ICT provision to disadvantaged urban communities: A study in South Africa and Nigeria

Olabode Samuel (OS) Akinsola, Marlien E. Herselman and S. J. Jacobs
Tshwane University of Technology, South Africa

ABSTRACT

The focus of this research was to develop a sustainable Information and Communication Technology (ICT) model in a Nigerian community, by evaluating ICT provision in South Africa's disadvantaged communities and comparing it with the Nigerian situation; to identify applicable models and service mechanisms; and, to identify pitfalls and risks. This research was conducted by analyzing the problem from four points of view: ICT infrastructure, management, influencing factors and the risks of ICT provision in disadvantaged communities. A literature review was undertaken to discuss those issues. Four ICT centres were involved in the case study. This study aims to evolve a commercially sustainable provision of ICT in the rural communities of Nigeria.

The authors argue that bridging the digital divide in disadvantaged communities requires adequate knowledge of the underlying causes of the divide, a favourable Government policy, a focus on the benefits of providing ICT, the provision of suitable infrastructure, and a committed management that is prepared to get round the various barriers or risks found in disadvantaged communities.

Keywords: Nigeria, South Africa, Rural communities, ICT provision, ICT infrastructure, ICT management

INTRODUCTION

Nigeria, a country on the West Coast of Africa, with an estimated population of 120 million (Common Country Assessment, 2001), is the most populous nation in sub-Saharan Africa. It occupies a landmass of about 923 768 square kilometers, and is generally known to have over 274 ethnic groups in the Federation. The Government's desire to move closer to the people has progressively led to the division of the three major regions into 36 states grouped under sixgeopolitical zones with a total of 774 local government areas (LGAs). A breakdown of the statistics available on Nigeria shows the following: More than 55% of the people are female; the poverty rate is about 67,8%, the majority of the people (70%) lives in the rural areas, and over sixty per cent of the young (0-15) are under the age of 15. These statistics indicate that the majority of Nigerians fits the main focus of the Global Forum, which is to reach those who are yet to be reached (the class of the poor, the illiterate, women, the marginalized, and those living in remote areas) through one form of education or the other (whether formal or informal education). In particular, women and minority communities, such as nomads, fishermen, and unemployed youths are examples of these hitherto neglected communities in Nigeria (Jegede, 2002:1).

In terms of its economy, Jegede (2002:1) points out that about 90 per cent of Nigeria's annual revenue comes from petroleum – it exports two million barrels of oil a day – and that it ranks as the country with the seventh largest oil reserves in the world. The country's less-than-desirable economic growth makes it almost impossible to cope with the resources needed by the huge and fast-growing population to develop the country and upgrade the welfare of ordinary persons, especially in the rural areas. Jegede (2002:1) mentions that only five per cent of the Nigerian population can access online Internet-based material. This group lives in the urban areas and are

the people described by Herselman (2002:270) as the "Resource Advantageous (RA)". The majority of the population – about 70 per cent – live in the rural areas, and this group, according to Jegede (2002:1), has no access to telephone, facsimile, computer or Internet-based services.

Herselman (2002: 271) points out that this group of people has fewer opportunities to take part in our new information-based economy, in which more and more jobs and services are related to computers.

The Federal Government of Nigeria realized that the country was lagging behind in the race to become a digital society, and saw the potential of information and communication technology (ICT) to empower people – particularly, people with disabilities, women, youth and rural communities. Therefore, it declared Information and Communication Technologies (ICTs) a national priority, in the year 2001 (Bello, 2003:1).

The success of ICT projects in rural communities, according to Disraeli (2001:4), depends on sustainability and the deployment of suitable infrastructure. In other words, an ICT-related project should consider local needs and local skilled staff, or the adequate training and development of the local people. If such projects still depend on foreign staff and skills, then it is not a case of the transfer of technology but of the "dumping" of technology that is often outdated. This results in a casual relationship between technology "dumping" and technology transfer. One finds that the "dumped" technology that is outdated is often provided to rural communities without the ability for community to use it. People in the community are not trained to use the technology or the hardware and software are so outdated that it cannot be applied to the benefit of the community (schools or businesses). One the other hand communities are then forced to use the outdated technology without any success. Conradie and Jacobs mentioned one of the six serious challenges in ICT development are reconciling the tension between technology push and local development needs (2003:30).

The main focus of this research is to develop a sustainable ICT model in a Nigerian community to bridge the digital divide, by evaluating ICT provision in South Africa, and to compare it with the situation in Nigeria.

PROBLEM STATEMENT

Rural communities in Nigeria are marginalized in this era of global integration by being denied access to ICTs, which, according to Bello (2003:1) have the potential to empower. The direct effects of such marginalization are:

- The lack of information in disadvantaged communities – information that would enable them to make informed decisions about their own development;

- The problem of the location of appropriate information, its delivery to the target user, and the coordination of its use by disadvantaged communities;

- The lack of mechanisms that would enable disadvantaged communities to generate and share information with other communities for national and international development;

- Disadvantaged-community decision-making, conflict resolution and self-governance constraints on account of incomplete, often unreliable, information;

- The need for capturing information from communities for effective development planning, governance and accountability.

The task of providing ICT access is subject to particular challenges common to the rural areas of developing countries. According to Caspary and O'Connor (2003:6), those challenges include the following:

- Remoteness, leading to high start-up and maintenance costs, as well as a lack of electricity, so that computers in rural areas often require generators and voltage stabilizers;

- A low population density, which again negatively impacts upon costs;

- The lack of relevant human capital (in particular, technicians for maintenance and repair). Consequently, costs are raised, since the equipment used must be extremely robust;

- The low-earning capacity of the rural population, so much so that considerations of commercial viability could lead to firms having to charge prices that, at best, only a tiny minority could afford.

Main research question: To what extent can ICT be deployed to bridge the digital divide in Nigeria?

METHODOLOGY

A case study method was chosen as the preferred research method for this study, as it allows specific contexts to be studied in greater detail to obtain knowledge that is "useful" and not merely interesting (Olivier, 1999:121).

Denscombe (2001:30) argues that a case study approach has certain features associated with it and when brought together they form a broad approach with an underlying rationale for the direction and planning of the investigation that separates it from the other research methods. Particularly, for this project, it will enable the researcher to benefit from the past experience of the community ICT centres currently operating in South Africa and abroad.

Participant selection

As part of the case study, the following data collection techniques were used:

- Semi-structured interview

- Non-participant observation

- Internet, Government publications, literature review and any other documents from these centres.

Table 1 shows details of the participants.

