e. Mt.Elgon Academy-Kitale ,Green Fields-Kitale ,Makin school-Nairobi ,Brookhouse-Nairobi.Peponi-Nairobi,Agkhan Mombasa,St.Andrews-Molo-kenya, Hill-school-Eldoret-kenya,Greesteds-Nakuru-Kenya). Another factor that influences pupils' learning is pupils' capabilities at a particular age.

According to Shield (2000), with a proper implementation, it can serve as an effective vehicle to facilitate changes from functional perspectives to business process-oriented perspectives not only in a traditional classroom but also in an e-learning course (Hawking & McCarthy, 2004). ICT can contribute in catering to individual needs of the Pupils/students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class. • Wider range of communication media: With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning is some of the resources that can be used in educational institutions. (Sanja & Rabah, 2013)

Collaborative learning:

Individualized learning strategies can enhance the quality of group as well as individual learning with the real society. This can ensure the applicability of knowledge. • Wider learning opportunities for pupils Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use online tests. This can ensure fulfillment of the employment required in the job market thus

<http://www.cisjournal.org>

minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

Connecting Geographically dispersed regions:

With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Pupils from different parts of the world can learn together by using online, offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing • divergent thinking ability in students, • Global perspectives • respect for varied nature of human life and acculturation. • Facilitation of learning.

Quick access to information:

Information can be accessed in seconds by connecting to the internet and surfing through Web pages. For the user, mobile telephony, built upon wireless and digital platforms, is in no way really different from old telephony except that it allows ease of use, has much more widespread coverage and also, in the long run, makes cheaper telephony possible. Internet telephony, also again no different in use and enabling possibilities, is set to make telephony all over and across the world extremely economical. Internet radio again provides much greater variety and reach than ever before. Broadband is expected to make TV over the Internet commonplace.

Easy availability of updated data:

Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies.

2. LITERATURE REVIEW

INTRODUCTION

The conceptual framework in this study draws heavily upon the theory of IT integration infrastructures, while also modifying and expanding it. This study quantifies the critical success factors that impact ICT implementation in Lower Primary school, its integration and the ensuing benefits. Furthermore, it analyzes the effects of system integration on ICT induced benefits. It also investigates the impact of ICT strategy in learning Institution induced benefits, and identifies the relationship between implementation strategy and system integration. Finally, it assesses the effects of ICT induced benefits on user (Pupil, teacher and administrator) satisfaction.

2.1 ICT Technology

Terminals:

There are ongoing efforts to develop the type of low-spec, low-cost, robust terminal device that could work in large numbers of poor communities. The most high-profile of these is the One Laptop per Child. Not coincidentally, a slew of relatively-similar devices are spewing forth. Some – like the PixelQi and the Intel

Classmate – have a similar intention to target developing country needs. Others – Linutop, InkMedia, Elonex ONE, Asus Eee and many more – are more generalized commercial products. Despite twenty years of overpromising and under delivering – from the "People's PC" to the Simputer – it seems low-cost terminals will be a central part of ICT4D 2.0.

Telecommunications:

Wireless has become the delivery mode of choice to provide connectivity into poor communities in the global South. Interest in satellite-based forms such as VSAT during the 1980s and 1990s has given way to a focus on land-based transmission systems. In the same way, attention is turning from WiFi-based systems and innovation to WiMAX. The overriding innovation issue remains the relatively low traffic demand and low population density of most areas of rural poverty; requiring solutions that can deliver broader reach at lower cost than current technology.

Power:

With only 15 percent of rural households in sub-Saharan Africa having access to electricity⁶, three areas of innovation continue to be required that take us through the power cycle – new, low-cost devices for local electricity generation; better ways to store, carry and transmit electricity; and lower power consumption by ICT devices.

2.2 Creativity and Innovation Key Factors during ICT Implementation in Lower Primary

A similar model was proposed by Cooper and Zmud Cooper (2000) which focuses on IT implementation in general and which comprises six stages; initiation, adoption, adaptation, acceptance, reutilization and infusion. The initiation and adoption stages describe the events in the chartering phase of the ICT project cycle. The adaptation stage maps directly to the project phase. The acceptance and reutilization stages match the shakedown phase, and finally, the infiusion stage is the same as the onward and upward phase, Cooper (2000)

Cooper (2000) summarized that group tasks could benefit IT innovation by forcing schools to develop clear goals, along with allowing a degree of uncertainty to exist in relation to how exactly those goals might be reached. This uncertainty is important because too many formal extrinsic constraints often hinder the creative capabilities of individuals (Amabile, 1988).

Cooper also showed that group norms could benefit creative IT requirements by fostering a degree of certainty regarding roles and responsibilities, as well as fostering a group environment conducive to cooperation and trust. Cooper went on to explain that group diversity could benefit IT change by mixing different functional backgrounds together within the group. It can also be useful to combine the collective network experiences of team members, including such things as culture, education, and leisure time pursuits. All of the factors of

<http://www.cisjournal.org>

individual creativity that were discussed earlier are important for ICT implementers in lower Primary in Kenya to understand, because many times the biggest roadblock to implementation success is the unwillingness of people to change specifically in Kenyan current county government. Therefore, to enhance implementation success, understanding the factors that influence individual and group creativity is essential (Rapah, 2009).

2.3 Creative Development in Schools Need Good Foundation

For creative development to increase in organizations, the intrinsic motivation of individuals must increase. This is quite obviously a difficult proposition because the very nature of intrinsic motivation implies that it must come from within. Cooper (2000) offered the following solution to remedy this problem: He showed that intrinsic motivation could be fostered by providing individuals with tasks that provide for increased autonomy, provide an opportunity for professional growth, and are perceived as enjoyable by group members.

Cooper's suggestion of giving individuals tasks that would lead to intrinsic motivation offers one solution to creativity development in organizations; however, another important factor that must be included in the equation is an organizational environment that is conducive to creative development. As Amabile (1996) stated, "intrinsic motivation can be significantly affected by the social environment" (p. 17). The study by Rubenson and Runco (1992) agreed with these findings by showing that investments in creative potential occur at a higher rate among individuals who function in an environment where creativity is valued and rewarded.

2.4 The Internet and Education Sector

The basic concept of the internet of things is the pervasive presence around a variety of things or objects such as radio frequency identifiers (RFID), tags, sensors, actuators, mobile phones, etc. – which are able to interact with each other and cooperate with their neighbours to reach common goals (Atzori, 2010). CASAGRAS defines the IoT as (Casagras, 2011): "A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities.

This infrastructure includes existing and evolving Internet and network developments. It will offer specific object-identification, sensor and connection capability as the basis for development of independent federated services and applications. These will be characterized by a high degree of autonomous data capture, event transfer, network connectivity and interoperability".

