

# *Electronic Journal of Africana Bibliography*

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*Volume 14*

2013

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## Information and Communication Technologies and the Digital Divide in Africa: A Review of the Periodical Literature, 2000-2012

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# Information and Communication Technologies and the Digital Divide in Africa: A Review of the Periodical Literature, 2000-2012

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## Abstract

The digital revolution has transformed much of the global economy. *Information and communication technologies (ICTs)* play a key role in this revolution. However, not everyone has equal access to these technologies. This gap exists on multiple levels, whether between individuals, small segments within a population, countries, or global regions. The term used to refer to this inequality is the digital divide. This bibliography focuses on recent literature written to describe the digital divide on the African continent.

**KEYWORDS:** ICTs, digital divide, Africa, annotated bibliography

# EJAB

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Volume 14 (2013)

## Information and Communication Technologies and the Digital Divide in Africa: A Review of the Periodical Literature, 2000-2012

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### Introduction

The digital revolution has transformed much of the global economy. *Information and communication technologies (ICTs)* play a key role in this revolution. However, not everyone has equal access to these technologies. This gap exists on multiple levels, whether between individuals, small segments within a population, countries, or global regions. The term used to refer to this inequality is the digital divide. This bibliography focuses on recent literature written to describe the digital divide on the African continent.

The UNESCO Institute for Statistics defines ICTs as “a diverse set of technological tools and resources used to transmit, store, create, share or exchange information.” The Institute goes on to include several technologies in their definition, such as computers, the Internet, telephony, and both live and recorded broadcasting technologies.<sup>1</sup> The Tech Terms Computer Dictionary defines ICTs as “technologies that provide access to information through telecommunications.” The dictionary distinguishes ICT from Information Technology (IT) because of its focus on communication technologies, and the creation of a “global village” which allows the world to communicate more readily.<sup>2</sup>

For the purposes of this paper, the digital divide describes the gap between those who can access and benefit from ICTs and those who cannot. This gap can be caused by a lack of access to the resources themselves due to insufficient information infrastructure, or the financial means to acquire the hardware or software necessary to participate in the information age. Another cause for the digital divide could be

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<sup>1</sup> UNESCO Institute for Statistics. *Guide to Measuring Information and Communication Technologies (ICT) in Education*. Montreal: UNESCO Institute for Statistics, 2009.

<sup>2</sup> Christensson, Per. “ICT (Information and Communication Technologies) Definition.” *The Tech Terms Computer Dictionary*. TechTerms.com, 2010. Web. 12 July 2013. <<http://www.techterms.com/definition/ict>>

from the lack of education and training needed to use ICTs. All these obstacles are widespread in Africa, making the digital divide a bigger problem here than most other regions of the world.

Dr. Catherine Nyaki Adeya compiled a substantial annotated bibliography of selected articles pertaining to ICTs in Africa for the period of 1990-2000, which International Network for the Availability of Scientific Publications (INASP) published in 2001.<sup>3</sup> Although ICT adoption and usage has improved a great deal, most of the key concepts brought out in her thematic review of the literature remain relevant today as do the checklist of obstacles and constraints.

## Bibliography

1. Abungu, Lorna. "Access to Digital Heritage in Africa: Bridging the Digital Divide." *Museum International* 54 (2002): 29-34.

Abungu worked with the National Museums of Kenya (NMK) from 1989-2000. At the time of the article, she was the Executive Director of the International Council of African Museums (AFRICOM). The article gives a history of the use of ICTs in museums, discussing examples of how these museums have attempted to bridge the digital divide. Examples include the NMK, the National Museum of Mali, and the Nairobi Museum in Kenya. Technologies these museums used include websites, interactive CD-ROMs, and touchscreen displays. The author also describes regional and international initiatives to help museums overcome technological challenges. These initiatives are AFRICOM, the Swedish-African Museum Programme (SAMP), and the West African Museum Programme (WAMP).

2. Addo, H. "Utilizing information and communication technology for education and development: issues and challenges for developing countries." *IFLA Journal* 27 (2001): 143-151.

Addo addresses the role of ICTs in education and development in developing countries. The article describes how World Bank created the World Links for Development program to assist developing countries in increasing connectivity and training for ICTs. The author discusses benefits countries receive by participating in the program. The paper also lists several challenges ICTs face in these countries. One challenge Addo lists is the lack of an infrastructure to support the technology. The article describes the lack of indigenous knowledge as another problem facing developing countries. The challenges caused by Globalization are also addressed in the paper. Addo discusses possible solutions for Africa, such as the use of multimedia software in education, and centers of excellence to teach the community computer skills.

3. Adeogun, Margaret. "The Digital Divide and University Education Systems in Sub-Saharan Africa." *African Journal of Library Archives and Information Science* 13(2003) 11-20.

Adeogun describes how the knowledge revolution has changed both how universities can educate students, as well as the demands on what students should learn. The paper explains that

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<sup>3</sup> Adeya, Catherine Nyaki. "Information and Communication Technologies in Africa: A Review and Selective Annotated Bibliography 1990-2000." INASP (2001): 1-62.

while there has always been an information gap between countries in North Africa and SSA, the current technologies available have increased this gap. This gap is even wider between urban and rural areas in SSA. The author feels it is up to librarians to use ICTs to bridge this gap, working together in partnerships and initiatives to fund and share information resources.

4. Ahmed, Allam. "Open Access Towards Bridging the Digital Divide—Policies and Strategies for Developing Countries." *Information Technology for Development* 13 (2007): 337-361.

Ahmed examines whether Open Access (OA) is an effective solution towards bridging the digital divide. The author gives a history of the OA movement, as well as definitions of commonly used terms in OA. The paper also includes a literature review of ICTs and the digital divide in developing countries. The Digital Opportunity Index (DOI) of African countries is listed for 2005. The author discusses while OA would benefit African countries, there have been challenges and threats facing OA in Africa. The author describes key success factors for OA, including economic value, training users and developers, and policy support for an OA strategy. The article concludes with a list of strategic and policy implications for building OA in Africa as a means to bridge the digital divide.

5. Ahmed, Allam, Ghoneim, Sherine and Ronald Kim. "Knowledge Management as an Enabler of Change and Innovation in Africa." *International Journal of Technology Management* 45 (2009): 10-26.

This paper summarized key points from the "Knowledge Management as an Enabler of Change and Innovation in Africa" conference held in Cairo, Egypt in 2007. The conference focused on sharing previous experiences and lessons learned in the effort to build knowledge management capacity and research dissemination skills throughout Africa. Emphasis was placed on ICTs enabling both socioeconomic development and a broader communication network. Regional networks like STATNET, UbuntuNet Alliance, and East Mediterranean knowledge Network were examined as well as individual country perspectives for Tanzania, Uganda, Ethiopia, and South Africa.

6. Ahmed, Allam and Nwagwu E. Williams. "Challenges and Opportunities of E-learning Networks in Africa." *Development* 49 (2006): 86-92.

Ahmed and Nwagwu examine the characteristics of existing E-learning networks in Africa and offer suggestions toward meeting both challenges and opportunities that are part of ICT adoption and usage. Several e-learning initiatives have been launched in African higher education institutions to engage and promote ICT technology within the standard curriculum. The authors also explain how several types of global learning networks operate.

7. Ajuwon, Grace Ada and Lenny Rhine. "The Level of Internet Access and ICT Training for Health Information Professionals in Sub-Saharan Africa." *Health Information & Libraries Journal* 25 (2008): 175-185.

This study's objective was to assess internet access and ICT training among health information professionals in SSA by means of a survey. The survey used a rating scale to determine the

professional's self-assessment of ICT-related skills and information accessing skills. The survey found 92.4% of those with internet access at work lived in cities. The study also found while health information professionals were aware of freely available digital resources in their field, a majority of them did not use them. According to the survey, health information professionals lack training in ICT-related skills because of affordability of this training. The authors of this paper argue the study's findings prove the need for health information funding.

8. Akoh, Ben and Kwami Ahiabenu. "A Journey Through 10 Countries." *Journalism Practice* 6 (2012): 349-365.

Akoh and Ahiabenu describe the African Elections Project, which was established in 2008 with the ambition of using mobile phones and the internet to assist journalists in election coverage. The project covered 10 African countries: Ghana, Cote d'Ivoire, Mauritania, Botswana, Namibia, Togo, Malawi, Niger, Guinea and Mozambique. The components of the African Elections Project consisted of: (1) training of editors, reporters, and journalists; (2) development of an election guide; (3) using Short Message Service (SMS) applications, microblogging tools, videos and images for content gathering and media coverage; (4) an online information and knowledge portal; and (5) media monitoring with an early warning system. The authors discuss observations learned during the course of the project, including challenges that need to be addressed to make future election coverage more effective.

9. Akpan-Obong, Patience and Mary Jane C. Parmentier. "Linkages and Connections: A Framework for Research in Information and Communication Technologies, Regional Integration, and Development." *Review of Policy Research* 26 (2009): 289-309.

The authors of this paper examine how ICTs and regional integration relate to socioeconomic development in Africa and South America. The paper includes a literature review of theories of integration and development, as well as the theoretical linkages between socioeconomic development and ICTs. The authors propose a theoretical model that shows the influences ICTs for development, regional integration, and socioeconomic development have on each other, and then apply the model to both South America and Africa. In Africa, the authors argue that because these factors relate to each other, spreading ICTs in Africa will require more than building a better infrastructure. For example, cultural roadblocks such as the colonial mentality that only products and services imported from outside Africa are acceptable needs to be overcome. The model proposed by the authors may help further research in challenges facing ICTs.

