DIGITAL DIVIDE IN SUB-SAHARAN AFRICA: IMPLICATIONS FOR E-GOVERNANCE

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Abstract

The phrase 'digital divide' has now come of age, having been conceptualized in the 1990s with various interpretations tied to it. Now, governments the world over are striving to bridge the digital divide in order to reap digital dividends in the social, economic and political spheres and lately to achieve Millennium Development Goals (MDGs). Among the digital dividends envisaged is e-governance that would enhance citizens' engagement with their governments, service delivery, transparency, accountability, prudent management of public resources, and overall good governance. It is also expected that by bridging the digital divide, e-government will flourish to bring about faster access to government services, lower costs for administrative services, enhance greater public access to budgets and documents, make internal operations more efficient, and cut down complex and over-stretched bureaucratic systems. The link between bridging the digital divide and e-Governance need not be over emphasised as the implementation and sustenance of e-government systems are predicated upon efficient, pervasive and affordable information or ICT infrastructure, universal access and universal service principles. Simply put, e-government cannot be achieved in an environment of widening digital gaps. This paper discusses the institutional frame-work for bridging the digital divide in sub-Saharan Africa and the implications for e-governance and development.

Keywords: Digital divide, Good governance, e-Government, e-Governance systems, sub-Saharan Africa, Digital dividends

Introduction

Governments the world over are now preoccupied with how to meet the Millennium Development Goals (MDGs) by the year 2015. One of the key catalysts in the attainment of MDGs is inclusive access to and effective use of ICTs by the entire populace of every country on the globe. Universal access (and universal service) have emerged as key strategies that governments are using in their attempts to bridge the digital divide within their countries and with the rest of the world. In general, the term universal access has come to be associated with enabling every person to have access to necessary ICTs within a given distance for enhanced communication. However, it would seem individual countries define the concept rather differently. The Botswana government for example, defines universal access as access to a telephone in every locality of more than 500 people. On the other hand, South African government perceives universal access as access to a telephone within a 30 minute travelling distance (Jensen 2000 cited by Lumba 2006). The term universal access has been expanded and now includes access to Internet facilities (PANOS, 2004 cited by Lumba 2006). Moreover, the concept of universal access is closely tied to the concept of universal service which is taken to mean that ICT should in addition to being accessed by all, be used by all people irrespective of their physical (dis)abilities.

As already pointed out, universal access and universal service are increasingly being perceived by governments as critical components in achieving Millennium Development Goals (MDGs). However, the so-called 'digital divide' poses the greatest challenge especially in the developing world particularly in the countries of Africa. The concept of 'digital divide' has been defined variously by different authorities. Spectar (2000) for example, views 'digital divide' in terms of inequitable access to ICTs such as PCs, Internet, telephones, cable and other Internet-related technologies by individuals or groups of people in a country or between countries. This definition however, fails to address issues of use and quality of access that have become pertinent in an increasingly interconnected world. This definition implies that addressing the digital divide is merely narrowing the digital gaps by improving access to ICT by a people within and between countries. However, Peters (2003) rightly points out that installing

computers and connections in underdeveloped communities is only part of what is needed to put information and communications technology to use for socio-economic development. Similarly, the ITU points out that the so-called 'new' or 'quality' digital divide is not attributable to the lack of equipment or connections, but in its present form, the character of the phenomenon is changing from "basic to advanced communications and from quantity to quality" (The International Telecommunications Union, 2002). Increasingly, digital divide should be seen and addressed holistically in terms of access, effective use of ICT and content. In addition, the quality of networks, adequacy of bandwidth and value derived from use of such ICTs to enhance the status of individuals or population in a country should be issues to be addressed in any attempt to bridge digital gaps within and between countries.

The origin of the concept 'digital divide' remains a mystery though it has come to be attributed to some professionals and the bureaucracy in the United States of America. For example, Larry Irving, a one-time Assistant Secretary for Communications and Information, and Advisor to the Secretary for Commerce, is reported to have used the concept in 1995. Similarly, the origin of the concept is attributed to Jonathan Webber and Amy Harmon of the *Los Angeles Times* during 1995 when they reportedly used the term to describe the social division between those who were very involved in technology and those who were not. On the other hand, the Benton Foundation believes that former US President Billy Clinton was the first to use the term in an address to the National Information Infrastructure (NII) Advisory Council in 1993 (Foster and Browski, 2000). But Miranda (2006) observes that Albert Gore used the phrase 'digital divide' for the first time in 1996 in a May White House ceremony when he observed that '...as part of our empowerment zone initiatives we launched this cyber-Ed Truck, a book mobile for the digital age it is rolling into communities, connecting schools in our poorest neighbourhoods and paving over the digital divide'. Thereafter, it is reported that the term started to find its way in US policy statements and documents.

Despite the mystery that surrounds the origin of the phrase 'digital divide', it has taken its place in ICT and development literature and is coming of age. It is now generally assumed that bridging the digital divide is inextricably intertwined with social, economic and political

development. The endeavour by countries to bridge the digital divide in order to reap digital dividends should therefore be seen in this context. Birdsall (2000) points out that the digital divide is now increasingly being perceived as a public policy challenge. For example, in both Canada and the United States of America the issue of the digital divide has become an administrative problem (Reddick, 2000). Moreover, it has shifted out of the political public policy arena into bureaucratic programs. Formulated as an administrative issue, the digital divide is now representative of the liberal pragmatic vein of the political cultures of both the US and Canada (Reddick 2000).

Despite the contradicting positions about who originated the concept of 'digital divide', it would seem that the emergence of the phrase is attributed in part to the revolution in ICT especially the Internet technology that swept across the world during the 1990s. However, digital gaps have existed since the invention of computer technology. For example, Birdsall (2000) points out that though the phrase 'digital divide' is relatively new to Canada, the issue of the equitable distribution of access to modes of communication is one that extends throughout Canadian history. For instance, during the nineteenth century, universalism in Canada became central to twentieth-century public policy when it was adopted in the provision of health care, and in other spheres of public policy.

Moreover, the awareness about emerging digital gaps is traced back to the information technology ideology that emerged in the United States in the 1970s in political circles when conservative politics started to embrace free market values, and technological determinism (Birdsall, 1996; Birdsall, 1997). This ideology was borne out of the convergence between computing and telecommunications driven by the perception that technological foundation was a catalyst for economic growth. Consequently, information technology with free market economics and conservative political values was adopted by the Republican and Democratic Parties. During the mid-1990s the Democratic Party through the then Vice-President Albert Gore became a prominent proponent of the development of a National Information Infrastructure (NII) as an economic growth strategy.

Measuring the breadth and depth of digital divide

Though there are various instruments or tools available that can be used to measure the breadth and extent of the digital divide, only the e-readiness assessment and rankings tools it would seem were developed specifically for assessing the breadth and depth of digital divide between developed and developing countries. However, tools such as Digital Opportunity Index (DOI), Information Society Index (ISI) and e-Government Index (EGI) can effectively be used to measure the extent of digital divide especially between countries.

E-readiness: The concept of e-readiness was originated by the intent to provide a unified framework to evaluate the breadth and depth of the digital divide between more and less developed countries during the later part of 1990s. Several tools were thereafter developed by the academia, private sector and development agencies to assist in measuring the extent of the digital divide. For example, in 1998 the Computer Systems Policy Project (CSPP) in the US developed an e-readiness assessment tool known as 'Readiness Guide for Living in the Networked World'. This tool defined e-readiness with respect to a community that has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are favourable to promoting connectedness and use of the network (Bridges.org, 2001).