Table 1: *Participant Selection*

Centres	Location	Community Population	Services	Type of Ownership
Enifade Cyber Café	Akinyele Bus/Stop, Abesan Housing Estate, Ipaja, Lagos, Nigeria	105 000 (estimate)	Internet call (VoIP), Local telephone call, Internet browsing, E-mail, Faxes, Photocopying, Desktop publishing, Binding and lamination, Basic computer training	Small business entrepreneur
Globe Net Cyber Café	Keda Bus/Stop, Abesan Housing Estate, Ipaja Lagos, Nigeria	105 000 (estimate)	Internet call (VoIP),Local telephone call, Internet browsing, E-mail, Faxes, Photocopying, Desktop publishing, Binding and lamination, Basic computer training, Access to Government services, Political information and awareness, Information on foreign and local institutions, bursaries, admission, Examination results	Small business entrepreneur
Mamelodi Community Information Services	Mini-Munitoria municipal offices near Denne-boom (Ko Renteng) near Pretoria, South Africa	The official government statistics indicate that the population was 154 466 during 1991 national survey. Independent consultants however, estimated the population to be approximately 750 000 during 1996.	Directory of services in and around Mamelodi Internet and e-mail training Internet and e-mail usage Public access touch screen information kiosk Information awareness provision, counseling and referrals Database of questions asked Need analysis survey Desktop publishing Computer and information literacy training Workshops	MACIS is registered under section 21 Company Act (Act No. 61 of 1973), as a non-governmental organisation with a not for profit making motive.
Bokgoni Technology Centre	Bokgoni Technical High School, Atteridge-ville, Gauteng, South Africa		OBE training Faxes Computer literacy training Lamination Scanning Word processing Internet and e-mail usage	Community-based ICT centre managed by Bokgoni Technical High School Management.

CHALLENGES FACED BY THE DIGITAL DIVIDE IN RURAL AREAS

According to the free encyclopedia, Wikipedia (2005), the term 'digital divide' refers to gaps that exist between groups regarding their ability to use ICTs effectively, due to differing levels of literacy and technical skills, as well as the gap between those groups that have access to quality, useful digital content and those that do not. Doczi (2000:4, 5) points out that the definition for the term 'digital divide' can be explained as follows:

> *The term digital divide was coined to define the gap between those who have adequate access to Information and Communication Technologies (ICTs), such as computers and the Internet (information haves) and those who have limited or no access, for either socio-economic or geographical reasons, or both (information have-nots).*

Wijewardena(2002:4) points out that, in order to bridge the digital divide, a clear understanding of the underlying causes of the digital divide is necessary for the development of policy prescriptions.

That is, the success of any policy prescription to narrow the digital divide will largely depend on the extent to which that policy prescription will deal effectively with the underlying causes of the digital divide. Caspary and O'Connor (2003:5) mention that reaping the potential benefits of the Internet presupposes that the problem of affordable and low-cost access in rural areas and other low-income communities has been resolved. In addition to the question of cost, the problem of quality of access should not be underestimated, especially in the remote areas of developing countries. Cables tend to be in poor repair, and international access to Internet is often very limited. The nearest server may well be farther than a local phone call away. A combination of such factors tends to make Internet access very slow and costly in those areas.

On the surface, the problem of bridging the rural-urban digital divide does not appear to be too difficult. It seems as if all that would be required is to go to a number of such underdeveloped rural areas and to provide and install the necessary information technology infrastructure and equipment that has been lacking there up to now. However, Conradie and Jacobs (2003:30-33) stated that unfortunately, there are many examples of well-funded rural development initiatives in Africa that have proceeded from this premise, but that have failed to provide any meaningful benefits to the local communities involved. Conradie and Jacobs (2003:33) conclude their findings by highlighting the importance to realise that ICT usage cannot be seen as a stand-alone sustainable activity in the rural environment, but rather as an activity in support of something else (for example promoting education, health, or government information actions). They particularly pointed out the importance to consult with the community to determine what local activities need be supported by ICTs, and to get support from the community leadership for any training or other actions involved in the initiative. Conradie and Jacobs (2003:33) further states that an ongoing monitoring and evaluation action that gives feedback from the community to the developing agents is needed. As stated by Conradie and Jacobs (2003:33), the prerequisite for success is therefore finding a formula that addresses and solves both the technical and social challenges involved in such development actions.

According to Conradie and Jacobs (2003:30-33), the Final Report of the ITU-D Focus Group 7 of the International Telecommunication Union (ITU) (2001:5-6) and Mwanjok (2002:12) the matter is clearly more complex and there are many technical and social challenges, which need to be considered. The following typical challenges exist:

- Reconciling the tension between technology push and local development needs

- The lack of electric power in some rural areas

- The lack of supporting communication infrastructure ain the rural area where an intervention takes place

- The lack of Personal Computer (PC)-related skills in the local rural community

- The lack of PC-related applications and sustainable career path opportunities in the rural area involved

- Other social challenges specific to the rural area involved (e.g. local power relationships, political divisions)

- The scarcity of technical staff.

- Difficult topographical conditions, e.g. lakes, rivers, hills, mountains or deserts, which makes the construction of wire telecommunication networks very costly.

- Severe climatic conditions that make critical demands on the equipment.

- Low level of economic activity mainly based on agriculture, fishing, handicrafts, etc.

- Low per capita income.

- Underdeveloped social infrastructures (health, education, etc.).

- Low population density.

- Lack of ICT policy

- Bureaucracy in dealing with ICT maters

- Lack of donor coordination

- Implementation delay resulting into a loss of interest

- Lack of awareness/understanding of ICTs

- Technology adaptation

- Lack of local manufacturing capacity

- Lack of spare parts

- Rapid technological changes

- High cost of hardware/software

In support of the above, Erwin and Taylor (2004: 24) state that certain social key elements in ICT adoption that also need attention and commitment are:

> *ICT competency as an essential skill, trust, collaboration with civil society, government and business sectors, perceived relevance, information granularity, spatial dimension and assessment, policy and research.*

Given the above problems, the probability of rural communities being provided with ICT appears to be remote. Nonetheless, this study aims to evolve a commercially sustainable provision of ICT in the rural communities of Nigeria.

BENEFITS OF ICT DEVELOPMENT

Cecchini (sa:1-3) identifies three priority areas in which ICT potential could be harnessed for the reduction of poverty: Opportunity, empowerment, and security. Opportunity makes markets work better for the poor and expands poor people's assets. Empowerment makes Government institutions work better for poor people and removes social barriers. Security helps poor people manage risk. The relatively low cost and wide reach of ICT infrastructures, such as the Internet, radio and television enable the delivery of education to isolated rural areas, and information technology training is beginning to be offered at rural schools and private institutes. ICT can also improve health-care delivery to the poor. Telemedicine can diminish the cost and hardships of long-distance travel for medical attention and diagnosis. E-mail and medical list servers can deliver recent medical findings to health workers lacking research and technological facilities, at a minimal cost. Furthermore, ICT can simplify medical data collection, record management and paper filing. With ICT, it is possible to locate service centres that provide documents, land records and other public services closer to citizens. Such centres may consist of an unattended kiosk in a Government agency, or a service kiosk located near the client. The potential benefits include increased transparency, less corruption, better delivery of Government services and greater Government responsiveness. Information disclosure and the possibility of interacting with officials also build pressure for Government accountability. The poor become empowered because they feel they are getting a service, rather than a favour. This view is further supported by Menou, Poepsel and Stoll (2004:49) when they state that even in a Latin American study on ICT provision

to community telecentres the challenge of service provision, finances, diversity, connectivity and human resources are the same as those for the two African countries.

