Rural Information and Communication Technology Connectivity Status in South Africa

Martin Mandioma, Hippolyte Muyingi
Telkom Centre of Excellence (CoE) in Developmental E-Commerce.
Computer Science Department
University of Fort Hare, Alice, P.Bag X1314, 5700
South Africa
Cell: +27765209731, tel: +27(40) 602 2464
(mandiomamt@gmail.com, hnmuyingi@ufh.ac.za)

Abstract

The paper introduces the state of Internet connectivity in South Africa. It explores the background in telecommunication networks .It goes on further to bring forth the initiatives which are being done to the disadvantaged rural communities in South Africa to bring Internet connectivity to the reach of the majority and the various challenges which have been faced in the mission of rural Internet connectivity.[1]

Key Terms: Internet Connectivity, Rural ICT, Rural Internet, ICT for Development, USAASA

1. Introduction

Internet connectivity is a central enabling agent in building the information society [1]. South Africa is currently experiencing rapid growth in Internet connectivity [2]. The International Telecommunication Union (ITU) reported in 2006 a 10.3% of the South African population having access to the Internet. The World Wide Worx, a leading independent technology research organization in its report "The Goldstuck Report: Internet Access in South Africa 2005", stated that 3.6 million South Africans would have access to the Internet at the end of 2005. This would translate to 1 in every 12 South Africans having access to the Internet. The figure represents 7.4% of the South African population mostly in urban centres having access to Internet [3]. According to a study previously released in 2003, 3.283 million South Africans had access to the Internet [3]. This figure reflects an upward trend in Internet access in South Africa and further implies an increase in technology adoption. **Table 1** shows the Internet trends in South Africa

YEAR	Users	Population	% Pen.	Usage Source
2000	2,400,000	43,690,000	5.5 %	ITU
2001	2,750,000	44,409,700	6.2 %	IWS
2002	3,100,000	45,129,400	6.8 %	ITU
2003	3,283,000	45,919,200	7.1 %	Wide World Worx
2004	3,523,000	47,556,900	7.4 %	Wide World Worx
2005	3,600,000	48,861,805	7.4 %	Wide World Worx
2006	5,100,000	49,660,502	10.3 %	I.T.U

Table 1 South Africa, Internet Usage and Marketing Report [4]

2. Fixed Telecommunications Access

Telkom South Africa was the only fixed land line operator in South Africa, before the granting of a license to Neotel formerly Second National Operator (SNO).Neotel was granted a license on 9 December 2005 to commence operations [5]. Neotel is a conceptualized company formed to end monopoly in the fixed telecommunication market of South Africa. Neotel has a leading edge in telecommunication networks built across the country [5]. Telkom has provided various Internet products including from wholesaling and retailing to Internet Service Providers (ISPs) and other customers in South Africa. The creatively packaged products include a wide range tailored for different users such as Home DSL, Integrated Services Digital Network (ISDN), Asymmetric Digital Subscriber Line (ADSL), Leased Lines, Diginet and Satellite [6]. These have contributed heavily to the

---

[1] **Martin Mandioma** (BSc Computer Science, University of Fort Hare, South Africa) He is currently, studying towards MSc in Computer Science at University of Fort Hare. His research interests are in areas of software development, wireless connectivity and PLC communication.

Hippolyte Muyingi (PhD PE Engineering VUB, Brussels) is with the Department of Computer Science, University of Fort Hare. Among his areas of academic interest are PLC communications, Network security, and ICT for Development. Prof Muyingi has a long experience in teaching and research and he is the Head of the Fort Hare Telkom Centre of Excellence in Developmental eCommerce, one of the prime sponsors of the Dwesa project, a rural field trial setting in the Eastern Cape coast of South Africa.

current growth of Internet connectivity in South Africa especially in urban areas.

The year 2004 saw the launch of Internet access by the second telecommunication operator Sentech. Sentech offers broadband wireless access mostly in the urban areas under the brand name MyWireless. They have creatively packaged various products which are distributed utilizing Wireless Fidelity (WiFi). The Department of Communication expects broadband access to increase through the Sentech wireless network. This is expected to increase Internet access in South Africa as more players come on board. The Department of Communications expects broadband access to increase tenfold with the introduction of Sentech wireless service network [7]. The government announced this major capital expenditure project on the roll out of Sentech wireless broadband network to increase access and reduce costs in April 2006 [7]. Market analysts, BMI-TechKnowledge believes that the market for Internet access service in South Africa will continue to grow. Broadband is cited as the key driver of growth in the South African Internet market. End-user trends have been changing as users migrate to broadband from dial up services [8].

