

Pro-Poor ICT Project Report – Rwanda:

A Community-driven Network

MAKE IT HAPPEN

FINAL VERSION

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EXECUTIVE SUMMARY

The following report provides comprehensive outputs from a pro-poor ICT research project that was conducted in the East Africa region including Kenya, Tanzania, Uganda and Rwanda. This research with its advocacy initiative is supported by the United Nations Development Program. It aims at exploring the concrete potential of a few emerging policy and implementation options that might be effectively deployed to address some of the current network and access gaps depending upon the particular national and institutional contexts. These include:

- *Open access approaches for building and financing infrastructure* that could be used to address gaps in network infrastructure and leverage new business and development models to reduce costs of rolling out backhaul connectivity from major cities to rural areas where market inefficiencies prevent telecom operators and service providers from deploying.
- *New models of network ownership and management at the community level* e.g. community-driven infrastructure that can expand access and contribute to network infrastructure development from the ground-up as well as strengthen local development and scaling-up of community-driven initiatives.

The research is one component of a program that is being supported within the context of UNDP's programmatic focus on *making ICT work for the poor*. It aims to contribute to the identification and codification of evidence-based ICT4D policy options and to strengthen advocacy and capacities for policy change to leverage such options. More specifically, it intends to:

1. review current ICT Policy and Poverty eradication strategies with a focus on those policies and strategies that target grass root communities in under-served areas;
2. facilitate/stimulate Forums for discussion and awareness campaign targeting decision makers, donor community, local community and ICT based service providers around the issues of network and market gap in specific locations mainly in rural areas;
3. propose policy and regulatory changes that might positively impact the development and expansion of community-owned networks through partnerships with various stakeholders and a great emphasis on understanding of local context,

capacity building, and integrating ICT at local level to catalyze local development strategies.

In the case of Rwanda, a Needs Assessment study was conducted in Nyamata, the main town of Bugesera District, in the Eastern region, at about 40 kms from the capital Kigali. The location was selected for a number of reasons; the place is known as one of the poorest areas in the country, especially due to drought and subsequent famine. In addition, the location has suffered severely from the various civil wars that took place in Rwanda, particularly the 1994 genocide. The population in Nyamata is about 50,000 (2002 Census). Since 2003, the district as a whole, and Nyamata town in particular has seen an increase of social and economic activities aiming at alleviating poverty in the area. The major activities include the establishment of farmers' cooperatives, women associations in support of social activities, and micro finance and micro credit institutions. As an example, the first Grameen village phone was created in Nyamata and the Millennium village, the first of its kind in the country, is established in the mentioned area as well.

The location has a great coverage of GSM based network provided by MTN and other telecommunication infrastructure projects are being planned to expand network coverage in the country at large and the Nyamata area in particular. With the new administrative reform expected to provide more power to local governments and great participation of the community in the decision making, there is great potential to integrate the community driven network model at local level provided that:

- the regulatory framework supports such an undertaking in terms of issuing licenses for community owned wireless local loop network and assisting in mobilizing resources for startup investment;
- dominant telecom operators provide backhaul connectivity at a reasonable cost;
- alternative energy is used in the area where public electricity is not available;
- last but not least, a business/governance model that suits local context is designed to meet minimum requirements for sustainability.

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List of Acronyms:

ADSL	: Asymmetric Digital Subscriber Line (transmission technology)
BCS	: Business Communication Services
BRD	: Banque Rwandaise de Développement/ Rwanda Development Bank
CAPMER	: Centre d'Appui aux Petites et Moyennes Entreprises au Rwanda
CDMA	: Code Division/Detect Multiple Access
CDN	: Community Driven Network
CONs	: Community Owned Networks
CSC	: Community Score Card
CWIQ	: Core Welfare Indicators Questionnaire
DHS	: Demographic and Health Conditions Survey
EASSY	: Eastern Africa Submarine System
EDPRS	: Economic Development and Poverty Reduction Strategy
EFA	: Education For All
EICV	: Enquête Intégrale sur les Conditions de Vie des Ménages/ Household Living Conditions Survey
ELECTROGAZ	: Rwanda Public Utility for Production, Transmission and Distribution of Electricity and Water
EVDO	: Evolution-Data Optimized or Evolution-Data only
GDP	: Gross Domestic Product
DHS	: Demographic and Health Conditions Survey
GoR	: Government of Rwanda
GPRS	: General Packet Radio Service
GSM	: Global System for Mobile communications
HDR	: Human Development Report
i.e.	: id est
ICT	: Information and Communication Technology
ICT4D	: ICT for Development
ILO	: International Labour Organization
IP-BPX	: Private Branch eXchange (also called Private Business eXchange or PABX for Private Automatic Branch eXchange)
ISP	: Internet Service Providers
ISPA	: Internet Service Providers Association

KIE	: Kigali Institute of Education
KHI	: Kigali Health Institute.
KIST	: Kigali Insitute of Science and Technology
LAN	: Local Area Network
MDG	: Millennium Development Goals
MINALOC	: Ministry of Local Administration, Good Governance, Community Development and Social Affairs
MINECOFIN	: The Ministry of Finance and Economic Planning
MTN	: Mobile Telephone Network
NGO	: Organisation Non Gouvernementale
NICI	: National Information and Communications Infrastructure
NUR	: National University of Rwanda
PRO-FEMMES/TWESE HAMWE	: Collectif des Organisations Rwandaises de Promotion de la Femme, de la Paix et de développement
PRSP	: Poverty Reduction Strategy Program
PSTN	: Public Switched Telephone Network
RITA	: Rwandan Information Technology Authority
RPSF	: Rwanda Private Sector Federation
RURA	: Rwanda Utilities Regulatory Agency
UAF	: Universal Access Fund
UNDP	: United Nations Development Program
USD	: United States Dollars
VL	: Village Office Location
VoIP	: Voice over Internet Protocol
VSAT	: Very Small Aperture Terminal
WiFi	: Wireless Fidelity
WiMax	: Worldwide Interoperability for Microwave Access

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I. Introduction

Rwanda is a country that has come remarkably far in a relatively short period of time. Despite a very recent history of war and genocide that aggravated the already rising levels of poverty and inequality, the country manifests considerable macro-economic and political stability. However, development challenges remain. The economy remains a largely subsistence-based and the agricultural sector faces land pressure and productivity challenges.

The country is heavily dependent on aid. Prior to the 1994 war and genocide, Rwanda received USD 300-350 million external assistance annually. The two years immediately after the genocide saw this assistance rise to USD 700 million in emergency and reconstruction aid. From 1998 to 2004, these figures dropped back to the pre-genocide levels, most of the assistance being directed to development. Today, aid is equivalent to 69 percent of total government spending.

Rwanda, like many African countries, has embarked on an ICT development strategy, which will be discussed in detail in this report. Rwanda has envisioned its economy becoming middle income by the year 2020 through transforming the economy from being predominantly agricultural to one that is information-rich and knowledge-based. The GoR has decided to use ICT as one of tools to reach this developmental goal. The vision document has been made operational through the national policy document widely known as the National Information Communication Infrastructure Plan [NICI 1 (2001-2005)]. Rwanda is currently implementing NICI II (2006-2010).

The country has gone through major economic reforms including telecommunications ones that aimed at increasing the competitiveness of the telecommunications industry and attracting foreign investment. Amongst those reforms, there was the establishment of an independent regulatory body known as the Rwanda Utility Regulatory Agency (RURA). The main mission of RURA is to promote fair competition, improve quality of services, create an enabling environment to attract investors and more important ensure the provision of services to all citizens in accordance to the Universal Access obligations set by the International Telecommunication Union.

Despite a high level political commitment to take ICT development forward as a priority area, the current trend in the sector's development reveals several gaps that need to be addressed if the country expects major returns within the coming 20 years. Those gaps are related to the issues of access to and affordability of ICT services in addition to weak institutional capacity and institution arrangement structural challenges. Meanwhile in order to address those gaps, a number of programs and projects are underway within the National Information and Communication Infrastructure Plan (NICI II Plan) framework. Those programs and projects focus on increasing network access around and outside the country over satellite and fiber technologies, increasing the efficiency of government service provisions through a variety of programs, and establishing applications in support of good governance and poverty eradication as a whole with a special attention to the development and transformation of the rural communities through the adoption and usage of ICT.

This report is structured into four sections, including the current introduction.

Section II discusses policies and strategies in Rwanda with respect to rural development and poverty reduction including an assessment of current approaches to development and the role of ICTs.

Section III discusses Community-driven ICT enabled development: An Illustration case. It further outlines the local profile, development needs and ICT activities in Nyamata, District of Bugesera.