BRIDGING THE DIGITAL DIVIDE IN SOUTH AFRICA

South Africa is the fourth largest country in the Commonwealth and has the sixth largest population. With fifty per cent of its population living in urban areas, South Africa has a higher rate of urbanization than most sub-Saharan countries. However, some of the huge disadvantaged townships are included in that urbanization figure.

South Africa, with its history of apartheid, has an outstanding commitment for changing its legacy of inequalities in freedom, access to information, wealth and opportunity based on race. The country is strongly devoted to overcome and mitigate the disadvantages in large parts of society that had resulted from past policies: Access to information and telecommunications, as well as education, freed from the crippling and discriminating concept of Bantu education, are crucial elements and form the building blocks of the concept of "empowerment.' (Intelecon Research 2000:38).

In South Africa, according to Mogale (sa:1), ICT centres were established in some part of the country as a way of addressing the digital divide problem. According to Benjamin(2002:11-12) the main thinking surrounding ICT centres in South Africa came from the ANC-aligned structures in the early 1990s, especially the NGO, Centre for Developing and Information and Telecommunication Policy (CDITP). This thinking led to the process of drawing up the Green and White Papers on telecommunications that led to the Telecommunication Act, 1996. In that process, an agency was proposed that could facilitate access to telecommunications for all South Africans. This was set up in early 1997 as the Universal Service Agency, at the same time the South African Telecommunications Regulatory Authority (SATRA) was established.

According to Intelecon Research (2000:39-46), the Universal Service Agency (USA) is a unique statutory body established by the South African Telecommunications Act, 1996. It is meant to promote affordable universal access and universal services in ICTs for disadvantaged communities in South Africa in order to facilitate development, empowerment and economic growth. Its short- to medium-term objective is to facilitate the provision of telecommunication services where everyone can access them, that is., within a reasonable distance, which means thirty minutes of traveling. The USA manages the Universal Service Fund (USF) which was established to finance needy telecommunication users in terms of the Telecommunications Act, 1996. A portion of it will be used to subsidize the initial funding of ICT centres. The USF is built up by contributions from telecommunication service providers and donor organizations.

The Universal Service Agency launched an ICT centre pilot project with the objective of providing universal access to telecommunications in South Africa. Those ICT centres are managed and operated by approved franchisees and are located in disadvantaged communities, particularly rural areas. The objective of the ICT centre project is to provide universal access through public facilities: telecommunications, facsimile, e-mail and telephone. Some will provide access to the Internet. The aim of the Agency is to develop a model for the effective running of ICT centres in disadvantaged areas, which could then be reproduced in such a manner that they would not need any more funding from the Agency. This would also promote community ownership and control.

In South Africa, the following important projects were identified and used to gain an appreciation of the use of ICT:

- SchoolNet;

- Mamelodi Community Information Services (MACIS);

- Technology-Enhanced Learning Initiative of Southern Africa (TELISA);

- Distance Education Digital Learning System (DEDLS) – in the planning stage;

- The African Virtual University (AVU) – pilot stage completed;

- The Universal Service Agencies' ICT centres.

With regard to the focus of those projects, there are two clear focus points: tertiary education and community projects.
ICT centres are situated at various locations within the community, each providing a different range of services. Other initiatives to bridge the digital divide in South Africa, according to Wright (2003:27), are the following:

- Projects spearheaded by the Department of Communication. The project has seen the outfitting of buses with computers and satellite dishes in an effort to take the Internet to communities that has never had access to it. The buses are parked at schools and community centres, and users are assisted to do everything – from typing up their CVs to setting up e-mail accounts and accessing Government information and educational material online.

- Professor Peter Wentworth of Rhodes University has developed a project tagged "Hole in the Wall": Computers are literally installed into a hole in a wall near a derelict playground where street kids used to play. The idea is to develop a computer that can be controlled by the user running a finger over a pane of glass. The idea is to install computers in secure locations in townships, such as at shops, post offices and community centres, where passers-by access them through the buildings' windows.

- Companies in the IT industry, such as Microsoft South Africa, has a number of projects aimed at providing previously disadvantaged and rural communities with real access and training. The digital village project comprises the creation of computer resource centres equipped with, among other things, computers with Internet access, and the latest Microsoft software and books. Each centre is managed by a community member who have been trained in the necessary IT and management skills.

- The "Citi-Bridge" project is a technological outreach and resource centre jointly developed by Bridges.org with CITI (the Cape IT initiatives). The centre will be housed within the Bandwidth Barn, a CITI-sponsored high-tech business incubator, and will be a public space with a variety of resources, where people can learn about using technology and understanding the implications of technology to become better informed Internet citizens. A training section will allow hands-on instruction with a range of educational programs, beginning with very basic lessons for new users. A library with information materials will be available for public use. The online component of the project will feature a "community directory" of organizations and initiatives helping spread information technology, a "volunteer directory" of individuals looking to help bridge the digital divide, and a schedule of regional events in IT-related policy and development.

- Community Informatics research network of Cape Peninsula University of Technology (Erwin and Taylor, 2004:21).

In the table below, a summary is given of Community Universal Access ICT projects in South Africa.

Table 2: *South African ICT Provision Project*
(Source: Adapted from Community Universal Access ICT Project in South Africa)

ICT provision	Its main focus
Universal Service Agency ICT centres	Provision of universal ICT access centres to disadvantaged areas (such as Mamelodi Community Information Services)
Vodacom Phone shops	To fulfil the universal service obligation to disadvantaged communities
GCIS Multi-Purpose Community Centres	Provision of Government services and information to disadvantaged communities
Department of Communication projects	ICT services through the post offices, establishment of research laboratory in traditionally disadvantaged institutions
Community computing/MPCCs	ICT literacy course, training, community- based information service (CBIS) centres

CURRENT STATUS OF THE TELECOMMUNICATION INDUSTRY IN NIGERIA

A look at the comparable system in Nigeria reveals that there has been a modest development in the telecommunication industry since the inception of NITEL, in 1985 (Arzika (2000:3-8). Today, Nigeria has a public network capacity of about 700 000 lines, 400 000 of which are connected. Nigeria, therefore, not only lags behind advanced countries, but also lags behind comparable African countries and even countries supposedly worse off. The process of deregulating the industry was initiated to tackle these observed shortcomings. This began with the establishment of the Nigerian Communications Commission (NCC) by Decree 75 of 1992, whose main objectives include the following:

- Creating a regulatory environment to facilitate the supply of telecommunication services and facilities;

- Facilitating the entry of private entrepreneurs into the telecommunication market;

- Promoting fair competition and an efficient market conduct among all players in the industry.