The following are examples on the applications of ICT in real life. The ICT has many applications in the health sector. These may include wearable staff support systems to locate both doctor and education in a hospital

at any point in time. It may also include IoT-based knowledge systems to detect adverse reaction to drugs in patients. The combination of sensors, Wi-Fi, and other technologies come handy in the monitoring of vital functions of the body such as The technologies that support the IoT are what we are traditionally familiar with. These technologies include wireless sensor networks, robotics, vision recognition, smart tags, microcontrollers, mobile devices, near-field communications (NFC), radio frequency identifiers (RFID), bar codes, social networks, ICT global networks, Wi-Fi, cloud computing, CoAP, 6LowPAN, geographic information systems (GIS), GPRS, actuators and satellite technologies, to name but a few. It is essential that Learning Institutions, specifically primary schools create an environment for their schools in which creativity is valued by utilizing internet. In fact, successful ICT reengineering and internet as a driver requires an environment that can foster creativity (Amabile, Conti, Coon, Lazenby, & Heron, 1996; Cooper, 2000).

2.5 Internet Services as Teaching Aid and Benefit to World Economy

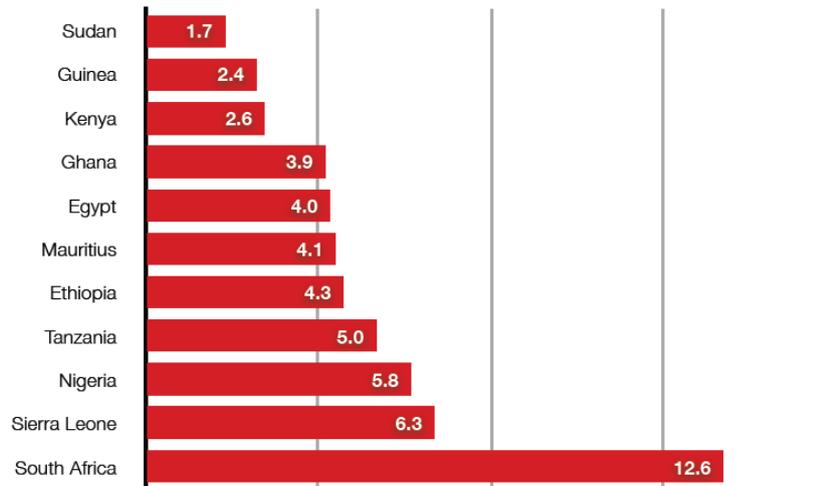
Wider learning opportunities for pupils:

Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use online tests. This can ensure fulfillment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

MTN has consistently had the highest price in South Africa for its cheapest prepaid product in terms of the Organization for Economic Co-operation and Development (OECD) 2010 prepaid low-user mobile basket (40 calls per month prepaid), with its 2012 cheapest lower-user basket cost sitting at ZAR167, while Vodacom's cheapest prepaid pricing has been constant and marginally lower, sitting at ZAR138 in 2012 for the OECD monthly low-user basket (OECD, 2010). In the first quarter of 2013, following price pressures from smaller operators and the enforcement of the third reduction of MTRs, both MTN and Vodacom reduced prices to the equivalent of ZAR122 for the OECD low-user basket, still higher than the cheapest tariffs of the small operators. Cell C's low-user basket cost is now at ZAR10, while Telkom Mobile's is at ZAR103. Telkom Mobile in 2013 announced a promotion that would see its on-net price at ZAR0, 95 per minute and its off-net price at ZAR0.95, the lowest mobile prices ever offered in South Africa. Whether Telkom Mobile keeps its prices this low, and is able to pressure other operators to reduce prices, remains to be seen.

<http://www.cisjournal.org>

2.6 Internet to Promote Education, Primary Education Delivery Uplift Economy



Source: RIA Pricing Transparency Index: Prepaid Mobile data

Kenya As Being One Of The Cheapest With Lower Tariffs Can Utilize Internet To Drive Primary Education. From the above data as recorded by RIA pricing Transparency Index ,Kenya as a country has the capacity, technology and means to utilize internet services to drive primary education ,as a teaching AID .when comparing South Africa with other African countries in terms of the OECD 2010 low-user prepaid mobile basket, South Africa is seven times more expensive than the cheapest country (Sudan) surveyed by RIA in Africa and twice as expensive as Sierra Leone, which is only the 10th cheapest country in the RIA Pricing Transparency Index: Prepaid Mobile. This comparison with other African countries studied by RIA shows that although the enforced reduction of MTRs, and price pressures, have brought about a reduction of tariffs, South Africa's prepaid prices continue to be very expensive in comparison to many other African Countries(Sanja ,2013).

In Table 1: below shows South Africa as a country comes 23rd out of 46 operators measured across Africa in the RIA Prepaid Mobile Price Index in terms of the cheapest prepaid mobile product in the country and 26th in terms of the cheapest prepaid mobile product in the country from a dominant operator.

Table 1: March 2013 prepaid mobile cost based on OECD lower-user basket of 2010

	Cheapest product from dominant operator		Cheapest product in country		% cheaper than dominant
	US\$	Rank	US\$	Rank	
Ghana	3.9	1	3.9	4	Dominant is cheapest
Egypt	4.01	2	4.01	5	Dominant is cheapest
Mauritius	4.13	3	4.13	6	Dominant is cheapest
Ethiopia	4.3	4	4.3	7	N/A
Kenya	4.37	5	2.58	3	41.0%
Sudan	4.56	6	1.72	1	62.3%
Guinea	6.26	7	2.41	2	61.5%
Tunisia	6.36	8	6.36	12	Dominant is cheapest
Algeria	6.48	9	6.48	14	Dominant is cheapest
Libya	6.88	10	6.88	16	Dominant is cheapest
Congo Brazzaville	7.82	11	7.82	17	Dominant is cheapest
Tanzania	8.32	12	5.01	8	39.8%
Uganda	9.17	13	6.32	11	31.1%
Rwanda	9.19	14	6.37	13	30.7%
Nigeria	9.48	15	5.77	9	39.1%
Namibia	12.2	16	12.2	19	Dominant is cheapest
Mauritania	12.33	17	12.33	20	Dominant is cheapest
Liberia	12.4	18	12.4	21	Dominant is cheapest
Cote d'Ivoire	12.75	19	12.75	24	Dominant is cheapest
Senegal	12.76	20	12.76	25	Dominant is cheapest
Benin	13.16	21	12.45	22	5.4%
Central African Republic	13.16	22	13.16	26	Dominant is cheapest
Sierra Leone	13.59	23	6.28	10	53.8%
Mozambique	14.02	24	14.02	28	Dominant is cheapest
Botswana	14.66	25	11.75	18	19.8%
South Africa	14.91	26	12.57	23	15.7%
Burkina Faso	14.95	27	14.72	29	1.5%
Mali	14.97	28	14.97	30	Dominant is cheapest
Togo	15.52	29	15.52	31	Dominant is cheapest
Chad	16.8	30	16.8	34	Dominant is cheapest
Malawi	16.91	31	16.91	35	Dominant is cheapest
D.R. Congo	17.1	32	17.1	36	Dominant is cheapest
Cameroon	17.32	33	17.13	37	1.1%
Seychelles	18.13	34	18.13	38	Dominant is cheapest
Zambia	19.07	35	18.57	39	2.6%
Niger	19.35	36	16.34	32	15.6%
Angola	22.55	37	19.41	41	13.9%
Zimbabwe	22.75	38	21.57	43	5.2%
Morocco	22.92	39	22.92	44	Dominant is cheapest
Madagascar	23.06	40	19.63	42	14.9%
Lesotho	23.74	41	19.28	40	18.8%
Swaziland	26.01	42	26.01	45	Dominant is cheapest
Cape Verde	29.82	43	29.82	46	Dominant is cheapest

