Digital Technology Access and Use among Socially and Economically Disadvantaged Groups in Turkana County, Kenya

Jeremiah Osida Onunga[1], Samuel Mbugua[2]

[1]Tutorial Fellow, Turkana University College and PhD Candidate, Kibabii University, Kenya.
[2]Director, Planning & Organization Performance, Kibabii University, Kenya.

Abstract: The involvement and experiences of socioeconomically disadvantaged people in Turkana County, Kenya, were examined in this article. This was a qualitative study that looked into how different groups use information and communication technologies (ICTs), such as the internet, smartphones, and computers. Access to digital information and communication networks, particularly via the Internet and mobile phones/smartphones, is increasingly considered as essential for full citizen engagement in modern society's economic, social, educational, political, and cultural activities. This is especially true as the prevalence of digital access and use among the general public grows fast, and as businesses and governments increasingly rely on ICT to deliver services, support, and information. Internet like water, gas, and electricity, broadband connectivity is quickly becoming a necessity. According to various researchers, a world without the Internet will become unfathomable for many people in the next few years or so, much as a world without telephones did many years ago. Data on ICT access, on the other hand, demonstrate that a large proportion of people in both the developed and developing world's still have limited or no access to ICTs and opportunity to use them.

Keywords; Digital Technology, Internet, Mobile phones, modern society, disadvantaged groups, socioeconomically

----

1.   Introduction

ICT definitions are as varied as they are wide-ranging. ICTs are a complex and heterogeneous combination of items, applications, and services used for producing, distributing, processing, and transforming information, according to Marcelle (2000). He sees them as technologies that enable the handling of information and facilitate various forms of connection between human actors, human beings and electronic systems, and electronic systems, according to (Ngenge 2003). ICTs are divided into two categories: "traditional" and "new." Non-electronic media, such as print and analogue technologies, such as radio, television, fixed line telephones, and facsimile machines, are considered traditional (old) ICTs. These technologies have increasingly been interwoven in people's and communities' daily life. Computers in all their forms, as well as data processing applications available through email, the Internet, word processing, cellular phones, wireless technologies, and other data processing applications, are referred to as 'new' ICTs (Gurumurthy, 2004). (Marcelle, 2000).

In most African countries, the benefits of ICTs are difficult to assess, especially in the face of poverty, famine, and disease. The United Nations Commission on Science and Technology for Development (UNCSTD) recognizes most African countries' position, but warns of greater isolation if ICT measures are not prioritized. "ICTs do not offer a panacea for social and economic disruption," the UNCSTD (Marcelle, 2001) emphasizes, "and this may encourage policymakers to put lower emphasis to the need to develop effective national ICT strategies."

However, based on the facts, it is clear that declining to participate in the ICT revolution carries significant costs. Failure to prioritize ICT strategies that enable emerging and transitioning nations to create national infrastructures while also joining the Global Information Infrastructure (GII) will widen the divide between affluent and poor. There is an increasing need to assess the social and economic implications of ICTs, as well as to develop capacity-building opportunities that will ensure their constructive usage and absorption into national economies and civil society.

It is also critical to consider whether ICTs may, in fact, alleviate poverty and enhance human situations, particularly among rural African women in Turkana County, which is marginalized in and of itself. Without a doubt, opinions on the function and use of ICTs in African development endeavors are varied and even contradictory. For example, (Kenney 1995) claims that access to ICTs is influenced by educational attainment and income distribution, but (Moyo 1996) emphasizes the inevitability and pervasiveness of IT in all sectors of the economy.

2. Literature Review

Many authors, such as Chowdhury (Adeya, 2002), believe that "the poor cannot eat high-speed Internet," whilst others, such as Barlow (Adeya, 2002), believe that "Africa should skip industrialism totally and rush directly into the information era." Nonetheless, there are four basic kinds of perspectives on the significance of ICTs in rural development: political, economic, social, and technological. The relevance of science and technology is emphasized in the economic ramifications (Basson, 1996). Basson emphasizes the importance of African nations utilizing science and technology in order to compete in trade and business.

This is in line with (Rathgeber, 2000), who cites Africa's key issues as a lack of skilled personnel and insufficient infrastructure, especially telecommunications infrastructure. According to Rathgeber, newly industrialized Asian countries rose to the occasion and provided Western investors with both skilled workforce and outstanding infrastructure. ICTs contributed for about 25% of total exports from East Asian economies in 1995. (Crede and Mansell in Rathbeger, 2000). This potential for ICT creation, according to the World Bank (1998/99), has made a significant contribution to East Asian economic growth.

The World Bank also claims that in many developing nations, the "knowledge gap" is a contributing reason to poverty. According to their analysis, the usage of ICTs is the most effective strategy to bridge this gap. ICTs are ideal communication channels because they can divorce or detach information from its physical repository. This viewpoint is backed up by (Pohjola in Bedi 1999), who claims that this decoupling property is "revolutionary" since it allows anyone to access vast amounts of data regardless of time or geography. (Bedi 1999) adds that the use of ICT networks allows a large number of people to have access to e-mail.

The Internet was one of the most revolutionary inventions of the twentieth century, and its consequences are transforming how traditional technology and wireless technologies are deployed. According to Marker, Wallace, and Macnamara (2002), the Internet significantly lowers the costs of disseminating information and gaining access to global information and knowledge resources. The authors go on to say that satellites and other advanced technologies enable new things, such as cutting-edge information and communication tools tailored to the needs of the poor. Recent innovations in hand-held devices, mobile telephony, and satellite communications, for example, have resulted in cutting-edge information and communication tools tailored to the needs of the poor.

Telecommunications also contribute to development by encouraging social transformation and economic activity, enhancing quality of life, reducing costs in rural social service delivery, and supporting good governance and transparency, according to the research. (The Panos Institute, 2004) cautions, however, that while initial installation is less expensive, mobile phones are more expensive in the long run due to greater equipment and call costs than land–line systems.

When it comes to political consequences, a narrative presented at the World Summit on the Information Society (WSIS) in Geneva, Switzerland, by (Mudhai, 2004) emphasizes the relevance of ICTs in uniting African countries in their development efforts. Mudhai discusses the current steps taken by African governments to enter the 'information age,' citing examples such as the increase in fixed telephone lines from 450,000 to 950,000 and the increase in mobile phone subscribers from 800,000 to 5.5 million in Nigeria during the last two years. Egypt, which emphasizes the relevance of the E-Africa Connection project with NEPAD, and the

Heads of State of Mozambique and Rwanda, who repeat that Africans have moved past the issue of choosing between ICTs and other development goals, are among Mudhai's other examples. Mozambique has developed a high-level multi-sector task force for ICTs, whereas Rwanda (a landlocked country) has "an ambitious ICT program" aimed at making it East Africa's technology hub within three years, with broadband fiber-optic and wireless access to all schools. Botswana, which is investing in ICTs as a critical industry with the proposed US$ 300 million East African Submarine Cable System, is also encouraging (EASSy). Kenya, Tanzania, Uganda, Mozambique, Madagascar, Djibouti, and South Africa are the anticipated docking places for this cable system.