According to the African Internet Status Report (2002:2) the extremely sparse and unreliable fixed-line network in Nigeria, which also suffers from severe inter-exchange congestion, is still a major impediment to widespread Internet uptake. Some of the wireless local loop operators, which have been licensed in the urban areas, have promised to provide data services over their subscriber links, but have yet to launch them.
The privatization of the public telecommunication operator, NITEL, and the introduction of a second network operator are expected to accelerate Internet use (African Internet Status, 2002:2).

The need to bridge the digital divide in Nigeria

According to Arzika (2000:2-4), telecommunication facilities in Nigeria were first established in 1886 by the Colonial administration. They were meant to discharge an administrative rather than a socio-economic function in the development of the country. Accordingly, the introduction of public telegraph services linking Lagos by submarine cable along the west coast of Africa to Ghana, Sierra Leone, Gambia and on to England was a greater priority than a robust telecommunication network.

The total number of telephone lines by the time of independence, in 1960, was only 18 724 for a population estimated at about 40 million people. This translated to a teledensity of about 0.5 telephone lines per 1 000 people. The telephone network consisted of 121 exchanges, 116 of which were of the manual (magneto) type with only five being automatic. Since independence, a number of development plans have been devised for the expansion and modernization of the telecommunication network and services. Most of them have never been fully implemented.
Nigeria, with a population of about 120 million people, is the largest black nation in Africa. The wealth of nations is no longer equated on the scale of the quantity of the inherent natural resources but on the quality and strength of the knowledge-based workforce. For decades, the nation's development has depended solely on its rich natural heritage of crude oil and other associated resources (Iriajen, 2000:1).

Arzika (2000:3) points out that, between 1960 and 1985, the telecommunication sector consisted of the Department of Posts and Telecommunications (P&T) in charge of the internal network and a limited liability company, the Nigerian External Telecommunications (NET) Limited, responsible for the external telecommunication services. NET provided the gateway to the outside world. Telecommunication development during that period was characterized by serious short-falls between planned targets and their realization, principally because of poor management, lack of accountability and transparency and a low level of executive capacity.

Iriajen (2001:1) acknowledges that Nigeria is still under the scourge of poverty and religious and ethnic unrest. Until recently, ICT development in Nigeria was among the slowest on the continent, with only 450 000 functional fixed telephone lines for a population of 120 million and a low Internet penetration due to a poor telecommunication infrastructure and little expertise.

By the end of 1985, the installed switching capacity was about 200 000 lines, as against the planned target of about 460 000. All the exchanges were analogue. Telephone penetration remained poor, equal to one telephone line per 440 inhabitants, well below the target of one telephone line to 100 inhabitants recommended by ITU for developing countries. The quality of service was largely unsatisfactory. The telephone was unreliable, congested, expensive and customer-unfriendly.

On account of this, the Posts and Telecommunications Department was split in two the Postal Division and the Telecommunication Division, in January 1985. The latter merged with NET to form Nigerian Telecommunications Limited (NITEL), a limited liability company, while the Postal Division was reconstituted into another organization called the Nigerian Postal Service (NIPOST). The main objective of establishing NITEL was to harmonize the planning and co-ordination of the internal and external telecommunication services, to rationalize investments in telecommunication development and to provide accessible, efficient and affordable services (Arzika, 2000:5).

Nigeriabusinessinfo.com (2001:1) points out that the Nigerian Government has also made efforts to provide Internet services, with an initial capacity of 5 500 points, starting with Lagos as the main point of presence (POP) with 3 000 ports. However, this can only be interpreted to show that less than five per cent of all Nigerians have access to the Internet. According to a report of

the United Nations, the total Internet connectivity in Africa is about 50 000 people, and more than 80 per cent of that number is in South Africa. Of that figure, only 9 000 are Nigerians. However, with the deregulation of the telecommunication industry, 108 licences have thus far been approved, 48 of which have been issued on payment of the fee. It is hoped that with democracy and the window of opportunity now being open to investors in the Nigerian economy, more and more companies will invest in the Nigerian telecommunication industry.

Bello (2002:2) points out that the Federal Government is aware that the country is lagging behind in the race to establish a digital society and has taken a number steps to bridge the digital divide in Nigeria. According to Iriajen (2000:3), recent moves by the Government include the following:

- The implementing of the New National Telecommunication Policy, in September 2000, to liberalize the sector;

- The declaration of ICT as a national priority project;

- The approval of the National Policy on Information Technology and the establishment of the National Information Technology Development Agency (NITDA) in March/April 2001;

- The implementing of the National Space Research and Development Agency (NARSRDA) for the Nigerian satellite system.

Benjamin (2000:12) mentions that privately owned cyber cafés have been established by businessmen in an effort to bridge the digital divide. They often provide as many services as other types of ICT centres, and are sustainable. In order to further justify the need to bridge the digital divide in Nigeria, the next section discusses the community information needs in Nigeria.

According to the Economic Commission for Africa (ECA) (2003:1), Nigeria has been less active in embracing ICT for social and economic development, even though it is dubbed by many as the potential powerhouse of the information society and of Internet growth in Africa. A National Information and Communication Infrastructure (NICI) workshop supported by various international development partners, including ECA, brought together various stakeholders in Abuja, in March 2000. The main recommendations of the workshop were to set up an ICT coordination mechanism and to develop a NICI policy and plan. Consequently, the Nigerian Information and Communication Technology Agency (NICTA) were created under the umbrella of the Ministry of Science and Technology. NICTA has produced a document, entitled "Nigerian National Policy for Information Technology (IT)", which was issued under the auspices of the Ministry of Science and Technology. The policy document that has 31 objectives, emphasizes, amongst others, the need for harnessing ICT for education, wealth creation, poverty eradication, job creation and global competitiveness.

The key strategies outlined in the policy document are the following: Establishing a national fund for ICT, setting up an ICT development agency, harnessing ICT to improve Government operations, empowering the public and private sectors and small and medium enterprises by creating an enabling environment, harnessing ICT in the education and health sectors and setting up information technology parks. The document is believed to stir public debate on the key areas identified by the policy drafting committee. ECA and UNDP are expected to spearhead this process in order to assist Nigeria to put in place a comprehensive ICT policy and NICI Plan for implementation, at both the federal and Government levels. A Development Agency for ICT has been put in place to coordinate the elaboration of a national strategy.