Similarly, the Economist Intelligence Unit, has since 2000, regularly published annual e-readiness rankings of the world's 60 largest economies, using a tool that defines a country's e-readiness as essentially a measure of its e-business environment, a collection of factors that indicate how amenable a market is to Internet-based opportunities. The ranking allows governments to gauge the success of their technology initiatives against those of other countries (Economist Intelligence Unit and IBM Corporation, 2004). For example, the 2006 global e-readiness rankings of countries by the Economist Intelligence Unit showed that of the 68 countries that were ranked, Denmark retained its top position from the previous year, followed by the US, Switzerland, and Sweden. The next five high performing countries were the UK, Netherlands, Finland, Australia and Canada.

Overall, Europe remained the dominant region worldwide. In Africa the only countries that made it to the list of those that were ranked included South Africa (35th), Egypt (55th), Nigeria (60th) and Algeria at 63rd position. South Africa was ahead of countries such as Malaysia (37th), Argentina (42nd), Turkey (45th), Saudi Arabia (46th), Thailand (47th), Russia (52nd), India (53rd) and China (57th) (Economist Intelligence Unit, 2006). Nearly all countries that were favourably ranked had made significant progress investing in broadband wireless technologies such as WiFi and WiMax for improved online access. In addition, leaders in e-readiness had put in place Voice over IP (VoIP) for enhanced connectivity.

Likewise, the International Records Management Trust (IRMT) has developed an e-records readiness tool, which is designed for use in conjunction with other existing e-readiness tools (including those that have already been described above) to provide high level assessment in determining what government records and information infrastructure is capable of supporting e-government initiatives (IRMT, 2004). The tool uses a brief questionnaire that provides a risk assessment of e-records readiness in government, at national and enterprise levels. The tool consists of twelve components of e-records readiness and measures compliance with information management procedures such as confidentiality; guidelines and good practices for computer systems security; backup and business continuity planning; documentation standards and system engineering procedures for ICT; guidelines for management of electronic records; standards formats for storage and retrieval of data; basic classification schemes; and policy on how information should be organized.

Digital Opportunity Index (DOI): The other tool that can be used to measure the digital divide is the Digital Opportunity Index (DOI). DOI measures and evaluates the opportunity, infrastructure and utilization of ICTs. DOI monitors the growth of mobile communications in many parts of the world, as well as more recent technologies such as broadband and mobile Internet access. Moreover it looks at falling prices of broadband, and increasing broadband speeds (World Information Society Report, 2006). For example, during 2005, the DOI for SADC member states in global ranking as shown in Table 1 was not competitive.

Table 1: DOI for SADC member states (Number of countries ranked globally = 180)

Country	World Rank 2004/5
Angola	135
Botswana	102
DRC	150
Lesotho	133
Madagascar	162
Malawi	174
Mauritius	50
Mozambique	169
Namibia	109
Seychelles	54
South Africa	91
Swaziland	116
Tanzania	165
Zambia	160
Zimbabwe	149

(Source: World Information Society Report 2006)

Information Society Index (ISI): The Information Society Index is another indicator that can be used to surmise the breadth and depth of digital divide. ISI examines how nations are positioning themselves to compete in the global information economy. The index is calculated based on 15 key data variables such as: IT spending as a percentage of GDP, software spending, IT services spending, PC penetration, Internet users, home Internet users, mobile Internet users, e-Commerce spending, broadband households, wireless subscribers, handset shipments, secondary education levels, tertiary education levels, civil liberties, and government corruption. In 2006, 70 nations were surveyed (International Data Corporation, 2007). The countries that were found to be leaders in the Information Society Index for 2006 included South Korea (1st), Japan (2nd), Denmark (3rd), Iceland (4th), Hong Kong (5th), Sweden (6th), United Kingdom (7th), Norway (8th), Netherlands (9th) and Taiwan (10th). African member states were not ranked favourably. Moreover, a similar IS index ranking of 53 countries worldwide in 2003 and 2004 placed South

Africa and Egypt (the only countries from Africa) at position 30 and 47 respectively (Minton 2003; International Data Corporation 2004).

e-Government Index (EGI): The E-Government Index can also be used to determine the extent of digital gaps between countries. For example, in a 2005 global digital government study of 98 municipalities (in countries with an online population of more than 160,000 people) undertaken under the auspices of the Division for Public Administration and Development Management Department of Economic Affairs, United Nations and the American Society for Public Administration, the city of Cape Town (South Africa) ranked at position 31st was the only one from Africa (Holzer and Kim 2005). The evaluation focused on current practices in government with regard to digital governance (delivery of public services) and digital democracy (citizen participation in government). The variables under study included security, usability, content of websites, type of online services being offered and the participation of citizens through websites established by city governments.

Nexus between digital divide and e-governance

From discussions in the preceding sections, there is an increasing link between bridging the digital divide and realising digital dividends in the form of development such as access to information about job opportunities, enhanced service delivery, enhanced educational opportunities, good communication facilities, etc. Heeks (2002) defines e-government as the use of information and communication technologies (ICTs) to improve the activities of public sector organisations. On the other hand, UNESCO-I (2004) defines e-governance as the public sector's use of ICT with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and efficient. Whereas e-government focuses on provision of information services to the citizens, e-governance puts a premium on citizen engagement with government. Increasingly, e-governance is widely being seen as a means to promote democratic participation of citizens in political decision-making (UN 2005):

> E-government the world over, is increasingly perceived as a panacea to the deficiencies of the traditional form of government where for example, citizens physically go to government

offices to seek services such as applying for passport, birth certificate, death certificate or filing tax returns with the consequent delays arising out of long queues, lost files or absence of relevant officials. By and large, e-government is an information intensive environment that consists of decision support systems such as records management systems, integrated financial management systems, human resource management systems, communication systems, databases and portals.

Many studies have shown that e-government services are benefiting largely the educated professionals, who have a better chance to be the first in a society to discover new developments such as e-government. Others in similar groups include business professionals who are the main beneficiaries of e-government; government by virtue of it being architects of e-governance; and information technology (IT) professionals who have good computer skills. Moreover, there are gaps in access to ICT on account of income and education. Similarly, studies by (Du 1999; Liang and Wei 2002) show that family income is a factor that determines Internet use and non-use. Likewise, gender gaps have been reported to exist as far as access to Internet is concerned with more males using the Internet than females. Similarly, age gaps have been reported in literature where there are more young people (younger than 30 years old) using the Internet than middle-aged and older people, presumably because the youths are more familiar with computers, are becoming more educated and are likely to have better paid jobs. Other factors affecting access to Internet and use of e-government include rural/urban divide, lack of awareness of what information e-government provides among others (Xiong 2006).

The world over, countries that have low digital gaps are also best performing in terms of economic development. For example, countries such as Switzerland, Finland, Sweden, Denmark, Singapore, the United States, Japan, Germany, the Netherlands and the United Kingdom are the world's top ten performing economies according to *The Global Competitiveness Report 2006-2007* (World Economic Forum 2006). These countries are also leaders in e-governance systems and score highly on digital opportunity index, e-readiness rankings, information society indices and e-government indices. These results in general demonstrate that, for e-governance to have

the desired effect of accelerated economic development, enhanced service delivery, and accountability, governments must strive to bridge digital divide gaps within and between countries.