In another example, (Mudhai, 2004) notes that the Kenyan government is working on developing an e-commerce master plan and e-government plans to make government administration more transparent, efficient, and democratic. According to the author, the Kenyan government aims to spend US$ 5.85 billion (Sh444.2 billion) by 2022 on: 1.4 million fixed telephone connections in rural areas. This translates to an average of 5 lines per 100 persons, up from 1.6 lines per 100 in metropolitan areas, or 2.4 million fixed telephone lines. This equates to an average of 20 lines per 100, up from 4 previously.

All of these efforts are unquestionably positive for Africans, as ICTs may and will give a new window for Africa to accelerate sustainable human development, which will inevitably assist rural women. In many African countries, however, the main difficulties underlying ICTs and rural development are issues of access and exclusion. (Bridges.org 2001) demonstrate that one of the major aspects required for integrating technology into society is 'real access' to technology. Is the technology in question, in other words, available, physically accessible, and affordable? For example, (Mudhai, 2004) claims that due to monopoly, corruption, and underinvestment, Kenya has been slow to reform the ICT sector. As a result, 200,000 to 300,000 fixed telephone applications have been placed on a six-year waiting list. This failure rate on 250,000 to 320,000 connected landlines, according to Mudhai, is one of the highest in the world, resulting in an increase in mobile phone and Internet rates. Similarly, the (IDRC 2005) claims that Kenya's severe lack of infrastructure severely restricts the use of ICTs for economic and social development. These are undeniably issues that rural women in many underdeveloped nations are concerned about.

Due to insufficient educational facilities, money, and labor in rural regions, neglect in educational development has added to the disparities that women confront in society. Furthermore, authors such as (Odame 2005) point out that women have less income, education, time, and mobility, as well as religious and/or cultural barriers that limit their access to and use of technology. Odame goes on to say that some women (such as rural women) are at a disadvantage compared to younger, more literate, or wealthier metropolitan women. (Ballantyne, Labelle, and Rudgard 2000) argue that lack of knowledge, skills, and training, a lack of capital resources for sustainability and maintenance, and a lack of acceptable content, both in terms of language and subject matter, all hinder the adoption of ICTs.

Many developing countries still lack an ICT policy discussion, owing to a lack of enthusiasm on the side of decision-makers to embark on ICT projects. ICT development is undeniably reliant on a dynamic national ICT policy environment, broadcasting license control, and the resulting skills required to use and manage this business. In comparison to South Africa, where the national ICT policy framework debate took a shorter time to approve, Kenya's ICT policy debate took longer in parliamentary debates, discussion, and approval. To this aim, the International Technology Development Group (ITDG 2005) has stated that because most women are uneducated, lack confidence, and mobility, they rarely contribute to the policy discourse surrounding poverty.

Despite the aforementioned issues with ICTs in rural development, there are some noteworthy projects in Kenya that have taken the initiative and are deserving of recognition. According to Esterhuysen (2003), African NGOs have been creative in their use of ICTs in ways that are compatible with the infrastructure and capability available. E-mail, mailing lists, and web database publishing are examples of these. The World Space satellite network is an innovative communication technique that allows individuals in even the most remote villages to receive information, even if they do not have access to telephone lines or electricity. Kenya, Uganda, Tanzania, and Ethiopia Ayieko are the four countries where it now operates (2001). ALIN – EA has partnered with groups in Kenya such as the Interlink Rural Information Service, a non-governmental organization based in a rural market center in Rongo. This multimedia program provides access to information spanning from health and HIV/AIDS to the environment, agriculture, micro-enterprise, and conflict resolution.

The second organization to highlight is AfriAfya (African Network for Health Knowledge Management and Communication), which was founded in 2001 by seven Kenyan health development organizations. Jebet (2003; Jebet, 2003; Jebet, 2003; Jebet Through the application of Information Communication Technologies, AfriAfya aims to harness information and technology for community health improvement in rural areas and urban slums (ICTs). The organization's mission is to use current information and communication technologies (ICTs) to improve community health and empower neglected Kenyan communities. This group discovered that in many regions, a lack of health facilities, along with a lack of information on disease prevention and treatment, has aided the spread of diseases. The unregulated spread of HIV/AIDS, for example, is due to a lack of awareness or misunderstanding among rural residents. In some societies, HIV/AIDS is regarded as a curse. Patients are ostracized, and as a result, they do not seek medical help.

Aga Khan Health Services Kenya, Amref Kenya Country Program, Care Kenya, and the Christian Health Association of Kenya are among AfriAfya's partner organizations (Chak). HealthNet Kenya, Plan International, World Vision, and the Ministry of Health are among the others. In Nairobi, the organization's field centers are located in Kwale, Siaya, Lugulu, Bunyala, and Kibera. It's worth noting that all field centers use technology to help underprivileged communities better their health, education, gender equality, environment, and economics.

"Women's Voices" is a third significant project utilizing the use of ICTs to communicate and spread information. ITDG manages a women's project for impoverished women in Kenya, Peru, and Zimbabwe (ITDG, 2005). Despite the fact that the women in the study live in urban rather than rural slum regions in these nations, it is nevertheless vital to notice the usage of ICTs in communication and information distribution in these places. The necessity for the women affected to have their opinions heard among relevant policy and decision-makers is particularly important. Disease is widespread due to insufficient sanitation and drainage infrastructure. HIV/AIDS isn't any different. These ladies, on the other hand, produced videos that captured their struggles, resolves, and dreams with only a little help from ITDG. The recordings, which show their poor living conditions, health, and alcohol and drug issues, have been broadcast on Kenyan television, African television, German television, the BBC World Service, ABC World News USA, and in a New Scientist article. In appreciation of its application of information and communication technologies for social justice, the ITDG initiative was also awarded the APC Herbet de Souza "Betinho" Communication Prize (ITDG, 2005).