10. Alzouma, Gado. "Myths of Digital Technology in Africa: Leapfrogging Development?" *Global Media and Communication* 1 (2005): 339-356.

Alzouma examines the concept that ICTs will enable Africa to leapfrog into the present day technological world and an abundance of economic opportunity by providing people with computers without serious taking into consideration the existing social conditions. The author outlines the perceived benefits that ICT adoption will bring along with the hindering aspects. Despite growth, he sees the digital divide as a gap both between countries and inside countries making it much more difficult to bridge. He further proposes that cyber-identities in the global environment could lead to loss of cultural identity. The author concludes that ICT adoption must

be handled wisely to insure this technological tool does not end up widening the very gap it was intended to narrow.

11. Assie-Lumumba, N'Dri T. "The Global Development Learning Network (GDLN) and Tertiary Education in Africa: Opportunities and Predicaments of Centralized Knowledge Broadcasting Programs on the World Scale." *Perspectives on Global Development & Technology* 7 (2008): 231-258.

This paper questions the "one size fits all" approach of the Global Development Learning Network (GDLN) in disseminating knowledge to higher education in Africa. The GDLN was established by World Bank to expand the opportunity for tertiary education in developing countries. The authors conducted a study to analyze the GDLN's agendas of liberalization and globalization. The study was conducted using surveys, focus group discussions, and in-depth face-to-face and telephone interviews. The study found that while ICTs were viewed favorably, there were technology challenges in actually receiving the knowledge, and a lack of follow up. Participants also criticized the lack of input they had in what courses the GDLN offered. Examples offered in courses were also often not relevant to developing countries in Africa. The study concluded with a call for designing and implementing programs that reflected Africa's diverse needs, instead of the homogenization offered by World Bank's GDLN.

12. Azzi, Angelo. "Scientific Publishing in Non Industrialized Countries: A Pilot Wireless Internet Project for Africa." *IUBMB Life* 57 (2005): 259-261.

This paper proposes a pilot project to provide cheap wireless connectivity and information access at an African university. The International Union of Biochemistry and Molecular Biology (IUBMB) collaborated with Buea University in Cameroon in this project. The proposal advocates the use of satellite technology, and the paper details how this technology will be implemented. The paper argues that connectivity must be provided cheaply and not be dependent on the local infrastructure in order for ICTs to succeed in the developing countries of Africa.

13. Birba, Ousmane and Diagne Abdoulaye. "Determinants of Adoption of Internet in Africa: Case of 17 Sub-Saharan Countries." *Structural Change and Economic Dynamics* 23 (2012) 463-472.

Birba and Diagne present a two-level hierarchy model which identifies the positive and negative aspects of Internet use in Africa based on their study using survey data collected from 17 African countries. They attempted to identify the variables that influence Internet adoption in different countries and determined that individual characteristics like education, age, sex, finances, and computer ownership do play a major role in Internet use on one level. However, geographical factors like population density and residency in an urban area versus rural community also affect usage on a second level.

14. Blignaut, Pieter. "A Bilateral Perspective on the Digital Divide in South Africa." *Perspectives on Global Development & Technology* 8 (2009): 581-601.

Blignaut examines the digital divide in South Africa with regard to both access and usage. The paper describes South Africa as having the largest difference between its rich and poor in the

world. The author also points out the gap between white and black South Africans. Blignaut proposes a model for the digital divide with an access layer including socio-economic indicators and a usage layer dealing with usage patterns and gratifications users obtain from the Internet and other computer equipment. The paper includes a breakdown of what demographics are more likely to be computer users. Since socio-economic status is a key indicator of both ICT access and usage, the author concludes the answer to the digital divide is to raise the socio-economic standard of the community.

15. Bonnah Nkansah, Godfred and Tim Unwin. "The Contribution of ICTs to the Delivery of Special Education Needs in Ghana: Practices and Potential." *Information Technology for Development* 16 (2010): 191-211.

Bonnah Nkansah and Unwin examine the use of ICTs to assist educating people with disabilities in Ghana. The study used interviews and focus groups to find why disability issues received little attention, what children with disabilities needed, and how ICTs could best support special education needs (SEN). The authors found that while ICTs played a crucial role in meeting SEN, there was widespread apathy in Ghana towards addressing these needs. The authors also argue that their research proves that the need for ICTs should be a central focus for educating people with disabilities, because they not only enhance SEN students' performance, but also make them more employable. The research also found challenges facing the implementation of ICTs. Finally, the authors conclude with possible steps to address these challenges.

16. Brakel, Pieter A. van and Justin Chisenga. "Impact of ICT-Based Distance Learning: The African Story." *The Electronic Library* 21 (2003): 476-486.

The authors discuss the benefits and challenges for ICTs in sub-Saharan Africa (SSA), with regard to distance learning. The paper describes the rise of online learning in the rest of the world, and explains why SSA is behind these Western countries. The authors argue distance learning would be beneficial to Africa because it can reach out to previously excluded groups, such as women with family responsibilities, or students in remote or impoverished areas. The paper describes desktop computers, telephone facilities and internet access in the region. The article covers initiatives for distance education such as the African Virtual University (AVU). The authors also emphasize the importance of information literacy.

17. Brännström, Inger. "Gender and Digital Divide 2000-2008 in Two Low-Income Economies in Sub-Saharan Africa: Kenya and Somalia in Official Statistics." *Government Information Quarterly* 29 (2012) 60-67.

Using some of the agreed upon objectives from the 1995 Beijing Fourth World Conference on Women, Brännström created a survey to examine the relationship between digital divide and gender in the SSA countries of Kenya and Somalia during the period of 2000-2008. The author paid particular attention to the aspect of women's empowerment in the ICT sector which was one of the agreed upon target objectives from the Conference.

18. Britz, J. J., Lor, P. J., Coetzee, I. E. M. and B. C. Bester. "Africa as a Knowledge Society: A Reality Check." *International Information & Library Review* 38 (2006): 25-40.

The authors discuss Africa's progress toward becoming a knowledge society by examining four criteria necessary for success: ICTs and connectivity, infrastructure and deliverability, intellectual capability, and usable content. Although Africa is still far behind, the authors identify several encouraging trends toward obtaining this goal.

19. Bussiek, Hendrik. "Pipes Without Water: And Where are the Pipes? Information and Communication Technologies in Africa." *Internationale Politik und Gesellschaft=International Politics and Society* 3 (2005), 97-107.

Bussiek looks at several aspects of Internet usage via available ICTs and identifies current trends that aid or hamper its growth. Mobile telephones are gaining popularity over fixed line infrastructure, which is almost at a standstill; however, Internet connectivity by mobile device is still under development. Establishing telecenters in rural areas, pursuing Wi-Fi capability, developing local internet exchange points (IXPs) to route internal Internet traffic at the national level, and encouraging partnerships between Internet service providers (ISPs) and telephone companies would all increase accessibility while helping to lower overall costs. Customizing search engines to operate in other languages and increasing availability of OA documents would also be highly beneficial.

20. Camera, Mohamed. "Finding Its Voice? Africa and the Global Information and Communication Revolution." *Florida Communication Journal* 38 (2010): 13-27.

Camera describes how ICTs have created the global information society (GIS) and the role Africa plays in the GIS. The article gives a history of Internet access and satellite technology in Africa. It also gives detailed statistics breaking down how much access individual African countries have. E-journals, e-learning, e-tourism, and e-commerce are also discussed in depth as ways Africa is joining the GIS. The author feels that the GIS revolution could not have come at a better time for Africa, which is experiencing more democratic political, economic, and media revolutions at the same time.

21. Darley, William K. "Public Policy Challenges and Implications of the Internet and the Emerging E-Commerce for Sub-Saharan Africa: a Business Perspective." *Information Technology for Development* 10 (2003): 1-12.

Darley addresses the opportunities provided by the Internet for SSA business. The literacy level, life expectancy, GDP per capita, and electricity consumption per capita for 44 SSA countries is presented. The paper also discusses the information infrastructure and internet usage of these countries. The author explains that commerce, communication, and research are all opportunities the Internet can provide for SSA businesses. To take advantage of these opportunities, the paper lists the public policy challenges and their implications that must first be addressed. Darley concludes with a call for improving the low statistics presented by the paper.

22. De Beer, Arnold S. "The Internet in Africa—A New Road to Developmental Opportunities or a Digital Highway Leading to Nowhere?" *Critical Arts: A South-North Journal of Cultural & Media Studies* 15 (2001): 135-153.

De Beer describes censorship and access restrictions to the Internet in SSA, covering both formal and informal restrictions. SSA has traditionally been restrictive of the media, and freedom of the press has often been low on the priorities of African governments. While the Internet provides new hope in the freedom of information, state censorship still exists through methods such as content filtering and state controlled ISPs, the article explains. The paper also discusses informal means of censorship, such as lack of infrastructure and economic limitations, or literacy and language difficulties. The author proposes ways to address these challenges, such as use of the oral tradition. De Beer concludes by arguing that while technological issues are important, socio-cultural issues should not be underestimated.

23. De Beer, C. S. "Africa in the Globalising World: Digital Divide or Human Divide?" *Communication: South African Journal for Communication Theory & Research* 33 (2007): 196-207.

De Beer looks at the concept of knowledge and access to technology being the key to Africa's future and proposes that solving the technical digital divide alone will not be enough—the human divide must also be addressed. The author proposes that the creation of groups of contagious intelligences will be far more productive in the longer term than focusing on individual intelligences and that these collective initiatives must involve everyone over the select few.