Section IV presents and discusses particularly the ways forward including an illustration of a technical setup of a community driven network **as well as regulatory incentives to support deployment of the CONs around the country.**

The meaning of poverty in Rwanda presents a multidimensional character as well as a reflection of its past. It is a situation whereby a person, a woman or a man is facing a complex inter-linkage of problems that cannot be resolved. The poor does not have enough land, income or resources and have little or no access to basic needs (GoR 2002a:13). About 63 percent of the population lives below the poverty line and earn one US dollar per day in average.

Though seemingly general, this definition of poverty in Rwanda is consistent with the generic classification of poverty, which is threefold (Townsend 1993).

The first category is income or consumption poverty, which is characterized by

rigorous measurement (Rowntree 1901, Orshansky 1969). Under this category, a person is considered as poor if his/her income or consumption falls below a determinate threshold. A survey conducted in 1995 after the tragic genocide in Rwanda showed that the level of poverty was 77% below a dollar day poverty line (World Bank 1995). In 2002, a Household Budget Survey estimated poverty to be 60.3% below a poverty line of RWF 64,000 consumption in 2001 prices (GoR 2002b).

The second category is the basic needs approach (Streeten 1982, ILO 1980s). This is where a person is considered poor if he/she cannot access a set of needs considered basic for survival. In Rwanda it has translated into poor access to services (health, education, etc.) and a resultant low quality of life, thus defining a poor person. Table 1 below presents some indicators of poverty in the Rwandan context.

Table 1: Indicators of Poverty

Life Expectancy	49 years
Maternal mortality per 100 000 births	810
Infant mortality per 1,000 (proportion who die before first birthday)	107
Child mortality per 1,000 (proportion who die before 5th birthday)	198
HIV prevalence (15-49 years)	13.7
Net primary enrolment (proportion of children of school going age going to school)	73.3
Gross secondary enrolment	10.2
Net secondary enrolment	6.0
Adult literacy (> 15years)	52,36 %
Rate of access to curative service (new cases per person per year)	0.26

The third category is human poverty and deprivation (Townsend 1987). This definition presents poverty as not being about income, consumption or access to basic needs but about lack of choice and low capability (Sen 1985, UNDP 1990). In Rwanda, groups that are afflicted by various forms of human poverty and deprivation include women heading households, orphans, the unemployed and powerless women and men whose conditions were aggravated by war and genocide (GoR 2002c). The Human Development Index is below .0.5. In 2002 it was 0.431 (HDR 2004). It ranked 164th in among 172 countries of the world or the eight in human poverty in the world.

The incidence of poverty in Rwanda (HCI) was estimated to be 45.7 in 1985, 72.4 in 1995, and 64.1 in 2000 (PRSP 2002). Today it is estimated to be 60.4. The most

recent survey (HCLS 2002) shows that the gap between the poor and non-poor may be widening. While the Gini-coefficient was 0.29 in 1985, it is estimated at 0.45 today. The present distribution shows that 60 per cent of the population account for 20% of the consumption expenditure and 10% mobilize only 50 per cent of the consumption expenditure.

II: Taking Development and ICT to Communities: Assessment of Current Approaches

II.1. Major National Policies and Strategies to Combat Poverty

The major policy guidelines to support poverty eradication include the Vision 2020 and the Poverty Reduction Strategy Paper which in its second phase is known as the Economic Development and Poverty Reduction Strategy (EDPRS) combining the Macro and Micro social and economic development strategies. In addition, the country's major Policy implementation framework is geared towards achieving the Millennium Development Goals by 2015 with specific targets including level of educational enrollment as well as access to health care for the general population.

II.1.1 Vision 2020

The vision 2020 document outlines government priorities by the year 2020. Its major aspiration is to transform Rwanda's economy into a middle income country with per capita income rising from USD 290 to USD 900, requiring an annual growth rate of at least 7%. In order to achieve this, the Vision states that Rwanda must, in the short run, ensure macro economic stability and wealth creation to reduce aid dependency. In the medium term, the government's goal is to transform the economy from a largely agricultural one to a knowledge-based economy, while in the long run the goal is to create a middle-class and to foster entrepreneurship capable of delivering a "modern, strong and united nation, proud of its fundamental values, political stable and without discrimination against its citizens."

The Vision revolves around six key pillars;

- Reconstruction of the nation and its social capital anchored on good governance, underpinned by a capable state;
- Transformation of agriculture into a productive, high value, market-oriented sector with forward linkages to other sectors;
- Development of an effective private sector spearheaded by competitiveness and entrepreneurship;

- Comprehensive human resource development encompassing education, health and ICT skills aimed at public sector, private sector and civil society. To be integrated with demographic, health and gender issues;
- Infrastructural development, entailing improved transport links, energy and water supplies and ICT networks;
- Promotion of regional economic integration and cooperation.

II.1.2. The Poverty Reduction Strategy Paper (PRSP)

Rwanda launched its first poverty reduction strategy (PRSP I) in 2002. Based on Rwanda's development challenges, the PRSP is judged to be broadly satisfactory drawing on four major quantitative surveys: The household living conditions survey (EICV) in 2001, the Demographic and Health Conditions Survey (DHS) in 2000, the Core Welfare Indicators Questionnaire (CWIQ) in 2001 and the Public Expenditure Tracking Survey in 2001 and several other participatory processes.

The PRSP identifies six priority areas in order of importance:

- Rural development and agricultural transformation;
- Human development;
- Economic infrastructure;
- Governance;
- Private sector development;
- Institutional capacity building;

II.1.3. The Place of ICTs in the PRSP

The government of Rwanda recognises the role that Information and Communication Technologies (ICTs) can play in accelerating socio-economic development towards information and knowledge based economy (MINECOFIN, 2002). The exact roles that ICTs can play are clearly articulated in the PRSP.

ICTs are an important tool that can be used to develop the service and manufacturing sectors in order to transform the economy. Strengthening their use would result in the re-establishment of Rwanda as a regional trade and service centre that it once was.

Commercial and information and communication technology services are identified as one way to diversify Rwanda's exports from primary commodities to new engines growth, building on the use of English as an emerging international language for trade and technology and her regional position which in the past was an important centre

for re-exports.

In the education sector, providing quality education for all (EFA) is first priority with the provision of training in ICTs being given special focus especially in secondary schools as well as better access to ICTs by females. The teaching of Science and technology, research, ICT and GIS are considered crucial for economic transformation and globalisation. Building an enabling environment for private sector development is a key component of the PRSP. The implementation of an ICT strategy in the service sector is one of the important steps in promoting the private sector.

The government of Rwanda is currently developing its second generation PRSP, known as the Economic Development and Poverty Reduction Strategy (EDPRS). It is expected to be finalised and launched in June 2007 and represents the country's comprehensive development agenda, ensuring progress across the productive and social sectors. Similar to the PRSP1, the EDPRS draws on the Vision 2020 and is presented more as an operation tool supported through detailed sector strategic plans. In the development of the EDPRS, ICTs clearly feature in one of the themes, (Theme 1) on "Economic growth, private sector development and infrastructure" (MINECOFIN, 2005).

II.2 The Main Instruments Developed for ICTs, to Enable and Facilitate Development of Rwanda in General and the Rural Areas in Particular

II.2.1 Background and Current Status

Telecommunication services in Rwanda were mainly provided by one fixed and one mobile company namely Rwandatel and MTN Rwandacell. In 2005, Rwandatel was privatized and was taken by TERRACOM an Internet service Provider. At the same time the Rwanda Government has through RURA, issued a mobile license to TERRACOM and a fixed license to MTN RWANDACELL. The following lays down the current services offered by each telecommunication company in RWANDA.

=> **Terracom - Rwandatel:** Was formerly an incumbent fixed line operator RWANDATEL, since 1993. Currently it is offering both mobile and fixed line and Internet services. It is an American base company that is laying fibre optics across the

country and installed wireless internet in many schools and communities. Currently is rolling a nationwide CDMA net work.

=> **MTN Rwandacell**: Mainly deals with the supply of the mobile services and is now currently offering internet services via its cell phone network (GPRS) and is busy rolling out wireless broadband data services through Wire Max technology. The company is in the process to rollout fiber optic network around the City of Kigali as well as a link from Kigali to Gatuna, at Ugandan border. The fiber network project is expected to be completed by December 2007.