The African Centre for Information and Communication Technology (African Centre for ICT) is a non- Another Kenyan NGO dedicated to the condition of women and girls in ICTs is ACWICT. The executive director, Constance Obuya, identifies "socio-cultural norms" and "non-gender responsive policies" as problem areas that need to be addressed (Obuya, 2003). To this purpose, the organization has launched a number of programmes aimed at encouraging girls and women to use ICTs. The Horn of Africa Regional Women's Knowledge Network (HAWKNet), which aims to improve women's livelihoods via the use of ICTs, is one of these programs. HAWKNet was created in 2002 and collaborates with the United Nations.

The United Nations Development Fund for Women (UNIFEM) and the World Bank's Information for Development initiative are two organizations that help women around the world (INFODEV). HAWKNet is a network of women and girls from Kenya, Uganda, Tanzania, Ethiopia, Eritrea, Djibouti, Sudan, Somalia, and Rwanda that uses the Internet, radio, and CD-ROM to assist women share knowledge.

In distant education, rural women's usage of ICTs is particularly important. "African women, long deprived of knowledge, education, and training, can look to improvements in information technology to bring learning to their doorsteps," writes the African Network of Information Technology Experts and Professionals (ANITEP) in Asare (1997). According to Ngechu (in Asare: 1997) of Nairobi, Kenya's Department of Remote Education, distance school is especially beneficial to impoverished groups in rural areas, as well as those seeking a second opportunity in education. Ngechu goes on to say that these programs have had a big impact on women, who choose programs based on their specific needs. The initiatives communicate information on diseases like malaria, as well as agricultural research discoveries from the University of Nairobi. According to reports, the vast majority of women (70 percent) have embraced tactics and procedures learned in these workshops.

E-Touch/Telecenters/Cybercafés are another area where ICTs are gaining traction among Kenyan rural women (Opala, 2004). These centers, according to Opala, provide low-cost communication and information services that are commonly found in low-income and rural areas of developing countries, and are primarily used for

basic access to phones, faxes, photocopying, word processing, and other activities such as e-mail and Internet access. In rural Kenya, there are already over 200 E-Touch Centres run by local entrepreneurs with the help of ISP Africa Online.

The Drumnet Project, sponsored by IDRC, is an outstanding example of how the Internet is being used to provide financial, marketing, and other information-related services to rural farmers. The goal of this IDRC-funded initiative is to demonstrate a relationship between information and business services for small-scale farmers (Opala, 2004). DrumNet has developed rural "Information Kiosks," according to Opala, which provide free daily information about commodity pricing to local small-scale farmers. According to Opala, neighboring Uganda and Zambia have successfully used the Internet to track down prices for the advantage of these farms. Women who live in the Loima Sub County's "rural" sections are given special emphasis in this study. The term "rural" refers to areas with features such as poor service levels (e.g., transportation, water, and medical services), non-urban communities (such as riparian villages), and high poverty levels (Ikoja Odongo, 2002).

3.   Research Methodology

Quantitative and qualitative data was obtained from a cross section of female residents living in the rural areas of Turkana County's Loima Sub County using the survey research method. The population was made up of all rural women in Turkana County, aged 18 to 65, who were studying, working, and living in Loima Sub County. The term "rural" refers to places that have rural characteristics, such as low levels of service, such as transportation, water, and medical care, non-urban communities, such as riparian villages, and high poverty rates (Ikoja-Odongo 2002b).

Geographically, Kenya's Rift Valley area is one of the country's largest and most economically vibrant. The Rift Valley is one of Kenya's eight regions, with a population density of 22 million people (Opondo and Sekou-Ochieng, 2020). Turkana County, on the other hand, is an administrative county in Kenya's Rift Valley region, located in the North Rift. The town of Lodwar serves as its epicenter. Other ethnic groups dwell in Turkana County, despite the fact that the Turkana people have historically dominated the area. The rural population of Loima Sub County is 53,453 females and 54,341 males, according to the (Bureau of Statistics of Kenya 2019).

To develop a sample frame, the researchers used non-probability deliberate and probability simple random sampling procedures. Purposive sampling was used to acquire the desired representation from various sub-groups in the population. The researcher was able to locate acceptable regions in Kenya with high population densities in marginalized areas, as well as the required age groups, using this sampling technique (Mugenda and Mugenda, 1999). Random sampling was then used to boost the chances of obtaining a representative sample even more. This method gave all qualified divisions an equal chance of being chosen. This method of sampling also helps to eliminate bias in the selection process. Women who were directly and indirectly related to each other were interviewed utilizing the snowball technique (Neuman, 2000). A total of 250 people were surveyed in Turkana County's Loima sub-county.

Gay's (1996) recommendations were used to determine the sample size. According to Gay, the larger the population size, the smaller the percentage of the population required to obtain a representative sample; sampling is pointless for smaller populations (N100); if the population size is around 1500, 20% of the population should be sampled; and beyond 5000, the population size is irrelevant; a sample size of 400 is adequate. This study uses a sample of 250 people in this regard. Women aged 15-20 years, 21-30 years, 31-40 years, 41-50 years, and 51-60 years were the key age groups sampled for the study. Both qualitative and quantitative data were collected using a standardized questionnaire to interview the respondents. In cases where the respondents were unable to communicate in English, the national language, Kiswahili, was utilized as a substitute.

The data analysis and interpretations for survey study were based on the completed questionnaires from 250 respondents. The Statistical Package for Social Science (SPSS) was used to create a coding scheme (SPSS). The data was then examined using descriptive statistics, which included the calculation of frequencies, percentages, and averages, as well as the presentation of the data.

4.   Results

Thus, in addition to the demographic profile of the respondents, this study presents findings on "which ICT resources are used by rural women and why?"; expands on "use and availability of ICTs in Turkana County's rural areas; presents responses to "how do ICTs enhance rural women's social welfare and quality of life?"; and investigates "what problems women face when accessing and using ICTs."

Demographic Profile of the respondents

Respondents were asked a series of questions aimed at eliciting personal information such as their line of work, educational attainment, and age. The goal of these structured questions was to find out if there were any correlations between demographic factors and the purposes and applications of ICTs. These questions had a 100% response rate since they were administered by one of the researchers.

The majority of responses (44.5 percent) were between the ages of 31 and 40, with 13 to 20 years in second place (25.5 percent). Respondents between the ages of 41 and 50, as well as those over 50, came in third and fourth, respectively, with (17.5 percent) and (7.5 percent). There were 11 (5%) responders between the ages of 21 and 30 in the lowest age category. According to poll data, the majority of respondents (32.5 percent) had received secondary education, (35 percent) had had primary education, and (14.5 percent) had received tertiary-college/varsity education. Only (18 percent) of respondents had received any formal education.