24. Dhlamini, Nodumo. "E-content Capacity Development—RUFORUM Network Experiences." *Distance Education* 32 (2011): 295-302.

Dhlamini is the Programme Manager for ICT Projects at the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). RUFORUM is a network of 25 Eastern, Central, and Southern African universities established in 2004. Its mission is to help these universities in fostering innovations for smallholder farmers through research and training. This report describes networking efforts by RUFORUM using ICTs. Open Educational Resources (OER) are discussed. Using studies conducted to assess member universities ICTs capabilities, the report suggests strategies to support e-learning. The paper concludes with a progress report of online courses created by RUFORUM and training provided to faculty.

25. Djite, Paulin G. "From Liturgy to Technology: Modernizing the Languages of Africa." *Language Problems & Language Planning* 32 (2008): 133-152.

Djite examines how to overcome the linguistic barrier between ICTs and African languages. The paper argues languages help make ideas and dreams become reality, therefore these languages will be the means of engaging the African masses in knowledge societies. The author explains how in the past the Church used African languages to spread the message of the Gospel through translated liturgy. Djite feels this method can also be used to spread science and technology in Africa today. The article details the current lack of African languages on the Web, and proposes

solutions such as software localization. The One Laptop per Child (OLPC) initiative is also discussed.

26. Eko, Lyombe. "New Technologies, Ancient Archetypes: The *Boston Globe's* Discursive Construction of Internet Connectivity in Africa." *Howard Journal of Communications* 21 (2010): 182-198.

Eko looks at a three-part series published in the *Boston Globe* on a fiber-optic system intended to bridge the digital divide in Africa. The paper gives a background of myths and archetypes often used in journalism, especially the archetype of Africa as the "Dark Continent." The author feels the *Globe* used this archetype while describing Africa's fiber-optic system. Using van Dijk's textual analytic approach to discourse analysis, Eko found that the *Globe* used a number of myths to portray Africa as the Dark Continent of the information age. The first myth of duality is exemplified with the digital divide, the paper explains. According to the study, The *Globe* also used the myth of the last frontier by portraying Africa as the last to join the global information economy. The author found ICTs were described as a new beginning, another myth in the Dark Continent archetype. Finally, the *Globe* portrayed a telecommunications consultant from Massachusetts as the heroine of the last frontier, another theme common to mythology, according to Eko's study. The paper concludes with the story the author felt the *Globe* ignored, which was how countries of Africa worked together to revolutionize African telecommunications and reduce the digital divide.

27. Ford, Dwedor Morais. "Technologizing Africa: On the Bumpy Information Highway." *Computers and Composition* 24 (2007): 302-316.

Ford presents case studies of ICT usage in Ghana, Kenya, and Egypt, which show the progress made in these countries and the challenges that hinder their progress. In 1995, Ghana was the first country in SSA to have full Internet connectivity but 2006 statistics showed that only a small fraction (1.9%) were actually benefiting from ICT usage citing poor literacy skills as the major hindrance. The Ghanaian government remains committed in their goal to prepare all citizens to be able to use ICTs effectively. In Kenya, computer usage was introduced into secondary school curriculums as early as the 1970s but struggles to meet the challenge of providing ICT resources for the entire student population. Progress has been hindered by an overwhelmed school infrastructure which occurred when free education for primary school students was instituted in 2003. Egypt began utilizing ICTs in the 1980s and the government's commitment to ICT adoption on a wide scale has been very beneficial. Their Smart School Network began in 2003 to help Egyptian students begin computer literacy training after completing preparatory school. Other projects have been instrumental in introducing ICT technologies to their marginalized groups.

28. Fuchs, C. and E. Horak. "Africa and the Digital Divide." *Telematics and Informatics* 25 (2008): 99-116.

Fuchs and Horak discuss the digital divide in Africa and examine possible solutions. The paper describes many levels of division for Africa as proposed by Pippa Norris, including the global digital divide, the social divide, and the democratic divide. Norris defines the global digital

divide as the difference in Internet access. According to Norris, the social divide applies to the gap between the information rich and poor. Finally, Norris portrays the democratic divide as the division between those who participate in public life using digital resources and those who do not. The paper includes statistical data to portray the level of digital divide in each African country. The authors look at Ghana and South Africa in more depth as case studies. The authors describe several strategies to close the gap, but criticize them for being too one-dimensional. The paper blames centuries of colonial and post-colonial exploitation, exclusion, and dependency of the continent for causing the divide.

29. Furuholt, Bjorn and Tore U. Orvik. "Implementation of Information Technology in Africa: Understanding and Explaining the Results of Ten Years of Implementation Effort in a Tanzanian Organization." *Information Technology for Development* 12 (2006): 45-62.

The authors describe attempts to introduce IT at a management college in Tanzania from 1991 to 2001. The data used for this study was gathered through both formal and informal interviews of project planners and other stakeholders. The study then describes the goals of this attempt at IT implementation, and the reasons it failed. Reasons the paper gives include both the staff and management not buying into IT, lack of incentives, and poor infrastructure and organization. The authors then describe what has changed since 1991 that makes conditions more favorable to IT today. However, the paper concludes that little has been done by 2001 to take advantage of these changes.

30. Gebremichael, Meseret D. and Jason W. Jackson. "Bridging the Gap in Sub-Saharan Africa: A Holistic Look at Information Poverty and the Region's Digital Divide." *Government Information Quarterly* 23 (2006): 267-280.

Gebremichael and Jackson look at the concept of digital divide from a holistic standpoint and emphasize the point that merely bringing ICTs to developing countries is not enough. Focusing on information literacy where the skills and knowledge necessary to use and maintain the technology is developed must also be present for it to have any real impact.

31. Gendall, Kathryn. "Centring Development: Education Centres Supporting Rural Development." *Communicatio: South African Journal for Communication Theory & Research* 34 (2008): 238-254.

Gendall examines what is required for effective ICT application in developing countries. This paper focuses on the centralized development of education centers in rural communities to distribute and increase ICT accessibility in marginalized areas with poor infrastructure and low education levels. The author presents an overview of previous efforts and evaluates the barriers and level of success these initiatives have encountered, particularly in South Africa.

32. Gunga, Samson O. and Ian W. Ricketts. "Facing the Challenges of E-Learning Initiatives in African Universities." *British Journal of Educational Technology* 38 (2007): 896-906.

Gunga and Ricketts discuss the potential of e-learning through Virtual Learning Environments (VLEs) at African universities. The paper gives a history of e-learning, as well as why it should be encouraged in Africa. However, the article explains that currently Africa lacks the capacity,

connectivity, and content necessary to make e-learning a reality. The authors also feel technophobia is a problem, and explain how to combat it. The paper also describes the AVU, which has collaborated with SSA universities to increase access to online educational resources. Public-private partnerships (PPPs) are also proposed as a method of spreading VLEs.

33. Gyamfi, Alexander. "Closing the Digital Divide in Sub-Saharan Africa: Meeting the Challenges of the Information Age." *Information Development* 21 (2005): 22-30.

Gyamfi presents the underlying barriers that hinder ICT adoption in marginalized areas and examines various local and national approaches being taken to rectify the situation. The author concludes with a list of specific needs that must be met for meaningful digital inclusion in SSA and emphasizes that strategic interventions by governments will be necessary to implement and sustain long-term initiatives.

34. Heeks, Richard. "E-Government in Africa: Promise and Practice." *Information Polity: The International Journal of Government & Democracy in the Information Age* 7 (2002): 97-114.

Heeks describes a perceived crisis in systems of governance in Africa and the importance of e-government in solving this crisis. The paper argues that e-government can help by using e-administration to improve public sector internal processes. The author also advocates e-government as a way for citizens to communicate with the government. E-government initiatives can build an e-society, helping build partnerships between businesses and government, and develop the community, according to the article. However, Heeks describes many challenges to e-Government in Africa, and looks at studies done to explain the success and failure of e-government. The author found the degree of change correlated to the chance of failure, and proposes a model to explain this design-reality gap. The paper concludes arguing the importance in addressing current realities in Africa when planning projects in order to ensure their success.

35. Igun, S. E. "Bridging of Digital Divide in Africa." *International Journal of Information & Communication Technology Education* 8 (2011): 11-20.

Igun describes the rise and promising impact of Global System Mobile (GSM) broadband communication services in Africa. The rapid adoption of ICT globally has had educational, social, and economic impact throughout the world increasing disparity between information accessibility and content for developed nations versus developing countries. The author presents the benefits of GSM services in Africa as well as the problems encountered which hinder its overall success.

36. James, Jeffrey and Mila Versteeg. "Mobile Phones in Africa: How Much Do We Really Know?" *Social Indicators Research* 84 (2007): 117-126.

James and Versteeg examine the general use of mobile phones in Africa and the difficulty of determining actual level of saturation across the population. The authors conclude that data collection needs to focus more on usage than ownership to get a more accurate picture of ICT adoption in African countries.

37. Jensen, Mike. "Making the Connection: Africa and the Internet." *Current History* 99 (2000): 215-220.

Jensen proposes that widespread adoption and use of ICT on the African continent is hindered by a lack of information literacy skills combined with a limited telecommunication infrastructure that is expensive to access. Although accessibility to Internet, satellite television and cell phone has greatly improved in the past five years, it remains out of reach for the majority who live outside capital cities. The author concludes with examples of projects hoping to improve this situation.