Source: RIA Pricing Transparency Index: Prepaid Mobile data 2013

INDEX: BASED ON PREPAID MOB

<http://www.cisjournal.org>

2.7 Mobile Broadband Cheaper Than Fixed

Primary education delivery to uplift economy by mean of mobile broadband, while prices for South Africa's prepaid mobile voice services continue to be very high by continental and global standards, the country's mobile data market, which is becoming a significant revenue stream for mobile operators, is highly competitive. From analyses of prepaid and postpaid mobile and ADSL (fixed) broadband RIA price categories, it is clear that fixed-line packages are (surprisingly) far more expensive than comparable mobile packages, such can help to drive education sector. Also boosting mobile data's appeal compared to fixed in South Africa, particularly for low data use and uneven consumption, are mobile data's lower setup costs (e.g. no monthly line rental charges and installation fees) and its more convenient prepaid charging options. It's true that mobile broadband that purely traces its data bank from the computer, can boost the teacher to child delivery as such mobile platform will support smart board functionality, primary school Head teacher supervision through twitter, Skype to the management of school functionality.

When comparing the ICT in School Education in the Developed World In the developed countries, and the urban elites of advanced economies, twenty-first century education integrates technologies, engaging pupils in ways which were not previously possible, creating new learning and teaching possibilities, enhancing achievement and extending interactions with local and global communities. Pupils live in a world that has seen an information explosion and significant and rapid social and economic changes and should be the way for Kenyan education-motion, means and the alternative way to developed.

2.8 World Analysis of ICT and Education Sector

2.8.1 ICT Application in European Schools

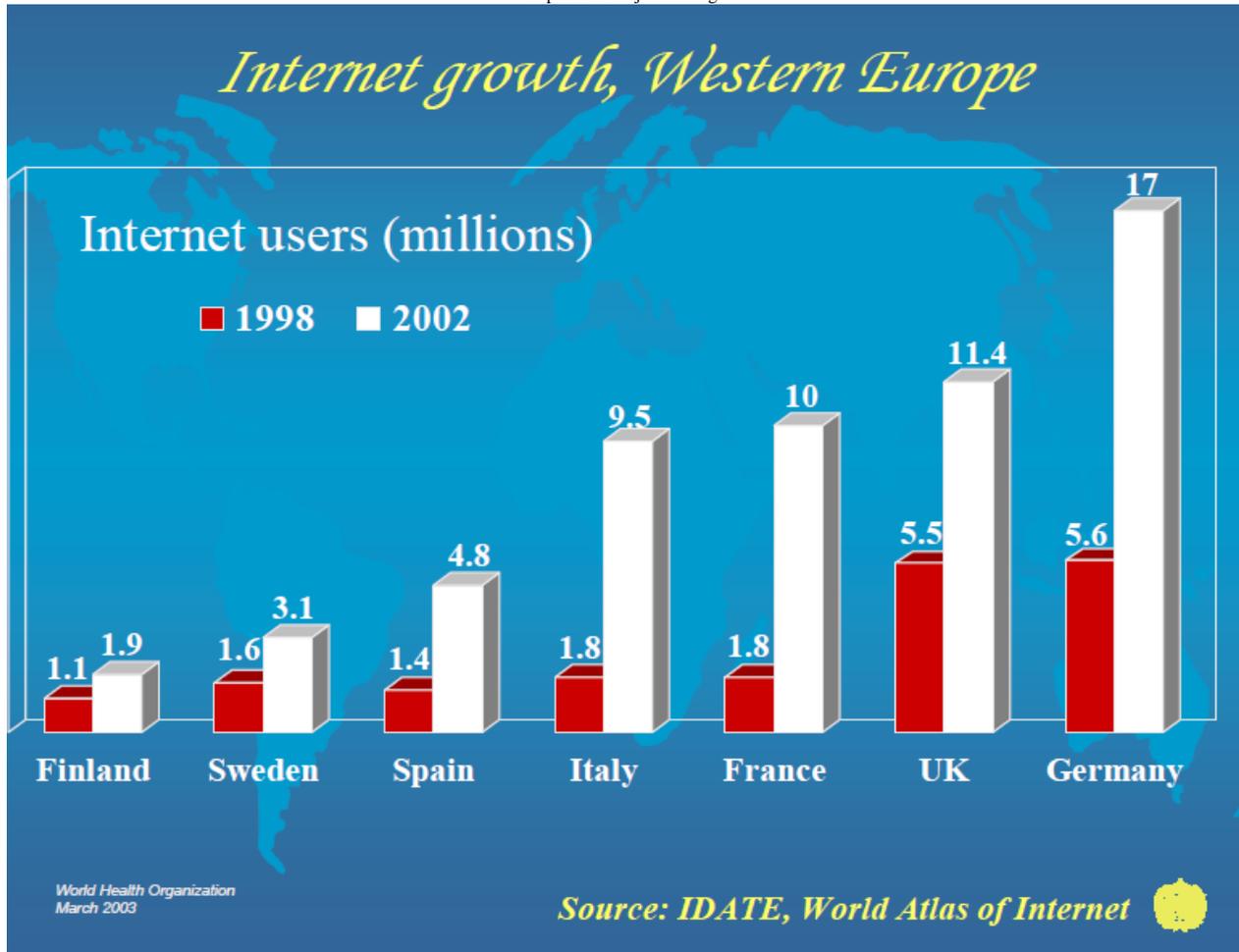
British universities are reacting to rapidly changing national and international environments. These transformations now bear important consequences for the management and organization of universities. Expansion in the 1990s has increased the number of students studying at universities by some 40% in a decade. While student numbers have increased dramatically, increases in resources have been much more modest leading to a declining per capita resource. At the same time that universities have sought to cope with expansion, and partly in reaction to the stresses that expansion has generated, there has been increasing demand from the state for accountability for public funds. The simple reporting of statistics to the central Higher Education

Statistics Agency (HESA) has been augmented by an increasingly invasive set of audits. The Research Assessment Exercise (RAE) and the Quality Assurance Agency (QAA) have sought to systematically evaluate teaching and research respectively leading to the establishment of 'league tables' (whether official or otherwise). These audits directly (RAE) or indirectly (QAA) are determining to a larger and larger extent the real levels of resource in university departments. At the international scale, universities are increasingly seeking to compete for lucrative foreign (non EU) high fee students and an increasingly international labour market. In terms of international research contracts and grants, such as those from the European Commission, universities are in a much more competitive environment.

In the developing world as compared European countries the, ICTs are used largely to increase access to and improve the relevance and quality of education. ICTs have demonstrated potential to increase the options, access, participation, and achievement for all pupils. The unprecedented speed and general availability of diverse and relevant information due to ICT, extends educational opportunities to the marginalized and vulnerable groups, among the other disadvantaged.