International efforts for bridging the digital divide

There are continuing efforts at global, regional and national levels aimed at bridging the digital divide between developed and developing countries and within countries. For instance, the US has since the unveiling of the digital divide phenomena in the 1990s taken concrete steps to narrow the digital gap especially within its midst. The Clinton-Gore Agenda for creating digital opportunity was promulgated in mid 1990s and consequently the private sector was mobilized to promote digital opportunity. Clinton announced US$ 2 billion over a ten-year period in tax credits to encourage private sector donation of computers, sponsorship of community technology centres and training of workers (Miranda 2006). The US government also carried this Agenda to the global arena when it put in place the strategy titled 'DOT-COM Alliance' which was funded through USAID to bring benefits of ICTs to under-developed regions and populations such as women especially in developing countries.

During the World Economic Forum meeting in 2000 in Davos, the US invited its leading ICT gurus such as Bill Gates of Microsoft and John Chambers of Cisco to articulate the relationship between development and ICT and propose measures that were needed to integrate ICT in both national and international development agendas. Following the Davos meeting the concepts of 'information society' and 'digital divide' became the theme of G8 group of countries summit in Okinawa Japan in 2000 where DOT FORCE was born to spearhead global efforts to bridge the digital divide. Similarly, in December 2001, the UN General Assembly passed a resolution 56/183 to hold a global summit on information society in Geneva in 2003 (Miranda 2006). The outcome of the WSIS Summit in Geneva was Declaration of Principles for achieving an information society. These principles include: building information infrastructure through telecommunication and investment in technology; opening gates by achieving universal and equitable access to information technology; meeting needs of the developing world, and making information a common good. The WSIS aims at promoting services and applications for economic,

social and cultural development. The Summit principles place to the fore consumer protection, privacy and security; relevant content, user training, and ethics of the information society. WSIS principles underline the roles of government, the private sector and civil society, intellectual property right, freedom of expression and internet access tariffs. In the area of education, WSIS principles sees ICT as tool to leverage education change, opportunity for enhancing teacher-student environment and providing opportunity for access to education by employed workers (WSIS 2003).

The World Information Technology Forum (WITFOR) on the other hand, is an offshoot of the International Federation of Information Processing body. WITFOR aims at reducing the North-South digital divide through the inception of projects that will in the end, help to bridge the divide. WITFOR conducts its business through a series of meetings and a final conference where commission chairs in a number of IT areas are chosen with the task to identify projects that can be undertaken and to seek funding for such projects. The first WITFOR conference was held in Vilnius on 27-29 August 2003 and culminated in the Vilnius Declaration which identified areas that WITFOR had to address (WITFOR 2003). The WITFOR 2005 was held in Gaborone, Botswana. The resulting Gaborone Declaration contains the proposed projects and actions that the participating countries and organizations should undertake in their attempts to bridge the digital divide (WITFOR·2005).

The International Telecommunication Union has set June 2015 as the date when the transition from analogue to digital broadcasting in Europe, Africa and the Middle East should be completed. The digitization of broadcasting is expected to enhance a more equitable, just and people-centred information society. Moreover, the digital switch-over will leapfrog existing technologies to connect the unconnected in underserved and remote communities and close the digital divide (ITU 2006).

Similarly, The Budapest Open Access Initiative is a recent development that has been facilitated by ICTs and the efforts of researchers and scholarly associations to address prolonged decades of inadequate access to journals due in part to high subscription costs (Kyrillidou and Young 2002). The concept of open access basically

refers to digital information that is free of charge, and free from most copyright and licensing restrictions (Suber 2005). The Budapest Open Access Initiative provides two basic strategies to achieve the open access environment namely: self-archiving (making electronic pre-prints and post-prints available on author home pages or depositing them in digital archives and repositories); and open access (OA) journals that do not charge readers or their institutions for access, instead the publishing costs are met by authors. In return, authors retain the copyright in their articles. There are several models of open access but the basic one is where the journal is set up and run by a university department. A modification of this is where the journal receives some funding, either by grants or sponsorship, to support some of the editorial or management costs. There are about 1,200 open access journals among 25,000 scientific and scholarly journals published worldwide (Lwoga 2006; Lwoga 2005).

In addition to the global-wide initiatives aimed at bridging the digital divide, there are likewise continental initiatives taking place in Africa. For example, the African Information Society Initiative (AISI) was entrenched at the May 1995 21st meeting of the Economic Commission for Africa (ECA) Conference of Ministers of social and economic development and planning. AISI seeks to build Africa's information highway that would utilise the information and communications technologies to accelerate the socio-economic development of Africa and its people. The action framework of AISI calls for implementation of national information and communication infrastructure; building institutional frameworks; human, information and technological resources in all African countries; and pursuit of priority strategies, programmes and projects for the sustainable information society in African countries (Amoako 1996).

Similarly, the New Partnership for Africa's Development (NEPAD) is a broad-based ICT institutional framework whose desire is to initiate the implementation of its ICT projects with a view to encouraging decentralised collaboration within Africa and between Africa and the rest of the world. NEPAD in partnership with the private sector has embarked on an e-school project across the continent through collaboration with respective ministries of education in member countries. Africa's first NEPAD e-school was launched in Uganda in July 2005. The project included equipping the school with computers

and accessories, server, internet, electricity, mobile telephone booster mast, computer desks, DSTV, e-health facility, and trained teachers. Other countries where the e-school project is being rolled out include Algeria, Burkina Faso, Cameroon, the Democratic Republic of Congo, Egypt, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Mali, Mauritius, Mozambique, Nigeria, Rwanda, Senegal, and South Africa (Mikenga 2005; Association for Progressive Communications).

The other African initiative aimed at bridging the digital divide is the African Regional Bureau, a key outcome of the Africa Regional Conference on the World Summit on the Information Society (WSIS) that was held in Bamako, Mali in May 2002 and attended by 51 African states with representatives from government, the private sector, civil society, NGOs, media and international development agencies. The African Regional Bureau was established to work with the WSIS secretariat. The Bureau was designated with the task to develop a set of principles and recommendations for developing a common African vision for an information society. The Bureau is expected through various activities to ensure that every citizen has access to information as a basic human right. Moreover, the Bureau is expected to facilitate removal of regulatory, political and financial obstacles to the development of communication facilities, as well as addressing linguistic specificities (Faye 2002).

During the 2003 WSIS Summit in Geneva, poorer countries, particularly those from Africa, lobbied successfully for the establishment of a "Digital Solidarity Fund" to help finance the infrastructure that is very much needed to close the perceived technology gap. Africa states argued that one of the key problems affecting access to ICT in Africa is lack of adequate requisite infrastructure including telephone access, road network, mass media and other forms of communication systems (PANOS 2004).