MODELS OF ICT PROVISION TO RURAL COMMUNITIES

Two clearly distinct ICT models are proposed for providing access to ICT services in disadvantaged areas of developing countries – multipurpose community centres (MPCCs) established by public institutions and cyber cafés established by private individuals. The major difference between the two types of centres, according to Proenza (2001:4), are ownership and operational purpose. Internet cafés are privately owned businesses which do not focus on development, but MPCCs are operated by institutions using perhaps the second most commonly used governance structure, that is, the non-profit non-governmental organization (NGO), traditionally relying on donor funding – at least to cover investment costs. Proenza (2001:5) argues that cyber cafés often provide as many services as other types of MPCC. They train their clients, for example, in basic computer skills and office applications, either in response to local demand or to stimulate a demand for their services. On the other hand, many NGO-run MPCCs are practically cyber cafés in disguise.

Wellenius (2003:4) argues that, when one relies solely on the profit drive of private sector entrepreneurship and investment in the provision of ICT services one is unlikely to achieve the desired development outcome in full. Extending access to people living in the developing world's rural areas requires some initiative and help from the Government. ICT centres may not be able to achieve commercial sustainability beyond initial public support in localities with very low incomes, with low population densities, or without access to good-quality, competitively priced telecommunication infrastructures. Minimum education levels, social and economic links, other infrastructure, and familiarity with modern technology, all probably correlated with income, are needed for a demand to build up and for ICT centres to contribute to development. As is also indicated by Erwin and Taylor (2004:22) many governments have recognised the growing issues associated with inequitable ICT access but the problem of effective use of the access whether it is based around physical, attitudinal, educational, disability, cultural or integration concepts as well as civil society and a new contract that binds civil society, public and private sectors into a value matrix are the challenging issues which face familiar forms of governance and business education.

Table 3 presents the ICT centre services under different categories (Jensen and Esterhuysen, 2001:46-48; Microsoft, 2000:24-30). Apart from the services, these centres also need content to support their services and products offered.

Table 3: *ICT services categorization*

Communication	Information	Business	Training
Telephone call	Employment agency	Transport bookings (air, sea, land)	Distance education
Internet (e-mail, Chart, Newsgroups, browsing)	Government information	E-commerce (exchange of goods and services)	E-learning
Facsimile	Local and international news	Secretarial services	Basic education for adults
Teleconferencing	Weather information	Desktop publishing	Basic computer literacy
File transfers (text, pictures, sound, video)	Stock quotes	Graphics design (business cards, logos, etc	
Document download	Market prices	Photocopying, printing	
	Web site directories	laminating, binding	
	Trade opportunities	video-, digital, still camera hire/Renter services	
	Product/service Information	Stationery sales	

FINDINGS

The findings in this research can be divided into different sections:

ICT centre infrastructure

Suitable ICT infrastructures for bridging the digital divide in respect of disadvantaged communities, as indicated in participants' responses, include:

• Power supply;

• Lifeline infrastructure, such as water, roads, transport, energy and security;

• Building;

• Hardware: telephones, computers, LAN network hub, printer, scanner, television set, fax laminating machine, codec camera, projector, radio, video, CD and audiotape players, microphone;

• Software: Windows 2000 server, XP, 98, MS Office, PageMaker and CorelDraw. Others tools are training CDs or audiotapes (for mathematics, chemistry, entertainment, etc.);

• Telecommunication: Narrowband packet radio, GSM 400, combined point-to-multipoint/wireless local loop systems, CDMA450, very small aperture terminals (VSATs), satellite-based Internet access, digital satellite radio, meteor burst communication, IMT-2000, wireless routers and Voice-over IP (VoIP).

Although the telephone line connection costs less and it is better safeguarded against computer hackers; it is regarded to be very slow in terms of access and can be deployed only when there is fixed-wire communication infrastructure. Fixed wireless tends to be suitable for some disadvantaged areas that are close to urban cities, but satellite connections are most suitable for Internet connection in the rural areas where other telecommunication infrastructures are not available, irrespective of the current disadvantages of satellite connections.

ICT centre management

ICT centre management should include members of the community, so that they can plan, organize, lead and control the efforts of organizational members and the use of organizational resources in order to achieve stated organizational goals. This is characterized by a cycle of "direct, measure, and control". It is equally important to involve the service of a full-time paid manager, who should be able to direct and control the resources of the centre, effectively, including other staff and the day-to-day administration of the centre. An adequate plan should be made for maintenance and repairs, support in the event of equipment breakdown, accountability measures and security.

The people manning ICT centres should be user-orientated rather than technical specialists. Evidence suggests that computer users are more likely to seek assistance from support staff who are friendly and who can build empathy with their clients than from people who are less able to do so, but who possess greater technical knowledge. The approach of ICT centres should be problem-orientated, not technology-orientated. They should respond to client encounters in a way that recognizes their primary and secondary effects. The primary effect is to solve a problem for which the client seeks the services of the centre. The secondary effect relates to the extent to which the client increases his/her understanding of the technology being used and the likelihood

of him or her using that knowledge to approach the centre for help in solving additional problems that may occur later on.

Influencing factors

The main influencing factor for ICT provision in disadvantaged communities is the need to provide less expensive access to reliable information and communication, which are currently inadequate. It is evident from the participants' responses that ICT possesses enormous potential to bring less expensive access to information and knowledge to every member of the disadvantaged community. Other factors include the need for community development, for employment provision, for the generation of income; for providing access to Government information and for fostering cooperation between the various community organizations.

Policies should be formulated that encourage ICT inflow into the country or disadvantaged communities by reducing taxes or allocating a subsidy for ICT infrastructure targeted for disadvantaged community deployment, by making social amenities available and by enabling legal support.

There is clear evidence that knowledge should no longer be the domain of the few. Success in promoting democracy, human resource development, socio-economic development, international cooperation, trade and commerce, requires access to information and an ability to use it effectively. The ongoing information and communication revolution is leading to accelerated globalization in economic and social activities. This presents tremendous challenges and opportunities for both industrialized and developing countries alike. Unless the benefits of ICT are successfully harnessed in the disadvantaged community, it will lead to greater disadvantages. The intensive use of ICTs could, according to NEPAD (New Partnership for Africa Development) (2002:119), be of unprecedented comparative advantage to the continent. ICT can –

- provide an impetus for the democratisation process and good governance;

- facilitate the integration of Africa into the new information society, using its cultural diversity as a leverage;

- be helpful tools in a wide range of applications, such as remote sensing and environmental, agricultural and infrastructure planning;

- utilize existing related tools better to provide training that would allow for the production of a critical mass of professionals using ICT;

- be used to establish, in the research sector, African programmes and technological exchange programmes that are capable of meeting the continent's specific needs, especially the need to combat illiteracy;

- be used to identify and exploit opportunities for trade, investment and finance;

- be used to establish regional distance learning and health education programmes to improve the situation in the health and education sectors; and

- be used in conflict management and in the control of pandemic diseases, to help organize an efficient early warning mechanism by providing the tools for the constant monitoring of tension spots.