Small-scale traders accounted for 35 percent of respondents, followed by housewives (13.5 percent), educators/teachers (13.5 percent), farmers (14.5 percent), and students (14.5 percent) (6 percent). Domestic workers and preachers each accounted for 4% of the population. Farm workers (3.0 percent), large-scale entrepreneurs (2.5 percent), nurses (2.0 percent), administrative workers (1.0 percent), and community development workers are all in the top ten (1.0 percent). Small-scale traders were clearly the respondents' single most common occupation in Kenya.

ICTs frequently used to access/receive educational, business/trade, health, agricultural and social welfare information.

Respondents were requested to answer questions on information needs and goals in a variety of fields that are frequent in rural areas. Education, health, business/trade, agriculture, and social welfare are among these domains. Following that, the respondents were instructed to answer questions on the ICTs they utilized most frequently in their search for information. This indicated that the respondents either owned or had access to the technologies in question, such as the internet, films, or mobile-cinemas.

Respondents' information needs in the field of education ranged from course work/research topics (22.5 percent), student services/colleges (20 percent), occupational information (13 percent), pre-school/primary school information (10percent), further studies (12.5 percent), business education/financial management (10.5 percent), teaching (7.5 percent), and curriculum studies (7.5 percent). (4 percent). Study assignments, counseling, child welfare, job prospects, study assignments, and future careers were among the reasons for disclosing educational information. Radio is very popular with users (54 percent). The TV is used by (21 percent) respondents. While (8 percent) of the respondents utilize films as a source of information, there are more respondents who use the cell phone (8 percent) than the telephone (3 percent). (3 percent). Three percent of respondents use video. A similar percentage of responders (3 percent) use both the computer/internet and the mobile cinema.

The respondents' health-related information needs ranged from family planning/gynecology (29.5%) to tropical diseases such as malaria (26.0%), HIV/AIDS (15.0%), respiratory illnesses/coughs (8.0%), cancer (3.5%), Sexually Transmitted Infections (2.5%), snake bites (4.0), waterborne diseases (2%), diet/nutrition (2.5%), and diabetes (2.5%). (3.0%). The reasons given by respondents for acquiring this information ranged from personal welfare to child and family welfare to general awareness in certain cases. As a source of information, the radio was first (86%). Only 35% of respondents watch television, while 28% watch movies. Only 4% of respondents use the telephone, whereas 16 percent use their cell phones. Only (4.0%) of respondents utilize video, and only (4.0%) use mobile cinemas. Notably, no respondents use a computer/internet or a CD-ROM for their health-related information needs.

Respondents needed information on everything from starting a business (32.0 percent), pricing/marketing (12.0 percent), finance/bookkeeping (10.5 percent), planning/management (12.5 percent), supplies/purchasing (8.0 percent), animal husbandry (7.0 percent), poultry keeping (.0 percent), craftsmanship (6.5 percent), and exchange rates in the business and trade arena (5.5 percent). Stocking, embroidery, financial management, business techniques, better living standards, profit making, income generation, and family welfare were among the reasons given by respondents. According to survey findings for business and commerce, whereas 66% of respondents use the radio for information, 35% use the television. Notably, just 5% of responders use films, whereas 9% use the cellphone. Only 4% of respondents use a phone, compared to a somewhat greater percentage (7%) who use a cell phone. Computer/internet use is extremely low, with only 1% of respondents utilizing computers to access information. The CD-ROM is not used by any of the respondents. 3 percent of respondents use video, while 3% use mobile cinemas (3%).

Animal husbandry (35.5 percent), farm inputs/new technology (45%), soil type (7.5%), crop type/diseases (3.5%, 2.5%), and gardening/crop management were among the agricultural knowledge needs of respondents (6%). This information was collected for a variety of reasons, including successful harvests, farming, and boosting herd fertility, disease control, aesthetic values, and health. The majority of respondents polled (65%) rely on the radio for information, while only 33% rely on television. While films are used by 11% of respondents for information, cell phones are used by 6 percent of respondents, compared to telephones (5%).The video is used by (5%) respondents for agricultural information needs. Only (3%) respondents use mobile cinemas. Notably, there are no respondents who use the computer/Internet and CD-ROM.

Requirements for social welfare information ranged from community

Projects/social gatherings (79%) are followed by water resources/pit latrines (7.5%), spiritual affairs (9.5%), sports (3%), shopping/traveling (2%), and pension/housing (2%). (3%). Leisure activities, spiritual growth, women empowerment, better living standards, relaxation, and health concerns were among the motivations for accessing this material. Once again, the radio was the initial source of information (79%). The majority of respondents (41%) watch television, while the rest choose to watch movies (19%). The mobile phone is utilized by 19% of respondents, whereas the telephone is used by only (6%) of respondents. Only 2% of people utilize the computer/Internet for their information needs, hence it plays no significant role. There were no respondents who used the CD-ROM, despite the fact that 3 percent of respondents utilize mobile theaters.

Use and availability of ICTs

The participants were asked to answer an open-ended question about the use and availability of ICTs in their community. This question was designed to elicit a range of thoughts and attitudes about the use and availability of ICT in the respondents' communities. The data was then subjected to content analysis.

Challenges in Implementing Digital Technologies in Turkana County

When you ask Nairobi residents where they would like to live if they didn't have to worry about commuting to work, the answer is practically unanimous: the suburbs. They claim that the suburbs are close enough to the city's amenities while escaping the city's traffic, expensive costs, and pollution. When I mention rural Kenya as a possibility, just a few people are enthusiastic. Why? Electricity, Internet connection, adequate schools, and healthcare facilities are frequently lacking in rural areas.

It's important for social innovators to pay attention. People may be hesitant to relocate to rural Kenya if they lack basic necessities, and their absence raises a number of issues for digital technology meant to work in those locations. Despite this, rural Kenya is home to 68.9% of Kenya's population, with the Arid and Semi-Arid Lands alone accounting for about 80% of the country's total landmass. Because of their size and population, they are critical to the country's economic prosperity, and it is critical that they do not miss out on the digital revolution.

Rural-Urban Divide

It's important for social innovators to pay attention. People can be put off by a lack of basic essentials. The deployment of digital technologies in Kenya's rural areas is hampered by a number of distinct development

problems. According to the World Bank's Kenya Economic Update, while 44 percent of the urban population has access to the internet, only 17 percent of individuals in rural areas do. What works in the city may not necessarily work in the country. This is why, at the moment, more individuals are working on technologies that are more suited to urban environments. Understanding the difficulties, on the other hand, may encourage more product developers to focus on rural markets.