The emergence of the Internet, evolving customer demands, the pressure to accelerate the business process, and the need to establish more collaborative relationships with key suppliers and business partners are pushing organizations large and small towards the use of an ICT solution. There is a constant need to integrate information systems within core business processes of the enterprise, and of course the introduction of new technologies into the workplace (Kesner, 2008). To prepare and educate managers to lead future organizations, it is imperative not only to teach them conceptual knowledge about integrated business processes, but also to allow them to de-velop hands-on skills in adopting, deploying, and actually using the technologies that drive business process integration.

To cope with these transformations there have been calls for academic institutions to operate less according to conventional structures and more as modern, flexible organizations. There is now a direct pressure on institutions to spend more effort on management and administration, for clearer roles and responsibilities, more efficient work practices, and to provide more data and information on 'relative performance



2.8.2 ICT Application in India

ICT generates new possibilities to address problems of rural poverty, inequality and environmental degradation. A major impact of e-governance must be felt in the rural areas where the bulk of the Indian population lives so the government has to support initiatives to solve the problems of rural dwellers by using IT. But more so many schools, progress rapidly due to IT projects, tools.

Numbers of projects have been initiated in keeping with India's local needs for application in rural development. For example, the National Dairy Development Board (NDDB) has successfully employed and IT-based machines are used in milk collection centers. This cheap and credible technology was being used in rural cooperatives to measure fat content of milk, test the quality of milk and promptly make payment to the farmers. As a result reduced time for payments and instilled confidence of the farmers in the cooperative set up. Amulcooperative has introduced a number of ICT-based operations, which have contributed to Efficiency of milk procurement and distribution. The NDDB has also been able to deal with problems of unethical practices in the milk enterprises (Bhatnagar, 2001: 65-66). For instance, in India, during 2004 – 05, while the Gross Enrolment Ratio for children enrolling in classes I to VIII was 97 percent, the Drop-out Rate for the same classes was as high as 46 percent. The situation is more worrying

at the secondary education level (classes IX and X), where the enrollment is recorded at 53 percent and the Drop-out Rate is as high as 60 percent¹. Efforts so far have addressed to a considerable degree, the concerns of equity as well as that of regional parity, however concerns of quality have not received adequate attention. Recognizing this, the Government of India's flagship education programme at the primary level - the Sarva Shiksha Abhiyan (SSA) - has streamlined its focus on 'quality'.

As per (The Hague: IICD, 2007), ICTs improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the easy acquisition of basic skills. The use of various multimedia devices such as television, videos, and computer applications offers more challenging and engaging learning environment for students of all ages.⁴ A study conducted by the International Institute for Communication and Development (IICD) indicated that 80 percent of its participants felt more aware and empowered by their exposure to ICT in education, and 60 percent stated that the process of teaching as well as learning were directly and positively affected by the use of ICT. (New York: UNDP-APDIP, 2003)

<http://www.cisjournal.org>

2.8.3 ICT Application in Afghan

To enable public ICT reconstruction and development, the World Bank and USAID provided the funding to help create a government and public communications network, which is now maintained and operated by Afghan Telecom. When fully implemented, this network will provide voice, fax, and Internet services, national and International calling access to provinces and districts, and video teleconferencing (VTC) services to provincial governors. Funding included an international satellite gateway in Kabul to access global voice, data, and Internet services.

The Afghan Aid Coordination Authority had been successful in providing proper Internet connectivity

to major ministries and aid agencies; however, the cost of Internet service is high compared with other South Asian countries. The number of citizens with Internet connection has increased substantially from 2000 to 2008, multiplying an estimated 1,000 to 580,000. Some of the key ICT indicators for Afghanistan are given as follows. The Afghan Aid Coordination Authority had been successful in providing proper Internet connectivity to major ministries and aid agencies; however, the cost of Internet service is high compared with other South Asian countries. The number of citizens with Internet connection has increased substantially from 2000 to 2008, multiplying an estimated 1,000 to 580,000. Some of the key ICT indicators for Afghanistan are given as follows:

Table 2 : ICT Parameters - Afghanistan

ICT parameters	Value	Year
Internet users (per 100)	1.9	2008
Internet subscribers (per 100)	0.24	2008
Broadband subscribers (per 100)		2008
Mobile coverage (%)	72	2007
Mobile subscribers (per 100)	29.03	2007
Personal computers (per 100)	0.32	2006–2007
Internet affordability (US \$/month)	24	2007
Mobile affordability (US\$/month)	5.6	2007
Radio subscribers (per 1000)	5.5	
Households with TV (%)	6.2	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

Afghanistan had an estimated 50,000 main line telephones and 600,000 cellular phones in 2004. Mobile phones were introduced in Afghanistan in 2001 and it became the principal means of communication very soon, which virtually stopped the expansion of main line telephone network. Around 3.2 million mobile phone subscriptions were active in 2006. By 2008 four mobile phone companies were operational. Plans call for the establishment of a unified countrywide mobile phone network based on code division multiple access technology, in cooperation with U.S. and Chinese companies.

The Afghan Aid Coordination Authority had been successful in providing proper Internet connectivity to major ministries and aid agencies; however, the cost of Internet service is high compared with other South Asian countries. The number of citizens with Internet connection has increased substantially from 2000 to 2008, multiplying an estimated 1,000 to 580,000. Such a senior can be an achievement as an eye opener to Kenya in terms of ICT implementation to primary schools.

Afghan Achieved One Laptop per Child

The One Laptop per Child (OLPC) project was launched in Afghanistan in 2008 through a PPP model involving the MoE, MoCIT, USAID's Afghanistan Small and Medium Enterprise Development (ASMED) and telecom development company – Roshan. Under the first phase of the project, XO laptops were distributed to

students of select schools. Teachers from these schools also received the laptops along with a four day training programme. Each XO laptop was pre-installed with the standard national curriculum books along with other manuals, guides, health information, and local directory and so on. The laptops also have access to word processor, email and internet browser. All the core activities on the laptop can be accessed through both the national languages – Dari and Pashto. Till 2009, 396 laptops were distributed to Istiqlal High School in Jalalabad covering grades IV to VI. It's possible for Kenyan government to opt for such a strategy.

2.8.4 ICT Application in Uganda

Globalization and technological changes have created a new global economy powered by technology, fueled by information and driven by knowledge. Makerere University Faculty of Computing and Information Technology has won an Africa Union (AU) bid to create an e-network that will provide connectivity for Eastern and Central African countries to a pan-African network through fiber optics and wireless links. This will enable the sharing of resources such as Black Board digital learning software, backups, and e-learning courses. The faculty has a department that trains staff in e-learning and supports learning in the whole of the university. The UNDP (2001:3-16) argues that harnessing ICTs for human development requires raising awareness and constituency building across all levels of society. As maintained by the UNDP, the link between ICTs and

<http://www.cisjournal.org>

many development challenges is not always obvious, especially in countries with high levels of illiteracy, low

levels of basic telecommunications infrastructure and electrification, and high levels of debt.