Risks of ICT provision in disadvantaged communities

There is a clear indication that to reap the benefits of ICT provision in disadvantaged communities, other social development resources, such as a stable electricity supply, telecommunication infrastructures, roads, transport, etc are equally important. Deployment of ICT in disadvantaged communities require more than ICT equipment donations or the funding of specialized programmes of the centre; there is a need to pay more attention to the centre's sustainability.

Other factors that could be considered as risks to ICT provision in disadvantaged or rural communities are the following:

- Political challenges at national and international levels;
- Bureaucracy in dealing with ICT matters;
- Lack of ICT policy;
- Low literacy rates;
- Lack of donor coordination;
- Implementation delay resulting in a loss of interest;
- Lack of awareness/understanding of ICT;
- Scattered population in rural areas;
- The cost of financing and the availability of funds;
- Technology adaptation;
- Lack of technical capacity/maintenance;
- Lack of infrastructure and social amenities (roads, water, energy, health, etc.);
- Lack of local manufacturing capacity;
- Lack of spare parts;
- Rapid technological changes;
- High cost of equipment/software.

ICT provision in Nigerian disadvantaged communities

ICT deployment in a Nigerian community to bridge the digital divide will require that all stakeholders properly address the following.

- Harnessing the benefit of ICT in disadvantaged communities depends on the availability of a suitable telecommunication infrastructure.
- Government policy should encourage ICT resource inflow by creating an enabling environment, and provide for specialized subsidies to rural ICT centre operators, education reform and the redistribution of socio-economic development that will enhance the income of all citizens.
- Management structure should be committed to maintenance, the support of donated ICT infrastructure and the provision of funds to cater for improvements and its sustenance.

- Other social infrastructures should be developed; for example, electricity, transportation, roads, water, etc.

RECOMMENDATIONS

The following recommendations can be made to private ICT centre operators, community ICT centre operators and Nigerian ICT provision policy makers.

Private ICT centre operators

Services commonly provided by privately owned ICT centres include e-mail, Internet browsing, facsimiles, computer literacy training, and desktop publishing. Fewer services are provided in the area of community development; while most of the contents that are browsed are developed outside the community or country. There is a need to include services and contents that will encourage community development, empowerment, and economic growth.

Privately owned ICT centres should work out modalities to network in a form of association, in order to enhance Government participation. This will improve the contribution of the centre to the development of its immediate locality, and will enhance patronage by creating awareness of local goods and services. Government involvement will be encouraged, while ICT centre associations could facilitate the implementation of Government policy on ICT provision in disadvantaged communities and thus benefit, either through reduced taxes or Government subsidies and legal support.

Community ICT centre operators

Most community ICT centres are established, either through donation of equipment or funds, for specific programmes or volunteer services. Their sustainability depends on the generation of funds for maintenance and support. Such a donation may be handled over to an established institution within the community, such as a school, library, hospital, etc., for better management. Otherwise, the management of such a centre should be prepared to assume responsibility for the maintenance and support of donated equipment, in order for it to be sustainable. Adequate plans should be made for paid staff, and the centre should not rely on volunteers who come and go, as they will.

I also wish to recommend that all equipment should bear the centre's name, to discourage buyers of stolen goods. Equipment furniture should be constructed with burglar-proof and padlocks installed to keep them in a fixed position with all doors provided with strong locks. It is important to note that all community ICT centres require proper assets management systems.
Finally, the centre and its full content should be insured against theft and fire.

Nigerian ICT policy makers

The recommendation to Nigerian ICT policy makers for harnessing the opportunities provided by ICT and reach the objective of bridging the digital divide in disadvantaged communities; it is essential to note the following measures:

- Provide an enabling environment and improve social amenities, such as stable electricity, telecommunication infrastructure, etc.

- Encourage ICT inflow, reduced taxes, or subsidies on ICT infrastructures (hardware/software), legal support to disadvantaged community ICT centre operators, etc.

- Encourage the use of public institutions (schools, libraries, hospital,s research centres, etc.) in introducing ICT, while private entrepreneurs are encouraged to set up public access in the form of cyber cafés.

- Reform national educational systems to embrace the use of ICT by learners and teachers alike. Create ICT research centres and training institutions.

- Encourage the implementation of e-government, e-education, e-health, e-commerce, etc, which will enhance the use of ICT for information access.

- Create public awareness and training to enable the public to make use of the services offered by ICT centres.

It is important and a matter of emphasis to understand that social amenities, such as a stable power supply, should have priority over all the other stated recommendations above.

Research limitations

To only focus this study only on how infrastructure, management, Government policy and risks are involved in ICT provision in Nigerian disadvantaged communities to bridge the digital divide, will limit its scope. It is also important to include ICT centres in Nigeria and South Africa (4 in total) and to compare the usage of ICT in these. Therefore two privately owned ICT centres in urban areas as case studies in Nigeria as well as two community-owned ICT centres as case studies in South Africa in urban disadvantaged areas were involved. The ICT centre managers were interviewed and the main focus was on restricting the study to disadvantaged communities. Greater attention was placed on Internet provision and access.

FINDING GENERALIZATION AND FURTHER RESEARCH

Although the findings of this investigation were limited to ICT provision in Nigeria to bridge the digital divide in disadvantaged communities, useful information was obtained on ICT provision to bridge the digital divide of a disadvantaged community. This is expected to provide scope for further discussion and research on how to deploy ICT effectively in disadvantaged communities.

Community ICT provision in South Africa compared to that in Nigeria.

The table below state the summary of ICT provision in South Africa compared to that in Nigeria, as it is revealed in the case of this study.

Table 4: *Summary of ICT provision in South Africa compared to Nigerian situation*

FACTORS OF COMPARISON	SOUTH AFRICA	NIGERIA
Model of provision	Educational/Community project.	Private entrepreneur, community cyber cafés
Aim of provision	Facilitate development, empowerment and economic growth	Business purposes (to generate profit)
Government policy	Adequate support, funding, coordination through Universal Service Agency (USA).	Deregulation of telecommunication industry, Yet to implement community project programme.
Infrastructure/ technology	Wireless, telephone, satellite	Satellite, telephone
Risks of provision	Security, funding, skills	Social infrastructures (electricity, roads, etc), Funding.
Management	Community-based	Private ownership
Contents/Services	Information, communication, Government services provision, job creation, community development, general awareness	Information, communication, employment opportunities.
Funding	Government, telecommunication operators, NGO's, international organization, ICT industries.	Personal savings, bank loan
Sustainability	Difficult to sustain	Sustainable

CONCLUSION

The aim of the research has been to contribute towards understanding the extent to which ICT could be deployed in Nigerian disadvantaged communities to bridge the digital divide, focusing on factors such as:

