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A review of telecommunications
policy development and challenges in Rwanda[1]

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Preface

The landing of undersea telecommunications cables on the east coast of Africa in 2009 – starting with Seacom and The East African Marine System (TEAMS) and to be followed in 2010 by the Eastern Africa Submarine Cable System (EASSy) – creates an important opportunity for the countries of East Africa to develop affordable broadband access to the internet for all.[2] A 2009 World Bank report has analysed the impact of broadband on growth in 120 countries from 1980 to 2006, showing that each 10 percentage points of broadband penetration results in a 1.21% increase in per capita GDP growth in developed countries, and a 1.38% increase in developing countries. Investing in broadband is an investment in economic growth and development.[3]

However, this opportunity takes place against a backdrop of the implementation of telecommunications reform policy over the last fifteen years that has shaped the environment into which the new bandwidth will arrive. It is important to understand this history and some of the problems that occurred in the implementation of telecom reform policy so as not to repeat them in the era of broadband internet access. This is the approach of the CICEWA project, with its emphasis on "communications for influence", linking advocacy, dissemination and research by building information and communications technology for development (ICTD) networks in Central, East and West Africa.

The project's overall objectives are:

- To conduct research that will identify obstacles to universal affordable access to broadband ICT infrastructure in a number of countries and sub-regions in East, Central and West Africa.
- To develop two sub-regional ICT policy advocacy networks that will disseminate research and undertake advocacy on ICTD and access to infrastructure at the sub-regional level.

CICEWA coordinated research in Kenya, Rwanda and Uganda. In each case the research sought to investigate the history of communications policy and pointed to a number of problems arising in the way in which policy had developed, been implemented and was currently impacting on the goal of universal affordable broadband at the level of content and infrastructure. The researchers emphasised different dimensions of the policy outcomes, and took different approaches to their research task, given their fields of expertise and interest. As a result, the reports are different in structure and methodology – however, they all provoke the question central to the CICEWA project: What learning lessons does the policy narrative of a country hold for today?

With the arrival of high-speed cables, East Africa is moving towards a single market in communications. This will require greater policy and regulatory harmonisation at the national and regional level and a willingness to create forums to debate the best way of doing this. We hope that the research will contribute to this process by highlighting some of the problems that have arisen that will impact on the new converged broadband environment in a single East African community.

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[2] www.seacom.mu/intro.html, en.wikipedia.org/wiki/TEAMS_(cable_system), www.eassy.org

[3] The World Bank Information and Communications for Development 2009: Extending Reach and Increasing Impact (Washington D.C.: The World Bank, 2009) go.worldbank.org/NATLOH7HV0

1. Introduction

The period after the 1994 genocide marked a moment of fundamental change in Rwandan communications. The government embarked on a policy that aimed to increase connectivity as a spur to development. This meant that the sole state-owned telecommunication company at the time, Rwandatel, would be treated differently by setting up an independent regulatory body known as the Rwanda Utilities Regulatory Agency (RURA), and altering the ICT market structure. Telecommunications reforms were aimed at increasing the competitiveness of the telecommunications industry and attracting foreign investment.

Rwanda is amongst the few African countries that developed an integrated ICT policy in the late 1990s with a clear vision of making ICTs a critical part of its socio-economic development plan. The hope was that the country would move from an agricultural-based economy to a knowledge-based economy through the development of competitive service-based industries. To reach this end, Rwanda sought to dominate what at the time seemed a niche market in the region by becoming a telecommunications hub in partnership with the private sector.[4] However, despite a high level of political will to take ICT development forward as a priority, the country faces a major challenge in that it lacks a skilled workforce.

Rwanda is a densely populated and landlocked country in East Africa, lying south of the equator and covering 26,338 square kilometres. It was admitted to the East African Community (EAC) in 2006. In 2008, its population was estimated at 9,139,919,[5] with 60% living below the poverty line. Rwanda's economy is largely based on agriculture, accounting for about 43% of GDP; the input of industry and services is 19% and 38% respectively. Its main export products are tea and coffee. GDP per capita is USD 230.

The country is trying to find a path that will set it on course to achieving the objectives laid out in its national strategic planning documents, known as Vision 2020, adopted by the government in 2002.[6] The strategy aims to rebuild the social, political and economic fabric of the country, fight poverty, address the challenges of diversifying Rwanda's economic base, and create a highly skilled and productive workforce by 2020.