=> **ARTEL**: Provides satellite communication network (VSAT) in the rural areas since 2002. It has also deployed 250 VSAT's across Rwanda. The company will soon move into Internet services particularly provision of high bandwidth capacity to various public institutions as well as low income organizations around the country through the Karisimbi project.¹

Table 2: ICT Policy Highlights as of 2007

Telecoms services	Policy
Fixed lines	<ul style="list-style-type: none"> - Rwandatel/ Terracom is the major telecom operator in Rwanda providing voice telephony and Internet services. MTN Rwandacel is also licensed to offer fixed line services though it is not operational yet - Artel is a private telecom company with fixed telephony via satellite mainly in remote areas
Mobile Services	<ul style="list-style-type: none"> - MTN-Rwandacell is the main private cell phone company established in 1998. In October 2005, mobile license was awarded to Terracom and now offer mobile services
Internet service Providers	<ul style="list-style-type: none"> - Rwandatel/Terracom is the major Internet Provider. Three others are: MTN Rwandacell, Artel (issued a Voice and Internet Operator licence for under-served areas) and ISPA, small ISP launched in 2005 focusing on corporate wireless connectivity. Two academic institutions have free licenses to provide internet services over VSAT for academic and research purposes.
Cyber cafes & Communit	<ul style="list-style-type: none"> - 500 Cyber cafes are estimated to be operational in the Country with 75% in the Capital Kigali. There is no license required to operate a cyber café. - Community Centers are being deployed in remote areas and are supported by both

¹ Karisimbi is High Mountain in the northern part of Rwanda. A high Mast has been established to facilitate deployment of communication facilities so as to access remote areas and beyond. The project is to start in the near future and will offer a variety of services including Internet, Radio, TVs and others.

y Centers	Gov. and International Organizations
Call Centre services	- MTN-Rwandacell and Electrogaz , the power company have the call centers for their won customers. In addition, Business Communication Service (BCS) has a call centre business which is used to service Tuvugane and its taxi business as internal clients. It is looking for other companies locally to develop a customer portfolio for the call centre
VSAT	- 20 Broadband VSATs are operational in Rwanda owned mainly by international organizations, ISPs and Higher Educational Institutions. License fee is USD 5525 per year plus 15% of the monthly satellite segment fee - Around 400 Narrowband VSATs are deployed by Artel in the country side
VoIP	- VoIP is not legal. The current duopoly licenses allow MTN and Terracom to use and offer VoIP services as their licenses are all-encompassing. However the legalization of VoIP by the regulator is at the preliminary stage.

II.2.2. Institutional Arrangement

The key public institutions in the ICT sector in Rwanda to support its development are:

Minifra: This is the Government ministry in charge of telecommunication, known as the ministry of infrastructure. Its main priority in 2006 has been to review the telecommunications law of 2001.

Rwanda Utility Regulatory Agency (RURA): Started to operate in January 2003. Its main objective was to regulate services that supply telecommunication networks and / or services, Energy, Transport, Communications and Waste management.

The RURA Board's activities in ICT have been associated with issuing radio communications and telecommunications licenses, tariffs regulations as well as analysis of the interconnection between MTN RWANDACELL and RWANDATEL. This board played a mediator's role as to help the two operators to find an

intermediate solution to that problem. In addition, the board decided that each operator shall contribute 2% of its turnover towards the Universal Access fund (UAF).

RURA has an alarming problem of lack of human capacity to be able to execute its mandate. It's worth mentioning that for the last 12 months it had only one person working on telecommunications issues. It needs more skilled man power from all fields of expertise.

Rwanda Information Technology Authority (RITA): Established to serve as a national coordinator of structures and bodies to support the development and the implementation of the NICI Plans. It has a responsibility for coordinating other ICT initiatives and projects that aim at achieving the main objective of transforming Rwanda into an information rich society.

In view of the above therefore, Rwanda is determined to succeed through its firm decision to use ICT as a tool to achieve its developmental goals. The open telecommunication market being developed, the emphasis on taking a proactive approach to developing trade relationships and to ensuring effective participation in regional and multilateral organizations and its ICT strategic plan leave no doubt that there is a very bright future and a hope that the underlying core goals shall be achieved.

II.3 Government Economic Perspectives of the ICT Sector in Rwanda

The ICT sector as a whole is seen in Rwanda as an engine to support economic growth. The government of Rwanda has embarked on a series of policies and regulatory changes in the ICT sector with the hope that the country will take the lead in reversing the traditional trends of agricultural based economy to a service-based economy within the coming 20 years.

The ICT-2020 policy sets out the orientation of the Government's ICT Policy and Strategies within context of the GoR's broad socio-economic development objectives within the Vision 2020 time frame of 20 years. The Government in formulating its ICT-2020 Policy is guided by the principle that if Rwanda is to take full advantage of the opportunities of the information age and develop a vibrant multi-sectoral

information and knowledge economy, it should not as a nation be just a consumer of ICT goods and services but also a producer and developer of the technology.

The GoR believes that development of a local ICT production industry and service sector is as equally important as the deployment, exploitation and utilization of the technology to support the activities of various sectors of the economy and society. The GoR as part of its ICT policy and strategy is therefore fully committed to simultaneously pursue both ICT exploitation and production policy which involves the utilization and exploitation of ICTs to support the delivery of government services and the activities of various sectors of the economy as well as the production, development and delivery of ICT products and services i.e. towards the development and promotion of an ICT industry and service sector.

The GoR will implement this ICT Policy over a period of twenty years (up to 2020) through the implementation of five-year NICI Plans in four phases. The 1st, 2nd and 3rd NICI Plans will focus on laying emphasis on the exploitation and utilization of ICT products and services to support the delivery of government services and the activities of various sectors of the economy. The 4th NICI Plan puts emphasis on the production, development and delivery of ICT products and services. Each of the NICI Plans will therefore have elements of ICT utilization and exploitation as well ICT production and development. But the 1st, 2nd and 3rd NICI Plans will be designed to lay emphasis on programs, projects and initiatives that promote the utilization and exploitation of ICTs in the society and economy with the 4th NICI Plan laying emphasis on programs, projects and initiatives targeted at accelerating the development of the ICT Production Sector to facilitate the development and production of ICT goods and services for the domestic and the export market.

II.4. Development of the Rwandan Information Society and Economy

The adoption of the socio-economic development policy in respect to the ICT-2020 policy framework will facilitate the process towards the realization of the Missions of the Vision for Rwanda to develop Rwandan's Information Society and Economy. The GoR is therefore fully committed to implementing this integrated socio-economic

development and ICT policy within the context of the Vision for Rwanda to by the year 2020 to transform Rwanda’s predominantly agricultural economy into:²

- A high income economy dominated by the trading in ICT products and services;
- An economy characterized by a large commercial service sector with a reasonably large and vibrant, ICT service sub- sector and industry;
- An economy in which the majority of the working population are either directly or indirectly involved in information and communications related activities;
- An economy in which a reasonable large proportion of the population has access to information and communications technology products and services.

Table 3: Socio Economic Performance of Telecommunication Sector in Rwanda

Socio Economic Indicators	2003 (Rwf)	2004 Rwf)	2005 (Rwf)	2006 (Rwf)
1. Total Investment	3,723,085,000	2,306,143,000	5,665,153,000	5,026,461,000
2. Annual revenue	15,663,469,000	20,056,201,000	18,812,518,000	33,144,313,000
3. Taxes	3,735,804,213	6,512,211,986	6,607,008,574	9,121,399,468
4. Direct job creation	128	131	145	152
5. Indirect job creation	1450	2600	3560	5820
6. Universal Access Fund		171,774,695	166,202,866	295,344,085

Source: Desk Research: Data collected from telecom operators and RURA; US\$d 1 equal to Rwf 545

II.4.1. Access to and Affordability of ICT Services

The availability of essential services like these will involve access and affordability issues which are intertwined. The later focuses on the availability of services with the price or tariff factored in, while the former looks at the availability of these services due to other factors other than the prices. This section will discuss these issues in detail.

² Information Available Online: http://www.rita.gov.rw/laws/ict_policy.html

II.4.1.1 Access Issues

II.4.1.1.1 Mobile and Fixed

The main telecommunications services currently available in Rwanda are limited to mobile as the major one, fixed and the Internet. While the fixed services have declined over the past ten years, mobile services have grown rapidly from its launch in 1998 with an annual subscriber growth rate of 30% until 2004. Since then, the annual growth rate had decreased to reach 10% per annum while the total number of mobile subscribers is still very low at 3%, one of the lowest in the region.

The issuance of a second mobile license in 2005 was expected to increase the rate of mobile subscribers by bringing competition between the two mobile operators, MTN and Terracom – Rwandatel. Despite its very competitive price, Terracom – Rwandatel mobile services have not yet taken off. Only a few thousands subscribers have been recorded since May 2006 when the company launched its new mobile services over CDMA technology.

Table 4: Increase in the number of Mobile and Fixed subscribers

Company	Service	2001	2002	2003	2004	2005	2006
Rwandatel	Fixed Lines	21,458	25,105	25,565	22,972	23,903	
	Public Telephones				3,933		
MTN Rwandacell	Mobile Lines	44,117	82,391	97,261	137,271	219,657	303,612
	Public Mobile phones				1,457	3500	5000
ARTEL		0	60	304	452	490	
TOTAL		65,575	107,556	123,130	166,085	244,050	

Source: RURA Annual Report 2004 and Desk research

Tele density is estimated at 2.09 per 100 people;

For the fixed network: 0.3 per 100;

For the mobile network: 2.9 per100.