3. Mobile Telecommunications Access

The cellular phone service providers MTN , Cell C, Virgin Mobile and Vodacom are currently offering Internet connectivity through General Packet Radio Service (GPRS), Enhanced Data for GSM Evolution (EDGE) (introduced in 2005; now as country wide backup), Third Generation (3G) and High Speed Downlink Packet Access (HSDPA). Although

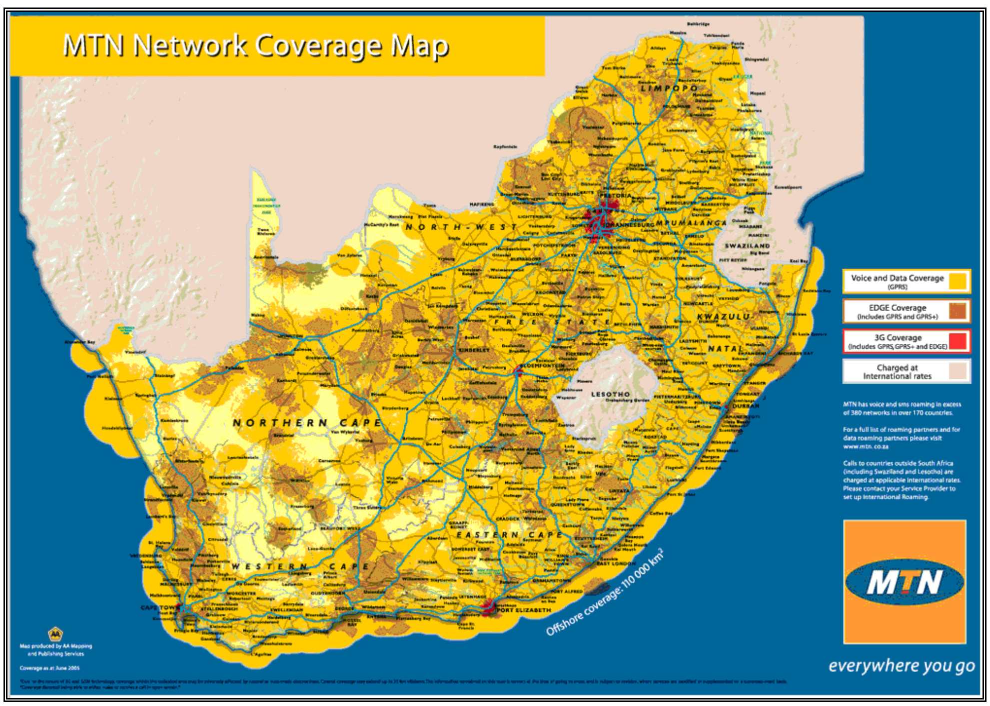

Figure 1 [10]

HSDPA and 3G are available in South Africa these can only be accessed in major metropolitan areas. However with South Africa having about 90% coverage combined on MTN and Vodacom cellular networks [9, 10]. GPRS can be utilized as an alternative. The reduction in tariffs rates from Vodacom to 39c per megabyte would offer affordable and accessible Internet coverage to all mobile subscribers [11]. This is one of the affordable Internet connectivity technologies which can be utilized for Internet access where there is coverage. These above mentioned initiatives and growth as reported by [3] have however not been able to benefit the poor who cannot Afford such services. The use of Internet connectivity through GPRS is not prevalent in the disadvantaged rural areas of South Africa. The major factor has been the type of phones which most of the rural folks own as they cannot access the Internet through GPRS since they do not have the capabilities. So as to afford telecommunication services in rural communities, Vodacom has rolled out subsidized community telephones in the under-serviced areas of South Africa [12]. These phones cannot be utilized for Internet access but have been able to provide voice and text message services. The establishment of community telephones was done as an initiative by the government to serve the marginalized rural areas in South Africa. Vodacom, with more than

5700 base stations in the country provides coverage to most parts of the country and as a result the majority of rural communities have benefited from this initiative [12]. From December 2006 Vodacom had 21.8 million cell phone users, representing 58% of the market [13]. This implies that Vodacom remains the most utilized cellular provider in South Africa. Vodacom has then set a ground for further rural Internet connectivity.