Table 3: List of operational providers in the different market segments

Service type	Providers
Fixed telephony	UTL MTN Warid Telecom Smile Communications Uganda
VoIP telephony	Infocom Limited
Mobile telephony	UTL MTN Zain/Celtel Warid Orange Telecom i-Tel Limited
Internet access service	UTL MTN Zain/Celtel Warid Infocom Africa Online Afsat Datanet (Spacenet) Kampala Siti Cable TMP Uganda Ltd (Broadband Company) Tangerine Orange Telecom

Source: UCC

A concern has been expressed by ISPs and entrants that even in the event that the fiber optic cable becomes available, access might be restricted by the new owners. This is not expected to occur before the completion of the EASSy cable in 2010 (if fair access is provided) – unless the government initiates a short-term solution through one or more additional high speed satellite links (e.g. through use of the RCDF for this purpose). Figure above shows that there was growth in usage of international bandwidth between 2002 and 2008, but usage is still limited. In March 2008, UCC estimated that uplink bandwidth was at 92 Mbps and downlink bandwidth at 291 Mbps (excluding local traffic exchanged via the Uganda Internet Exchange Point [UIXP]).

Ugandan Internet Market

Internet services are a nascent market in Uganda. Internet services in Uganda are provided via the following technologies:

- Dial-up narrowband internet services;
- Digital Subscriber Lines (ADSL) mainly used by UTL, offering speeds between 64 kbps and 256 kbps;- Private VSAT satellite wide area network as provided by AfSat;
- WiMAX as rolled out by MTN in 2007; and- Mobile

services via 3G (offered by UTL), GPRS, and EDGE offered by other mobile operators. Despite being landlocked, it is hoped that Uganda will benefit from one of the ongoing regional initiatives to connect the East African region to the rest of the world in 2009 or 2010 via submarine cables, including the Kenyan-led TEAMS, SEACOM, The East African Marine System and the East African Submarine System (EASSy). In the absence of fiber-optic cable connections to the World Wide Web, providers have relied on their own earth stations and satellite links for international voice and data traffic, including Internet traffic. Typically, operators and ISPs have their own earth stations, rather than using shared gateways. This is due to the high prices offered by the main telecommunications operators. Satellite capacity is relatively expensive, costing around 1,500 USD/Mbps/month in each direction.

A concern has been expressed by ISPs and entrants that even in the event that the fiber optic cable becomes available, access might be restricted by the new owners. This is not expected to occur before the completion of the EASSy cable in 2010 (if fair access is

<http://www.cisjournal.org>

provided) – unless the government initiates and finances a short-term solution through one or more additional high speed satellite links (e.g. through use of the RCDF for this purpose). Figure above shows that there was growth in usage of international bandwidth between 2002 and 2008, but usage is still limited. In March 2008, UCC estimated that uplink bandwidth was at 92 Mbps and downlink bandwidth at 291 Mbps (excluding local traffic exchanged via the Uganda Internet Exchange Point.

One of the most innovative breakthroughs of the 20th Century was the Internet, whose effects are changing how traditional technologies are used, and how wireless technologies are deployed. According to Marker, Wallace and Macnamara (2002: 14), the Internet dramatically reduces the costs associated with making information available to others and accessing global information and knowledge resources. The authors further add that satellites and other advanced technologies make new things possible; i.e., recent innovations in hand-held devices, in mobile telephony, and in satellite communications have led to cutting edge information and communication tools specifically relevant to the needs of the poor. In some developing countries, rural health workers are now using small hand-held devices to record health data from their clients.

2.8.5 ICT Application in Tanzania

The United Republic of Tanzania is composed of Tanganyika and Zanzibar, which merged in 1964 shortly after independence. From the 1970s up to 1995, Tanzania was a one party state with an inward looking development

strategy and socialist experiments for rural development, especially in the 1970s. Tanzania is one of the poorest countries in the world with a per capita GDP of US\$ 193 in 12,000 (PPP US\$ 700). The economic growth rate has been around 5 percent during the last years. The main economic activity is agriculture, which still accounts for almost half of the GDP, but for 80% of the labour force and 85% of exports. Industry is underdeveloped with a share of only 17% of the GDP and 20% of the labour force.

Currently there are two major development statements by the government. The first is the 1999 Tanzania Development Vision 2025. It sketches the way for Tanzania to become a middle-income country by 2025. To achieve this objective the document calls for high quality livelihood, good governance and the rule of law, and a strong and competitive economy. The second is the Poverty Reduction Strategy Paper, which comprises the national guidelines that direct government activities. Basically, all development activities are said to be guided by the principals provided in the two policy documents.

The largest city and economic power hub is Dar es Salaam, although officially the government resides in Dodoma. Population in Tanzania is estimated at more than 36 million in 2001 with population growth still at 2.6 percent per year. Tanzania is one of the least urbanized countries in Africa. 75 to 80 percent of the population lives in rural areas

Table 1: Country Overview

Capital	Dodoma
Population	36,200,000
Main city	Dar es Salaam
Population	3,000,000
% of rural population	75-80
Population density	38.1 (per km ²)
Currency (US\$ exchange rate)	1000 TSH = US\$ 1.25
Major language	English, Kiswaheli
GDP per capita (PPP)	531.0
Population below the poverty line	51.1%
Gini coefficient	38.2
Administrative structure	25 Regions; 123 Districts
Literacy rate	74.7% (1999)
Infant mortality rate	90 (1999)

Source: HDR, WDR

There were three public phone box operators supplying more than 1000 card phones in Dar es Salaam. However, the market is consolidating as one major player's phones recently got swallowed by TTCL. The trouble in the public phone market is closely related to the failure of pagers to break through in Tanzania. The success story of Tanzanian connectivity is cellular telephony. Currently there are four cellular phone

networks working. These are TriTel, backed by TRI Malaysia, MIC, backed by Millicom, Vodacom, backed by Vodacom South Africa, and Zantel, backed by Etisalat (operating only in Zanzibar). A fifth operator, TTCL's subsidiary CelTel, is to start its services soon.

2.8.6 ICT Application in U.S

With digital technology, radiologists in Bangalore, India do not have to come to the U.S. to

<http://www.cisjournal.org>

practice, U.S. radiology films can go to them. Even more profoundly, digital technology is changing the locus of care delivery and allowing for more care – care that may fall under the umbrella of the hospital -- to occur outside of the hospital's walls. In the U.S., the Department of Veterans' Affairs (VA) is on the cutting edge of using digital technology to better meet the needs of a growing number of military veterans, both those who are reaching their senior years and those newly returned from current conflicts. The data on the USSD is then routed via WASP (wireless access protocol) and stored on a remote database that is accessible to doctors on the web via an internet connection. Although the USSD system is not two-way (i.e. it cannot respond directly to the sender), it can identify the information and credentials of the sender through the logged data, which normally contains the sender's mobile number, time and date of the sent data. ICT encompasses all those gadgets that deal with the processing of information for better and effective communication. In education, communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format. The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However ICT today is mostly focused on the use of Computer technology for processing the data. In this context, advantages of ICT in education can be listed down as follows.