Additionally, most countries in Africa have realized the folly of highly regulating telecommunication markets and are now increasingly opening the markets for competition by liberalizing their telecom industry. This change in political thinking has realised phenomenal growth in mobile phone communications, modest growth in fixed line telephony, gradual opening up of Voice over Internet Protocol (VoIP) and Very Small Aperture Terminal (VSAT). These developments

have occasioned growth in telephone communications, and data/ Internet, thus offering a major opportunity for rural areas to communicate and access desired information. Africa is reported to boast the fastest growth rate in the world, forecast to add 265 million new mobile subscribers over the next 6 years. Moreover, Africa was estimated to have 113.55 million mobile subscribers by the end of 2005 and it was forecast that this number will rise to 378 million by 2011, growing 22 percent (Mobiledia Corp 2007). At individual country level, Tanzania has for example higher mobile phones coverage than fixed networks. There is an estimated 4 million mobile phone owners in the country with a growing coverage of rural areas. In Kenya during early 2007, there were about 10 million mobile phone subscribers against fixed lines of 280,000 (Reuters, 2007). In Botswana, the mobile phone subscribers were estimated at about 700,000 in 2007 against about 150,000 fixed lines. In South Africa the mobile phone subscribers were estimated at 35 million by December 2005 (Mobile Telephone Networks 2006) in a population of about 47 million people.

There are also regional initiatives for bridging the digital divide in Africa. For example, the Southern African Development Community (SADC) member states have established some institutional frameworks to enhance e-readiness and propel the region into an information society and also enable countries of the region to play great roles in the information age. For example in 2001, the SADC heads of states established the SADC E–readiness Task Force (2001) to study e-readiness status of the region in order to provide the framework to address issues relating to bridging the digital divide in order to propel the region to an information society status. Similarly, the SADC member states are signatories to the SADC IT protocol that focuses on among other things developing an information society in Southern Africa; encouraging growth of software and hardware; improving human resource capacity, increasing investment in information and communication technology infrastructure services; enhancing economic and social development; increasing productivity and competitiveness; reducing costs related to IT and developing SADC-wide ICT infrastructure (SADC 1999:27).

Similarly, some SADC member countries have agreed to co-ordinate their science policies and work together to develop the region's

science and technology infrastructure. In particular, the countries - which include Zambia, Zimbabwe, Namibia and Botswana - will harmonise some of the rules governing how scientific research is carried out, especially customs regulations on the movement of researchers and scientific equipment. They have also agreed that although primary and secondary education will remain a national responsibility, higher education should be coordinated at regional level and that the creation of regional training centres should be made a priority. These decisions were taken at the regional meeting of the ministers of science and technology of the states involved in this partnership in Maputo, Mozambique on 1 December 2005 (SciDev.Net 2005).

Similarly, in the East African region, the East African Community (EAC) member states consisting of Kenya, Uganda and Tanzania are working collaboratively to enhance the region's participation in the information society through various initiatives. The East African Community Secretariat has for example, developed a vision for the regional e-government framework which covers all major aspects of regional cooperation such as online public services; e-education for public administration and e-business and entrepreneurial support. Currently, the three East Africa Community countries are individually and collectively at different stages of developing national ICT policies.

Within the west African region, the Economic Community of West African States (ECOWAS) consisting of 15 member states that include Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo in a meeting in 2006 in Lome, Togo promulgated an ICT policy framework that would address the challenges of building the information society at the ECOWAS level, including harmonizing national ICT policies and plans, developing an enabling environment, building a regional infrastructure/backbone, developing local content and financing mechanisms and for the Information Society (Faye 2006; Bureau of African Affairs 2002).

There are individual national initiatives aimed at bridging the digital divide in Africa. For example, there are attempts to establish Internet exchange points that will obviate the need for traffic to be routed through Europe even when communication involves two parties in the same country. Kenya and Tanzania have established such Internet

exchange points, while stakeholders in Botswana are discussing the possibility of such Internet exchange point (ITU 2006).

Status of digital divide phenomenon in sub-Saharan Africa

Atkins (2005) quoting the World Bank wrote that the "digital divide" between rich and poor nations is narrowing fast, calling into question a costly United Nations campaign to bring hi-tech telecommunications to the developing world. According to the World Bank, telecommunications services to poor countries were growing at an explosive rate and the digital divide was rapidly closing. The World Bank report was based on the premise that people in the developing world were getting more access especially to cell phone communications far faster than they got access to new technologies in the past. The Report noted that half of the world's population now enjoyed access to a fixed-line telephone, and 77 percent to a mobile network - surpassing a WSIS campaign goal that calls for 50 percent access by 2015.

The World Bank study however, did not take into account the multiple dimensions of the digital divide such as quality of access, adequacy of content in the wires and ability of the general populace to use the technology and content. In a nutshell, the Report could be right with respect to telecommunications growth particularly mobile telephony, but it is debatable that the digital divide phenomenon could be narrowing especially in Africa from the point of view of quality of access, adequacy of content, effective usage and affordability of access. Moreover, sub-Saharan Africa has a lot of catching up to do compared with the developed world with regard to digital literacy, availability of relevant content, affordability of access, quality of networks, universal access and universal service. Similarly the extent of digital divide is inextricably intertwined with levels of development, yet development gaps between developed and developing countries are widening. For example, estimates of the world distribution of income show that global distribution of income is very unequal and the inequality has not been falling over time between low and high income countries (Bourguignon and Morrison 2002; Milanovic 2002; Milanovic 2005).

Additionally, the International Telecommunication Union (ITU) and the International Network of UNESCO published the ICT Opportunity Index (IOI) in time for the second WSIS meeting in Tunis in 2005 which showed that digital opportunities are unequally distributed between developed and developing countries and suggested that the gap between the ICT-poorest countries and most others is actually growing. The report noted that the Infostate gap between countries ranges from a high of 225 to a low of 8. They concluded that literally, the 'have' and 'have-not' countries are worlds apart. Moreover, countries with the least developed Infostates are heavily concentrated in Africa, with some Asian countries as well (International Telecommunication Union 2005).

The digital divide in developing countries especially in Africa is exacerbated by the predominant use of satellite which is a more expensive mode of communication compared to fibre optics (which the continent especially the Southern and Eastern African region lacks). For example, the cost of international data transfer via satellite in the Eastern and Southern Africa region was in September 2004 about US$5,000 per megabit, compared with US$500 per megabit with the maritime link (undersea fibre cable). Further, while a satellite-hop to the UK took 650 microseconds, the fibre optic link took 150 microseconds (*Kenya Times* 2007). On the other hand, a study by the Business Leadership Group on 15 countries world-wide said ADSL (broadband) costs in South Africa were 139% higher than the average rate in the nations surveyed. The study noted that local calls at peak hours were 199% more expensive (Naidoo, 2007). Consequently, if the cost of access in South Africa is taken as the barometer for the rest of the continent (given that South Africa has a well-developed telecommunication infrastructure), then the situation in other countries can only be anybody's guess. This is confirmed by the World Bank as cited by Nyasato and Kathur (2007) who observe that international phone call and high-speed Internet connection charges in 25 East and Southern Africa countries are beyond the reach of average classes.

Bridging the digital divide in its multifaceted forms between Africa and the western world may for now be a pipe dream given that economic gaps have never been effectively narrowed between developed and developing countries despite protracted interventions by multilateral

financial institutions such as the World Bank and IMF. For example, during the 1990s, the International Monetary Fund (IMF) set in motion the Structural Adjustment Programmes (SAPS) which recipients of donor funding especially in the developing world were expected to implement in addressing their economic meltdown (International Labour Office (ILO), 1998). However, the 2000 UNDP Human Development Report noted that since 1913, the global poverty gaps between the world's richest quintiles and the poorest quintiles has been widening significantly. For example, in 1913, the gap between world's richest quintile and poorest quintile was 13:1; in 1990, this rose to 60:1 and in 1997, this gap had reached 74:1 (UNDP 2000).