38. Johnson, Hazel and Alan Thomas. "Sustainable Development and African Local Government: Can Electronic Training Help Build Capacities?" *Compare: A Journal of Comparative Education* 37 (2007): 447-462.

Johnson and Thomas examine a study by the Electronic Distance Training on Sustainability for African Local Governments (EDITOSIA) project that found electronic distance training (EDT) was "useful and feasible" as a means of teaching those in African local government on sustainability. The paper gives a background on sustainability, as well as the role of knowledge and learning in sustainability in the context of local government. The article also explains surveys and studies done by EDITOSIA and gives a history of other distance learning projects. The authors also cover the prospects of workplace learning and its challenges. Finally, the article describes how ICTs can assist with workplace learning, as well as conventional distance learning. The paper concludes with Johnson and Thomas providing two differing models in learning for sustainability.

39. Kalu, Kalu N. "Capacity Building and IT Diffusion: A Comparative Assessment of E-Government Environment in Africa." *Social Science Computer Review* 25 (2007): 358-371.

Kalu examines e-government and the digital divide that exists between utilization in industrialized versus developing countries and what is necessary for African countries to participate in e-government based on the factors outlined in the E-Government Readiness Index. The author's research is based on data from the 2004 Global E-Government Readiness Report from the United Nations Department of Economic and Social Affairs (UNDESA) and the scores and relative rankings of 38 African countries on the E-Government Readiness Index.

40. Kamau, Nancy and Symphrose Ouma. "The Impact of E-Resources on the Provision of Health and Medical Information Services in Kenya." *Journal of Electronic Resources in Medical Libraries* 5 (2008): 133-147.

Kamau and Ouma look at ways that SSA libraries have used ICTs to provide access to health information resources through Internet connectivity. Their research examines the provision of health and medical information services in Kenya through electronic resources. The authors collected data via survey on e-resource usage at Kenyan libraries and resources centers. Results indicated quality of information services is specifically correlated with the level of staff training and expertise and that inadequate ICT facilities create challenges for libraries and information centers.

41. Kamel, Sherif. "Building the African Information Society." *International Journal of Technology Management* 45 (2009): 62-81.

Kamel reviews some of the projects and initiatives that have been implemented across Africa to build up ICT infrastructure. After outlining ICT developments in general, the author narrows the focus specifically on Africa and the ICT development goals of African leaders across the continent that are committed to the long-term strategy of the African Information Infrastructure (AII). Success to date has come about through many entities including national and regional initiatives and projects, civil society initiatives, nongovernmental organization (NGO) social and educational development programs, as well as country based initiatives. Specific country-based examples are given for Egypt, Rwanda, Mauritania and Morocco. The author then outlines the objectives and goals of the African Information Society Initiative (AIS) and the initiatives designed to carry them out. The paper includes two informative summary tables of challenges and opportunities for the various developmental areas and proposed projects. Enabling institutional framework, universal access, ICT usage adapted to special local needs, and skilled ICT users are essential to the development and sustainability of AII initiatives. It also requires collaboration among all stakeholders including government, private sector, NGOs and the media for continued success.

42. Kasusse, Michael. "Bridging the Digital Divide in Sub-Saharan Africa: The Rural Challenge in Uganda." *International Information & Library Review* 37 (2005): 147-158.

Kasusse examines the problem of digital divide in SSA with particular focus on rural Uganda. ICTs are an important element in the development of rural communities in Uganda. Radio and mobile telephone technology has had much more success in rural communities than traditional PC technology due to factors like lower purchase price and the ability to operate by wireless rather than fixed line connectivity. At the time of this study, ICT usage was primarily clustered in Kampala's urban area meaning 90% of the population was excluded. The author outlines the benefits and challenges of ICT adoption and what will be necessary to effectively bridge digital divide across rural sectors of the country.

43. Kebede, Gashaw. "The Information Needs of End-Users of Sub-Saharan Africa in the Digital Information Environment." *International Information & Library Review* 36 (2004): 273-279.

Kebede addresses the concept of digital divide in SSA and what is necessary for successful ICT adoption. The author contends that successful adoption in SSA requires an understanding of end users' information needs. The author's research model names three essential elements: nature of user tasks, state of electronic resources, and level of user experience.

44. Kinuthia, Wanjira. "Another Spotlight on the Continent: TechTrends in Africa." *TechTrends: Linking Research & Practice to Improve Learning* 52 (2008): 21-23.

Kinuthia gives a brief overview of some initiatives intended to bring ICTs to Africa. The article describes the AVU and its efforts in spreading learning (ODL) throughout the continent by collaborating with more than 50 institutions in over 27 countries. It also describes SchoolNet Africa, an NGO that promotes the use of ICTs in schools. The author also lists several OER

projects and discusses the advantages of OER. Also covered in the article is the OLPC project and non-formal education (NFE). Finally, the author describes networking through conferences, seminars, and organizations such as the Educational Technology for Development Network (SANTEC).

45. Kirigia, Joses M., et al. "E-Health: Determinants, Opportunities, Challenges and the Way Forward for Countries in the WHO African Region." *BMC Public Health* 5 (2005): 137-148.

This study examines members of the World Health Organization (WHO) in Africa and their preparedness to use ICTs to implement e-health services. To determine this, the study sought to find availability of PCs, telephones, and the Internet in Africa, as well as the population's ability and accessibility to use such technology. The authors analyzed secondary data obtained from the United Nations Development Programme (UNDP), the World Bank, and the International Telecommunications Union (ITU) and reported their findings. The study found on average these countries had 32 telephone mainlines, 60 cellular subscribers, and 17 Internet users per 1000 people, and 2 PCs per 100 people. The authors felt that a relatively low literacy rate as well as low primary and secondary education enrollment has hampered ICTs in the region. The authors urged African countries to come up with a plan to utilize e-health to reach out to its citizens.

46. Kole, Ellen S. "Appropriate Theorizing about African Women and the Internet." *International Feminist Journal of Politics* 3 (2001): 155-179.

Kole details an electronic survey conducted by WomenAction 2000, an initiative by UN organizations and African NGOs with the mission of empowering women, particularly in the media. The purpose of the survey was to learn the ICT needs of African NGO women. The survey found several problems, with lack of electronic connectivity being the biggest. The author then applied theories that integrated both social and technological issues to these findings to help address ICT issues and how they apply to African women. The author found that none of these theories completely addressed the problem, but together could create a model that could be used to study the topic. Kole felt that constructivist theories were a good starting point for this model.

47. Kyem, Peter A. Kwaku. "Is ICT the Panacea to Sub-Saharan Africa's Development Problems? Rethinking Africa's Contentious Engagement with the Global Information Society." *Progress in Development Studies* 12 (2012): 231-244.

Kyem argues for adopting ICT in SSA countries as a means of economic development and poverty alleviation. The paper applies Weber's theories of rational economic behavior to ICT adoption, and explains the differences in European and African societies concerning values and decision-making. The author then uses these differences to explain why ICT and other technological innovations fail in SSA. Kyem then argues that despite the fact that ICT will continue to use Western rationalization in its implementation, these technologies can still promote development in SSA. Finally, the article concluded by discussing how ICT deployment could take place.

48. Kyem, P. A. K. and P. K. LeMaire. "Transforming recent gains in the digital divide into digital opportunities: Africa and the boom in mobile phone subscription." *Electronic Journal of Information Systems in Developing Countries* 28 (2006): special issue.

The authors describe Africa's mobile phone boom and explains how it can help bridge the digital divide. The paper shows Africa has the largest average annual growth rate of mobile phone subscriptions during the 1999-2004 period. However, the paper states Africa's progress in Internet and broadband penetration are way behind. Kyem and LeMaire explain how socio-economic differences lead to the digital divide. The paper then discusses how mobile phones can overcome these differences, detailing both the economic and socio-cultural benefits the technology delivers. The authors also suggest what role African governments can play in using phones and other ICTs to bridge the divide.

49. Lance, Kate and Andre Bassole. "SDI and National Information and Communication Infrastructure (NICI) Integration in Africa." *Information Technology for Development* 12 (2006): 333-338.

Lance and Bassole examine two data infrastructures promoted in Africa, and how they have been implemented. The infrastructures are Spatial Data Infrastructure (SDI) and National Information and Communication Integration (NICI). So far, NICI initiatives have been more successful than SDI initiatives, according to the paper. The authors explain this is due to the structure of their respective implementation strategies, as well as the tools and initiatives in support of these strategies. The paper concludes with a discussion of how the UN Economic Commission for Africa (ECA) is integrating both NICI and SDI as an effort to form more connections in geo-information technology (Geo-IT) and ICTs.

50. Le Roux, C. J. B. and N. Evans. "Can Cloud Computing Bridge the Digital Divide in South African Secondary Education?" *Information Development* 27 (2011): 109-116.

The authors discuss basic secondary education in South Africa and how cloud computing may be able to speed up adoption of ICT technologies across a larger segment of the country. Several service models are examined along with initiatives outlined in the Horizon Report that is published annually.

51. Lelliott, Anthony, Pendlebury, Shirley and Penny Enslin. "2. Promises of Access and Inclusion: Online Education in Africa." *Journal of Philosophy of Education* 34 (2000): 41-52.

The authors discuss globalization and the learning society, and how they relate to ICT in Africa. The paper looks at how ICTs can both help and hinder African society. The authors begin by examining the current state of ICTs and Internet connectivity. Next, they explain the role of ICTs in promoting democracy on the continent. The paper also covers education and ICTs. The authors feel that ICTs have made misleading and false promises in what they can provide for Africa, because the technology has not arrived, and such efforts can divert attention from more important needs or better solutions. The paper concludes with the argument that while ICTs are inevitable and can offer meaningful contributions to African development, an idealistic approach to implementing them could hurt these efforts.