Monitoring technologies enable disease management questions and objective data – for instance, blood glucose levels of a diabetic patient – to be uploaded to their Electronic Health Record (EHR) daily. Care coordinators, who are usually nurses and social workers, use these data to prioritize who among their patients needs active care management. CCHT enables a single care coordinator to support a caseload of between 120 and 150 patients depending on case mix. In selected patients, videoconferencing capabilities even allow for virtual physician office visits in the home, which is especially beneficial for patients living in remote areas care. Remote this application of technology is not intended to replace the high-touch aspect of care delivery.

2.8.7 ICT Application In ZAMBIA

Improving the quality of information and decision support at the patient level, with inputs into the HMISSmartCare seeks to make a complete patient health record available to the clinician. A full patient health record gives the health care professional a complete view of the patient's medical history, enabling the professional to make better care decisions. SmartCare also collects data required by the HMIS for the modules that SmartCare covers and loads this data into the HMIS. Dr Albert Mwangi, the MoH National ART Coordinator, spearheaded this effort, bringing together key partners in HIV care and treatment. Partners included the MoH, ZPCT, CRS, CIDRZ, HSSP, nine hospitals, and the MUTI Medical Center. The effort was widely seen by

stakeholders as a success – “amazing,” in the words of one. By 2006, the MoH and its health partners had developed a single set of ART reporting forms. These forms are used by health partners across Zambia today and served as the backbone for SmartCare's ART treatment module.

Zambia today ICT has affected teaching, learning and research (Yusuf, 2005), with the potential to improve the quality of education. What then, are the potential benefits of ICTs to education, particularly at high school level? In group research projects for instance, pupils can have an online collaborative platform where they can share information and ideas and work on the project simultaneously across space and time. This has the added advantage of creating teamwork skills in the pupils which will be useful in their post high school lives. ICTs have the potential to increase learner independence and ensure pupils' active participation in school (Newhouse, 2002). This is possible where pupils can have access to learning material independent of the teacher and can have self-paced lessons not restricted by space or time. In addition, a student can have access to electronic learning resources like Encarta encyclopedia, and other scholarly articles available electronically that have the potential to increase knowledge and add value to the pupils learning process.

In Zambia teachers can also benefit from the use of ICTs in education through integrating different ICTs into the various teaching activities. They can easily prepare, modify and distribute course material to pupils through email or Content Management Systems (CMS) that allow one to place documents in a pre-defined area so that pupils can access such information. Non-teaching tasks such as calculating continuous assessments and assessing individual pupil's performance over time and other administrative tasks like compiling pupil's attendance hours in a particular school term can be easily managed by use of software applications designed to perform such tasks. Further, teachers can use multi-media such as projectors, audio-video and so on to present their lessons in different ways and have students make presentations using different multi-media.

2.9 General ICT Applications

The donor, government or development practitioner, especially those yet to be convinced about the role of ICTs, the recommendations are: The impact and effectiveness of using ICTs to support Education sector and the delivery of pro-poor services should be continually assessed – rapid changes in ICTs can offer new ways of working. There should be continual assessment of whether ICTs can produce efficiencies and increase effectiveness in mainstream development co-operation; particularly where there are scarce resources and ICTs may create savings.

ICTs will have an increasing role in the practice of development co-operation by virtue of

<http://www.cisjournal.org>

their increasing role in day-to-day life and so should not be ignored – they will increasingly impinge on the life of the Boy / Girl child, teacher and the poor. However, on the basis of the evidence, it is apparent that the risks of failing to participate in the ICT revolution are enormous. Failure to give priority to ICT strategies that enable developing countries and countries in transition both to develop their national infrastructures and to join the GII (Global Information Infrastructure) will exacerbate the gap between rich and poor.

Development co-operation seeking to adhere to good-practice principles should consider how ICTs can support and enhance practices such as ownership and participation, cooperation and collaboration, and country capacity-building. Co-operation with the private sector is particularly pertinent for increasing ICT access, but synergies with other sectors should be sought. To some extent, today's schools at all levels are faced with less structured, non routine problems, but the quantity and magnitude of these decisions increase as a manager rises higher in an organization. ICT system is used to bring more structure to these problems to aid the decision-making process. In addition, because of the inherent flexibility of ICT systems, managers at all levels are able to use such system to assist in some relatively routine, programmable decisions in lieu of more formalized management information systems.

ICT can be a powerful enabler of reconstruction and development goals in Education sector. It is both a sector and an enabler of cross-sector reconstruction and development for Kenyan Economy. As a sector, ICT supports national capacity building and export market focus and plays a critical role in reestablishing basic economic linkages by relieving communication bottlenecks from financial, governmental, and cultural information flows. As an enabler, it supports global positioning focus and adoption of cross-sector strategies that can be used to harness the uniqueness of ICT to accelerate a wider reconstruction and development process in the building of education curriculum, specifically to boost lower primary education sector.

2.10 ICT Application In KENYA

The second NGO worth mentioning is AfriAfya (African Network for Health Knowledge Management and Communication) which was established in 2001 by seven Kenyan-based health development agencies. (Jebet, 2003). AfriAfya seeks to harness information and technology for community health improvement in rural areas and urban slums through the use of Information Communication Technologies (ICTs). The organization's vision is to harness modern ICTs for community health and for marginalized Kenyan communities. It was observed by this organization that in many areas, lack of health facilities, coupled with inadequate information on preventive and curative measures, has fuelled the spread of diseases.

The unchecked spread of HIV/AIDS, for instance, is as a result of inadequate information or the information of rural people. HIV/AIDS, in some communities, is viewed as a curse. Patients are stigmatized and hence fail to seek medical attention. By the same token, the IDRC (2005:2) contends that an acute lack of infrastructure in Kenya seriously limits opportunities for using ICTs for economic and social development. Undeniably, these are areas of concern for rural women in many developing countries.

Neglect in educational development has added to the inequalities that women face in society, due to inadequate educational facilities, resources and manpower, which are much less in rural areas. Additionally, authors such as Odame (2005: 15) point out that women have less income, education, time, mobility, and face religious and/or cultural constraints that restrict their access to, and use of, technology. Odame further argues that some groups of women (i.e. rural women) are more disadvantaged than younger, more literate or wealthier urban women.

The debate surrounding ICT policy is still wanting in many developing countries, as there is a lack of enthusiasm on the part of decision-makers to embark on ICT projects. Undeniably, ICT developments are dependent on a dynamic national ICT policy environment, the regulation of broadcasting licenses, and on the ensuing skills required to use and manage this industry. For instance, as opposed to South Africa, which does have a national ICT policy framework, the ICT policy debate in Kenya still awaits parliamentary approval after numerous years of trial, discussion and debate. To this end, the International Technology Development Group [ITDG] (2005) has expressed the view that women rarely contribute to the policy debate surrounding poverty as most are often illiterate, lack confidence and mobility.