II.4.1.1.2 Internet and Data Market

The demand for data services as a whole and the Internet in particular has grown over the past few years and is expected to be even bigger over the coming years with the implementation of the second NICI Plan II that is focusing on e-Government applications as well as Network Infrastructure development. The major operators including MTN and Terracom-Rwandatel are all involved in developing national infrastructure backbone over fiber optic, Wi Max and CDMA technologies. In terms of subscriber's growth, individual subscribers have not yet taken off considerably despite the number of technological options as alternatives to traditional dial up subscriptions over cooper that has shown its limitation due to the shortage of fixed land lines.

Interesting to note is the fact that the demand from individual users has moved to wireless for those that can afford to acquire laptops. Two main technologies are currently available: EVDO over CDMA, provided by Terracom-Rwandatel and GPRS provided by MTN. The total number of wireless subscribers from both providers is estimated at 2000 with an increased advantage on EVDO due to its high capacity bandwidth compare to GPRS even though the monthly fee is a bit high.

The major Internet user increase is coming from public access such as cyber cafes and Telecenters. Cyber cafes have got a great success in the major cities and semi urban areas. The total number of cyber cafes is estimated at 500 with a great number in Kigali, the capital of Rwanda. The lower average daily access rate is 10 (semi rural area) while the highest average daily access rate is 60.

The national network coverage as far as Data traffic is concerned has grown up rapidly over the last two years with the establishment of Terracom as a new Internet service provider in 2004. The company has made tremendous effort in terms of building high-capacity network infrastructure around the capital city, Kigali as well as from Kigali to Butare , the University city in the southern province – at approximately 130 km from Kigali. After the acquisition of Rwandatel over the privatization, Terracom has built a CDMA network on top of existing Rwandatel network facilities around the country and is now offering Internet and mobile services over CDMA technology mainly in Kigali city and major urban areas.

After the issuance of a new license to provide data services, MTN Rwandacell is currently involved in building a data network infrastructure since the mid of 2006.

The first Internet service that MTN started with is the GPRS whereby users can access either through Mobile phones or through laptop computers. The GPRS has so far shown its limitation due to limited bandwidth – maximum bandwidth is 148 kbps - despite the availability of access over MTN network coverage, MTN is also offering Wi Max technology targeting corporate customers. The major network infrastructure development is due to happen in the coming two to three years with a variety of projects on board such as the Electrogaz Fiber optic project, a New Artel project to expand connectivity through the Karisimbi Mast targeting government institutions as well as lower income segments such as the rural area.

As far as the International Bandwidth is concerned, the country is still relying on satellite connectivity. The private sector has heavily invested in international bandwidth within the last three years due to high demand of Internet access from government institutions - central government, Education and Health sectors are the major institutions requiring high bandwidth capacity. In addition, with the increase of public access points either cyber cafés or Tele centers, the need for high bandwidth for public access is becoming a big challenge as well as opportunities for major telecommunications companies. The following table shows the increase of bandwidth over the last three years.

Table 5: Increase of International bandwidth from operators' perspective

Company	2004 (Mbps)	2005 (Mbps)	2006 (Mbps)
RWANDATEL – TERRACOM	8	16	52
MTN Rwandacell	2	4	5.5
ARTEL – New ARTEL	2.5	2.5	2.5 (50 projected by end 07)
ISPA	*	*	3
TOTAL	12.5	22.5	63

Source: Desk Research – Data from Telecom Operators and RURA * ISPA was launched in 2006

Table 6: Increase in the number of Internet Subscribers

Company	2001	2002	2003	2004	2005	2006
RWANDATEL	1,482	2,047	2,378	2,497	2,484	350
MEDIAPOST	0	0	114	130	*	*
ARTEL	0	0	12	28	28	37
TERRACOM	0	0	0	220	**	5,200
MTN Rwandacell	0	0	0	0	0	1,200
TOTAL	1482	2047	2504	2875	2,512	6,787

Source: *RURA Annual Report 2004 and Desk research*

* No longer in operation as an ISP; ** No data available for Terracom in 2005

Subscribers and users are not necessarily the same thing. For example, a subscriber has a formal relationship with an operator like a contract or an account. There may be any number of users under a subscriber's account. An Internet café may be one subscription. There may be dozens of people who use the café. In 2000 there were only 5000 Internet users with one Internet service provider, Rwandatel. By 2004 the number of Internet users had increased from 5000 to a reported 25000.

The use of the Internet for educational purposes is currently limited to the higher learning institutions such as the National University of Rwanda (NUR), Kigali Institute of Science and Technology (KIST), the Kigali Institute of Education (KIE) and the Kigali Health Institute. Computers and the Internet remain under-used in the school system. While many schools now have computers most schools have no reliable electricity or telephones. The GoR started to provide telephone and internet connectivity in 2004. Access to electricity remains a problem.

II.4.1.2 Universal Access

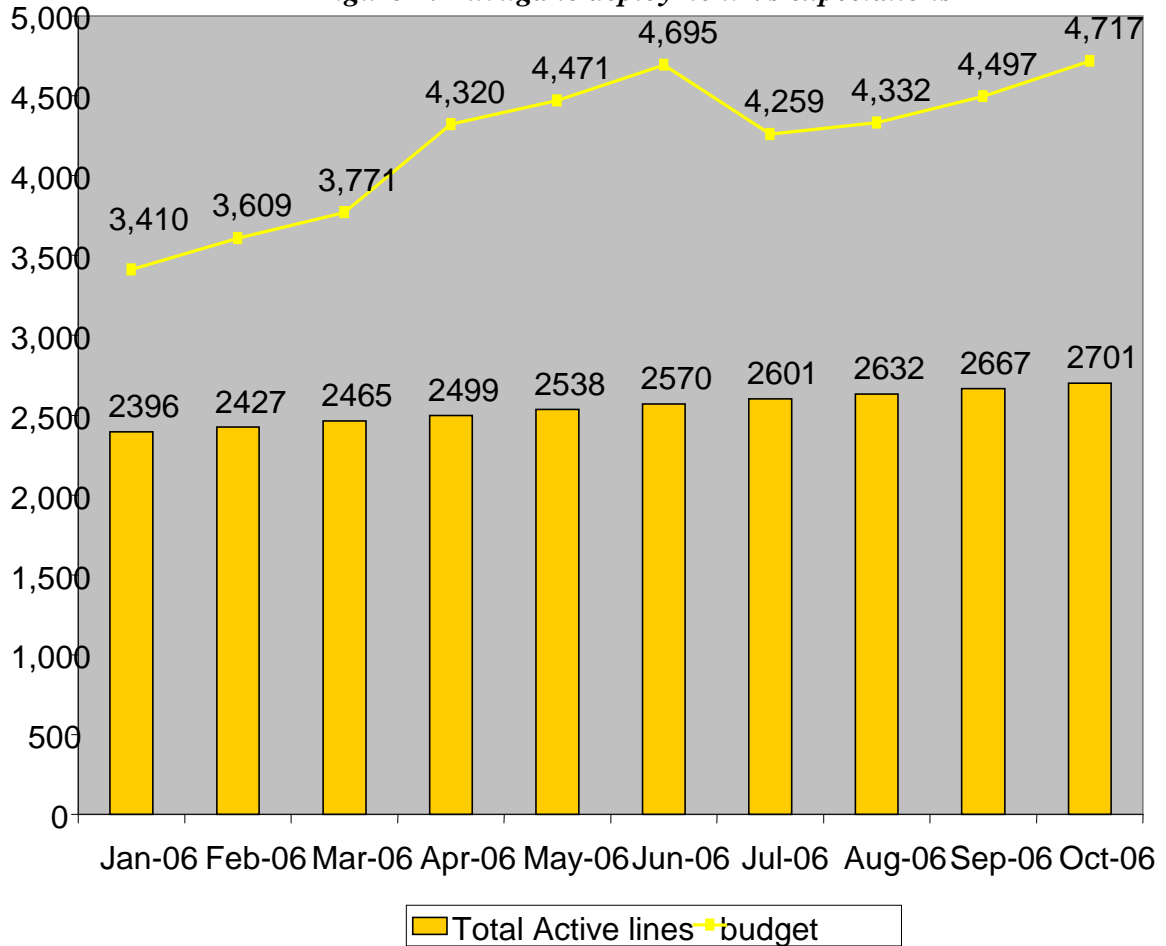
Several policies have been adopted by the GoR to ensure access to telecommunications facilities in underprivileged areas. On that note, a Presidential order says each operator has to pay 2% of their turnover, exclusive of taxes and interconnect fees to create a fund to be used to connect rural areas. In addition there is a certain percentage to be allocated from the government annual budget

The GoR is looking at decreasing the average distance to a public phone from 15 to 3 kms within a period of the five coming years. In addition, the GoR has decided that all ICT equipment (including electrical equipment/Generators, solar panels) be exempted from Import taxes. This is all aimed at increasing ICT usage and more importantly reducing the cost of ICT related activities, hence increasing the affordability of these essential services as we move into becoming an ICT hub for the region.