With 85% of Rwandans living in rural areas, the rapid development of the rural economy will, among other things, depend on access to adequate telecommunication services. The country believes that the efficient development of telecommunications infrastructure can contribute significantly to balanced regional development, and address rural-urban imbalances in terms of living conditions and access to education, health and other social services. By offering a number of opportunities for the rural population, ICTs can contribute to the fight against poverty. More generally, better telecommunications can improve the ability of the community to participate in the political life of the country.

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[4] Republic of Rwanda Rwanda Vision 2020 (Kigali: MINECOFIN, 2000)

[5] National Electoral Commission Final Voter List Statistics (Kigali: CNE, 2008) www.comelena.gov.rw/fr/index.php?&Effectif

[6] Glen Farrell ICT in Education in Rwanda (Kigali: infoDev, 2007) infodev.org/en/Publication.423.html

The country's ICT sector itself is embryonic and still accounts for a relatively small share of the economy's output. Many of Rwanda's rural areas and small towns lack affordable and reliable access to ICTs, including telephones, internet, fax and computers.[7] However, the ICT sector, together with others such as construction, is growing rapidly. Currently it is largely import oriented, which provides abundant opportunities for import substitution through local assembly, creates a market for a wide range of components and accessories, and offers new business opportunities such as partnerships with global vendors..[8]

The key public institutions in the telecommunications sector in Rwanda are the Ministry of Science, Technology and Scientific Research; the Rwanda Information Technology Authority (RITA), a government body set up to implement the country's National ICT Policy; and RURA, the regulator. As a multi-sector regulator, RURA is also responsible for the regulation of energy, transport, communications, water and waste management utilities.

Rwanda is a member of the Common Market for Eastern and Southern Africa (COMESA). It benefits from membership in the Association of Regulators of Information and Communication for Eastern and Southern Africa (ARICEA) and from the COMESA ICT policy that was developed to serve as a policy model for the harmonious development and application of ICTs across member states. The policy framework focuses on providing affordable, ubiquitous and high-quality services, building a competitive regional ICT sector, and creating an enabling environment for sustainable ICT diffusion and development.

This report examines the implementation of telecommunication reforms in Rwanda, with particular attention paid to broadband issues.

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[7] U.S. Agency for International Development Rwanda - Information and Communication Technologies for Elections and Community Access (Kigali: USAID, 2007)

[8] "Rwanda's Economy: Rwanda's ICT sector provides a knowledge-based economy" Monitor Online 19 September 2005 www.monitor.co.ug/artman/publish/special_rwandas-economy/Rwanda_s_ICT_sector_provides_a_knowledge-based_economy_46086.shtml

2. Historical overview of policy development

As is the case for many other sectors, the timeline for telecommunications policy development in Rwanda can be divided into two major periods: the periods before and after 1994. The first period is characterised by a centralised and government-based telecommunications sector, where the Ministry of Telecommunication plays the role of both service provider and regulator until 1993.

2.1. Telecommunications sector before 1994[9]

According to Kabayiza's (1999) excellent historical overview of teleco mmunications in Rwanda:

1930: The telegraph is introduced in Rwanda. The first wireless telegraphy station (TSF) is established to link Kigali and Bujumbura.

Between 1956 and 1962: Rwanda and Burundi set up their own provincial administration, and the first local telephone networks, served by small manual telephone exchanges, were established. In Rwanda, these stations were set up in Gisenyi, Butare and Kigali. First successful attempt to forward telephone messages directly to Europe without routing them through Belgian Congo, via a connection between Bujumbura and Kinshasa. In 1959, an aerial line between Kigali and Butare was installed.

The period after Rwandan independence in 1962: The country's telecommunications system operated within the Common Telecommunications Agency of Burundi and Rwanda (ATCBR). Telegraph, telephone and telex services opened between Kigali and Brussels in 1963. The same year saw the installation of an international telex network and a manual telephone switchboard centre with 75 numbers in Kigali, and the country began serving its first manual table telex customers.

Further expansion and changes in Rwanda's telecommunications network went on in the late 1970s and early 1980s. As an illustration, the switchboard centre at Kigali was extended from 2,000 to 3,000 customers in 1977, and in 1979, the extension was increased from 3,000 to 5,000 customers. In 1979, according to the African Internet Service Providers Association (AfrISPA),[10] the installation of an automated telex centre and the inauguration of the Ecole Nationale Mixte des Postes et Telecommunications in Kigali took place. In 1980, fourteen linkages for a rural telecommunications network were established, and in November of the following year a high-frequency connection between Kigali and Ruhengeri was replaced.