Moreover, despite recent hype about bridging the digital divide by bringing on board the majority of people who remain excluded especially those living in rural areas in developing countries, little impact has been achieved. For example, in some village in India (new India) discussed elsewhere in this article, the so called knowledge centres situated well in rural areas detached from urban centres meant well in principle for bridging the urban/rural divide, but it has emerged that some of the residents living next to the so called knowledge centres do not even know that they exist and/or what they are all about (*The Economist Newspaper* and The Economist Group, 2005). This situation reveals yet the unexamined rural/rural digital divide. This contrasts with optimism of the 1990s that rural ICTs would leapfrog development, information societies and a host of other electronic age applications for the previously excluded communities.

Similarly, Bill Gates observed that community centres or similar ventures are distractions from real problems of development. He pointed out that 99% of benefits of having a PC come when you have provided reasonable health and literacy to a person going to sit down and use it (*The Economist Newspaper* and The Economist Group 2005). These observations concur with the outcome of e-readiness assessments in Botswana in 2005 where rural communities preferred interventions that would enhance access to anti-retroviral drugs, information about where they would fetch good prices for their goods, and information on how to track lost cattle than to having access the Internet or computers (Maitlamo 2005). Similar observations have been reported in South Africa where people are more preoccupied

with issues of security, shelter, access to clean water, electricity, and access to health facilities than with Internet connectivity.

The G7 group of countries sponsored a conference on 'information society and development' in South Africa in May 1996 which concluded that a large gap existed between industrialized and less industrialized countries in terms of information infrastructure. The conference noted that this gap was occasioned by far less investment in ICT infrastructure by developing countries. The conference urged developing countries to increase investment in ICT infrastructures to narrow the digital gap with the industrialized countries.

Likewise, the March 2007 NEPAD Support Unit of Economic Commission for Africa (ECA) publication noted that electricity use per capita on the African continent is less than 2 per cent. The report concludes that without access to sufficient, quality and reliable energy, every social and development activity was critically constrained in Africa. Moreover, the report noted that for Africa, to achieve MDGs in a sustainable manner, it must address the unique challenges which energy deficits create. African countries must also pursue initiatives which will secure access to energy for, at least, 35 percent of Africa's population within 20 years, especially in rural areas (Economic Commission for Africa, 2006). In Africa, electricity supply shortages make it difficult for connectivity to the Internet even where infrastructure such as wireless technologies such as VSAT could be easily deployed. Additionally, even where there is a power grid, power outages due to droughts affect the capacity of hydro power generating plants in such countries as Kenya, Uganda, and Tanzania. This forces consumers including large government installations to revert to the use of power generators that are not suited for powering delicate gadgets such as computers.

The energy crisis in Africa it would seem will not be resolved in the foreseeable future. The Eskom power utility of South Africa has for decades had excess electricity supply which it was easily exporting to neighbouring countries such as Botswana, Zimbabwe, Lesotho, Swaziland. Moreover, the utility company was in due course expected to export electrical power to the rest of Africa by installing fibre optic cable to expand the power grid into a continental wide network to tap the electricity generation potential of the Congo. However, for the last

three years, South Africa has increasingly found it difficult to meet its own domestic electricity demand because of rapid industrialization taking place in the country. This does not augur well for Africa where largely most parts of sub-Saharan Africa experience perennial shortages of electricity supply with the rural areas bearing the brunt of it all.

The World Bank Report on 'African Region Communications Infrastructure Programme' released in early April 2007 (Nyasato and Kathuri 2007) observes that the Eastern and Southern Africa region suffers bandwidth deficiency as it accounts for less than one per cent of the world's international bandwidth capacity. Additionally, the countries in the region lack direct terrestrial access to global information and communications infrastructure, relying on expensive satellite connectivity to link up with the rest of the world. As a result, telecommunication users face some of the highest costs in the world. The countries affected in the region include: Angola, Botswana, Burundi, Comoros, Democratic Republic of Congo, Djibouti, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, Somalia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. The report further notes that the international wholesale bandwidth prices in the region are 20 to 40 times higher than in the United States, and international calls are on average 10 to 20 times more costly than in other developing countries.

Infrastructure development projects in Africa

The Eastern and Southern African region lacks a fibre optic cable system. Consequently, the region relies exclusively on satellite links for voice and data transmission at about ten times the cost and at transmission speeds of less than a quarter those of fibre optic links. For example, the annual cost of using satellite communications is estimated at $15,000 (Sh1.05 million) per megabyte (Morris 2007).

The high cost of connectivity has prompted major infrastructure projects across the African continent by regional governments to enhance access and bridge the digital divide within the continent and between Africa and other continents. Some of these projects include:

- East African Submarine Cable System (EASSy)

- SEACOM – "Carriers' Carrier" project
- SAT/SAFE 3
- Multipurpose Community Centres
- COMESA Telecommunication project (COMTEL)
- Kenyan Government's TEAMS undersea fibre optic project

The East African Submarine Cable System (EASSy) is proposed to cover 9,900km with undersea fibre optic cable. The project is the brain-child of 13 Eastern African countries. It is believed that the installation of the fibre optic network would slash internet costs and open avenues in the information and communications technology sector in the region which has lagged behind due to lack of an optical fibre cable connecting the country to the rest of the world. Apart from Kenya and Djibouti, other countries involved in the project are South Africa, Sudan, Mozambique, Madagascar, Tanzania, Uganda, Rwanda, Malawi, Botswana, Ethiopia and Somalia. The undersea cable system will link Mtunzini, located just north of Durban in South Africa, to Port Sudan in the Sudan (Morris, 2007). It is envisaged that with EASSy fibre in place, the annual cost of connectivity will go down to as little as $500 in a period of less than six years (Morris, 2007). The EASSy project when completed will link with SAT3/SAFE on the western part of Africa thus encircle Africa and consequently reduce the region's dependency on satellite communications.

SEACOM is the "carriers' carrier" project planned to be implemented on the eastern seaboard of Africa. The SEACOM cable will follow the same route as the EASSy but it will either connect internationally directly into Italy or India via VNSL (Videsh Sanchar Nigam Ltd network). The project is reportedly being funded by the Africa and Middle East Fund based in Europe and two private equity groups in Africa. The project will invest in terrestrial backhaul directly or buy it from backbone providers. SEACOM is expected to bring down the price of bandwidth to US$91 per mbps per month in ten years time. (Southwood 2007).

During 2004, the Common Market for Eastern and Southern Africa (COMESA) signed a deal with what was then Anderberg-Ericsson Consortium of Mauritius as the strategic partner for the regional Communication Telecommunication Project (COMTEL). The planned

network was designed to connect the 21 countries of COMESA, using a combination of micro-wave and fibre links. The entire network, if and when built, would be 18,000 kilometres long (Southwood 2005). This project would be Africa's premier voice and data network when completed. Though the project has been mired in problems of a political, technical, investment and management nature since it was conceived, it is hoped that once it is up and running, it will immensely address problems of bandwidth and connectivity in eastern and southern Africa.