- ICT infrastructure;
- ICT centre management;
- influencing factors in ICT provision in disadvantaged communities;
- risks involving ICT provision in disadvantaged communities; and
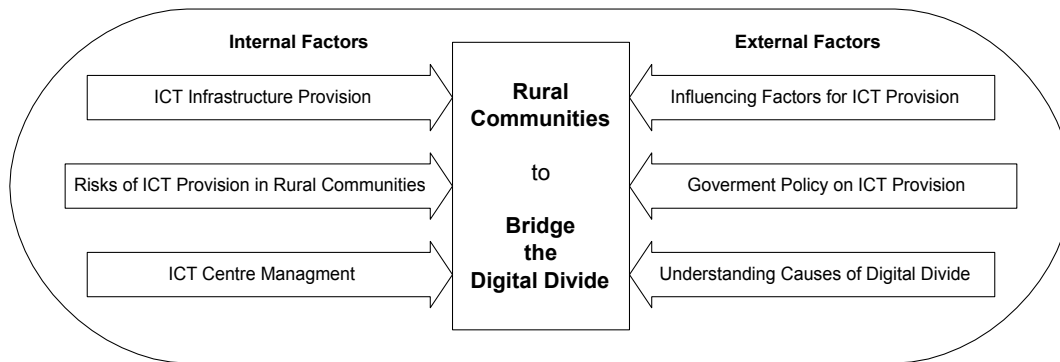- Current Government policies and civil society.

Figure1: *Influencing Factors towards a Sustainable ICT Model*

The investigation revealed that different types of ICT infrastructures exist by means of which disadvantaged communities can be empowered to access and share information relevant to their need. Some such types of connection being wired, fixed wireless, satellite, etc. The management structure and its level of involvement, in addition to Government policy on ICT adoption, as well as factors influencing ICT provision, are contributing factors to determine whether a centre would be sustainable or not, while most ICT centres managed by private entrepreneurs or public institutions, such as schools, seem to be sustainable. ICT centres that are managed by community organizations are difficult to be sustained due to inadequate funding and the level of commitment of the management.

The study also revealed that various risks or barriers exist that could hinder the provision of ICT in disadvantaged communities. The need to improve and empower all citizens should be a large enough influencing factor for overcoming such barriers.

In the final analysis, ICT provision in Nigerian disadvantaged communities to bridge the digital divide should be implemented with the aim of providing a sustainable structure. According to Figure 1 above, causes of the digital divide in disadvantaged communities may be coupled to the risks involved in providing ICT in the area. There is a clear indication that a committed management structure and appropriate ICT Government policies with suitable infrastructure would produce the desired benefits that would make ICT centres in disadvantaged communities sustainable. Fundamental to this is the recognition of the concept of civil society alongside business and government as a triumvirate to deal with the huge problems of inequity that ICTs are delivering across the world. As Erwin and Taylor (2004:22) suggest a new social contract is required that binds and partners civil, private and public sectors in delivering social inclusion and social cohesion in ways that strengthen economic, social and cultural benefit in the information society. This divide is one of the many facets of the basic social divide, which is growing in all countries. A comprehensive approach is required that would leverage all strengths and assets at community centres and which involves individuals at the centres, businesses, governments and civil society as well as action research where observation and analysis will be conducted by the actors themselves and where the results can be fed back to these centres for improvement. This will hopefully lead to a better understanding of and enhanced capabilities in harnessing ICT in the service of real human development.

REFERENCES

African Internet Status, (2002). *The African Internet – a status report*. [Online].Available at: http://www3.sn.apc.org/africa/afstat.htm Accessed 2003/06/13.

Arzika, M. (2000). National Policy on Telecommunication. [Online] Available at: http://www.ncc.gov.ng Accessed 2003/08/15.

Bello, H. M. (2003). *The role of information and communication technology in the fight against poverty – the:Nigerian experience.* (Paper presented at the Symposium on ICT and the Society of Information. 9th-11th December 2002. Algiers). [Online]. Available at: http://allafrica.com/stories/200301200386.html. Accessed 2003/04/18.

Benjamin, P. (2000). *Telecentre 2000 Report 2: International case studies, section 2.1,: International case study – Africa* [Online]. Available at <http://www.communitysa.org.za>, Accessed 2003/05/09.

Benjamin, P. (2000). *Telecentre 2000 Report 1: Literature review* [Online]. Available at <http://www.communitysa.org.za> /T2000litrev.htm>, Accessed 2003/05/09

Bless, C. & Higson-Smith, C. (2000). *Fundamental of Social Research Methods: An African Perspective*.

Bowie, N. A. (2000). *The Digital Divide: making knowledge available in a global context*.   In: Schooling for Tomorrow – Learning to Bridge the Digital Divide, Education Skills OECD 2000.

Bryman, A. (2001). Social research method. New York: Oxford University Press.

Cecchini, S. S.a. *Information and communication technology for poverty reduction: Lesson from rural India*. [Online]. Available at: http://www.developmentgateway.org/node/133831/sdm/docview. Accessed 2003/05/29.

Colorado State University. (2003). *Writing guide of Colorado State University*. [Online]. Available at: http://Writing.colostate.edu/references/research/casestudy/index.cfm?guides_active=empirical. Accessed 2003/06/19.

Community Universal Access ICT Projects in South Africa. [Online]. Available at: <http://www.communitysa.org.za/projrev.htm> Accessed 2003/05/18.

Conradie, D.P. & Jacobs, S.J. (2003). Challenges encountered when using ICTs (Information and Communication Technologies) in support of development in rural African communities. *Engineering Management*, 30-33, February 2003.

Coombes, H. (2001). *Research using IT*. Basingstoke: Palgrave.

Corbetta, P. (2003). *Social research*. London: Sage Publications.

Creswell, J.W. (2003). *Research design: qualitative, quantitative and mixed method approaches*. (2nd Edition). Thousand Oaks, London: Sage publishing.

Denscombe, M. (2001). *The Good Research Guide for small-scale social research projects.* Open University Press. Buckingham.

Disraeli, B. (2001). *Information technology for the development of youth in Africa*.[Online] . Available at: http://www.ayf.de/documents/Dixit.doc Accessed 2003/05/29.

Doczi, M. (2000). *Information and Communication Technologies and Social and Economic Inclusion.* Ministry of Economic Development, New Zealand, Information Technology Policy Group.

Erwin, G. & Taylor, W. (2004). Social appropriation of Internet Technology: A South African platform. *The Journal of Community Informatics*, (2004), Vol. 1, Issue 1, pp 21-29.

Fairer-Wessels, F.A. (1990). Basic community information needs of urban black women in Mamelodi, Pretoria, South Africa. *South African Journal of Library and Information Science*, 58(4). pg 359-369.

Focus Group 7, International Telecommunication Union. (2000). *New Technologies for Rural Applications : Final Report of ITU-D Focus Group 7* [Online]. Available at http://www.itu.int/ITU-D/fg7/pdf/FG_7-e.pdf. Accessed 2003/07/15.