Looking further at the initiatives made to address the challenge of rural connectivity, a company called BCS runs a GSM public payphone network called **Tuvugane** (Let's Talk), launched in April 2004.. It was established with the main objective of bringing

mobile communication to rural communities. It offers per second billing. This project became more successful than anticipated in terms of revenues collected as depicted in the table below. it has over 4,000 payphones. It buys airtime from MTN and the revenue is split as follows; Phone partner: 20%, BCS: 13% and MTN: 67%.

Figure 1: Tuvugane deployment Vs expectations



Source: Desk Research – Data from BCS Company

According to the distribution manager of MTN Rwandacell, 90% of the revenue collected is from Kigali city, basically implying that the main objective of bridging the digital divide has not been achieved. However there are other initiatives in the pipe line to address this issue, for instance MTN is introducing a project called the “Village Phone” together with the Grameen Foundation which is to focus on the rural areas only.

II.4.1.3 Affordability Issues

Table 7: Affordability of ICT Services

Affordability	Rwanda		Low-Income Group	Sub-Saharan Africa
	2000	2004	2004	2004
Basket for fixed line (US\$ per month) residential	8.4	7.9	6.6	8.5
Basket for Mobiles (US\$ per month)		24.8	11.6	13.5
Basket for internet (US\$ per month)		66.8	45.5	54.8
Price, 3 minute call to the United States (US\$)	11.23	2.45	1.95	2.43

Source: World Bank ICT at a Glance

II.4.1.3.1. World Bank Figure

To test the effect of lack of controls on prices, the World Bank ICT at a Glance affordability data is tested against the figures for other parts of Africa and the down from US\$ 8.4 to \$ 7.9, placing it 19.6 percent above the Low-Income Country Group average of US\$ 6.6 but below the Sub-Saharan African Region level of US\$ 8.5. For Mobiles the Rwanda Basket was US\$ 24.8 per month, 112 percent above the Low-Income Country Group average of US\$ 11.6 and the 84 percent above the Sub-Saharan African Region level of US\$ 13.5. A similar pattern existed for the internet where Rwanda was at USD 66.8 per month 47 percent above the low-income country group average of US\$ 45.5 and 22 percent above the Sub-Saharan African Region level of US\$ 54.8.

Table 8: Selected Tariffs Rwanda

	Prepaid Mobile to MTN 3 Minute	Prepaid Mobile to Nairobi 3 minute	Prepaid Mobile to Fixed 3 minute
MTN Peak	417	885	417
MTN Off Peak	354	885	354
Terracom "illimité"	264	1125	264
Terrcom Mobile	270	1125	270
Artel	360	1140	360

Source: MTN (web site), Terracom (web site), Artel (interview)

For a 3 minute call to the United States there was a dramatic fall in prices between 2000 and 2004. The price fell by 78 percent and is now comparable with the prices in the Low-Income Group, US\$ 2.45 compared with US\$ 1.95 (26 percent above) and virtually equivalent to the Sub-Saharan level of US\$ 2.43. The absence of price controls has not prevented the prices of calls to the US falling by 78 percent. Fixed line charges have fallen, by six percent placing them just above the Low-Income Group average and just below the Sub-Saharan Average. The table contained no prices for the internet in 2000. In 2004, internet prices in Rwanda were well above the average for both of the other groups. However, it should be noted that prices in Rwanda have fallen since 2004, but this has probably been true elsewhere too.

II.4.1.3.2 Advertised Tariffs

Prices were not a primary focus of the study. It has not been possible to do a comprehensive analysis. Also, working from published tariffs it is possible that only the combination of prices most favorable to the customer have been listed. However, it is possible to discern some clues as to the strategies of the respective companies. As with the inter-country analysis later in the report, attention is focused on the all important mobile sector. Each company's supplied information determined the cost of a three minute call to MTN (the dominant operator with 90 percent of subscribers), a three minute prepaid mobile call to Nairobi and a 3 minute call from a prepaid mobile to a fixed telephone.

II.5. Gaps to Be Addressed as Emerging Issues

II.5.1 Access Gap Between Urban and Rural Areas

Previous studies including the household survey made in 2004 and the current data available from the major telecommunications companies reveal the disparity in the level of access to urban and rural areas. As an illustration, the current MTN Network estimated at 75% covers urban areas and main roads in the town. The remote sites outside the above geographical locations are not yet covered and yet the penetration of mobile is estimated at 60% in the capital city of Kigali and 40% for the rest of the country.

There is a need to expand both network coverage as well as increase the penetration especially in the areas that are relatively populated with minimum socio-economic activities that can integrate communications services in their strategies and daily businesses. As mentioned in section II.4.2.1.1, traditional fixed services over copper or wireless have declined over the past ten years. It is likely to continue over the coming years. The only possible alternative will be the introduction of the voice over internet protocol (VoIP) in addition to wireless local loop.

This could enable remote areas that have suffered from lacking basic infrastructure such as electricity and connectivity, faster access to communications means by acquiring appropriate technologies such a solar energy as well as wireless local loop through Wi Max or Wi Fi in some cases. The introduction of VoIP in remote areas can only succeed if the telecommunications market is restructured with a clear separation between Network Infrastructure Providers and Services Providers. The proposed segmentation of the market can therefore allow small scale service providers either private or community based to enter into play especially in the areas where the major telecommunications companies are not likely to operate as service providers.

The above scheme will require review of the regulatory licensing regime and will bring in provisions to support and facilitate the establishment of small scale enterprises in remote areas to provide a range of services from voice, data and other related applications to promote the creation of information based society in underserved areas. The financing mechanism as one of the major challenges has to be studied carefully to ensure that the cost of the infrastructure investment as well as its

running cost will allow the coming up of service pricing scheme that is affordable to the citizens and hence the ability of the sustainability over time, despite the withdrawal of external financial support. The main and initial source of funding is obviously the universal access fund (UAF) that is contributed by the telecommunications companies over 2% their annual turnover as well as government contribution. The UAF could be complemented by a low interest loan from any development bank such as the Rwanda Development Bank (BRD) or Micro Credit/ Micro Finance Banks to some extent.

II.5.2. Policy Gap

Having accomplished and established a comprehensive ICT national plan, is not an end in itself but rather a necessary condition not a sufficient one. The implementation of the plan remains a challenge in Rwanda. It's important to avoid duplication of roles that result in conflicts and misuse of limited resources the Government is investing in the ICT sector. Therefore there is a wake up call necessary to streamline ICT Policies and regulatory measures and make sure that institutions involved in the policy implementation as well as regulatory changes are equipped with both adequate human capacity as well as support resources.

II.6. Conclusion and Recommendation

The ICT sector can be characterized by two major aspects:

- a) Significant progress made both in policy and regulatory reforms to ensure that ICT becomes an engine for poverty eradication as a whole and a catalyst for socio economic development across the various sectors of the economy in particular.
- b) Important issues and challenges to increase access, penetration and usage of ICT across the various segments of the society and particularly in the rural areas.

The reforms adopted have seen a number of changes in the telecommunication market with the entrance of new players and introduction of new technologies and services to meet the market demand. The public and private investment in network infrastructure development has significantly taken up and expected to grow over the coming five years within the framework of the NICI II Plan.

Indicators shown in this report are comparatively very low despite the emphasis in increasing accessibility and usage of ICTs in the country. The major reasons for such gaps are primarily related to the high cost of setting up network infrastructure and its maintenance particularly in the current context of shortage of electricity that lead to the high price of access as well as usage especially for mobile and internet services.

The Rwanda Information Technology Authority (RITA) has initiated dialogue with major telecommunication operators aiming at defining an innovative model of sharing network infrastructure. This sharing model is expected to reduce considerably the cost of network access and therefore will allow new service providers to enter into play with the hope that the price of usage will go down and this will increase the number of users especially ICT services in remote areas.

The NICI II Plan has ambitious programs and projects to support increase of ICT access and usage around the country. The main target is to allow the central and local governments to communicate through ICT means in order to enhance good governance as well as provide efficient services to the general population through internet-based applications. However, the main concerns remain the lack of institutional capacity and expertise to support the implementation of the NICI II Plan. The main public and private agents faced by the mentioned challenges including; RITA, RURA and ICT service providers and are still severely facing shortage of technical skills and expertise in order to fulfill their respective requirement towards the achievement of the NICI II Plan.

In view of the above, the following would be the proposed course of action to address the above mentioned issues. There is need to strengthen Institutional Capacity. The current context of the major institutions involved in the ICT development leave a lot to be desired. A number of changes therefore, have to be made in order to make them more competitive in terms of improving their respective interventions on the ground.