Africa has also stepped up efforts in rolling out community tele-centres. For example, in Tanzania, Multipurpose Community Tele-centres (MCTs) have been implemented in a number of villages and they have proved useful in raising awareness on the use of ICTs (Kapange, 2002). Moreover, there are lots of Public Call Offices (PCOs) in urban centres which are now spilling over to the rural areas to provide access to Internet. Africa Connection Centre for Strategic Planning (2002) recommends that Community Telecentres are the most viable model for Internet access to the majority who are excluded from mainstream internet connectivity in offices, homes, libraries and schools. Tanzania has Internet Points of Presence at each district headquarter, and the trend is trickling further down to smaller towns and some villages (Kapange 2006). Moreover, Internet kiosks, cyber cafes and other forms of public Internet access are increasingly being set up in several countries. For example, the cyber café sector is booming in several countries in Sub-Saharan Africa such as Tanzania, Malawi, Kenya, Mozambique, Eritrea, Mali and Senegal to mention but a few. Some of these telecentres are established in community phone-shops, schools, police stations and clinics bringing information access to the doorsteps of consumers in the rural areas.

At national level, infrastructure developments are also taking place to bridge the digital divide in Africa. For example, the Government of Kenya is spearheading The East Africa Marine Systems (TEAMS) undersea fibre optic cable that is expected to be operational by 2009. The cable will run from Fujaira in the United Arab Emirates (UAE) to Mombasa in Kenya, covering a distance of 4,726 km. The project is a joint venture of the Government of Kenya through Telkom Kenya and the UAE, through its telecommunication service provider Etisalat

(Southwood 2007). TEAMS will provide high speed Internet connectivity that is expected to reduce the cost of doing business and promote economic growth in Eastern Africa. Moreover, after its completion that is expected in 2009, interconnectivity between Eastern Africa and the rest of the world will be greatly enhanced. The project will connect several Eastern and Horn of Africa countries to the rest of the world including Kenya, Madagascar, Burundi, Ethiopia, Uganda and Tanzania.

Similarly, the Kenya government has completed part of an optical fibre cable from Mombasa to the border town of Malaba with Uganda. The Mombasa – Nairobi portion has already been completed. It is expected that this cable will enhance the quality of telephone and internet connections in western Kenya. The project is among several that will see all provinces and districts in the country connected through fibre-optic cable in the country. It will open up the towns and rural areas to ICT business, including call centres, where even a small firm in a rural town can supposedly serve clients from around the world, offering such services as switchboard monitoring of calls, and connections from remote locations. The Nairobi-Malaba cable will be laid alongside the oil pipeline owned by Kenya Pipeline Corporation (KPC). Telkom will, in return, connect KPC's depots and offices to the cable network (*Business Week* 2006).

Addressing Africa's peculiar digital divide problems

The peculiarity of Africa in terms of diversity of its people and languages, poor infrastructure, high illiteracy levels, expansive land mass, wide intra urban/rural divides, etc demand extraordinary measures in attempts to bridge the digital divide. For example, outdoor advertising, use of road-shows, billboards, and promotion posters, advertisements around strategic places such as shops, churches, schools, stadium, airports, clubs, and public transport that have helped to entrench mobile phone connectivity in rural areas in Africa could be similarly applied to create awareness about the increasing digital opportunities that can be accessed by the populace. However, care should be taken for such campaigns not to target the largely affluent and leave out the rural majority.

Similarly, integration of local content in the promotion campaigns to get people to know about new technologies and how they can use them would help enhance access to digital opportunities by communities. For example, community video programmes, and theatre can be useful tools to bring connectivity to the people. NGOs could produce local content using videos about the rural communities where they operate, and show them within and to neighbouring villages. The involvement of communities in ICT projects through telecentres, the use of open source software to develop local applications and involvement of women who make up a great proportion of rural population can immensely enhance the development of local content that is easily accessible and relevant to communities (Etta and Wamahiu 2003). Additionally, the use of low cost technologies such as radio that is pervasive in Africa can enhance access to information. Governments should be lobbied and encouraged to enact local content policies to spur relevant content development (Hyder 2005). E-government systems being implemented by African states can be used to provide access to development information, service delivery and communication between a people and its government.

Africa suffers from a paucity of infrastructure for internet connectivity and also for electricity power supply. However, there is equally under utilization of available infrastructural facilities. For example, in Botswana, Botswana Television Corporation (BTV), Botswana Telecommunication Corporation (BTC), Botswana Railways Services (BRS), Botswana Police Services (BPS) and Botswana Power Corporation (BPS) each has extensive fibre optic cable running in some parts of country with spare bandwidth which could be used for example to provide internet connectivity, power or telephone services to unserviced areas (Maitlamo 2005). On the other hand, the South African portion of the SAT3/SAFE undersea fibre optic cable within the control of Telkom South Africa which runs on the western part of Africa from Cape Town to Far East Asia is reportedly underutilized (Davie 2007). This under utilization arises out of Telkom's pricing monopoly powers.

Solutions to Africa's digital divide problems should be engineered for poor infrastructure on the continent and also take cognizance of inadequate and inefficient electricity supply. Similarly, application programmes for this environment that has linguistic and cultural

diversity should fit in well with cultural realities and sensibilities of the people of Africa. Additionally, the technology should be transferred (adapted to local engineering practices, skills and capabilities) rather than being transplanted akin to technology dumping.

The peculiarities of digital divide in Africa demand a combination of interventions including use of non-conventional approaches to bridge the divide. For example, traditional broadcasting media have maintained a larger coverage than the Internet in Africa, and are in many cases cost-effective and more appropriate for simple information dissemination. However, they have remained commercialised consequently limiting their use. Commercial media tend to reach only those who are privileged in society, well schooled and monied. There is need to enhance access to media using local language newspapers, and community radios that can address the unique information needs of local communities such as rainfall patterns, food security, cultural practices, politics, government projects, health, education, church functions, weddings, etc. Some countries are making good attempts to introduce community radios. They include among others, Mozambique, South Africa, Kenya, Uganda, and Ghana to mention but a few. Other countries including Botswana are yet to agree on the way forward as far as community radios are concerned.

The use of mobile cinemas can help bridge the digital divide. For example, in Tanzania, mobile cinemas are run by church organizations, and some government ministries. Mobile cinemas involve vans carrying a videonic projector and screen. The vans travel on fixed monthly itineraries from one location to another giving outdoor shows in the evenings with no entrance charges. Mobile cinemas provide a unique opportunity of reaching out to the rural and down-market audience targeting males and females in equal proportions as well as children (Kapange 2006). On the other hand, in Kenya, government has made attempts to deploy VSAT to enhance Internet connectivity to remote outpost schools, and government centres that lack fixed line connectivity.

The use of cell phones is enhancing bridging the digital divide in Africa because of its wide reach especially in remote rural areas. Mobile subscriber numbers in Africa increased by over 1000% between 1998 and reached 51.8 million in 2003 (ITU 2004). More-

over, mobile user numbers have long passed those of fixed line, which stood at 25.1 million at the end of 2003 (ITU 2004).