Infrastructure

It is critical that social entrepreneurs pay attention. A lack of basic necessities can turn people off. A number of separate development issues are impeding the introduction of digital technology in Kenya's rural communities. According to the World Bank's Kenya Economic Update, while 44% of the urban population has internet connectivity, only 17% of the rural population does. What works in the city might not work in the countryside. As a result, more people are currently working on technologies that are more suited to urban surroundings. On the other side, understanding the challenges may drive more product developers to concentrate on rural areas.

Even if the infrastructure is present, the quality may be inadequate. While Safaricom's 4G network covers 77 percent of Kenya's main cities, the country's total 4G population coverage is only 57 percent, with the majority of unconnected areas being rural. The area with the least coverage, as seen in the map below, is rural Kenya, and 4G coverage is relatively poor. From left to right, Safaricom, Airtel, and Telekom are shown on this network coverage map (pink-GSM, yellow-3G, and orange-LTE).

Nicholas Sarojoo, who has worked in rural areas installing digital solutions, says that even the most basic technology don't always operate as intended. The USSD service, which is a text-messaging protocol similar to SMS, is an example of this. Any phone can send messages using USSD by dialing a command, such as *123#, which prompts the user to respond with a digit based on the service desired. While this functionality is available on any phone and comes at no cost to the user, many older SIM cards do not support it. Before they can utilize the USSD service, users must first replace their SIM cards.

Digital Literacy

Digital literacy is one of the most significant impediments to internet use in Kenya. Despite the fact that smartphone adoption is increasing, the percentage of people who can effectively use a variety of digital technologies remains low. According to the 2019 Kenya Population and Housing Census, Kenya has roughly 10 million Internet users, but Google puts the figure closer to 13 million. That amounts to a 20-25 percent Internet usage rate in a population of 47.6 million individuals. According to a 2018 GSMA research, Kenyans utilize mobile internet at a rate of 25% of the population. In comparison, in the first quarter of 2020, Internet usage in the United States was approximately 95%.

Smartphone penetration is higher in urban areas than in rural areas, as one of the hindrances in rural areas is literacy levels. Many older people struggle to use smartphones while those with little education are wary of such technologies. This was one of the challenges that the government's Digital Learning Program faced, where many teachers were unable to use the devices that were provided. The availability of experts who can offer technical support is also low.

Smartphone adoption is higher in cities than in rural areas, owing to literacy levels being one of the major roadblocks in rural areas. Many older individuals find it difficult to use smartphones, and those with limited knowledge are afraid of them. Many teachers were unable to use the devices provided by the government's Digital Learning Program, which was one of the obstacles it encountered. Experts who can provide technical assistance are likewise in short supply.

Income Levels

While poverty is a big issue throughout Kenya, rural communities bear a disproportionate amount of the burden. Because residents in rural locations do not have as much discretionary cash as those in metropolitan areas, demand for many services is lower. Even if the total population is considerable, lower population density makes economics more difficult.

Offering services for free but placing adverts that consumers must view is an alternate business model for digital products. As a result, products like Facebook, which have grown in popularity even in rural locations, are gaining traction.

Despite the notion that rural residents have lesser purchasing power than urban residents, the cost of some services may be higher in rural locations due to higher construction, maintenance, and even fueling expenses. A 10 Mbps link costs at least KShs 30,000 in Northern Kenya, but it costs less than KShs 10,000 in Nairobi, according to Michael Ouma, who supplies Internet services in the region. When compared to their metropolitan counterparts, the additional expense raises operational costs for rural enterprises.

Breaking the obstacles into three broad groupings, as I have done, is a useful strategy for expressing the concerns more clearly, but these issues do not live in silos in the actual world. For example, a lack of consistent power affects businesses, schools, and households, as well as contributing to poor income levels. Companies that may create mobile infrastructure are deterred by a shortage of power, which has an influence on people's income. Low money and a lack of mobile infrastructure also dissuade people from purchasing mobile devices, limiting their exposure to technology and, as a result, lowering digital literacy rates.

Overcoming the Challenges

In terms of pricing, entrepreneurs must price their products in a way that is appropriate for the rural economy. Instead than asking for a large sum of money up front, one novel approach is to make the installments reasonable. This technique has proven to be successful with a variety of products, which may explain why Safaricom expects to sell 1 million 4G-enabled gadgets in Kenya next year for only KShs 20 per day. According to a Nielsen research, products priced less KShs 55 account for more than 70% of fast-moving consumer goods purchases. It is also necessary to identify or develop technologies that are acceptable for rural locations. Devices that use a lot of electricity and programs that rely on a stable internet connection might not be the best choice. Instead, entrepreneurs should concentrate on using technologies such as USSD, SMS, interactive voice services, non-grid-powered gadgets, and apps that can run on basic smartphones.

The expense of entering rural markets might be considerable as well. Partnerships can help innovators get around this problem by helping to subsidize the cost of admission. They could also choose to share infrastructure, as other telecoms firms have done in the past.

Digital literacy is a widespread issue that must be addressed both through formal schooling and through other initiatives to upskill people. When it comes to digital abilities, the elderly are at a disadvantage in comparison to youthful digital natives. Innovators focusing on rural areas must keep their ideas basic and easy to use so that even persons with minimal abilities can benefit.

Great Challenges and Needs

Rural Kenya has its own set of hurdles for digital social innovation, but the people who live there also happen to be among the most in need of the correct products and services. Engineers and businesses with a social conscience will find the location appealing. The difficulty is to recognize the impediments and navigate around them appropriately.

5. Discussion

Which ICT resources are used by rural women and why?

In all industries, the use of ancient technologies such as radio and television is high. The average use of the radio was 76.4 percent, while the average use of the television was 39.8 percent. Notably, these two ICTs are very popular, in contrast to modern technologies like the internet and video, which only get 1.5 percent and 4.1 percent of the vote, respectively. The mobile phone (11.8 percent) performed better than the telephone (5.0 percent) and performed pretty well against "new" technologies on the market. In a situation comparable to that of South Africa, it is wise to suggest that the mobile phone has an edge over the telephone in Kenya, as the results show that it is used up to three times more frequently. The use of a mobile phone is proving to be useful on average, especially among Kenya's poor and disadvantaged. These mobile efforts connect ICTs to sustainable livelihoods in activities like agriculture, pastoralism, entrepreneurship, and employment information. According to (Wainaina 2005), the usage of mobile phone text messaging to provide underprivileged communities and slum dwellers with market prices, job vacancy alerts, and local news adds

incalculably to poverty alleviation. SokoniSMS, for example, is an SMS market price service created by the Kenyan Agricultural Commodity Exchange (KACE) in 1997 that empowers farmers.