The main challenges to overcome include the implementation of clear demarcation between the Ministry in charge of Communications and Energy, the RURA and the RITA in order to streamline their respective interventions in accordance to the laws and policies that govern ICT development in Rwanda. The redefinition of roles and responsibilities of each of the above institutions will help to identify skills and

expertise needed for each one to fulfill its mission in line with the NICI II Plan as well as help to strengthen their relationship in order to provide better services.

The issue of access to and affordability of ICT services will be addressed by the discussed development of network infrastructure across the country supported by private and public initiatives. This is an important milestone towards the realization of a wider access to ICT services for the general population. The cost of network access remains the main challenges to increase ICT usage and penetration. It is therefore paramount to put proper procedure for sharing of network infrastructure amongst the major telecommunication operators in place, in order to reduce the cost of access and hence encourage new service providers in an open and competitive environment.

Furthermore, improving ICT access for low income and remote areas, there is a need to increase participation of the community in the development and deployment of ICT in the country. The process will involve great awareness of the potential benefits of ICT as a cross-cutting tool to support development in the various sectors of the society hence poverty eradication. The full participation of the community in the management and maintenance of ICT services can provide an alternative for increasing ICT access and usage for low income and remote areas in general. This will require a number of regulatory reforms to allow small scale enterprises to get involved in the areas where major service providers are not present and will also require significant changes in the provision of licenses to facilitate access to network services on a cost based pricing.

III. Community-driven ICT Enabled Development: An Illustration

III.1 Profile of Nyamata – Bugesera District

Bugesera District is part of the Eastern Province close to the Burundian border. Located at 40 kms from Kigali, the capital of Rwanda, it can be classified as a rural area with the potential to grow and become a big suburb of Kigali, especially with a highway that is under construction and a modern and regional airport that is being planned in the Bugesera area within the coming five years. Nyamata is the main town of Bugesera and hosts the main socio-economic activities of the whole district.

The distribution of the population is as follows:

- Estimated Population : 58,313
- Percentage of Female : 56%
- Percentage of Male : 44%
- Percentage of youth under 16 years: 55%
- Percentage of people with less than US\$ 2 a day: 62%

Bugesera District offers a variety of agricultural products and a great number of farmers within cooperatives. There is also a large number of micro finance institutions to support poverty alleviation by assisting community driven local business initiatives. The education sector especially at the primary and secondary school level is well represented even above the national average. There is no higher learning institution. Students in the area must move to Kigali and Butare to get higher education, in some cases they are traveling to Kigali on a daily basis to attend classes. There is one main public hospital in the main town of Nyamata and several health centers around the district. As far as governance is concerned, the district has both newly-elected and appointed motivated local leaders. This is part of the decentralization process and administration reforms that took place in Rwanda early the year 2006. These policy initiatives aim at facilitating participation of citizens in the decision making process as well as providing government services at local level.

As in most rural areas around the country, the general infrastructure is still lacking. Access to electricity, telecommunication and clean water is very poor despite the proximity to the capital, Kigali.

III.2. Needs Assessment

The needs assessment approach involved a combination of a ‘community score card’, and a ‘futures’ methodology. Community Score Cards (CSC) are a qualitative participatory tool used to provide feedback on user perceptions on the quality, adequacy and efficiency of services at the local level. The futures methodology on the other hand is a tool to be employed in the process of creating dialogue among key stakeholders on various future-oriented topics of discussion and debate (Candy, 2004).

A combination of the two approaches was, on the one hand, geared towards obtaining information on the current role of ICTs in the activities of the community. On the other hand, it was intended to create a framework within which the information obtained can provide a basis upon which to initiate processes for advocacy and future policy influence for pro-poor ICTs as manifested by the representatives of the poor themselves.

III.2.1. Choice of the Project Site

The selected site for the needs assessment was Nyamata town in Bugesera district. The predetermined criteria for site selection were as follows:

- Pre-existing ICT experience, such as a telecentre, schools/health network etc. (i.e. on the margins but with some ICT provision);
- Some capacity in (non-ICT) networking activities, for instance around NGOs, cooperatives, women’s groups etc.;
- An area sufficiently large to engage in meaningful local networking, such as half a dozen junior schools, a number of health centres, local government service centre/s, some agriculture or production cooperatives/enterprises;
- The presence of public services delivery locally.

Based on the above criteria, Bugesera district in the Eastern Province was selected. Bugesera district was considered appropriate for this study because in addition to meeting the above, it also manifests typical characteristics of a poor rural community, poverty being a key component of this project. The district experienced severe destruction and loss of human lives during the 1994 war and genocide. Evidence of this legacy is still visible in many ways such as households headed by women and children. However, while the district presents a high level of poverty, vulnerability, poor harvests and frequent cases of food shortage, it is regarded as having prospects for development partly attributed to its close proximity to the capital Kigali. These factors made Bugesera an appropriate case for pro-poor ICT advocacy.

Drawing from the above information on Bugesera, representatives of existing groups of the community were purposively selected as key informants to represent all categories of community members. They are categorized into four:

- Health sector representatives;
- Education sector representatives;
- Private sector representatives;
- “Community” representatives (local associations, farmers, women’s groups).

III.2.2. Needs Assessment Process

The needs assessment process involved three interrelated phases.

Phase I: Seeking a Collective Set of Perspectives

This phase was intended to identify the community’s development needs in general. All the participants were gathered in one room and individual perspectives sought. These perspectives were then discussed collectively.

Phase II. Examining Specific Group Perspectives

During this phase, participants were split into their respective groups listed above. The purpose of this session was to further understand the set of development-related

ICT needs, purposes, networks etc that are considered appropriate to specific groups within the community.

This phase involved focus group discussions where individual groups identified the different ways in which they interact with ICTs and their expectations regarding specific ICTs to accomplish different needs. Also during this phase participants demonstrated potential partnership models for making these ICTs available, showing their own potential as well as support needed.

Phase III. Reaching Consensus

After understanding the group perspectives, the purpose of this phase was to arrive at a collective community representation on how ICTs can be pro-poor. It also involved examining existing strengths and weaknesses for making ICTs work for the community.

III.2.3. Outputs of the Nyamata Pro-poor ICT Needs Assessment Workshop

People from different development-related activities in the area, like business, education, health, etc. attended the workshop. Using the methodology set out before hand, the needs assessment workshop came up with the following results:

III.2.3.1. A Collective Set of Perspectives

The workshop was organized into two plenary sessions and a group discussion. The expected outcome was:

1. A common vision on Bugesera area development needs to be addressed using ICT as a tool for solutions;
2. A clear vision on the ICT understanding in the area;
3. Clear participants' engagement in playing their role in ICT project process.

The first plenary session conducted in four steps provided the researchers with the following results:

III.2.3.1.1. The Population's ICT Awareness

Due to information broadcasted by Radio Rwanda and Rwandan Television (both are public radio and television), by independent broadcasting stations and different

newspapers, the population of Bugesera is aware of what ICT is. The table below shows some ICT equipment available in the area as enumerated by the participants:

Equipment	Availability	Comments
1. Radio	Yes	Most of the people have radio sets.
2. Television	Yes	Very few
3. Internet	Yes	Only one telecentre is available
4. Newspapers	Yes	Only public newspapers are available but they arrive a bit late to the readers. Private newspapers are bought in Kigali.
5. Fixed telephone line	-	Rare
6. Cell phones	Yes	Popular. Among the audience only one person did not possess a cellular phone because of living with people who own phones, so he feels no need to buy one.
7. Computers	Yes	Very few: More than $\frac{3}{4}$ of the audience know how to use a computer. Two among them have never used a computer.

III.2.3.1.2. Bugesera Community's Development Needs: Individual Perspectives

Workshop participants identified the following as the areas of development needs:

Categories	Needs	Observations
Infrastructure	Electricity	The region has electricity but most of the area has no access to it. Frequent power cut offs, there no biogas .
	Water	Area without water supply, taps without water, but there are water supply programmes.
	Tarmac roads	One is being constructed
Agriculture	Solution to the drought	Long dry season that hinders activities related to agriculture and animal husbandry.
	Solution to infertile soil	
	Modern agric. methods	The population still using traditional methods
	Crop conservation methods	
Education	Illiteracy	$\frac{3}{4}$ of the population is illiterate.
	Nursery, primary, secondary schools and	Insufficient nursery, primary and secondary schools, no Universities and libraries

	secondary schools and universities	Universities and libraries.
Demography	Job	A large number of unemployed persons (educated and non-educated persons)
	Solve problems related to overpopulation	The population is encouraged to adopt family planning principles.
	Economical inequality	
Governance ³	Decentralized services.	Some services that are not yet decentralized: Information, notification, etc.
	Modern habitat	The population resists to change (as an example, request to abandon traditional habitat and adopt modernity receives high resistance) and policy ownership by the population is not straight forward at the beginning).
	Business always open	A lot of meetings by local leaders keep businesses closed for a long time
	Knowing the judicial reform	Judicial reform which is not yet understood.
Health	Good health services	Health services are insufficient: the hospital and health centres do not treat all kinds of diseases.
	Adhere to health insurance	Some people are unable to fund insurance fees
	Health materials	Lack of materials
	At least one health centre in each sector	The population must travel a long way to the hospital
	Ambulance services.	Too few ambulances for the transport of the sick.
Cooperatives	Market for their products	Lack of market
	Storage for their crops	Problem related to stocking the crops
Telecoms	Cheap telecoms prices	Telecommunication services are very expensive in comparison to the capacity to pay of the population

III.2.3.1.3. Use of ICT in emergency situations

In addition to the traditional practices of working in solidarity and helping one another when there is an emergency situation, Bugesera population is gradually learning to

³ After enumerating several services that are expected from the leaders, such as information on security, credentials, habitat planning, among others, the audience stated that with the decentralized institutions service delivery is improving.

use ICT to solve unexpected situations. Some of their reactions when such a case occurs are:

- Call using a telephone;
- Send an announcement to radio communication;
- Using an Internet by sending an e-mail.