E-Touch / Telecasters/Cyber cafés are yet another area in which ICTs are gaining popularity amongst rural women in Kenya (Opala, 2004). According to Opala, these centers offer low-cost communication and information services commonly found in low income and rural areas in developing countries, and are used primarily for basic access to phones, faxes, photocopying, word-processing and other activities such as e-mail and Internet access. Today, there are over 200 E-Touch Centers in rural Kenya operated by local entrepreneurs with the support of ISP Africa Online

2.11 ICTS Frequently Used To Access/Receive Educational, Business/ Trade, Health, Agricultural And Social Welfare Information In Kenya. [n=200]

ICTs	Education		Health		Business		Agriculture		Social Welfare		Av
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%	
Radio	154	77	176	88	130	65	130	65	153	77	74.4
Television	81	41	65	33	71	36	71	36	85	43	37.8
Films	25	13	47	24	13	7	17	9	39	20	14.6
Cell phone	24	12	40	20	14	7	14	7	36	18	12.8
Telephone	7	4	5	3	8	4	8	4	9	5	4.0
Video	7	4	10	5	6	3	10	5	11	6	4.6
Computer/ Internet	5	3	-	-	2	1	-	-	2	1	1.0
Mobile cinemas	5	3	7	4	5	3	5	3	6	3	3.2
CD-ROM	-	-	-	-	-	-	-	-	-	-	-

Constrains Of Ict Tools in KENYA

A critical mass of professional and community users of ICTs in education sector has not yet been reached in developing countries. Many of the approaches being used are still at a relatively new stage of implementation, with insufficient studies to establish their relevance, applicability or cost effectiveness (Martinez, et al, 2001). This makes it difficult for governments of developing countries to determine their investment priorities (Chandrasekhar and Ghosh, 2001). However, there are a number of pilot projects that have demonstrated improvements such as a 50% reduction in mortality or 25-50% increases in productivity within the healthcare system (Greenberg, 2005).

In Health as a complex interaction of biomedical, social, economic, and political determinants. It places the discussion of health firmly in the poverty and development debates and pays particular attention to how ICTs can best be used to move towards achievement of the Millennium Development Goals (MDGs), as part of poverty reduction strategies and in order to improve the health of the most poor and vulnerable people.

2.12 Education Sector

Heeks (2006) argued that a collision of rationalities may easily lead to implementation and usage failure. Managerial rationality applies to hospital managers who operate from legal, financial and control perspectives. Medical rationality typically refers to physicians, who prefer to put medical information and patients at the centre of the system. Since systems are particularly directed at increasing the controllability of hospital processes by means of integration and

standardization, they can be considered examples of managerial rationality.

Bennis (1984) suggested that management of change is actually 'management of meaning', and therefore involves an attempt to: (1) convince others of the credibility and legitimacy of particular problem definitions and solutions; and (2) gain consent and compliance (Boddy, 2002). This managerial rationality may collide with some of the other rationalities.

Pettigrew (1973; 1985; 1988) argued that organizational change can be understood by considering the interactions between the content, context and process of change within the organization. The implementation of change is an 'iterative, cumulative, and reformulation-in-use process' (Pettigrew, 1988: 63). Successful change is a result of the interaction between the content or 'what' of change, the process or 'how' of change (implementation), and the organizational context or 'where' of change (the internal and external environment). He also suggested that the change agent must be willing to intervene in the political systems of the organization, and to legitimate the change in spite of competing proposals and ideas.

ICT allows easy and immediate access information regarding inventory, product or customer data, and prior history information (Shehab et al., 2004). However, it was later expanded to cover external customers and suppliers (Turban et al., 2006). Nah and Lau (2001) stated that most ERP systems now have the functionality and the capability to facilitate the flow of information across all business processes internally and externally. Furthermore, ERP systems have the capability to "reach beyond their own corporate walls to better

<http://www.cisjournal.org>

connect with suppliers, distributors and customers to engage in e-business

3. RESEARCH METHODOLOGY

The research utilized qualitative and quantitative methods to obtain a general understanding of ICT implementation in Primary Education. The survey involved interviewing 50 haedteachers between private primary and public primary schools from 5 counties.

Ten (10) respondents were drawn from each of the seven (10) high schools, divided into three (5) teachers, six (10) pupils in grades 10, 11 or 12 and one (1) administrator. Purposive sampling was used to select only those respondents who actually used ICTs. Self administered structured questionnaires were employed to collect primary data. The data was analyzed using the Statistical Package for Social Sciences (SPSS).

3.1 Research Findings

Composition of Respondents The study yielded 90% response rate comprising 42 starred eight pupils and (21) members of staff bringing the total number of respondents to 63. Pupil distribution by gender comprised 65% male and 35% female. In terms of grade 30% were in grade (11) while grades (12) and (10) pupils made up 35% a piece. The teaching staff taught subjects ranging from English, GHCE subjects, science, mathematics, Kiswahili and Computer. Composition of members of staff was 63% male and 37% female. This gender imbalance is not surprising as it is a reflection of the male dominated society in which the female are disadvantaged in all spheres of human development, the education sector being no exception.

3.2 Available Ict Facilities in the Schools

The study results revealed that all participating schools had few computers, only with various Randomly installed application software ranging from word processing, database, spreadsheet and presentation software and all schools had reliable no reliable Internet access. Other ICTs that were available in the schools were telephones mobile phones; the schools had radio and television. Teachers mostly accessed computers from the staff room while private (academy schools) pupils used the computer laboratories.

3.3 Recommendations the Government.

Resources should be mobilized to purchase ICT equipment and educational materials. Technological connectivity and infrastructural facilities in educational institutes can be enhanced through the judicious utilization of the resources.

The Education sector should be assisted by the scholars to develop ICT curricula at primary, secondary and tertiary level in order to encourage and generate participation in courses like Computer science, multimedia, communications, and engineering.

It is important to impart specific skills to the teachers and trainers in ICT-related subjects. The education sector should be supported by Kenyan central government for initiating such train-the-trainer programs.

Opportunities for exposure to technology should be created for the pupils/students located in remote areas. Initiating Mobile Internet units to visit various schools, setting up networking academies that supports the institute to design, build and maintain computer networks, and developing telecasters and telephony that would remain operational during and after the school hours can act as an effective mechanism for enhancing technology specific skills for the students.

Development co-operation seeking to adhere to good-practice principles should consider how ICTs can support and enhance practices such as ownership and participation, cooperation and collaboration, and capacity-building. Co-operation with the private sector is particularly pertinent for increasing ICT access, but synergies with other sectors should be sought. Education Curriculum Planning tools – should include an analysis of the role of ICTs in Teaching methodology, delivery services, and seek to put in place a positive enabling proper learning environment.

Work toward the preparation and official international adoption of official computer-based fonts applicable to the educational and business languages of Kenya. To ensure the implementation of ICT at the administrative level it is important to cooperate with the public agencies, through which the civil servants can be trained in ICT skills and applications.

Public access to information and opportunities can be enhanced through educational radio program; distribution of written materials where appropriate; and establishment of kiosks at public locations (such as airports, ministry departments, and so on). Mutually beneficial opportunities should be identified for the public and private schools / sector in order to utilize ICT as a tool for achieving developmental goals for the country.

The impact and effectiveness of using ICTs to support education sector and the delivery of pro-poor services should be continually assessed – rapid changes in ICTs can offer new ways of Teacher –pupil and working Modalities. There should be continual assessment of whether ICTs can produce efficiencies and increase effectiveness in mainstream development co-operation; particularly where there are scarce resources and ICTs may create savings.