In March 1982, the first Intelsat tests on the Nyanza-Kicukiro Terrestrial Station were performed. In the late 1980s, a new TSF station was opened at Karengeri, and a new automated switchboard at Kigali was established.

In the early 1990s, Rwanda's domestic telecommunications network consisted of twenty-six telegraph stations, twelve automated telephone switchboard centres, and the telex centre at Kigali

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[9] This historical background is taken directly from Alphonse Kabayiza "Rwanda" in Telecommunication in Africa ed. Eli M. Noam (New York: Oxford University Press, 1999), 130-135

[10] African Internet Service Providers Association African Regulatory Index Reports: Rwanda Report (Region One) Third draft (AfrISPA, 2005) www.ttcg.net/TecConsult/reports/AfrISPA/RW_Third%20Draft%20Version%20vers%206.1.pdf

for connections between Rwanda and the rest of the world via telex, telegraph and telephone. Two earth stations for satellite communications, one Intelsat and one Symphonie, both located in Kigali, had been commissioned.

The use of computers in the telecommunication sector was weak in Rwanda before 1994. According to the United Nations Economic Commission for Africa (UNECA), the first computer arrived in Rwanda in 1978, and was used for the country's first population census. Very few attempts towards the general use of computers in public offices were recorded around 1985. In 1990, the Ministry of Planning adopted a systematic approach to IT development. These efforts resulted in the formulation of both a National IT Policy in 1992 and a Government Master Plan on Information Technology in 1993.

Because of the tragic events in 1994, the implementation of the above plan and policy was not possible until 1998, the year during which new technological developments had made the 1992 policy and plan obsolete. This was due to the fact that the integration of computer and telecommunications technologies was not a major concern in 1992.[11]

2.1.2. The Post Office's role in telecommunications services

The Poste, Téléphone et Telecommunications (PTT) played a crucial role in the development of telecommunication in Rwanda. The PTT in its early incarnation was introduced in Rwanda by the Belgian colonial administration.[12] The inauguration of its first bureau was held on 18 September 1922 in Kigali. Since then, Rwandan postal administration was linked with both the Burundian and the Belgian Congo postal administrations in one single organisation whose headquarters was established in Leopoldville, the capital of the Belgian colonial administration of Congo and Ruanda-Urundi. This organisation was a government institution in charge of managing postal and telecommunications services, under the Ministry of Transportation.

On 26 October 1961, a postal administration was created for Rwanda and Burundi, shortly after the Belgian Congo became independent. This administration was dissolved by the 1962 Brussels Protocol and was replaced by the Rwandan national posts corporation as a single postal administration on 1 April 1962. The administration was first ranked as "Postal Directorate", but considering the scale of the services provided, was upgraded to "General Postal Administration", linked to the Ministry of Transport, Posts and Telecommunications, on 18 December 1972.

This was to remain the case until the government of Rwanda decided to give more autonomy to the postal and telecommunication sectors, by creating two organisations to provide these services.

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[11] United Nations Economic Commission for Africa National Workshop on Information and Communications Technologies, Policy and Strategy for Rwanda, Overall Report (Draft) (Kigali: UNECA, 1998) www.uneca.org/aisi/NICI/country_profiles/rwanda/Rwanpap1.htm

[12] IPOSITA-Rwanda Historical Overview accessed 29 December 2008 i-posita.rw/eng/content/view/31/129/lang,en_EN/

2.2. Pressure for change

Rwandatel was founded on 3 January 1993, the sole fixed-line telephony operator in Rwanda offering voice, data and internet services. In 1995, it became Rwandatel SA[13] when the PTT was separated into a post and telephone unit. One year later, the company already had 12,000 subscribers, and turnover of USD 6 million.[14]

Before the creation of RURA, the regulator, there was no effective regulation of the telecommunications sector in Rwanda. Rwandatel was, in fact, given multiple roles: it had to act as a policy maker, regulator and operator. This resulted in inefficient use of scarce resources like frequencies. Traditionally, regulatory frameworks were designed for an era when clear functional differences existed between services and infrastructure, but these regulations are increasingly inadequate for dealing with today's world.