III.2.3.1.4. Specific group perspectives

The workshop participants formed four groups to identify each of the following:

- health development needs;
- community's development needs;
- education development needs; and
- Business development needs.

Each group was assigned an hour-long task to answer the following questions:

1. How does this group understand ICT-assisted development?
2. Are ICTs important to your development needs?
3. What role(s) can the group play towards the existence of ICTs to meet these needs?
4. What support would be needed to meet your group's development needs?

The overall needs assessment including findings on specific group perspectives is available on the following web site (www.propoor-ict.net)

III.3.2. An integrated ICT-Enabled Community Empowerment Approach

III.3.2.1. The Community Driven Networking Model

The ongoing decentralization process in Rwanda in general and Nyamata in particular is an important asset to take into consideration towards the realization of a community driven network. In its fundamental essence, the decentralization overall policy calls for individuals and communities to play key roles in the governance of their administrative areas through participation in the decision making as well as supporting social and development activities aiming at alleviate poverty in the respective livelihoods.

Around the Nyamata area, a number of organizations such as NGOs, cooperatives, small business incubations and all kind of associations are already operating to address specific issues. Information and Communication Technologies are seeing as the missing link to support communication and information sharing within and without the area.

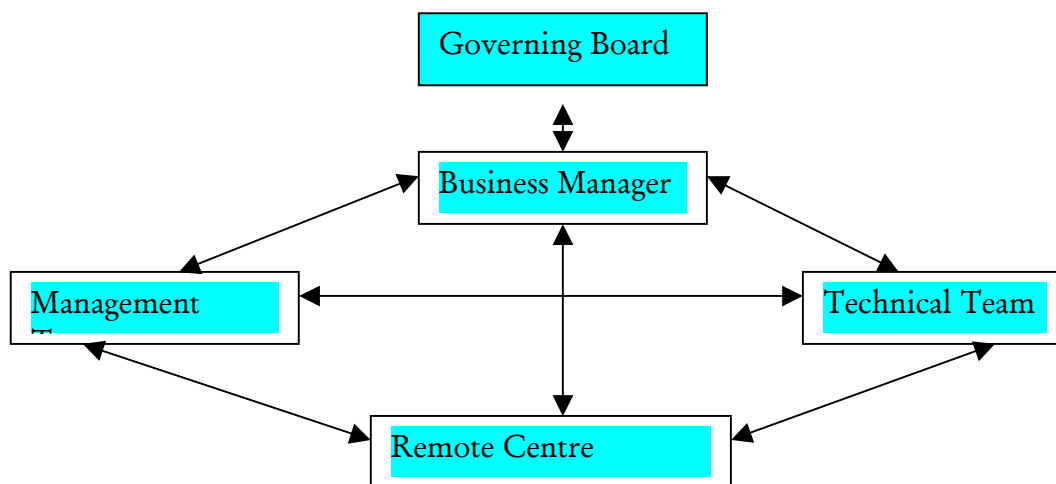
The more realistic CDN model has to take into account the local context and make sure that the targeted groups and individuals are equally represented in this important undertaking.

The organization chart below results from discussions and inputs from different stakeholder:

The Network governance Model will be as follows:

- Governing Board made up by community representatives
- Management Team headed by appointed Business Manager with targeted goals
- Small technical team to support both the Hub center and remote access points.

Figure 2: Governance Modal of the Network



III.3.2.2. Benefits of the Community Driven Model Versus Purely Private Sector Model

Community participation in the management of the facility has three major goals:

- ⇒ Ensure access and affordability of services within the network and from the network to other locations;
- ⇒ Ensure participatory mechanism in the decision making process for ownership and sustainability purposes;
- ⇒ Advocate for the CDNs role in supporting social and economic activities thus poverty alleviation;

The above goals can not be achieved if the network is purely private owned. In the essence, the private sector always look for profit no matter how many people access the network or how the network impacts the living condition of the community.

III.3.3. Community Driven Network Model in Detail

III.3.3.1. The Roles of Various Local Actors

As stated in the section 3.2.1. the major groups to support and manage the CDNs are the ones that have already initiated some models of collaboration in the area. Obviously the local government has a key role in terms of facilitating initial discussions within the community for the establishment of the CDN and providing initial logistic supports such as housing facility. Its role will also be to advocate for support to the central government and other development partners as the CDN has to be seen as a local initiative owned by the community. Other groups from different organizations will participate based on their respective expertise. For example, the business community will be useful in helping the CDN in the financial management aspects of the CDN as well as accessibility to small loans for individuals to acquire phones and other devices needed to access and enjoy the network services. The education community may help to build capacity and awareness around potential users within the community while the health group and other associations promoting specific public interests may use this network facility and tools to reach out the community.

III.3.3.2. The Technology Level

The choice of technology is going to be a critical issue as it will definitely determine the sustainability of this whole undertaking over time. The critical question remains, how best can the CDN identify various technologies needed that respond to local conditions. To recall the CDN's primary goals is to reduce ICT access and usage gaps in the under-served areas that are characterized by high illiteracy rate, low level of income and shortage of basic ICT infrastructure such as power and connectivity.

Preliminary findings from the technical assessment suggest that voice services over Voice over Internet Protocol may be the first priority in the area. On top of this, the deployment of wireless local loop and the usage of traditional phone sets with VoIP adapters will help the increase penetration and lower the cost of usage. The usage of PCs based services and applications should be deployed in shared environment such as schools, health centers, public information centers to reduce the ownership cost and expand access.

Connectivity from the CDN to the main national backbone outside the network is a critical issue to consider as it will determine possible expansion of the CDN to other locations. Discussions are underway with the regulator and main public telecom operators to seek for subsidized prices of access to the backbone from the CDN and more importantly applying a cost-based asymmetrical termination charge between the CDN and to urban areas.

III.3.4. Needs of this Model and its Challenges:

III.3.4.1. Human Resource and Capacity

We envision a CDN as an enterprise in the form of a community based cooperative that provide ICT services but can also serve other types of services related to ICT so as to generate more income. The CDN as a cooperative will have some commonalities with number of other cooperatives especially in its governance but also will have

some unique specificities and targets that need to be taken into consideration while developing its business plan.

On the supply side, the CDN requires some level of business and managerial skills as well as technical skills that are likely not available in Nyamata area. Therefore, it is critical to identify ways of building a variety of expertise as stated above around the area to make sure that the CDN does not rely on people that are based outside the Nyamata area.

On the demand side, both the beneficiaries (access points) and End users need specific training to be fully prepared to effectively and efficiently utilize the proposed services. The key success factor is for the community and individual in particular to acquire information and knowledge and apply it the various sectors of intervention with the hope that it will help to address poverty issues.

III.3.4.2. Technology Needs

As mentioned above, technology is a critical component to achieve the CDN goals and objectives. A variety of technologies from the supply and demand sides will be needed to support the launch, development and expansion of the CDN. Critical factors to take into consideration while selecting suitable technologies include cost implications, capacity of usage, scalability and power consumption. The above factors have to be taken into consideration while designing the CDN technical setup.

III.3.4.3. Financial Needs

The potential for the CDN to attract startup funding is being discussed amongst the main stakeholders including the Rwanda Information Technology Authority (RITA), the Rwanda Utility Regulatory Agency (RURA) and few development donors that have specific interests in supporting rural transformation. The stakeholders have suggested further studies to be undertaken and come up with technical and business plans within an overall implementation proposal with options to set up more than one CDN depending on the availability of funds. Strong considerations should be taken to ensure that a governance model that is realistic in the local context and sustainability

measures that articulate possible phase out strategies to make it possible for CDNs to sustain with little financial external support.