4. Government Initiatives

The government has put in various initiatives to afford rural communities' access to the Internet. The Universal Service and Access Agency of South Africa (USAASA) is such one organization, established and operating under the regulatory and policy framework enshrined in the Telecommunications Act No. 103 of 1996 (as amended in 2001). USA seeks to promote the goals of universal service and universal access [14]. A universal service is a reliable connection to the communication network that enables any form of communication to and from any part of South Africa. Universal access is the ability to offer communication network at a reasonable distance and affordable price by providing relevant information and necessary capacity in under-serviced areas where 42.5% of the South African population lived according to the 2001 census [15]. One may assume little change in this figure since population migration towards urban in South Africa might not be too significant. The under-serviced communities comprise mainly of rural and peri-urban areas. These areas are characterized by high levels of poverty, poor infrastructure, high levels of unemployment with a few employment opportunities and limited access to a variety of services including telecommunications,

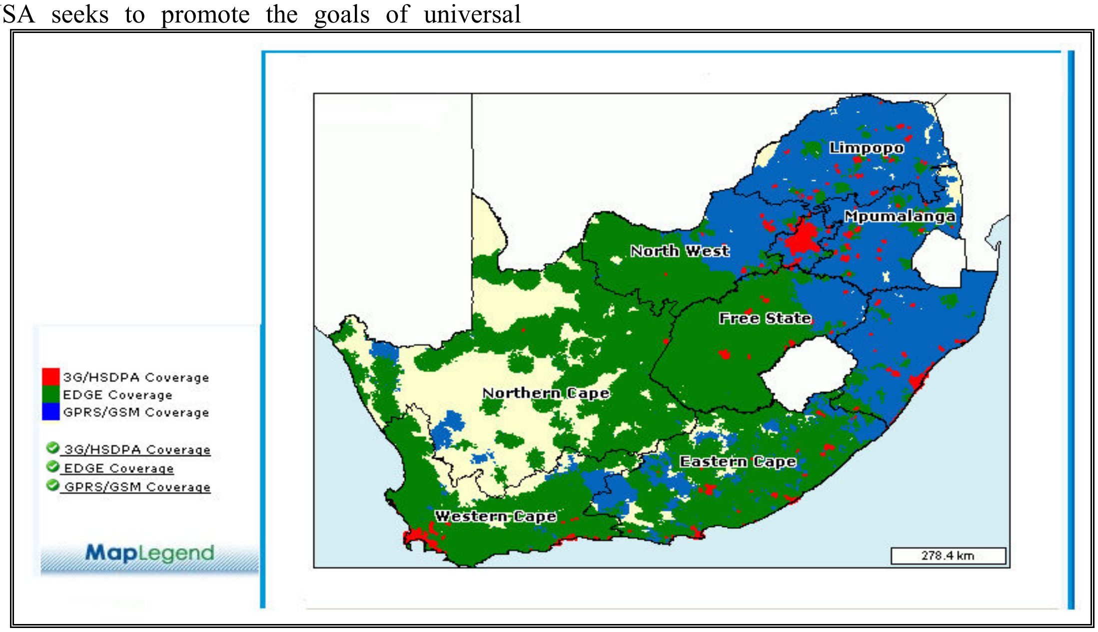

Figure 2 [9]

a) The Universal Service Fund

The USAASA is funded by the Universal Service Fund through a Ministerial Policy Directive. All telecommunications licensees, including the Value Added Network Services (VANS) licenses from 2003 are required to contribute a percentage of their annual turnover to the Universal Service Fund. VANS means a telecommunication service provided by a person over a telecommunication facility, which facility has been obtained by that person in accordance with the provisions of section 40(2), to one or more customers of that person concurrently, to which value is added for the benefit of the customers (Republic of South Africa Telecommunications Act No. 103 1996). The VANS contribution should not exceed 0.5% of their annual turnover. The Private Telecommunication Network (PTN) and the under serviced area licenses are exempted from paying contributions to the Universal Service Fund [16]. The PTN is a telecommunication system provided by a person for purposes principally or integrally related to the operations of that person and which is installed onto two or more separate, non-contiguous premises and where the switching systems (nodes) of at least two of these premises are interconnected to the public switched telecommunication network as contemplated in section 41 [14]. The contributions from the VANS and PTN are reviewed by the Minister from time to time. This means that Universal Service Fund depends on the profitability level which the telecommunication companies achieve in a particular year.