52. Limb, Peter. "The Digitization of Africa." *Africa Today* 52 (2005): 2-19.

Limb discusses the trends and priorities in the digitization of Africa. The author feels OA should be the top priority. The paper summarizes several digital libraries in Africa, as well as digital projects about Africa in Western countries. Limb also discusses African digital journals, as well as efforts to digitize other print materials. After outlining these projects, the author turns his attention to issues in digitization. The first issue the paper addresses is providing digital access. As well as becoming more affordable, access must also be sustainable, Limb argues. After addressing the issue of sustainability, the paper looks at legal, ethical and commercial issues. The author closes by suggesting combining OA with not-for-profit models to increase access, sustainability, and fairness in digitization.

53. Maele, Veronica. "Africa in the Digital Age: Opportunities and Threats to the Preservation of Library and Archival Materials." *South African Archives Journal* 43 (2003): 69-78.

Maele examines what impact digitization has had on the preservation of materials in libraries and archives in Africa. The paper discusses the spread of e-journals, as well as the growth of CD-ROM technology and other ICTs. The author explains with more people gaining Internet access, many online libraries are becoming available. The article details the African Digital Library (ADL) and JSTOR. The paper also discusses the financial challenges libraries and archives face in digitization. Lack of training in IT is a serious problem, according to Maele. Finally, the article addresses how libraries and archives can best use the new technology in its mission of preservation.

54. May, Christopher. "Escaping the TRIPs' Trap: The Political Economy of Free and Open Source Software in Africa." *Political Studies* 54 (2006): 123-146.

May examines the use of free and open source software (FOSS) in SSA to avoid the costs of intellectual property rights (IPRs), enabling the continent to join the information society. According to the paper, countries in SSA spend \$24 billion on proprietary software each year. The author discusses informational development and the role ICTs play in its deployment. The article also describes the Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement, which governs the global use of IPRs, and is overseen by the World Trade Organization (WTO). May also discusses the philosophical differences between FOSS, and looks at the advantages of using FOSS. The paper also details the political issues involved in the implementation of FOSS, on both the private and the governmental level. May concludes by suggesting outside pressures from software companies will limit the time SSA countries have to pursue FOSS as an alternative.

55. Megwa, Eronini R. "Bridging the Digital Divide: Community Radio's Potential for Extending Information and Communication Technology Benefits to Poor Rural Communities in South Africa." *Howard Journal of Communications* 18 (2007): 335-352.

This study looks at the role community radio can play in bridging the digital divide between rural and urban communities in South Africa. Megwa begins with a description of the history of community radio in the country, as well as the role it plays. Using face-to-face interviews,

community conversations, observation, and document analysis, the study examined ten South African radio stations and their use of ICTs. The paper describes how computers, the Internet, e-mail, telephones, fax machines, photocopiers, cellular phones, instant messages, and broadcast signal transmitters are used at the stations. The author explained how the stations use ICT in news reporting by using stories lifted from the Internet. The stations also had a strong presence in the community, according to the study. The paper concludes, however, the stations were not meeting the full potential they could provide in spreading ICTs.

56. Mercer, Claire. "Telecentres and Transformations: Modernizing Tanzania Through the Internet." *African Affairs* 105 (2005): 243-264.

Mercer presents research from a case study on ICT adoption in Tanzania utilizing data collected from three Internet cafes in Dar es Salaam and one Multipurpose Community Telecentre (MCT) in Sengerema. The author proposes that ICT adoption often redefines poverty symptoms into a lack-of-technology problem giving the illusion that all can be solved with access to technology that is not accurate as her study data on the Sengerema MCT pilot project illustrates. The author suggests that Internet currently serves three purposes in Tanzania: identifies developed Tanzanians, identifies developed Tanzanian communities, and excludes the majority of people who do not have sufficient education or material resources to utilize ICTs.

57. Milek, Anne, Stork, Christoph and Alison Gillwald. "Engendering Communication: A Perspective on ICT Access and Usage in Africa." *Info* 13 (2011): 125-141.

This paper is an examination of disparities in ICT access and usage between men and women in Africa. The authors point out previous studies that have found a digital gender gap in lesser-developed countries. The paper also describes other studies comparing gender technology access and usage. This study considered education, age, income, culture, and the overall state of ICTs in each country as factors. The study used household surveys in sixteen African countries to acquire its data. The authors found in eleven of these countries there was no difference in mobile phone ownership between genders. Internet usage in all countries was low for both genders, but males were more likely to be familiar with and use the Internet, or have e-mail. Radio is the most used ICT in Africa, but is less accessible by women. The study found these gender gaps exist more where there are inequalities in socio-economic factors.

58. Miner, Edward A. and Cliff Missen. "Internet in a Box: Augmenting Bandwidth with the eGranary Digital Library." *Africa Today* 52 (2005): 20-37.

Miner and Missen discuss the eGranary Digital Library, an open source initiative created by the University of Iowa's WiderNet Project. The paper argues initiatives such as eGranary serve two roles in ICT development. First, they help provide access to traditionally unavailable international scholarship. Second, they expose African research to the rest of the world. The authors describe the differences in ICT development between universities in the U.S. and Africa. It also discusses connectivity differences. The article details a survey by WiderNet that revealed bandwidth limitations. The paper explains to address these limitations, the eGranary Digital Library delivers digital resources to African institutions via hard drives shipped directly to them. The article also describes the digital resources in eGranary, and the experiences of some of the

institutions who use it. Because users of the digital library can also upload their website, the paper explains eGranary can disseminate the institution's research to the rest of the developing world cheaply.

59. Minishi-Majanja, Mabel and Ezra Ondari-Okemwa. "Enhancing Government Basic Service Delivery and Performance Effectiveness in Sub-Saharan Africa Through E-Governance." *Mousaion* 27 (2009): 17-35.

This study examines the role of e-government, defined as governmental tasks achieved through digital means, in SSA. The authors also explain e-government covers using ICT to improve activities in the public sector. The paper describes the government procedures in public administration that could be assisted by ICT and knowledge management and how. To show how countries in SSA are implementing e-governance, the paper looks at the knowledge index (KI) and knowledge economy index (KEI) scores of 25 countries in the region. The authors then address the role of e-governance in improving efficiency. The paper also details the current level of readiness in SSA for e-government, and lists the challenges countries face and what they need to do to improve readiness. The authors conclude by arguing for providing information literacy, an ICT infrastructure, and relevant government e-services in SSA.

60. Minishi-Majanja, Mabel K. and Dennis N. Ocholla. "Auditing of Information and Communication Technologies in Library and Information Science Education in Africa." *Education for Information* 22 (2004): 187-221.

This study examines the diffusion of ICTs in Library and Information Science (LIS) education in SSA. The authors have four objectives of their study. First, they intended to audit which ICT competencies are taught in LIS education. Second, the study intended to determine which ICTs are used in LIS schools, and how they are applied. Third, the authors hoped to identify what levels of ICT support the schools had. Finally, the study was meant to recognize ICT problems and suggest strategies for bridging the digital divide in LIS education. The paper includes a literature review that covers Rogers' Diffusion of Innovations Theory. The study was conducted using a survey sent to faculty members in 18 SSA countries. The study found 88% of the schools offered at least half of the courses covered in the survey. The authors found widespread use of ICTs, but discussed many challenges facing this use. The paper reported most schools had a fragmented ICT policy, if they had one at all, which added to availability and implementation problems. The study concludes with a long list of items for the future ICT agenda of LIS education as well as areas of future research.

61. Minishi-Majanja, Mabel K. "Mapping and Auditing Information Technologies in Library and Information Science Education in Africa: A Review of the Literature." *Education for Information* 21 (2003): 159-179.

Minishi-Majanja gives a literature review of ICTs in Africa. The paper's focus begins with a broad overview of ICTs globally but then focuses in on their use LIS education. The review also covers the landscape of ICTs and higher education in Africa before turning its discussion to LIS. Finally, the author details literature on issues and challenges in the topic, as well as solutions for these problems.

62. Moloji, Julie and Stephen Mutula. "E-records Management in an E-Government Setting in Botswana." *Information Development* 23 (2007): 290-305.

Moloji and Mutula examine the management of e-records in the public sector of Botswana by looking at the status of e-records management, the level of computerization within governmental agencies, the policy and legal framework for managing e-records, and the challenges and hindrances of managing e-records and the necessary ICT. Data was collected through case studies of 19 government ministries and by survey data collected from key personnel at these ministries. Personnel were interviewed using a set of open-ended questions specifically designed for each of the three groups, which were records management personnel responsible for public sector record usage, IT specialists who provide the technical support and action officers who create and use these records within government.

63. Molla, Alemayehu. "Downloading or Uploading? The Information Economy and Africa's Current Status." *Information Technology for Development* 9 (2000): 205-221.

Molla describes the information economy and where it stands currently in Africa. The paper provides a conceptual framework of the information economy including ICT infrastructure and services and how they relate to e-commerce and informatization. According to the article, studies have shown Africa is lagging behind in ICT, e-commerce, and informatization, with numbers provided in the article to back these findings. The author also points out that the numbers for Africa concerning the information economy are much worse when South Africa is excluded. The paper concludes listing challenges developing countries face in catching up with the rest of the world, including other developing countries, and strategies for overcoming the gap.