REFERENCES

- [1] Atzori, L., Iera, A., Morabito, G., The internet of things: a survey, Computer networks, 2010
- [2] Baker, J.L. (2000) Evaluating the Impact of Development Projects on Poverty, World Bank, Washington, DC.

<http://www.cisjournal.org>

- <http://siteresources.worldbank.org/INTISPMA/Resources/handbook.pdf>
- [3] Bhatnagar, S. and R. Schwere (2000) *Information and Communication Technology in Development: Cases from India*. New Delhi, Sage Publications.
- [4] CASAGRAS, RFID and the inclusive model for the Internet of Things report, EU Project Number 216803, pp. 16-23, 2011
- [5] Chakwizira, J., Maponya, G., Nhemachena, C., Dube, S., Strengthening the decentralized healthcare system in rural South Africa through improved service delivery: testing mobility, information and communication technology intervention options, CSIR Science Real and relevant conference 2010
- [6] Etta, F. (2002) *The Trouble with Community Telecasters*, IDRC, Ottawa. http://www.acacia.org.za/telecentres_etta.htm.
- [7] Engvall, A. and O. Hesselmark (2004), *Profitable Universal Access Providers*, Sida, Sweden.
- [8] European Commission (2001). *Communication from the Commission to the Council and the European Parliament. Information and Communication Technologies in Development. The role of ICTs in EC Development Policy*, Brussels, [Online]. Retrieved 12 October, 2005 from: http://europa.eu.int/eur-lex/en/com/cnc/2001/com2001_0770en01.pdf
- [9] Hawking, P., Bassett, P., & Foster, S. (2002). An applied approach to teaching HR concepts using an ERP system. *Proceedings of Informing Science Conference 2002*, Ireland: Cork. Retrieved from <http://proceedings.informingscience.org/IS2002Proceedings/papers/Hawki128Appli.pdf>
- [10] Hawking, P., & McCarthy, B. (2004). Integrating e-learning into enterprise resource planning (ERP) curriculum. *Journal of Issues in Informing Science and Information Technology*, 1, 23-30. Retrieved from <http://informingscience.org/proceedings/InSITE2004/014hawki.pdf>
- [11] Hawking, P., McCarthy, B., & Stein, A. (2004). Second wave ERP education. *Journal of Information Systems Education*, 15(3), 327-332.
- [12] Johnson, T., Lorents, A., Morgan, J., & Ozmun, J. (2004). A customized ERP/SAP model for business curriculum integration. *Journal of Information Systems Education*, 15(3), 245-254.
- [13] Kenny, C. (2006) *Overselling the Web?*, Lynne Reiner, Boulder, CO. Walsham, G. & Sahay, S. (2006) *Research on information systems in developing countries*, *Information Technology for Development*, 12(1), 7-24.
- [14] Heeks, R. (2002) *Information systems and developing countries: failure, success and local improvisations*, *The Information Society*, 18(2), 101-112. ISBN: 92-64-10128-4. Paris.
- [15] ITU (2007) *Measuring Village ICT in Sub-Saharan Africa*, International Telecommunication Union,
- [16] International Institute for Communication and Development, *ICTs for Education: Impact and Lessons Learned from IICD Supported Activities (The Hague: IICD, 2007)*, <http://www.iicd.org/files/icts-for-education.pdf> (accessed March 14, 2009).
- [17] Heeks, R. (2009) *The Godfather of ICT4D*, and *ICT4D's First Computer*, *ICT4D Blog*, 1 Jan. <http://ict4dblog.wordpress.com/2009/01/01/the-godfather-of-ict4d-and-ict4ds-first-computer/>
- [18] Heeks, R. & Molla, A. (2009) *Impact Assessment of ICT-for-Development Projects: A Compendium of Approaches*, *Development Informatics Working Paper no.36*, Centre for Development Informatics, University of Manchester, UK. http://www.sed.manchester.ac.uk/idpm/research/publications/wp/di/di_wp36.htm
- [19] Marker, P., Mcnamara, K. & Wallace, L. (2002). *The significance of information and communication technologies for reducing poverty*. [Online]. Retrieved on 31 March, 2006, from: http://www.oecd.org/dac/ictcd/docs/matrixdocs/GBR_paper1.pdf. Accessed
- [20] OECD (2001), *the DAC Guidelines Poverty Reduction*. Development Assistance Committee (DAC), OECD. Paris. (ISBN 92-64-19506-8). www.oecd.org/dataoecd/47/14/2672735.pdf.
- [21] OECD (2003a), *ICT and Economic Growth, Evidence from OECD Countries, Industries and Firms*, OECD (2003b), *Donor ICT Strategies Matrix*, CD-Rom, 2003 Edition, Development Assistance Committee (DAC). Paris.
- [22] OECD (2003c), "Integrating Information and Communication Technologies in Development Programmes", the OECD Observer, Policy Brief. Paris. OECD (2004a), "ICTs for Development: Lessons Learned and Good Practices". Paris.
- [23] OECD (2004b), *ICT, E-Business and SMEs, Promoting Entrepreneurship and Innovative SME*

<http://www.cisjournal.org>

in a SGlobal Economy: Towards a More Responsible and Inclusive Globalization. Paris.

(2012).

<http://www.sap.com/india/about/company/successes/pdf/wockhard.pdf> (accessed July 12, 2012).

- [24] Shield, G. (2000). A Critical Appraisal of Learning Technology Using Information and Communication Technologies [31 paragraphs], The Journal of Technology Studies, XXIV (1) [Online], Available:
<http://scholar.lib.vt.edu/ejournals/JTS/Winter-Spring-2000/shield.html> [2001, April 12].
- [25] Sanja.M & Rabah.K.(2013),Journal of Emerging Trends in Computing and Information Sciences ©2009-2013 CIS Journal. All rights reserved. Vol. 4, No. 11 November 2013 ISSN 2079-8407.
- [26] **Sanja M (December, 2013)**, Impact of Enterprise Resource Planning System in Health Care, International Journal of Academic Research in Business and Social Sciences Vol. 3, No. 12 ISSN: 2222-6990.
- [27] Venkateswaran, S, and V Mahalakshmi. "ERP Implementation: A Compilation and analysis of critical success factors." *Academica: An International Multidisciplinary Research Journal (South Asian Academic Research Journals) 2*, no. 1
- [28] Wafula .K & Ocholla .D, 2007: The feasibility of ICT diffusion amongst African rural women: a case study of South Africa and Kenya, *International Review of Information Ethics*, Vol.7 (09/2007).
- [29] Wang, M., & El-Masry, E. (2009). Assessments and outcomes of an ERP/SAP fundamentals course. *Issues in Information Systems*. 10(1-2), 109-114.
- [30] Winkelmann, A., & Leyh, C. (2010, summer). Teaching ERP systems: A multi-perspective view on the ERP system market. *Journal of Information Systems Education*, 21(2), 233-242.
- [31] World Development Report (1998/99). The power and reach of Knowledge. [Online]. Retrieved 15 January, 2006 from:
<http://www.worldbank.org/wdr/wdr98/ch01.pdf>
Accessed 15/01/06