Simu ya Jamii [family phones] Community Phone services are another example of such programs. Small-scale enterprises operate mobile telephone kiosks with the support of Safaricom PLC limited and other local microfinance institutions, which provide credit to small-scale entrepreneurs. As a result, there is now better access to telecommunications, jobs, and other commercial prospects. The Community News Service, which is located in the midst of the slums, is another project. Over 3,000 inhabitants in Kenya's largest informal settlement, Kibera, receive daily messages about health, sanitation, business guidance, and scholarship opportunities through this service. [Up to 70% of Nairobi's population lives in informal settlements, with Kibera accounting for the majority] (Wainaina, 2005).

How useful and available are ICTs in the rural areas of Kenya?

According to the poll, the majority of respondents (67.5%) said that ICTs were too far away, too expensive, or unavailable. Only 10% of respondents acknowledged the value and accessibility of ICTs, describing them as "handy" or capable of "improving access to information." On this point, Harris (2004) emphasizes the importance of a technological as well as a physical/information infrastructure in the effective implementation of ICTs. Even when such infrastructure is in place, the author claims, problems with cost, access, and/or maintenance exist. Similarly, the World Bank (2002) claims that Kenya's Gross Domestic Product (GDP) rose by only 1.5 percent in 2002, with only 10 telephone lines per 1000 people overall and 77 per 1000 in Nairobi. According to the analysis, as long as poor countries like Kenya have limited telephone connectivity, the gap between them and the developed world would widen.

How do ICTs enhance rural women's social welfare and quality of life?

ICTs [especially radio and television] played a big role in helping women keep informed about current events both within and outside Kenya, according to an average of 89.0 percent of respondents. The fact that access to the radio is free and does not require a phone line or literacy supports its ability to improve the quality of life for rural women. According to (IIboudo 2003), radio has the ability to encourage broad engagement of men and women in a local society. According to the author, radio is the most affordable of all mass communication methods, and it is easily accessible to rural populations. IIboudo goes on to say that radio has the following qualities: a means of disseminating key information in a variety of languages and in geographically remote or restricted areas, a platform for dialogue and debate between developmental stakeholders, a platform for the expression of rural and urban voices and communities, a tool for awareness–building and social mobilization, and an instrument for awareness–building and social mobilization.

Not surprisingly, few rural women utilize ICTs for data processing and e-commerce, which both have low averages of 25.0 percent and 19 percent, respectively. According to (Marcelle 2002), the United States accounts for 83 percent of all e-commerce websites, with Western Europe and Asia accounting for the rest. Marcelle goes on to say that deploying ICTs for advanced applications like e-commerce is difficult since necessary infrastructure and accompanying regulations are unevenly dispersed. (Marcelle 2002) advocates for women's empowerment through improved skills, knowledge, and access to ICTs in order to increase the effect and use of ICTs. Making improvements in access and encouraging initiatives to involve rural women and women in the informal sector are two key precondition for providing ICT-based economic benefits to as big a group of women as feasible, according to the author.

Problems experienced by women when accessing and using ICTs

According to the aforementioned study, issues of access and exclusion are prevalent, as 67.5 percent of respondents confront issues ranging from cost to time and distance. It's worth noting that the average number of people who use computers and the Internet is tiny (2.0 percent). The majority of rural women are still educationally disadvantaged, with 35.0 percent having just completed primary school. This is in addition to the fact that 18 percent of people encounter issues including computer illiteracy and cultural taboos (14.5 percent). The following conclusions can be drawn from the above data. Accessibility barriers must be greatly removed, either before or during the introduction of technology, in order to develop a demand-driven ICT

consumer community in rural areas. According to the United Nations Development Programme (UNDP), there are six major issues that have influenced the design, implementation, and outcomes of information, communication, and technology development (ICTD) initiatives:

According to the UNDP, utilizing ICTs for human development necessitates raising awareness and creating constituencies at all levels of society. According to the UNDP, the link between ICTs and many development concerns is not always evident, particularly in countries with high illiteracy rates, poor telecommunications infrastructure, and high debt levels. Then there's politics, which, according to the UNDP, can stifle or limit the effectiveness and potential of ICTD projects based on national and/or local power dynamics. The third issue is one of accessibility. Impediments to universal access, according to the UNDP, include not just the availability of telecommunications infrastructure and computing equipment, but also educational and/or socio-cultural barriers to individual access (for example, technophobia).

Relevance and meaningful use is the fourth barrier, and three interrelated concerns are identified. To begin, information must be relevant and helpful to end-users in order for ICT efforts to be adopted. Second, even if the information accessible is valuable, developmental consequences will be little until end users have the ability to act. Market pricing supplied to the rural poor, for example, are useless if there are no highways to transport commodities, and medical advice to rural healthcare providers is useless if there is no money to buy medicine. Third, ICTs are most effective when they enhance or expand upon existing or clearly desired information flows. To put it another way, it's critical to include end-users in the planning stages of a project in order to determine what kinds of information and services are most appropriate.

The fifth obstacle, according to the UNDP, is sustainability, which is hampered by unrealistic time goals, insufficient training, and improper technology. Finally, the UNDP mentions coordination as the sixth obstacle, claiming that a lack of collaboration could result in duplication of efforts and technical incompatibility.

The World Bank (2002) cites the problem of building communications networks in poorer nations as a significant concern for reaching entire populations. According to the World Bank, two distinct "gaps" must be bridged: the "market efficiency gap" and the "access gap." Market efficiency, according to the World Bank, is "the difference between the levels of service penetration that can be achieved under present plans and conditions and the level one would expect under ideal market conditions." For example, service penetration in the context of sound policies and a liberalized market vs service penetration in the absence of these conditions. According to the World Bank, the access gap is defined as "certain" places or populations that "cannot be reached commercially without some type of intervention." In other words, because "the market has some constraints," there is an "access gap."

6.   Recommendations and Conclusions

More education, at all levels from literacy to scientific and technological education, is the single most essential component in boosting women's ability to fully exploit the potential afforded by information technology in developing countries." As a result, women are underserved in the knowledge economy because they have less access to scientific and technical education, as well as training and development opportunities. Authors like (Solange & Momo 2005); (Ikoja-Odongo 2002a); and (Adhiambo 2001) have expressed concern that, although being at the forefront of most economic activity, women's contributions are still unacknowledged. The authors agree that more effort should be made to educate young ladies for the benefit of society.