64. Mulauzi, Felesia and Kendra S. Albright. "Information and Communication Technologies (ICTs) and Development Information for Professional Women in Zambia." *International Journal of Technology Management* 45 (2009): 177-195.

The purpose of the authors' study was to investigate whether professional women in Lusaka, Zambia use ICTs to access development information for health, education, agriculture, environment, good governance, and water and sanitation. The study was based on five hypotheses: the women have access to ICTs, the women have access to development information, the women are able to access development information in English, the women use ICTs, and the women have barriers to relevant content. Data was collected by self-administered survey from a random sample of 200 professional women from 10 private and 10 public sector institutions. Findings indicated that professional women have access to both old and new ICTs and they are using ICTs to access development information in both English and their local languages.

65. Munguatosha, Godfrey Maleko, Muyinda, Paul Birevu and Jude Thaddeus Lubega. "A Social Networked Learning Adoption Model for Higher Education Institutions in Developing Countries." *On the Horizon* 19 (2011): 307-320.

The authors present a model for combining social networked learning with traditional learning methods in African higher education utilizing data they collected through interviews and survey.

Their research builds on the Technology Acceptance Model (TAM) and data was collected in Tanzania.

66. Mutasa, Mukundi and Evelyn Mashingaidze. "Information and Communication Technologies: Tools for Development. What are the Benefits and Challenges for the African Information Society?" *ESARBICA Journal* 24 (2005): 114-129.

Mutasa and Mashingaidze look at the benefits and challenges of ICT adoption in Zimbabwe and the concept of National ICT Policy. This paper examines the advantages that ICT technology brings to education and research and evaluates what aspects should be addressed within a National ICT Policy. After defining ICTs and their value, the authors identify factors that impede ICT adoption and what can be done to alleviate these hindrances.

67. Mutula, Stephen M. "Information and Computer Technology Management Challenges in the Networked World: Implications for Libraries in Africa." *Journal of Interlibrary Loan, Document Delivery & Electronic Reserve* 19 (2009): 57-73.

Mutula describes information management in the networked world and how it applies to African libraries. He begins with a description of the information society and its uses by schools, publishers, libraries, and governments. The author then explains how Africa has been unable to benefit from the networked world as much as other parts of the world. Mutula lists several reasons for this divide, including lack of staff and infrastructure, a lack of English speakers, and a lack of locally published content. The author argues it is up to librarians to assume a more progressive role in IT environments. The paper also examines the digital divide on a global level, as well as in Africa itself. The author concludes by advocating digital literacy, community awareness, government subsidies and corporate donations to help Africa's libraries join the information society.

68. Mutula, Stephen M. "Evolving Paradigms in the Networked World and Their Implications for Information Management in African Libraries." *African Journal of Library, Archives & Information Science* 18 (2008): 89-102.

Mutula looks at paradigm shifts influenced by the networked world and how they apply to the creation and management of information in African libraries. The article describes how the role of the librarian has changed from a preserver of print material to a timely deliverer of information in all forms of media. The author also discusses the evolution of the information society, and what it requires for full participation. Another new paradigm the paper covers is e-government. Mutula describes the roles libraries can play in e-learning and digital scholarship. The last paradigm the paper details is the digital divide in Africa between the "haves" and "have-nots." The author concludes that libraries must consider all four paradigms and implement policies so they can participate in the networked world.

69. Mutula, Stephen M. "Digital Divide and Economic Development: Case Study of Sub-Saharan Africa." *Electronic Library* 26 (2008): 468-489.

Mutula examines the link between digital divide and economic development and the efforts being made at continent, region, and country level to bridge this gap. The author points out that most studies are based solely on e-readiness assessment but there are other assessment tools available like the DOI, the Information Society Index (ISI), and the eGovernment Index (EGI) that are equally effective in measuring digital divide between countries and gives some background for each. Mutula then looks at current bridging strategies being employed in SSA through initiatives like the AISI, New Partnership for Africa's Development (NEPAD), and the African Regional Bureau. He also identifies key regional initiatives like Southern African Development Community (SADC), East African Community (EAC), and Economic Community of West African States (ECOWAS) as well as national initiatives in Kenya, Tanzania, and Botswana. Infrastructure initiatives and hindrances are also examined.

70. Mutula, Stephen M. "Peculiarities of the Digital Divide in Sub-Saharan Africa." *Program: Electronic Library & Information Systems* 39 (2005): 122-138.

Through literature survey and assessment of existing models, Mutula focuses on several factors unique to SSA that negatively impacts bridging of the digital divide. The conclusion emphasizes successful adoption of ICT is dependent upon a multi-pronged approach that addresses the factors collectively rather than individually.

71. Mutula, Stephen M. "Bridging the Digital Divide Through E-Governance: A Proposal for Africa's Libraries and Information Centres." *Electronic Library* 23 (2005): 591-602.

Mutula reviews digital divide literature focusing on African countries and the reasons for slow adoption of ICT. The author further examines the feasibility of African libraries and information centers utilizing e-governance to both improve ICT accessibility for a greater population as well as increasing usage in their facilities. Mutula's research observed that low utilization of existing ICT resources at libraries was a problem and points out the mutual benefits from libraries collaborating with e-government initiatives.

72. Ngugi, Catherine N. "OER in Africa's Higher Education Institutions." *Distance Education* 32 (2011): 277-287.

Ngugi discusses OER and the role it can play in higher education in Africa. The paper gives a history of higher education in Africa beginning in the colonial era. It also covers South Africa's reformation post-apartheid. The author also discusses the challenges faculty face due to lack of funding and resources. Ngugi briefly describes open and distance education before going in depth on OER. The paper covers OER Africa, an initiative of South African Institute for Distance Education (SAIDE). The author argues that it is important for African institutions to contribute to OERs and not merely consume them. Ngugi also reminds the reader that OER is just a step in the education process, and not the only solution.

73. Ngwainmbi, Emmanuel K. "Globalization and NEPAD's Development Perspective: Bridging the Digital Divide with Good Governance." *Journal of Black Studies* 35 (2005): 284-309.

Ngwainmbi presents a literature review of the NEPAD initiative that looks at both the positive and negative impacts it has had on ICT adoption on the African continent. Globalization and good governance are defined and discussed in relation to Africa's socio-cultural and politico-economic development and how these influences affect progress today. The impact of foreign investments and neo-imperialism on ICT growth can be detrimental in some cases as the strategic development objectives of NEPAD are weakened and shifted from the original objective of leadership and control through partnership between African countries and foreign entities that is provided by Africans to seeking and receiving technical assistance from international entities who take the leadership roles in regional development planning. The author concludes that while NEPAD has made progress there are too many goals with no clear milestones in order to regularly evaluate progress.

74. Nwagwu, Williams E. and Allam Ahmed. "Building Open Access in Africa." *International Journal of Technology Management* 45 (2009): 82-101.

Through an extensive literature review, Nwagwu and Ahmed examine OA as a means of helping to narrow the information divide between developed and developing countries. In particular, the authors evaluate OA as a means of accessing scientific knowledge in SSA and provide several specific examples of OA initiatives being carried out in SSA.

75. Ocholla, D. N. An overview of information and communication technologies (ICT) in the LIS schools of Eastern and Southern Africa, *Education for Information* 21(2-3) (2003), 181-194.

Ocholla studies the use of ICTs in LIS schools in selected eastern and southern African countries. The study discusses the contradiction of ICTs being important in these schools, yet underemphasized. The author received responses to surveys sent to LIS schools in Botswana, Kenya, South Africa and Uganda. The paper reports the study's findings at the schools regarding computer literacy, staff access of ICT, software used, ICT teaching quality and quantity, database availability, and student's job market preparation. The study also reports the survey's findings regarding ICTs in research and academic management. The author finally reported the study's findings regarding ICT resource support and comments made on ICT trends, issues and problems. The study concluded ICT in LIS schools was limited by the ICT capabilities of their respective countries.

76. Oguya, Vivienne. "Bridging Africa's Digital Divide: A Case for CD-ROM Technology." *Quarterly Bulletin of the International Association of Agricultural Information Specialists* 51 (2006): 159-165.

Oguya proposes CD-ROMs as an answer to bridging Africa's digital divide. The article argues the Internet has not provided researchers with the information they need due to lack of funds for paid subscriptions to peer-reviewed journals. While initiatives such as the Programme for the Enhancement of Research Information (PERI) exist to help cover these funds, high Internet costs are still a factor. Another problem the paper discusses is many Africans lack experience and knowledge in using ICTs. The Technical Centre for Agricultural and Rural Cooperation (CTA)

sent a survey to African, Caribbean, and Pacific countries to determine their level of ICT development and preference for information distribution. The survey found almost half of African countries preferred subscriptions on CD-ROM. Oguya suggests that while Africa will eventually be globally connected via the Internet, CD-ROMs can bridge the gap in the meantime.

77. Ojedokun, Ayoku A. and Kgomotso H. Mahi. "Information and Communication Technology (ICT) Systems in Botswana Government Departments." *African Journal of Library, Archives & Information Science* 16 (2006): 79-88.

The authors describe Botswana's efforts to apply ICTs to major government functions. The paper lists reasons governments consider computerization. It then discusses the history of computerization in the Botswana government, as well as its plans for the future regarding ICTs. The authors describe Botswana's National Development Plans (NDP) and what they mean for ICT implementation. The article includes a list of ICT systems in government departments and their expenditures in each NDP. The paper also discusses how the Botswana Power Corporation (BPC) and the Water Utilities Corporation (WUC) have computerized. The authors conclude that computerization is needed for economic growth and sustainability.