b) Telecentres

The USAASA had established 133 telecentres nationwide in disadvantaged rural communities by December 2005 [17]. These telecentres are telecommunication access points deployed in unserviced and under-serviced rural areas to provide access to electronic communications services. The purpose of setting up these centres is to provide universal access to Information and Communication Technologies (ICTs) to communities in unserved and under-serviced areas. The unserved areas are defined as those that do not have telecommunications access whilst the under-serviced are areas that have teledensity lower than 5%. The telecentres have enabled communities to access basic services like computer services, telephones, data (fax, Internet, email), video, ICT training services, typing, printing and photocopying [17]. In areas where formal building structures are limited ICT Telecontainers have been deployed. These serve as telecentres in such areas. But the question is still how many in rural communities can afford Internet service fees.

c) Cyber Laboratories

Schools in under-served communities have also been used as access points to ICT through the establishment of Cyber Laboratories by the USAASA. By December 2005, 235 Cyber Labs had been established in schools in all of the nine provinces of South Africa [18]. These laboratories provide ICT services and computer literacy training to the schools in the communities. The schools are responsible for maintenance costs while Internet connectivity for the initial 12 months is paid for by the USAASA. The Cyber Laboratories are equipped with thirty computers, one photocopying machine, and one printer. Fax machines are provided when there is need. The USAASA provides for the whole setup and security of these labs [18].

d) Batho Pele Project

South African government introduced the *Batho Pele* project which seeks to increase access to services and has seen such projects as Gateway, Call Centers and Multi Purpose Community Centres (MPCC) being launched [19]. The aim of the project is to provide twenty four hours a day, seven days a week for government service delivery to its citizens irrespective of their geographical location using information technology. The MPCC are emerging as one stop development service centres in many of the disadvantaged rural communities as government increasingly recognizes the need for an Integrated Rural Development Strategy (IRDS) and Urban Renewal Strategy (URS) to meet the socio-economic needs of the disadvantaged rural communities. The project has seen MPCC being rolled out in partnership with Government Communication and Information Services (GCIS) [20]. The USAASA has been able to setup telecentres inside the existing MPCC as part of promoting access to technology and capacity building. These provide services such as telephones, Internet, photocopying, scanning, faxing and computer training using appropriate equipment [21]. The MPCC has been able to improve government communication since at least six departments are represented in each centre. The government services which are provided include pensions, health, education, passports, IDs and library use. The actual level of Internet usage enabled by *Batho Pele* project is still unknown.

e) Community Digital Hubs

A new concept of community centres to be deployed in demarcated areas for rural development called Community Digital Hubs (CDH) has been drawn [22]. The areas of CDH are advanced ICT facilities deployed by USAASA to provide human capacity building and technical support to the remote telecentres and cyber laboratory. The hubs are set to provide support for content development and to deliver various applications such as e-government services, e-education, e-health, e-business development and other various services [22]. The CDH is made up of a combination of technology centres offering various ICT services.

f) Under-serviced Area Licenses

The USAASA has also introduced the Under-serviced Area Licenses (USALs) in areas with a teledensity of less than 5% [23] so as to provide basic telecommunication facilities. The USALs are issued by Minister of Telecommunication to those geographic areas where teledensity is less than 5%. This allows small businesses to provide telecommunication services or facilities in such areas. The Minister of Telecommunication identified 28 areas in the under-serviced areas to receive USALs. This culminated into the USAASA granting license holders R5 million grants for development in the under-serviced areas. The grants would enable the Black Economic Empowerment (BEE) enterprises to kick start the roll out of infrastructure in the under-serviced areas. This will also provide employment and alleviate poverty thereby improving the quality of life of the people living in the rural and remote areas of South Africa [24].

The telecentres established by the USAASA have been connected mostly through Telkom landlines, which at the initial stage of the project Telkom was the only fixed landline operator. These have been used for Internet access where this service is provided. According to [25] the use of Vodacom phones as dial up had worked better for three reasons;

- They had proved to be more reliable;
- They were prepaid meaning they would not reach crippling debts as in the case of Telkom post billing;
- Vodacom allowed a greater profit margin since its charges were lower than those of Telkom which

also included monthly rental charges.

However the Vodacom lines can only be utilized for telephones only. They can not be utilized for Internet connections. Efforts are underway in remote rural areas to utilize other access technologies such as satellite and wireless Internet access [26], [27].