However, while the computer and e-mail communication period has not been well received by women (Nair, 2002), (Huyer, 1997) emphasizes that "when women can grasp and feel the benefits of ICTs, they are ready to use them." Specific information requirements/needs using specific ICTs have accelerated this demand. Given the time constraints that women confront, providing internet connectivity in a local health center, for example, would allow them to obtain health information while on a health-related visit. Huyer claims that little research has been done in poor nations on women's information demands and access to suitable information. ICTs should be positioned in other local institutions where women have open and equal access, such as NGO's, women's employment centers, libraries, and churches, in order to enable access for diverse categories of women (Huyer,1997)

(Huyer and Sikoska 2002) emphasize the need of women banding together to identify the type of information they require, the manner in which that information is delivered, and the precise methods by which that

information may be accessed and used. The authors emphasize the need of stakeholders addressing the following impediments to ICT access: Low literacy and education levels, as well as training in languages commonly used on ICT platforms and the internet, Women's household, productive, and community management obligations take up less time, resulting in substantially longer workdays than men's access to financial resources that could potentially cover the cost of equipment and access , Geographical location, as more women in developing countries live in rural areas than men. According to these authors, infrastructure in such places is unreliable, and travel to ICT centres is made difficult by cost, time and cultural taboos.

The adoption of a participatory approach to development operations is an issue worth considering. For example, (Bessette, 2004) emphasizes the necessity of incorporating deep user and stakeholder involvement into the design and development of technology and organizational systems at all stages of development, including planning, testing, and implementation. The author goes on to say that encouraging community self-organization is only feasible when the state lacks the resources to take on all of its tasks. Bessette's thesis is based on the participatory development communication paradigm (PDC). According to the author, the community should be encouraged to participate in development initiatives through the strategic use of various communication strategies, which include: discussing natural resource management practices and problems; identifying, analyzing, and prioritizing problems and needs; identifying and implementing concrete initiatives to respond to these problems; identifying and implementing concrete initiatives to respond to these problems; and identifying and implementing concrete initiatives to respond to these problems.

Other key variables that should be considered in a two-way communication process are also mentioned by Bessette. These include using adult education as a non-directive teaching method and making material available in a format that is appropriate for the participants' characteristics.

Identifying communication instruments already in use in the local community, such as mainstream media (newspapers, radio, and television), traditional media (storytelling, theaters, and songs), "group" media (video, pictures, posters), and community media such as short-range rural radio broadcasting.

Last but not least, there's the issue of "empowerment." "Empowerment" implies that women must not only have equal capabilities (such as education and health) and equal access to resources and opportunities (such as land and employment), but also the agency to use these rights, capabilities, resources, and opportunities, according to a recent report prepared by the UN Millennium Project Task Force on Education and Gender Equality (Grown et al 2005). (Such as is provided through leadership opportunities and participation in political institutions). The Beijing Declaration and Platform for Action, as well as the Cairo Program of Action, are among the seven strategic priorities included in the study. Strengthening opportunities for post-primary education for girls, ensuring universal access to a broad range of sexual and reproductive health information services, investing in infrastructure to reduce women's time burdens, ensuring girls' and women's property and inheritance rights, eliminating gender inequality in employment, and increasing women's share of seats in legislatures are among the top priorities.

The fact that "there is still a widespread misunderstanding about how substantial benefits can be derived from ICT as much of the difficulty arises because the development community has yet to get in touch with the IT community in a meaningful dialogue that would help both parties" is fundamental to understanding the role of ICTs, particularly in rural development, according to Harris (2002:3). According to Harris, ICTs in rural development are only feasible when information systems and technology development strategies are drawn from and coordinated with overall national development strategies. The study found a strong link between a community's educational levels, the types of ICTs used and accessed, information seeking behavior, and the socioeconomic landscape/environment.

7.   References

1.   Adhiambo,O.(2001). Transforming tradition as a vehicle for women's empowerment: a critical dimension for poverty eradication. [WWW document]. http://www.un.org/womenwatch/daw/csw/empower/documents/Adhiambo%20EP7(accessed April 4 2006)
2.   Adeya, C. (2002). ICTs and Development: a literature review. [WWW document].
3.   http://www.hec.unil.ch/aosterwa/Documents/%20eDev/IdPVD_Seminaire_ 03_04/Adeya_2002.doc. (accessed 13 January 2004).

4. Asare, K. (1997). Women find a shorter route to the classroom. [WWW document]. http://www.afronets.org/archive/199705/msg00009.php. (accessed 9 September, 2003).

5. Ayieko, F. (2001). Worldspace radios link up the rural. [WWW document] http//www.Kenya.ms.dk/partnernews/visartikel.asp?id=209 (accessed 15 January 2004)

6. Ballantyne, P., Labelle, R. and Rudgard, S. (2000). Information and Knowledge Management: Challenges for Capacity Builders. (Policy Management Brief No. 11). Maastricht: ECDPM. [WWW document]. http://www.chs.ubc.ca/lprv/PDF/lprv0075.pdf (accessed 2 May 2005).

7. Basson, N. (1996). Passage to progress: the CSIR's journey of change 1945-1995. Johannesburg: Jonathan Ball Publishers.

8. Bessette, G. 2004. "Involving the community: a guide to participatory development communication". [WWW document] http://www.bytesforall_readers/2002-August/00833.html. (accessed 3 August 2005).

9. Bedi, A. (1999). The role of information and communication technologies in economic development – a partial survey.

10. Bridges.org (2001). Spanning the Digital Divide: Understanding and tackling the issues. [WWW document]. http://www.bridges.org/publications/65 (accessed 2 May 2006).

11. Central Bureau of Statistics (CBS). (2002). 1999 Population and housing census of Kenya. Nairobi, Kenya: Government Printers, Kenya.

12. Esterhuysen, A. (2002). Networking for a purpose: African NGO's using ICTs. [WWW document] http://www.piac.org/rowing_upstream/chapter1/ch1spectrum.html (accessed 13 January 2004).

13. Gay, L.R. 1996. "Educational research: Competencies for analysis and application". (5thEd.). Upper Saddle River, NJ:Merril/prentice Hall.

14. Grown, C.; Rao Gupta, G.; and Kes, A. 2005. "Taking action: achieving gender equality and empowering women. Task force on Education and Gender Equality". [WWW document] http://www.unmillenniumproject.org/documents/Gender-complete.pdf (accessed 5 July 2006).

15. Gurumurthy, A. 2004. "Gender and ICTs: overview report". [WWW document]. http://www.bridge.ids.ac.uk/reports/CEP-ICTs-OR.pdf (accessed 25 September 2006).