78. Omojola, Oladokun. "English-Oriented ICTs and Ethnic Language Survival Strategies in Africa." *Global Media Journal: African Edition* 3 (2009): 1-13.

Omojola discusses colonialism's impact on ICTs in Africa in regards to language. The paper explains in many countries, those who speak the language of the colonizing country form an elite group. According to the article, many ICTs are not available in indigenous languages, leaving these populations unable to benefit from them. The author examines factors that have led to English being a dominant language on the continent. Omojola also looks at the dangers of favoring some indigenous languages over others, and examples of software that have made this decision. The paper finds that Google Yoruba, Google's first local Nigerian language website, failed in its attempt to be relevant to locals. The author concludes it is up to Africans themselves to Africanize ICT content for their countries.

79. Opesade, Adeola O. "Strategic, Value-Based ICT Investment as a Key Factor in Bridging the Digital Divide." *Information Development* 27 (2011): 100-108.

After outlining the three phases of the e-readiness process (assessment, strategy development, and implementation) the author points out that most previous studies have been focused on assessment or first phase of the process. Opesade then presents a conceptual model for ICT investment to assist developing countries in planning and realizing their ICT objectives that focuses on the second or strategy development phase.

80. Opoku-Mensah, Aida. "Twin Peaks: WSIS from Geneva to Tunis: Whither Africa in the Information Society?" *Gazette: The International Journal for Communication Studies* 66 (2004): 253-273.

The author begins by examining ICT emergence in Africa through the formation and subsequent action of the AISI to address African digital divide issues based on the four main development goals associated with it. The author also examines the NEPAD initiative to coordinate national

efforts and regulate ICT frameworks across the various sub-regions. The rest of the paper primarily discusses the African Regional Conference held in Bamako, Mali in May 2002 to prepare for the upcoming World Summit on the Information Society (WSIS) meetings in Geneva and Tunis. The resulting Bamako Declaration on WSIS is included which specifically outlines what their group expects to accomplish through participation in WSIS. Africa had the highest number of leaders in attendance at WSIS—more than any other continent—including several presidents of African countries. One notable achievement was that WSIS created more opportunities for cooperation as well as ICT incorporation into development work. The knowledge that digital divide in most African countries occurs between urban and rural centers pointed out the need to benchmark and evaluate ICT progress based on rural adoption and usage to get a more accurate picture.

81. Otiso, Kefa M. and William G. Moseley. “Examining Claims for Information and Communication Technology-Led Development in Africa.” *African Geographical Review* 28 (2009): 99-116.

This article provides an overview of which ICTs are making an impact in socioeconomic development in Africa’s less developed countries (LDCs). The authors also list obstacles ICTs face on the continent. The paper details how the Internet has become popular in Africa via email and internet telephony. However, according to the article, web browsing and e-commerce is not as popular. The authors also cover the widespread use of cell phones and gives reasons for their success. The paper lists six improvements in Africa from ICTs. First, ICTs have improved telecommunications. Second, Africa is more connected to the global economy. Third, it has enabled more participation on the continent from the African Diaspora. Fourth, ICTs have led to more African-owned corporations. Fifth, education has improved, especially in colleges and universities. Finally, ICTs have changed the political climate in many countries.

82. Oyedemi, Toks Dele. “Digital Inequalities and Implications for Social Inequalities: A Study of Internet Penetration amongst University Students in South Africa.” *Telematics and Informatics* 29 (2012): 302-313.

Oyedemi collected data via survey to investigate Internet access and usage by university students in South Africa. The survey collected data from 1044 students at five universities and looked for patterns based on gender, geography (place of family residence), race/ethnicity, household type (both parents vs. single parent), and family income. Data analysis revealed digital inequality patterns that closely mirror existing social inequalities within the country.

83. Polikanov, Dmitry and Irina Abramova. “Africa and ICT: A Chance for Breakthrough.” *Information, Communication & Society* 6 (2003): 42-56.

Polikanov and Abramova look at the status of ITC adoption across Africa and identify several areas ITC adoption could improve including a more simplified tax collection process, stabilization of financial and banking systems, information exchange between multiple law-enforcement agencies, environmental protection, and life-long learning opportunities in the healthcare field. In addition, ICTs make improved information exchange, online publishing, and the ability to provide professional services from a distance possible as well as offering access to worldwide experiences and events like virtual museum tours, concerts, movies, and sporting

events. The authors also outline the basic hindrances and discuss methods of diminishing digital divide through utilization of cyber-cafes, public access centers, and wireless devices.

84. Rhine, Lenny. "The Impact of Information Technology on Health Information Access in Sub-Saharan Africa: The Divide within the Divide." *Information Development* 22 (2006): 242-250.

Rhine explores the potential benefits of ICT adoption in the health sector of SSA. Many African libraries are full of out-dated books with no funds available for acquiring more materials that are current. This lack of support means many health professionals must perform their jobs without access to vital new information. While ICT accessibility will greatly improve accessibility to vast clinical knowledge, analytical training is essential to be able to evaluate the quality of information. The author identifies types of access (search engines, databases, gateways, portals, and Listservs) and provides some relative examples like Google Scholar, PubMed, INASP Health Links gateway, the Health InterNetwork Access to Research Information (HINARI) project, HIVinSite, and AfroAIDSinfo. He also mentions how valuable e-mail can be for providing timely communication between health professionals. Rhine then goes on to outline some of the global initiatives such as Global Review that are striving to break down barriers in health information accessibility for developing countries.

85. Robins, M. "Are African Women Online Just ICT Consumers?" *International Communication Gazette* 64 (2002): 235-249.

Robins discusses the impact of ICTs on women in SSA. The paper describes how the digital divide is wider between women and the rest of the world and lists reasons why. The author also discusses initiatives created to assist women in accessing and using ICTs. Robins argues that the power ICTs have to help women could also be used to hinder them, so it is important to monitor who controls the technology. The article covers globalization and how it relates to ICTs and African women. Robins uses the case of Senegal as an example of what impact ICTs have, both positive and negative. The author also uses Senegal as an example of who controls the initiatives.

86. Rodrigues, J. A. and W. J. Muliaro. "Tertiary ICT education in the East African Community (EAC): Human Capital and Curriculum Development." *International Journal of Computing and ICT Research* 1 (2008): 76-84.

This paper focuses on human resource and curriculum development of twelve East African tertiary institutions to portray a snapshot of ICT education in the region. The authors discuss the importance of human capital development as a factor for economic success. The paper then describes the curriculum needed to attain this development. The article also discusses Learning Communities (LC) as an alternative to the traditional curriculum. The authors use the Inter University Council of East Africa (IUCEA) Report to examine the twelve selected schools. The paper explains that additional staff is needed to increase human capital, and describes barriers to recruiting this staff. In addition to LCs, the authors encourage open source software (OSS). The paper concludes its discussion by addressing the link between challenges, risks and opportunities and the IUCEA Report's recommendations.

87. Roycroft, Trevor R. and Siriwan Anantho. "Internet Subscription in Africa: Policy for a Dual Digital Divide." *Telecommunications Policy* 27 (2003): 61-74.

Roycroft and Anantho focus on the issue of lack of basic telephone networks to support Internet access in developing nations and the prohibitive cost of Internet subscription for those who do have access. The authors looked at several mediating factors such as level of economic development, availability of locally provided content, international bandwidth capacity, cost of local calls, languages spoken along with degree of English-language capability, and ISP market structure to evaluate a country's ICT functionality and make some suggestions toward improvement.

88. Sebusang, S. E. M. and S. Masupe. "ICT Development in Botswana: Connectivity for Rural Communities." *Southern African Journal of Information and Communication* (2003): pp. 41-51. Accessed April 16, 2013. <http://hdl.handle.net/10625/42477>

Sebusang and Masupe examine ICT accessibility in Botswana. There is a strong telecommunications infrastructure in Botswana and provision of universal access to ICTs is the stated policy of the government and the Botswana Telecommunications Authority (BTA). This paper looks at reasons why Botswana is still lagging behind in the "information society" despite this national effort particularly focusing on rural communities.

89. Smart, Pippa. "Increasing the Visibility of Published Research: African Journals OnLine." *Africa Today* 52 (2005): 38-53.

Smart discusses the African Journals OnLine (AJOL) service and its efforts to increase visibility of African journals in the international research community. The paper also describes other initiatives intended to bridge the divide between Western publications and Africa such as HINARI, PERI, and Access to Global Online Research in Agriculture (AGORA). The article explains the status of the research gap, and gives a history of AJOL. The paper includes qualifications for a journal to join AJOL and statistics regarding AJOL's use. The author concludes by addressing lessons learned from AJOL.

90. Somolu, Oreoluwa. "Telling Our Own Stories: African Women Blogging for Social Change." *Gender & Development* 15 (2007): 477-489.

Somolu examines how blogs and blogging can be used to improve and promote equality and empowerment for African women. Past research has shown low interest in ICTs by African women due to a lack of relevant content. The author looks at specific technology, economic and social conditions that hamper ICT adoption among this group and how this can be rectified. Somolu also reviews programs that have been successful in Nigeria and Uganda. Research indicated that blogs were seen as forums for everyday Internet users where they could easily communicate and share information and that African women blog on a variety of topics including career/education, current affairs, fashion, food/health, the arts, parenting, sports, and women's issues.

91. Sonaike, S. Adefemi. "The Internet and the Dilemma of Africa's Development." *Gazette: International Journal for Communication Studies* 66 (2004): 41-61.