Conclusion

Bridging the digital divide has become a preoccupation of many countries around the world. This is because of the realisation that countries that have high infostates stand better chances of economic, social and political development. In Africa, there are various initiatives at continental, regional and national levels aimed at bridging the divide within and between countries. These initiatives are largely in the areas of infrastructure development, legal and policy frameworks with a focus on laying of undersea and terrestrial fibre optic cables to connect with other parts of the world, liberalisation of the telecommunication sectors, investment in mobile phone connectivity, e-governance and more. However, these efforts should take cognisance of Africa's peculiarities especially in terms of its linguistic and cultural diversity if they have to bear the desired fruits of bridging the digital gaps. Moreover, it is important that the various efforts being undertaken to bridge the digital divide should be followed by impact assessments to determine whether the desired outcomes are being achieved. This is imperative given that there are conflicting reports of whether the divide is narrowing or widening especially in developing countries. Impact studies would provide some indication of where change of strategy and more investment with regard to infrastructure development and policy changes are needed. All said and done, it is right at this point in time to state that mobile phone connectivity has pervaded most of the rural Africa that for a long time had no pulse of fixed line presence, thus contributing in no small way in bridging the intra-country, rural/urban and inter-country digital divides.

References

Adam, L and Wood, F.1999. An investigation of the impact of information and Communications technologies in Sub-Saharan Africa. *Journal of Information Science* 25(4):307-318.

African Connection, Centre for Strategic Planning. 2002. The next step: a rural ICT programme for Africa. Draft 2 Report prepared by Intelcom Research and consultancy Ltd. Vancouver. Canada.

African Technology Development Forum. 2004. Mobile communications in Africa. [Online]. Available WWW: http://www.atdforum.org/spip.php?article89 [Accessed 10 April 2007].

Amoako, K. Y. 1996. Conference on empowering communities in the information society: A keynote address. South Africa, 15 May. [Online]. Available at: http://www.uneca.org/eca_resources/Speeches/amoako/96_97/empower2.htm [Accessed on 28 August 2004].

Association for Progressive Communications. 2005. Kenya: 6 schools to gain from Nepad ICT programme. [Online]. Available WWW: http://rights.apc.org/africa/index.shtml?apc=21878ne_1&x=554614 [Accessed 20 April 2007].

Atkins, T. 2005. Digital divide narrowing fast, World Bank says [News item 13:52)] 24 February 2005.

Birdsall, W. F. 2000. The digital divide. [Online]. Available WWW: http://www.firstmonday.org/issues/issue5_12/birdsall/ [Accessed 1 April 2007].

Birdsall, W. F. 1997. The ideology of information technology. *Queen's Quarterly* 104 (Summer): 287-299.

Birdsall, W. F. 1996. The Internet and the ideology of information technology. [Online]. Available WWW: http://www.free.net:8001/Docs/inet96/e3/e3_2.html [Accessed 17 April 2007].

Bourguignon, F and Morrison, C. 2002. Inequality among world citizens: 1820-1992. *American Economic Review* 92 (4):731-32.

Bridges.org. 2001. Comparison of E-readiness Assessment Models: Final Draft. [Online]. Available WWW: http://www.bridges.org/eredainess/tools.html [Accessed on 16 July 2003].

Bureau of Africa Affairs. 2002. *Economic Community of West African States (ECOWAS)*. Washington DC.: US Department of State.

Business Week. 2006. Telkom Kenya unveils optic fibre cable to connect Nairobi, Mombasa. [Online]. Available WWW: http://www.busiweek.com/index.php? [Accessed 20 April 2007].

Davie, K. 2007. The identity of Telkom's 52% controlling shareholder may come as a surprise to some. *Mail Guardian Business* (13 April 2007), 21.

Economic Commission for Africa. 2006. Per capita electricity use in Africa is less than 2 percent, says new report by ECA's NEPAD Unit [Online]. Available WWW: http://www.uneca.org/nepad/Story070326.htm [Accessed 2 April 2007].

Economist Intelligent Unit. 2006. *The 2006 e-readiness rankings*. London. Economist Intelligence Unit.

Economist Intelligence Unit and IBM Corporation. 2004. Scandinavia consolidates lead in fifth annual Economist Intelligence Unit e-readiness rankings. [Online]. Available WWW: http://www.store.eiu.com/index.asp? [Accessed 16 April 2004].

The Economist Newspaper and the Economist Group. 2005. Behind the digital divide. [Online]. Available WWW: http://www.economist.com/printedition/ [Accessed 10 April 2007].

Etta, E. and Wamahiu, P. S. 2003. *Information and communication technologies for development in Africa: the experiences with community telecentres*. Ottawa. IDRC.

Faye, M. 2002. Bamako 2002 spells out vision for African information society. Addis Ababa. ECA. [Online]. Available WWW: http://www.uneca.org/eca_resources/ [Accessed 31 March 2006].

Faye, M. 2006. ECOWAS experts adopt a draft information society declaration. [Online]. Available WWW: http://www.uneca.org/eca_resources/ [Accessed 30 March 2006].

Foster, S and Borowski, A. 2000. Who coined the term? Origin of 'digital divide' escapes even the experts. [Online]. Available WWW: http://www1.soc.american.edu/students/ij/co_3/digitaldivide/history.htm [Accessed 10 April 2007].

Heeks, R. 2002. *E-government in Africa: promise and practice*. Manchester. Institute for Development Policy and Management University of Manchester.

Holzer, M. and Kim, S. T. 2005. Digital governance in municipalities worldwide (2005): A longitudinal assessment of municipal websites across the world. [Online]. Available WWW:

http://unpan1.un.org/intradoc/groups/public/documents/ASPA/UNPAN022839.pdf [Accessed 15 February 2007].

Hyder, S. 2005. The information society measurements biased by capitalism and its intent to control dependent societies: a critical perspective. *The International Information and Library Review* 37:25-27.

ILO. 1998. Report on human resource development in the context of structural adjustment and transition. [Online]. Available WWW: http://www.ilo.org/public/english/dialogue/sector/techmeet/jmps98/jmpsrep3.htm [Accessed 3 June 2006].

International Data Corporation. 2004. Information society index: Middle East and Africa. [Online]. Available WWW: http://www.idc.com/groups/isi/main.html [Accessed 22 February 2006].

International Data Corporation. 2007. Information society index: An IDC report series. [Online]. Available WWW: http://www.idc.com/getdoc.jsp?containerId=IDC_P7066 [Accessed 12 February 2007].

International Telecommunication Union.2005. ITU and Orbicom publish ICT opportunity index: A step towards the implementation of the WSIS' Plan of Action. [Online]. Available WWW: http://www.itu.int/ITU-D/ict/publications/dd/summary.html [Accessed 17 April 2007].

International Telecommunication Union. 2004. Africa: the world's fastest growing mobile market: does mobile technology hold the key to widening access to ICTs in Africa? Geneva. ITU International Telecommunication Union.2002. World Telecommunication Development Report: Reinventing Telecom. 6th.ed. International Telecommunication Union. Geneva.

International Records Management Trust (IRMT). 2004. *The e-records readiness tool*. London: IRMT.

ITU. 2006. In brief: Digital broadcasting goes global by 2015. [Online]. Available WWW: http://www.physorg.com/news69687991.html [Accessed 19 April 2007].

Jensen, M. 2000. Trail blazer or lost leader: South Africa's ICT policies. Into or out of the digital divide: perspectives on ICTs and development in Southern Africa. Lusaka: PANOS Southern Africa.