Compared to other African telecommunications service providers, Rwandatel's market penetration has been exceptionally low, with only 0.27 fixed lines installed per 100 people in 2005. This was among the lowest in Africa. The waiting list for a fixed-line connection was the highest in Africa when measured as a proportion of fixed lines installed, while as a percentage of population it was the highest in Africa with the exception of Kenya. In such a situation, privatisation was an urgent need.

The fact that Rwandatel controlled the telecommunications market meant that it did not have to worry about quality of service, or even the competence of its technicians. Since there was no good competition law, there was very little chance of establishing a competitive market, which would promote advancement in any sector.

By the time of privatisation, Rwandatel was an underperforming fixed-line operator that failed to provide adequate access to telecommunications services, with a high level of demand amongst underserved parts of the country reflected in an unusually high level of mobile penetration – mostly provided by MTN Rwandacell, which was launched in 1998, and, until recently, was the only mobile service provider in the country.

2.3. Privatisation programme

Rwanda's privatisation programme was established by Law No. 2 on Privatization and Public Investment, dated 11 March 1996, with the presidential decree putting the necessary institutions in place issued in May 1996. The process draws on the experience of a number of African countries, and relied on the private sector as the engine of growth.

 The broad objectives of privatisation were:

- Relieving the financial and administrative burden on the government
- Improving the efficiency and productivity of the privatised enterprises and thereby augmenting the sources of government revenue

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[13] For convenience, simply called Rwandatel in this report

[14] Rwanda Privatization Secretariat "Rwandatel: Can private investor do better?" Rwanda Privatization: Magazine of the Privatization Secretariat 19 (2004): 4

- Reducing the size of the public sector in the economy
- Broadening the ownership base of Rwandan enterprises.

The institutional framework for privatisation included:
- The Cabinet, which has final authority over the sale of public enterprises
- The National Privatisation Commission, which has the general management responsibility for privatisation
- The Privatisation Technical Committee, which is responsible for recommending the terms and conditions of individual sales and negotiating with the bidders
- The Privatization Secretariat, which became operational in 1997, and actually implements the privatisation process.[15]

It took some time, however, before a privatisation strategy was put in place for Rwandatel.

2.4. National Information and Communications Infrastructure (NICI) Plans

Rwanda has embraced ICT as part of its development strategy. The goal is to transform an economy that predominantly relies on agriculture into one that relies on information and knowledge. As a result, ICT has been placed at the centre of the country's development strategy. The primary vision has been made operational through a national policy document widely known as the National Information Communication Infrastructure (NICI) Plan. The first of these plans, NICI I (2001-2005), has since expired, and Rwanda is currently implementing NICI II (2006-2010). Another key policy instrument is the National Policy on Science, which strives to support the adoption of science, technology, innovation and ICT.

The NICI Plans are made up by programmes and projects to incorporate ICT at every level and in every sector of society based on the following ten pillars: Education, Human Capacity Development, Infrastructure Equipment and Content, Economic Development, Social Development, E-Government and E-Governance, Private Sector Development, Rural and Community Access, Legal, Regulatory and Institutional Provisions and Standards, and National Security.

As part of the NICI II Plan, a national fibre backbone representing 2,300 kilometres of distance is being implemented around the country and will definitely impact the development and affordability of broadband to the general population. The fibre optic project is expected to be completed towards the first quarter of 2010.

2.5. Telecommunications market liberalisation

The enabling framework for the liberalisation of the telecommunications sector was put in place by the current Telecommunications Law, passed by the Transitional National Assembly in 2001 (Law No. 44/2001 and Law No. 39/2001).

The Telecommunications Law established RURA, the regulator, granting it the authority to regulate telecommunications and setting up a regulatory board to carry out that function. It requires all operators of telecommunications services to be licensed, and created individual licences and

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[15] Government of Rwanda, 2006

standard licences. Individual licences are ones that require competition in order to select the best offer based on technical and financial proposals from potential contenders. A good example of this is global system for mobile communications (GSM) licences. Rwanda currently has three GSM licences in force and the regulator is planning to issue a call for proposals for a fourth licence towards next year. The standard licences are the ones that do not require competition, such as internet service provider (ISP) licences.

The logic of the telecom reform policy in Rwanda was to restructure the telecom sector so as to break the monopoly of Rwandatel, open the telecom market to new entrants, introduce regulatory agencies to enforce fair competition between network operators and service providers, and regulate prices where competition was limited. The overall aim of the telecom reform policy was to increase universal affordable access to telecommunications in the interests of social and economic development.