Sonaike begins with a discussion of the digital divide concept in general and then focuses on Africa providing statistical data on Internet status for various countries. The author then analyzes factors that hinder growth and searches for viable solutions providing several examples of African initiatives that address ICT adoption and use.

92. Teferra, Damtew. "Striving at the Periphery, Craving for the Centre: The Realm of African Scholarly Communication in the Digital Age." *Journal of Scholarly Publishing* 35 (2004): 159-171.

Teferra discusses Africa's place in the knowledge domain in the digital age. The paper explains while universities create the most knowledge on the continent, they face problems such as decreased funding and a lack of resources. The author describes the role of journals in spreading knowledge and their availability in Africa. The paper details Africa's participation in the digitization of journals. Also covered in the paper are the role of conferences and other non-serial publications in scholarly communication. Teferra describes initiatives to address the lack of access to ICTs in SSA countries, as well as the importance of utilizing free resources. The author concludes with a discussion of the challenges and opportunities the future of digital scholarly communication can provide.

93. Tettey, Wisdom J. "Information Technology and Democratic Participation in Africa." *Journal of Asian & African Studies* (Brill) 36 (2001): 133-153.

Tettey examines how much of a role ICTs have played in bringing democracy to Africa. The paper contains a literature review framing the argument for ICT's ability to enable citizen participation in democracy. The author argues the situation in Africa is different, because ICTs are enabling only the elite few who have access to participate. The article covers other obstacles to participation such as computer literacy, language barriers, and gender differences. The paper also discusses how African governments have responded to ICTs, including attempts by some to control the Internet. The author analyzed two Ghanaian Internet discussion forums and found they contribute little of value to the political discourse. Tettey concludes ICTs should be critically studied before being accepted as the way to a democratic future.

94. Thompson, Mark and Geoff Walsham. "ICT Research in Africa: Need for a Strategic Developmental Focus." *Information Technology for Development* 16 (2010): 112-127.

Thompson and Walsham discuss the lack of literature published concerning a strategic developmental focus for implementation of ICTs in Africa. The authors argue previous information science (IS) literature has been too narrow and focuses more on "point" design and implementation. The paper advocates research to be more global, include broader infrastructures, and encourage researchers from other disciplines. The authors propose four areas of study to achieve this goal. First, ICTs can improve infrastructures in public health and communications. Second, ICTs can enable users to participate in governance and civil society. Third, ICTs can act as an economic catalyst. Finally, ICTs can open Africa up to the global market.

95. Unwin, Tim. "Towards a Framework for the Use of ICT in Teacher Training in Africa." *Open Learning* 20 (2005): 113-129.

Unwin stresses the need for teacher training to achieve the Millennium Development Goals (MDGs) Africa has set for 2015. The author also argues ICTs should not be limited to just computers and Internet, but offer a variety of learning solutions. The paper covers current initiatives designed to bring ICTs into African schools, including their successes and failures. Unwin advocates focusing on using ICT for education instead of just educating people on how to use ICTs. The author also advocates locally produced content so the curriculum is relevant. The paper discusses other principles of good practice as well. Unwin concludes by proposing a framework to put his principles into use.

96. Unwin, Tim, et al. "Digital Learning Management Systems in Africa: Myths and Realities." *Open Learning* 25 (2010): 5-23.

This paper is a report on a survey covering the use of learning management systems (LMSs) in Africa. The authors provide a background of e-learning in Africa, which previously mainly used the Web for information gathering and e-mail for communication. The study was conducted by sending a survey of mostly closed questions to staff at various African institutions. The survey found many respondents were familiar with LMSs, however actual usage was lower. The study confirmed lack of training could be a possible reason for low use. The authors also reported findings about knowledge of features of LMSs. The survey found users preferred LMSs because of the quality of learning and ease of access. However, the study also found factors limiting LMS use, including access. The paper includes case studies conducted in Mozambique and Kenya using the same survey. The authors conclude advocates of LMSs in Africa are still a small minority, and many infrastructural barriers must be overcome first before the systems become widespread.

97. Wakunuma, Kutoma J. "Using ICTs to Enhance Healthcare in Zambia." *Africa Media Review* 16 (2008): 29-48.

Wakunuma looks at the use of ICT technology in the Zambian healthcare sector. This technology helps to increase access to quality healthcare through programs like the Zambia Electronic Perinatal Record System (ZEPRS) being used in Lusaka. The author examines what variables help and/or hinder its success. Analysis has shown that the ZEPRS project has made a positive impact on clinics as well as individual patients by making instant communication possible between clinics and hospitals.

98. Warf, Barney. "Uneven Geographies of the African Internet: Growth, Change, and Implications." *African Geographical Review* 29 (2010): 41-66.

Warf paints a geographic picture of internet usage in Africa. He begins by describing the technology's history on the continent beginning in the 1980s. The paper details the fiber optics and satellite networks that make up Africa's internet infrastructure. The article also discusses telephone networks and cybercafés. Using data gathered from various websites, Warf maps each country's number of internet users, internet penetration rate, and internet usage growth. The

paper then covers government policies, cultural and linguistic factors, and other factors that shape the African internet's geography. Warf also examines Reporters Without Borders' internet censorship rankings. The article concludes with a discussion of e-commerce and e-governance and their relationship to geography.

99. Wasserman, Herman. "Mobile Phones, Popular Media, and Everyday African Democracy: Transmissions and Transgressions." *Popular Communication* 9 (2011):146-158.

Wasserman examines the effect mobile phones and other ICTs have in creating social change and enabling users to engage politically in Africa. The paper includes criticisms from Malcolm Gladwell and others claiming social networking is low-risk participation. The author also discusses how readily Africa has adapted to mobile phone technology. Wasserman argues these phones have begun to bridge the digital divide. While the paper still points out limitations, it argues the technology has still changed Africa's social practices. The article then discusses areas where mobile phones have made an impact in participation in government on both a national and local level. Wasserman also describes the business impact of mobile phones. Finally, the author examines the continent's preference to use the technology to connect with local friends and family instead of the global network.

100. Wasserman, Herman. "Renaissance and Resistance: Using ICTs for Social Change in Africa." *African Studies* 64 (2005): 177-199.

In this paper, Wasserman looks at how ICTs are being used in Africa for social change. The author uses a South African activist group known as the Treatment Action Campaign (TAC) as an example. The TAC's mission is to spread HIV and AIDS public awareness and make the diseases' treatment more accessible and affordable. The paper explains how the TAC's use of the traditional media as well as websites and e-mail forced the South African government to approve a national treatment plan. The author also discusses problems that challenge ICT's viability as an instrument for social change such as connectivity issues. The paper cautions that not only should these limitations be considered, but the solutions also should be African-specific.

## Acronyms

ADL	African Digital Library
AFRICOM	International Council of African Museums
AGORA	Access to Global Online Research in Agriculture
AII	African Information Infrastructure
AISI	African Information Society Initiative
AJOL	African Journals OnLine
AVU	African Virtual University
BPC	Botswana Power Corporation
BTA	Botswana Telecommunications Authority
CTA	Technical Centre for Agricultural and Rural Cooperation
DOI	Digital Opportunity Index
EAC	East African Community

ECA	UN Economic Commission for Africa
ECOWAS	Economic Community of West African States
EDITOSIA	Electronic Distance Training on Sustainability for African Local Governments
EDT	Electronic Distance Training
EGI	eGovernment Index
FOSS	Free and open source software
GDLN	Global Development Learning Network
GEO-IT	Geo-information technology
GIS	Global information society
GSM	Global System Mobile
HINARI	Health InterNetwork Access to Research Information
ICTs	Information and Communication Technologies
INASP	International Network for the Availability of Scientific Publications
IPR	Intellectual property rights
IS	Information Science
ISI	Information Society Index
ISPs	Internet Service Providers
IT	Information Technology
ITU	International Telecommunications Union
IUBMB	International Union of Biochemistry and Molecular Biology
IUCEA	Inter University Council of East Africa
IXPs	Internet exchange points
KEI	Knowledge economy index
KI	Knowledge index
LC	Learning communities
LDCs	Less developed countries
LIS	Library and Information Science
LMSs	Learning management systems
MCT	Multipurpose Community Telecentre
MDGs	Millennium Development Goals
NDP	National Development Plans
NEPAD	New Partnership for Africa's Development
NFE	non-formal education
NGO	Nongovernmental organization
NICI	National Information and Communication Integration
NMK	National Museums of Kenya
OA	Open Access
ODL	open and distance learning
OER	Open educational resources
OLPC	One Laptop per Child
OSS	Open source software
PERI	Programme for the Enhancement of Research Information
PPPs	Public-private partnerships
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SADC	Southern African Development Community
SAIDE	South African Institute for Distance Education

SAMP	Swedish-African Museum Programme
SANTEC	Educational Technology for Development Network
SDI	Spatial Data Infrastructure
SEN	Special education needs
SMS	Short Message Service
SSA	Sub-Saharan Africa
TAC	Treatment Action Campaign
TAM	Technology Acceptance Model
TRIPs	Trade-Related Aspects of Intellectual Property Rights
UNDESA	United National Department of Economic and Social Affairs
UNDP	United Nations Development Programme
VLEs	Virtual Learning Environments
WAMP	West African Museum Programme
WHO	World Health Organization
WSIS	World Summit on the Information Society
WTO	World Trade Organization
WUC	Water Utilities Corporation
ZEPRS	Zambia Electronic Perinatal Record System