Kapange, B. 2002. ICTs and national agricultural research systems: the case of Tanzania. [Online]. Available WWW:

www.isnar.cgiar.org/pdf/inars/tanzania.pdf [Accessed 14 February 2006].

Kapange, B. 2006. Globalizing agricultural information: Improving access to remote areas in Tanzania. Paper prepared for First IAALD Africa Chapter Conference held at the Hotel Intercontinental Nairobi from 21-26 May 2006 Nairobi, Kenya.

Kenya Times. 2007. World Bank's Sh8b boost to TEAMS project. [Online]. Available WWW: http://www.timesnews.co.ke/10april07/business/buns2.html [Accessed 10 April 2007].

Kyrillidou, M. and Young. M. 2002. Research Library Trends. [Online]. Available WWW: http://www.arl.org/stats/arlstat/01pub/intro.html [Accessed 17 April 2007].

Liang, G. and Wei, B. 2002. Internet use in China: a comparative analysis. In Zhang, J. and Woesler, M. (ed.). *China's digital dream: the impact of the Internet on Chinese society*. Bochum: The University Press Bochum, pp. 71-92.

Lumba, P. H. 2006. From access to knowledge networking: A holistic paradigm on bridging the digital divide. Paper prepared for First IAALD Africa Chapter Conference held at the Hotel Intercontinental Nairobi from 21-26 May 2006 Nairobi, Kenya.

Lwoga, T.E. 2006. Open access and open source: considerations for agricultural academic libraries in promoting collaboration and sharing of information and knowledge. Paper prepared for First IAALD Africa Chapter Conference held at the Hotel Intercontinental Nairobi from 21-26 May 2006 Nairobi, Kenya.

Maitlamo. 2005. *ICT sector survey in Botswana. Report of National ICT Consultancy for Botswana*. Gaborone: Consulting and Audit Canada.

Mikenga, S. 2005. *Africa's first NEPAD e-school is launched in Uganda*. Pretoria: Nepad e-Africa Commission.

Milanovic, B. 2005. *Worlds apart: measuring international and global inequality*. Princeton, NJ: Princeton University Press.

Milanovic, B. 2002. True world income distribution, 1988 and 1993: First calculation based on household surveys alone. *Economic Journal* 112 (476):51–92.

Minton, S. 2003. Nordic nations still top information index. The World Paper. [Online]. Available WWW: http://www.worldpaper.com/2003/oct02/isi1.html [Accessed 13 August 2004].

Miranda, A. D. 2006. Technological determinism and ideology: questioning the 'information' society and the 'digital divide'. [Online]. Available WWW: http://www.ces.uc.pt/bss/documentos/2006_11_13_alvaro_de_miranda.pdf [Accessed 2 April 2007].

Mobiledia Corp. 2006. Half the world will use a cell phone by 2009. [Online]. Available WWW: http://www.mobiledia.com/news/43104.html [Accessed 18 April 2007].

Mobile Telephone Networks. 2006. Country profiles: MTN South Africa. [Online]. Available WWW: http://www.mtn.com/mtn.group.web/investor/profile/ [Accessed 18 April 2007].

Morris, A. 2007. SatCom Africa celebrates 10 years of business excellence. [Online]. Available WWW: http://www.satcomafrica.com/ [Accessed 9 April 2007].

Naidoo, S. 2007. Telkom has lost its head. Business Times. April 8 2007. [Online]. Available WWW: http://www.mybroadband.co.za/nephp/? [Accessed 18 April 2007].

Nyasato, R. and Kathuri, B. 2007. High phone charges hamper region's growth, says W Bank. *The Standard*. [Online]. Available WWW: http://www.eastandard.net/hm_news/news.php?articleid=1143967136 [Accessed 10 April 2007].

PANOS. 2004. *Completing the revolution: the challenge of rural telephony in Africa*. PANOS Report No. 48. London: The PANOS Institute

Peters, T. 2003. Bridging the digital divide-global issues. *An Electronic Journal of the U.S. Department of State* 8(3). Available at WWW: http://usinfo.state.gov/journals/itgic/1103/ijge/gj08.htm [Accessed 17 April 2007].

Reddick, A. 2000. *The dual digital divide: the information highway in Canada*. Ottawa: Public Interest Advocacy Centre.

Reuters. 2007. Celtel Kenya starts mobile phone money transfers. [Online]. Available WWW: http://www.engineeringnews.co.za/article.php?a_id=106838 [Accessed 18 April 2007].

SADC. 1999. *SADC in the next millennium: the opportunities and challenges of information technology*. Gaborone: SADC Secretariat.

SADC E-readiness Task Force. 2002. *SADC e-readiness review and strategy*. Johannesburg: SADC, 1060.

SciDev.Net. 2005. Southern Africa adopts a regional approach to science. [Online]. Available WWW: http://www.scidev.net/content/news/eng/southern-africa-adopts-a-regional-approach-to-science.cfm [Accessed 30 March 2006].

Southwood, R. 2007. Outsider east coast fibre project comes in from the cold - SEACOM goes public. Balancing Act. Issue 349. 31 March 2007. [Online]. Available WWW: http://www.balancingact-africa.com/news/back/balancing-act_349.html [Accessed 20 April 2007].

Southwood, R. 2005. Heavy blow to COMTEL fibre project as Ericsson says it will not be an investor. Balancing Act Issue No. 262. June 24 2005. [Online]. Available WWW: http://www.balancingact-africa.com/news/back/balancing-act_262.html [Accessed 10 April 2007].

Spectar, J. 2000. "Bridging the global divide: frameworks for access and the world wireless web", *North Carolina Journal of International Law and Commercial Regulation* 26:57.

Suber, P. 2005. Open access overview. [Online]. Available WWW: http://www.earlham.edu/~peters/fos/overview.htm [Accessed 17 April 2007].

UNESCO-CI. 2004. E-governance. [Online]. Available WWW: http://portal.unesco.org/ci/en/ev.php [Accessed 15 March 2005].

United Nations. 2005. Global e-government readiness report. Online]. Available WWW: http//: unpan1.un.org [Accessed 17 April 2007].

WITFOR 2005. WITFOR – Vilnius 2003 provision programme. [Online]. Available WWW: http://www.witfor.lt/BLOBimage2.asp?id=552 [Accessed 19 April 2007].

WITFOR 2005. WITFOR – Botswana 2005. [Online]. Available WWW: http://www.witfor.org.bw/about_witfor/vilinus.htm [Accessed 19 April 2007].

World Economic Forum. 2006. Global competitiveness report 2006-2007. [Online]. Available WWW: http://www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm [Accessed 18 April 2007].

World Information Society Report. 2006. Digital opportunity index 2005: World. [Online]. Available WWW: http://www.itu.int/osg/spu/publications/worldinformationsociety/2006/World.pdf [Accessed 13 February 2007].

WSIS. 2003. World summit on the information society: *Draft declaration of principles*. Geneva: World Summit on the Information Society.

WSIS Civil Society Working Group. 2004. [Online]. Available WWW: http://www.wsis-pct-org/prepcom2-declaration.html [Accessed on 7 November 2004].

Xiong, J.A. 2006. Current status and needs of Chinese e-government users. *The Electronic Library* 24(6):747-762.

Endnote

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