The USAASA telecentre programme has had mixed results. There are cases where the local organizations could use the technologies to meet local needs; and many cases where a combination of technical, financial and lack of capacity limited the effectiveness of the telecentres [25]. Sustainability of telecentres has also been a major challenge. The telecentres are of limited use unless if the services provided are relevant to the local community. Although telecentres have the potential to serve various aims which include universal access to telephones, other developmental services to meet basic needs, education in information age skills and local telephone connections, their usefulness as an effective means of addressing the issue of connectivity has still to be proven [26]. Cheaper alternatives could be utilized (pay phones), while no mechanism yet exists to enable the accomplishment of universal access. Thus in other cases telecentres have to an extent improved access especially for under-serviced areas but the model has not helped in achieving universal service and access [25]. The high rate of technical failure especially in connectivity has also been sited as a major problem. This could be solved through the deployment of easily configurable technologies which suite people with low technical skills.

5. Challenges

Despite the effort to afford rural communities' access to ICTs many remote rural areas and communities still pose challenges as they remain out of coverage. Some of the rural areas still have a teledensity that is less that 5% in some parts of the country [20]. Other communities are very remote from existing infrastructure making it difficult to achieve the mission of connectivity. The lack of electricity has also been a large barrier to telecommunication and Internet connectivity in these rural areas. The telecommunication networks require a source of energy to power components which make up the network. This presents a large investment for setting up the network infrastructure. In other cases alternative sources of energy such as solar energy and generators have been implemented. The solar energy and generators have proved good alternatives in the absence of electricity. However, where solar energy has been in use the major problem has been theft of the solar panels. Community awareness of the use and application of solar power is widespread and has led to an actively fraudulent market for solar panels. It is in this market that the stolen product is being sold [29]. The impact is such that some sections of the networks are permanently affected. This has left major breakdowns within the network thus resulting in bad lines in areas where telecommunication services are already bleeding The most successful anti-theft mechanism has however been the education and involvement of local communities [30]. This has hampered the rate of economic development in these rural areas.

The cost of deploying the network infrastructure is capital intensive. This results in companies calculating the return on investment in deployment to the rural areas. Consequently most telecommunication companies have preferred to invest in areas of brisk business that is the urban centres. Sentech for example has offered wireless packages tailored mainly for users in the major metropolitan cities. This indicates that telecommunication companies continue to invest in areas of high business. This has left the rural disadvantaged areas with little or no telecommunication services. Thus serving the rural remote areas remains a task to be accomplished

6. Conclusion

Internet connectivity continues to rise in South Africa; however this has mostly been in the urban areas where the few stay. The majority of the people who stay in the rural areas have started realizing the coming of Internet connection moreover in other cases they was not even telecommunication lines. The initiatives which have been put in place by the government will address a certain sector but more still needs to be done in the disadvantaged rural. More importantly is in our view a radical change of view towards a commodity nature of information exchange need for all which all major players would adhere to. Rural African remains an unknown market and needs more innovative ideas to disclose its eventual potentials.

References

[1] ITU, 2003, Building the Information Society: a global challenge in the new Millennium. Last Accessed January 2006. Available: http://www.itu.int/dms_pub/itu-s/md/03/wsis/doc/S03-WSIS-DOC-0004!!PDF-E.pdf#search=%22Internet%20connectivity%20is%20a%20central%20enabling%20agent%20in%20building%20the%20information%20society%22

[2] United Nation Economic Commission for Africa, 2004, South African Internet Connectivity. Last Accessed January 2006. Available: http:www.uneca.org/aisi/nici/country_profiles/South%20Africa/southinter.htm.

[3] Goldstuck, A 2007, SA Internet access grows, but only for the haves. Last Accessed July 2007 [Online]. Available: http://www.theworx.biz/access07.htm.

[4] South Africa, Internet Usage and Marketing Report Last Accessed September 2007 [Online]. Available: http://www.internetworldstats.com/af/za.htm