III.3.4.4. Regulatory Needs

The undertaking of CDNs implementation within the country requires a number of regulatory measures to support a smooth establishment and expansion of CDN based Enterprises around the country. The important ones include:

- ⇒ Promote small scale ICT Enterprises in remote areas through incentives such as no-fee licensing as well as financial support as startup investment;
- ⇒ Applying cost based asymmetrical termination charges between CDN and major national operators;
- ⇒ Enabling wireless regulations;
- ⇒ Stimulating backhaul development to rural area with public-private funding;
- ⇒ Enforcement of shared infrastructure regulatory Policy to allow small players in the rural areas to access network backbone at cost based price.

Due to number of advocacies and showcases including the CDN studies and presentations, the government of Rwanda through the Ministry of Communication has initiated consultation around the region that will help to move from vertical to horizontal licensing scheme. The government has also adopted the open access concept especially in the network infrastructure sharing. The concept still needs to be translated into policy before its implementation.

Following the workshop on CDN conducted in April this year with the support from the regulator, the later is committed to support the development of small scale ICT enterprises in the rural area as well as considering funding support through Universal Access Fund once the CDN implementation plan is ready.

IV. Community Owned Network – Next Steps

IV.1. Overview

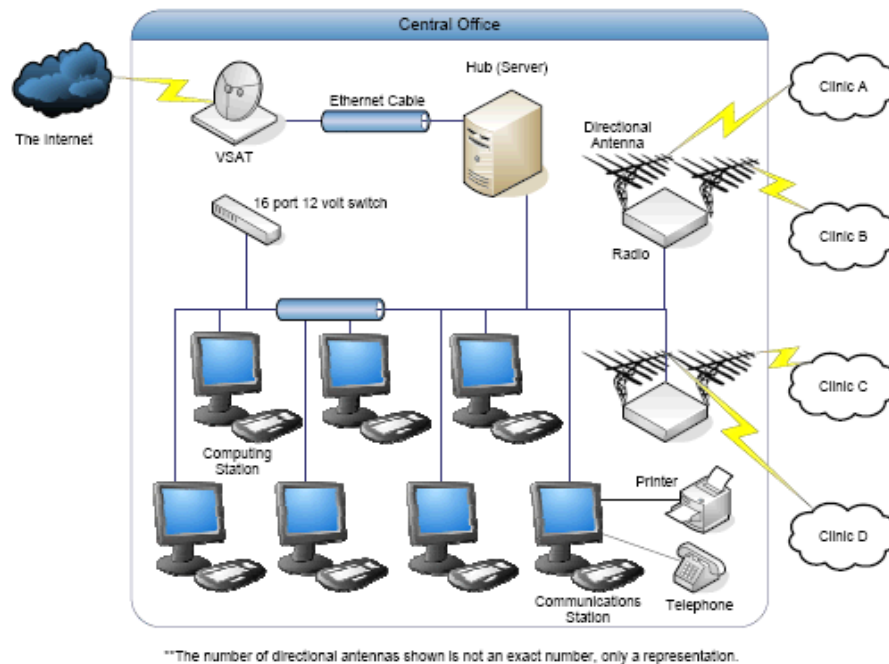
The whole process of this research, from the study to advocacy for community owned networks, has revealed a number of policy and regulatory challenges that must be addressed in order to fulfill the minimum requirement for the establishment of the Community Owned Networks. There is an increasing demand for ICT services in remote areas, evident from different organizations that attended our workshops and meetings, as they believe that this is the only way for poor communities to access telecommunications services, including both telephony and internet. The momentum is also critical as we see the development of new technologies, particularly in low-cost wireless as well as computers with low power consumption at relatively cheap price. All these are making the Community Owned Networks approach very attractive. The approach is especially appealing in the context of poverty reduction strategies because, unlike more conventional network development efforts, it puts control and voice into the hands of the beneficiaries. Local people will decide on charges for using the facilities, will receive the income from selling services, will share among the community those resources and will be able to upload their own original content.

Meanwhile, the establishment of the Community Driven Network calls for partnership between public and private on the supply side and the community at the demand side as each of the partners has a specific role to play and responsibilities to take for the success of this important undertaking.

IV.2. Illustration of a Community Owned Network Technical Setup – Inveneo Technical Proposal

IV.2.1. Typical Network Installation – Central Office Location

Figure 3: Typical Network



The Hub Station “Hub (Server)” located at the Central Location provides the following functions for the network:

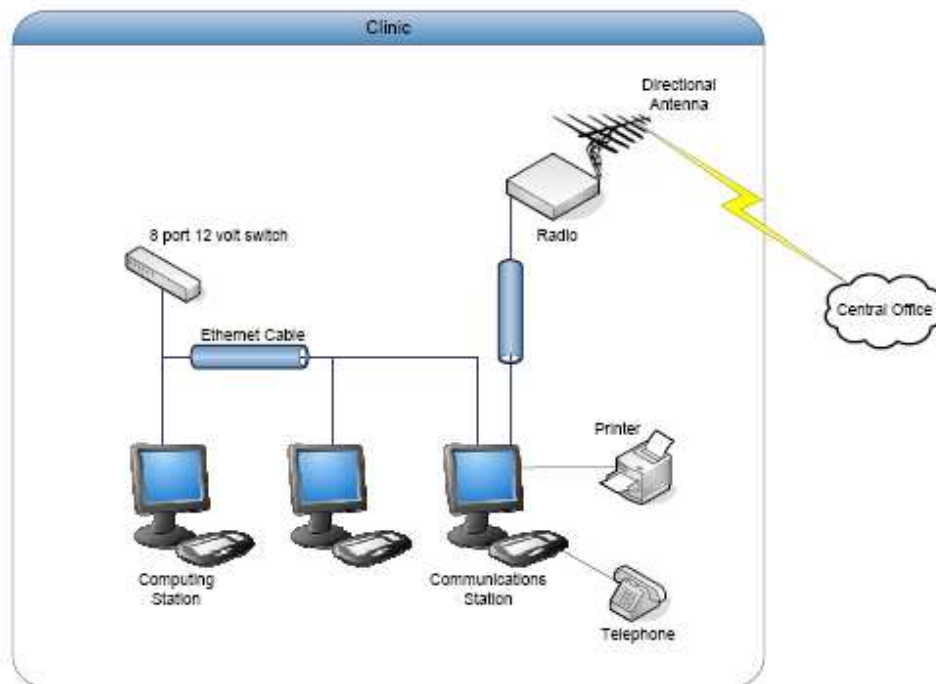
- It acts as the gateway to Internet and PSTN services (note: PSTN connectivity not noted in diagram).
- It houses software Central Location based PBX, known as an IP-PBX, which acts as the call manager for the Central Location and the Village Office Locations. It is the same type of system, which operates in many enterprises and provides extensions, call routing, etc among the offices over the Local Area broadband Network (LAN). The technology used for this inter-office connectivity is VoIP. If there is a call placed beyond the LAN, as noted above, the call reverts to a standard PSTN type call and is routed to a local PSTN network.
- It acts as a firewall, content management system and file server.

Any of these entire networks can be solar-powered with a battery back-up system.

IV.2.2. Typical Network Installation – Village Office Location

The following equipment is typical for a Village Office Location (VL) here noted as a clinic. The number of computers and antennae required varies for each project.

Figure 4: Typical Network Installation



Each Village Office Location is connected to the Central Location via long distance WiFi Local Area Broadband Network. This enables them:

- Access to a 11 Mbit/s broadband network among the other HFs and the CO.
- Connectivity to the Internet via the Central Location connection to the Internet
- Telephony (VoIP) between the CL and the other VLs
- Access to domestic and International calling via the Central Location connection to the PSTN.

Also, multiple locations can be connected in a village area using a slightly different wireless (WiFi) technology that is designed for shorter distances. Those locations may include just a single wireless phone using VoIP technology.

Any of these entire networks can be solar-powered with a battery back-up system.

The full Inveneo technical and cost proposal is available on the following web site:
www.propoor-ict.net

IV.3. Pre implementation Phase for a Pilot in Nyamata – Major Milestones

The Community Owned Network model is a new concept in the region and therefore requires piloting to make sure that key lessons and experiences can be drawn before expanding to other locations. A pre implementation phase is critical to allow completion of technical studies and assessment before the launch of the pilot. The activities to undertake include the following:

- ⇒ A Market assessment that includes services and Income and Business plan that is inclusive of the local community in Nyamata town to make sure that the representatives of the community owned the process;
- ⇒ A technical study that brings up connectivity options in the area as well as gateway options to connect to the national backbone as well as costing/pricing;
- ⇒ A technical study on power supply either from public grid or solar energy depending on the location. The costing of both over time should also be integrated in the business plan for sustainability purposes;
- ⇒ Awareness and advocacy activity within the community and at the national level through public media, workshop and individual meetings targeting decision makers from public and private sectors.

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