16. Hafkin, N and Taggart, N. 2001. "Gender, Information Technology, and developing countries: an analytic study". [WWW document]. http://www.aed.org/ToolsandPublications/upload/CPGenderSummaryMF5M__acol.pdf (accessed 30 June 2006)

17. Harris, R. 2004. "Information and Communication Technologies for poverty alleviation. UNDP/APDIP".[WWW document]. http://eprimers.apdip.net/series/info-economy/poverty.pdf (accessed 15 November, 2005)

18. Harris, R. 2002. "Rural development theories and ICTs". [WWW document]. http://www.bytesforall_readers/2002-August/00833.html (accessed 12 October 2003).

19. Huyer, S. 1997. "Supporting women's use of Information technologies for sustainable Development". [WWW document]. http://www.wigsat.org/it/womenicts.html (accessed 10 June 2003).

20. Huyer, S. and Sikoska, T. 2003. "Overcoming the Gender Digital Divide: Understanding ICTs and the potential for the empowerment of women". [WWW document] www.un instraw.org/en/docs/gender_and_ict/Synthesis_Paper.pdf. (accessed 25 September 2006)

21. IDRC. (2005). Kenya National ICT policy development. [WWW document]. http://www.idrc.ca/en/ev-50209-201-1-DO_TOPIC.html (accessed 20 March 2005)

22. Ikoja-Odongo, J.R. 2002. "The study of information needs and uses of the informal sector of Uganda". Ph.D. thesis (unpublished), University of Zululand.

23. Ikoja-Odongo, R. 2002a. "Insights into the information needs of women in the informal sector of Uganda". South African Journal of Library & Information Science Vol. 68, N.1, 39-52.

24. IIboudo J.P. 2003. "The role and use of rural radio in Africa". In: The one to watch- radio, new ICTs and interactivity. Edited by Bruce Gerard. [WWW document]. file:///docrep/fao/006/y4721e/y4721e00.pdf (accessed 9 April 2006).

25. Information Technology Development Group [ITDG]. (2005). Women's voices. [WWW document]. http://www.itdg.org/?id=womens_voices2 (accessed 6 November 2006)

26. Jebet, D. (2003). Empowering rural poor. [WWW document] http://216.185.134.103/archives/october/fri03102003 (accessed 3 October 2003).

27. Kenney, G.I. (1995). The missing link – information. Information Technology for development (6)33-38. Kenyaweb.com.ltd.(2002).Background information about Kenyaweb.com ltd. [WWW document]. http://www.kenyaweb.com/services/aboutus.html. (accessed 8 September 2004)

28. Marcelle, G.M. 2000. "Transforming information and communications technologies for gender equality". [WWW document]. http://www.undp.org/gender/resources/mono9.pdf (accessed 10 November 2005)

29. Marcelle, G. M. 2002. "Getting gender into African ICT Policy: a strategic view". [WWW document] http://www.archive.idrc.ca/books/focus/903/06chp03.html (accessed 20 October 2005).

30. Marcelle, G. 2002. "Information and communication technologies and their impact on the advancement and empowerment of women: report from the online conference conducted by the division of the advancement of women ". [WWW document] http://www.un.org/womenwatch/daw/egm/ict2002/reports/Reportonline.PDF (accessed 7 January 2004).

31. Marker, P., Mcnamara, K. & Wallace, L. 2002 "The significance of information and Communication technologies for reducing poverty". [WWW document]. http://www.dfid.gov.uk/pubs/files/ict_poverty.htm. (accessed 20 November 2005)

32. Moyo, L. M. (1996). Information technology strategies for Africa's survival in the twenty-first Century: IT all pervasive. Information technology for development. 7:17-27.

33. Mudhai, Fred O. 2004. "Shs 444b. to be spent on phones upgrade by 2015". [WWW document]. (accessed 15 January 2004).

34. Mugenda, O.L. and Mugenda, A.G. 1999. Research methods: quantitative and qualitative approaches. Nairobi: African Centre for Technology studies. Nair, P. 2002. "Molding ICT to their needs: Kerala's women overcome their misgivings". [WWW document]. http://www.isiswomen.org/pub/wia/wia202/moulding.htm (accessed 19 March 2006).

35. Ngenge,G.A. 2003. "Gender equity and new information and communication technologies". [WWW document] http://www.sdnp.undp.org/sdncmr/fawecam/ngenge.htm.(accessed 15 August 2005).

36. Neuman, W. L. 2000. Social research methods: qualitative and quantitative methods. 4th ed. Boston: Allyne and Bacon.

37. Obuya, C. 2003. Horn of Africa Regional Women's Knowledge Network (HAWKNet): bringing African women's voices. [WWW document]. www.globalknowledge.org/gkps_portal/view_file.cfm?fileid=1137(accessed 20 February, 2004)

38. Odame, H. 2005. Gender and ICTs for development: setting the context. In: Gender and ICTs for development. [WWW document]. (accessed 20 November 2005)

39. Opala, K. 2004. Kenyan farmers discover the Internet. [WWW document]. http://web.idrc.ca/en/ev-47033-201-1-DO_TOPIC.html (accessed 2 January 2004)

40. Opondo, O; Sekoh - Ochieng. 2003.We're 28.7 million, and now it's official [WWWdocument]. http://www.profilekzn.co.za/aboutKzn.htm. (accessed July 28 2003)

41. Panos.2004. "Completing the revolution: the challenge of rural telephony in Africa". [WWW document]. http://www.researchictafrica.net/modules.php?op=modload&name=News&_file=article&sid=411 (accessed 24 April 2006)

42. Rathgeber, E.M. 2000. Women, Men, and ICTs in Africa: Why gender is an issue. [WWW document]. http://www.idrc.ca/en/ev-32944-201-1DO_TOPIC.html (accessed 20October 2005)

43. Solange R. and Momo, M. 2005. Expanding the role of ICTs in Africa. [WWW document].http://www.idrc.ca/acacia/ev-32970-201-1- DO_TOPIC.html (accessed 28 January 2006)

44. United Nations Development Program, Evaluation Office 2001. "Information communications technology for development". Essentials: Syntheses of Lessons Learned No. 5 (2001). www.undp.org/eo/documents/essentials_5.PDF (accessed 28 February 2006).

45. Wainaina, M. 2005. "Using ICTs for poverty reduction and environmental protection in Kenya ". [WWW document]. http://www.iisd.org/pdf/2005/networks_dev_connection_kenya.pdf (accessed 28 April 2006).

INFO

Corresponding Author: Jeremiah Osida Onunga, Tutorial Fellow, Turkana University College and PhD Candidate, Kibabii University, Kenya.