[5] SNO Telecommunication (Pty) Ltd: A Brief History, 2006. Last Accessed May 2006 [Online]. Available: http://www.snotelecom.co.za/sno_history.shtml
[6] Telkom South Africa: Internet Services, 2006, Last Accessed October 2006 [Online], Available: http://www.telkom.co.za/athome/index.html
[7] Business Report. Call tariffs likely to drop as broadband gains popularity. Last Accessed May 2006. Available: http://www.busrep.co.za/index.php?fSectionId=566&fArticleId=3222755
[8] BMI Tec Knowledge. Broadband Access to Drive Internet Growth in South Africa. Last Accessed October 2005 [Online]. Available:http://www.bmi-t.co.za/bmi/Content/News-archives/news-archives.htm#21
[9] Mobile Telephone Networks, National Coverage. Last Accessed August 2005 [Online], Available: http://www.mtn.co.za/?pid=11789&mid=7978
[10] Vodacom South Africa, 2005, Vodacom Coverage Map. Last Accessed August 2005 [Online], Available:http://www.vodacom.co.za/packages/common/Vodacom_coverage_map.pdf
[11] Vodacom South Africa 2005. Super fast Mobile Internet Now Even More Affordable. Last Accessed May 2006 [Online]. Available:http://www.vodacom.com/vodacom/mccomcrdetail.do?id=456&action=detail
[12] Vodacom South Africa, 2005, Overview. Last Accessed November 2005 [Online]. Available: http://www.vodacom.com/vodacom/investor_relations/company_profile/profile_overview.jsp
[13] Stones, L 2000, SA shade Nigeria in cell phone users. Business Day 2 February 2007.
[14] Telecommunication Act No 103 of 1996. Pretoria: Government Printers
[15] Statistics South Africa. Investigation into appropriate definitions of urban and rural areas for South Africa. Last Accessed August 2006 [Online] Available:http://www.statssa.gov.za/census01/html/UrbanRural.pdf
[16] Department of Communication. Policy Directions Issued by Minister of Communication. Last Accessed May 2005 [Online], Available:http://polity.org.za/html/govdocs/policy/telecomms.html
[17] Universal Service Agency 2005. USF Projects. Last Accessed May 2006 [Online]. Available: http://www.usa.org.za/telecentres.html
[18] Universal Service Agency 2005. USF Projects. Last Accessed May 2006 [Online]. Available: http://www.usa.org.za/cyberlabs.html
[19] Batho Pele. Principles. Last Accessed May 2006 [Online]. Available: http://www.dpsa.gov.za/batho-pele/Principles.asp
[20] South African Government Communications and Information Systems. MPCC Business Plan. Available at: http://www.gcis.gov.za/docs/publications/mpccplan/vision.pdf. Last access January 2006
[21] Universal Service Agency 2005. USF Projects. Last Accessed May 2006 [Online]. Available: http://www.usa.org.za/mpccs.html
[22] Universal Service Agency 2005. USF Projects. Last Accessed May 2006 [Online]. Available: http://www.usa.org.za/hubs.html
[23] South African Consulate General (2003) Communications. Last Accessed May 2005 [Online]. Available: http://www.southafrica-newyork.net/consulate/telecom.htm
[24] Universal Service Agency 2005. USF Projects. Last Accessed May 2006 [Online]. Available: http://www.usa.org.za/usals.html
[25] Benjamin, P 2002, Telecentres in South Africa Last Accessed Nov 2006 [Online]. Available: http://ip.cals.cornell.edu/commdev/documents/jdc-benjamin.doc
[26] L. Dalvit, M. Thinyane, H. Muyingi, and A. Terzoli, "The Deployment of an e-Commerce Platform and Related Projects in a Rural Area in South Africa," International Journal of Computing and ICT Research, vol. 1, pp. 9-18, 2007.
[27] G. S. V. R. K. Rao, A. Terzoli, H. Muyingi, and M. T. Mandioma, "A study on Addressing Digital Divide through ICT initiatives in South Africa, ICTe Africa ", 2006
[28] Schofield A, Sithole H, Universal Service Agency Achievement of the Telecommunication Act Objectives Analysis of the extent to which the objectives of the telecommunications Act (103 of 1996), as amended were achieved (in the period 1997 to 2004) Last Accessed Jan 2006 [Online]. Available http://www.usa.org.za/docs/gen/Achievements%20of%20the%20Objectives%20of%20the%20Telecom%20Act%20of%201996%2020.pdf
[29] Barendense, A 2003, ‘Innovative regulatory and policy initiatives at increasing ICT connectivity in South Africa’, Journal of Telematics and Informatics, vol.21, no 1, pg 49-66
[30] Rycroft, M.; Lesianawai, I.; Twidell, M.; Aumanu, P.; Paisawa, A. Telecommunications Energy Conference, 1997. INTELEC 97, 19th International Volume, Issue, 19-23 Oct 1997 Page(s):215 – 219
.