Fulton-Calkins, P. (2003). *Technology and procedures: for administrative professionals* (12th Ed.). Ohio: Thomson/South-Western.

Gillham, B. (2000). *The research interview*. London: Continuum.

Hannagan, T. (1998). *Management: Concept and practices*. (2nd Ed.). London: Pitman Publishing.

Harris, R. W. Sa. *Evaluating Telecentre within National Policies for ICTs in Developing Countries*. [Online]. Available at http://www.idrc.ca/telecentre/evaluation/nn/18_Eva.html Accessed 2003/06/19.

Herselman, M.E. & Britton, K.G. (2002). Analysing the role of ICT in bridging the digital divide amongst learners. *South African Journal of Education*, Vol 22(4), p270-274.

IDRC.ca, Sa. *Proposed telecentre research framework: IDRC Research Network*. [Online]. Available at: http://network.idrc.ca/ev.php?URL_ID=10531&URL_DO=DO_TOPIC Accessed 2003/06/18.

Intelecon Research, (2000).*The use of information and communications technology (ICT) in learning and distance education*. [Online]. Available at: http:/www.col.org/colint/00intelecon.pdf. Accessed 2003/09/18.

Iriajen, C. S.a. *Perspective, impacts and goals of IT as a source of development for young people of Africa, Nigeria – a case study*. [Online]. Available at: http://www.ayf.de/documents/Cynthia.doc. Accessed 2003/05/18.

Jaques,D., (1994). *Learning in groups*. [Online]. Available at: http://www.csd.uwa.edu.au/altmodes/to_delivery/casestudy.html. Accessed 2003/09/23.

Jegede, O. (2002). *An integrated ICT-support for ODL in Nigeria. The vision, the mission and the journey so far*. [Online]. Available at: http://www.ukhap.nic.in/ict/docs/s3/jegede.doc. Accessed 2003/05/18.

Jensen, M. and Esterhuysen, A. (2001). *The community telecentre cookbook for Africa: recipes for self-sustainability*. [Online]. Available at: http://unesdoc.unesco.org/images/0012/001230/123004e.pdf. Accessed 2003/10/14.

Kumar, (1999). *Research Methodology – a step-by-step guide for beginners*. London: Sage Publications.

Leedy ,P.D. and Ormrod, J.E. (1985). *Practical research: planning and design*. 7th edition. New Jersey: Prentice-Hall.

Macome , E. (2002). *The dynamics of the adoption and use of ICT-based initiatives for development: result of a field study in Mozambique*. Ph.D Thesis, University of Pretoria [Online] Available at: http://upetd.up.ac.za/thesis/available/etd-02192003-161649 . Accessed 2003/06/19.

Marshall, C. and Rossman, G.B. (1995). *Designing qualitative research*. 2nd edition. London: Sage Publications.

Mcleod, G. & Smith, D. (1996). *Managing information technology projects*. Danvers, Mass: Boyd & Fraser Publishing.

McNair, S. (2000). *The Emerging Policy Agenda*. In: Schooling for Tomorrow – Learning to Bridge the Digital Divide, Education skills OECD 2000.

Melville, S. & Goddard, W. (1996). *Research Methodology: An introduction for science and engineering students*. Kenwyn: Juta & Co.

Menou, M. J., Poepsel, K.D. & Stoll, K. (2004). Latin American Community Telecentres: It's a long way to TICperary". *The Journal of Community Informatics*, 2004, Vol. 1, Issue 1, pp. 40-57.

Microsoft, (2000). *MSDN Training: Introduction to Web Development Technologies. Course number 1912*. Workbook. Part Number: X05-91011. Released 07/2000. Microsoft Corporation, USA.

Miles, M. B. & Huberman, A. M. (1994), *An expanded source book: qualitative data analysis 2nd* Ed. London: Sage Publications.

Mogale, I. S.a *South Africa: Technologically divided* . [Online]. Available at: <http://www.wfsnews.org/citylife/inside2.htm. >Accessed 2003/05/09.

Mwanjoka, O. (2002). *Final workshop report: Introduction of information and communication technologies in rural areas*. [Online]. Available at: http://www.ics.trieste.it/documents/hightech/telecom/activities/ws-dec2002/Final%20Report.pdf Accessed 2003/08/14.

New Partnership for African Development (NEPAD), (2001). [Online]. Available at : http://www.uneca.org/nepad/NEPAD.doc. Accessed 2003/07/22.

Neuman, W. L. (1997), *Social research methods: qualitative and quantitative approaches*. Boston: Allyn and Bacon.

Ngathie, D. (2003), *Bridging the digital gap between Africa and the developed world*, [Online] Available at: http://www.apc.org/english/rights/africa/news-content.shtml?x=14215. Accessed 2003/10/03.

Nigeriabusinessinfo.com, (2001). *Communication and Information Technology*. [Online] Available at http://www.nigeriabusinessinfo.com/telecoms.htm. Accessed 2003/09/04.

Nordic Information Society Statistics, (2002). *ICT infrastructure*. [Online]. Available at: http://www.ssb.no/emner/10/03/ikt/ict_nord/kap3.pdf. Accessed 2003/08/08.

Olivier, M. S. (1999). *Information Technology research: A practical Guide*. South Africa: [sn].

Perrow, C. (1987). Organization Design and Structure. In: Harding, H. (1987) *Management appreciation: a handbook for PAs and administrators*.

Proenza, F.J. (2001). *Telecentre sustainability – myths and opportunity*. [Online]. Available at: http://www.developmentgateway.org/node/133831/sdm/doview. Accessed 2003/05/29.

Richard. (2003). *Information and communication technology: a catalyst for growth*. *Management Today.* Pp30-31

Sarantakos, S. (1998). *Social research*. London: Macmillan Press.

Venezky, R. L. (2000). *The Digital Divide within formal school education: causes and consequences*. In: Schooling for Tomorrow – Learning to Bridge the Digital Divide, Education Skills OECD 2000

Wijewardena, M. (2002). *Assessment of existing empirical analyses of the underlying causes of the digital divide – ideas for policy makers*. [Online] Available at http://www.gtlaw.com.au/t/publications/default.jsp?pubid=385 Accessed 2003/06/11.

Wikipedia, (2005). *Digital Divide* – the free encyclopedia. [Online] Available at http://en.wikipedia.org/wiki/Digital_divide. Accessed 2005/07/12

Williams, B. K., Sawyer, S.C., and Hutchinson, S.E. (1999). *Using information Technology: a practical introduction to computers and communication* (3rd edition).

Wilson III, E.J. and Wong, K. (2003). African information revolution: a balance sheet [Online]. *Telecommunications Policy*, Volume 27, Issues 1-2, Pages 155-177. Available at: http://www.sciencedirect.com/. Accessed 2003/04/25.

Wright, B. (2003). Bussing past the digital divide, *SA computer magazine* August 2003 edition pp 27-29.