A privatisation strategy for Rwandatel was adopted on 25 June 2003, in which the government committed to sell all of its shares in the operator. Rwandatel was formally privatised in June 2005, with the bid going to Terracom, a US-based IT and communications provider.[16] It was licensed to provide mobile services in addition to fixed and internet services.

However, the company has passed through several changes of ownership since that time. Under Terracom, Rwandatel[17] launched evolution-data optimised (EVDO) and asymmetric digital subscriber line (ADSL) services in February 2006, starting in Kigali, but soon after that expanding to the provinces. Code division multiple access (CDMA) mobile services were also launched. In August 2007, the government took back ownership of the company when Terracom failed to honour its agreements.[18]

The operator was then re-privatised and sold to LAP Green on 23 October 2007. LAP Green is a subsidiary of the Libyan government-owned investment vehicle Libyan African Investment Portfolio (LAP). It owns 80% of Rwandatel, while Rwanda Social Security Funds (CSR) owns the remaining 20%.

In order to promote competition in the telecommunications sector, Rwandatel sold its 28% stake in MTN Rwandacell in 2004. As the main cellular provider, MTN Rwandacell currently has coverage in all of the provinces in Rwanda, covering about 75% to 90% of the country. The operator mainly supplies mobile services, but is now offering internet services via its general packet radio service (GPRS) cell phone network. The operator has also started to roll out wireless broadband data services using WiMax, and, with its new fixed-line licence, has started offering fixed-line services. On MTN Rwandacell's tenth anniversary in 2008, the company introduced Blackberry services.

There have been few changes in the market following the privatisation of Rwandatel. Today Rwandatel is a backbone ISP with over 500 kilometres of fibre at its disposal and more than 300 points of presence in the country. However, fixed penetration continues to decline, despite the

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[16]Terracom had been operating in Rwanda as a small ISP

[17]Known as Rwandatel/Terracom

[18]Rwanda Utilities Regulatory Agency Decision n° 02/2007 of 14th June 2007 on penalties taken to the company TERRACOM S.A.R.L for failure to its obligations (Kigali: RURA, 2007) www.rura.gov.rw/board_decision/Decision2rTERRACOM.pdf

introduction of wireless phones, known as Easy Call, by the operator (under Terracom). MTN Rwandacell still enjoys its monopoly status, with relatively little increase in overall mobile penetration.

A third mobile licence was issued in December 2008 to international operator Millicom/Tigo, and the company was expected to launch its services in 2009.

Table 1 summarises the milestones that occurred from 1994 to date, as well as some ongoing and planned projects from 2007 to 2009, based on interviews with policy makers as well as the managers of major telecoms companies.

Table 1: Major milestones in the ICT sector in Rwanda

	1994-1997	1998–2000	2001-2006	2007-2009
Legislation			Law No. 39/2001 of 13/09/2001 creating the Rwanda Utilities Regulatory Agency (RURA) Law No. 44/2001 of 30/11/2001 establishing the Telecommunications Law (The law grants the government the authority to regulate telecommunications and set up a regulatory board to carry out that function) Law No. 32/2002 of 02/10/2002 creating the Rwanda Information and Technology Authority (RITA)	Review of the Telecommunications Law of 2001 Consumer Rights Law specifically for ICT services
Policy and plans	No stated policy as such; Rwandatel as the only telecom operator; efforts to recover telecom infrastructure and replace damaged equipment	ICT 2020 Vision An integrated ICT-led socio-economic development policy and NICI I Plan for Rwanda	Review of the NICI Plan I Drafting of NICI Plan II Economic Development Poverty Reduction Strategic Programme (EDPRSP)	Drafting of guidelines for broadband development Implementation of the NICI II Plan with focus on national backbone roll-out and ICT applications and services
Regulation	The Ministry of Transport and Communications and Rwandatel take up the role of regulation	The Ministry of Transport and Communications and Rwandatel take up the role of regulator	Establishment of RURA (multi-sector regulator) as an independent body Privatisation of Rwandatel (known as Rwandatel/Terracom)	Re-privatisation of Rwandatel: LAP Green awarded full licence that covers fixed, mobile and internet services Issuance of a third mobile licence to Millicom/Tigo
Market structure	Monopoly	Entrance of the first mobile operator Rwandatel introduces internet	Entrance of three internet service providers (Terracom, ISPA, Artel)	New national backbone and carriers to come on board:

		services Public monopoly on fixed services Private monopoly on mobile services	Establishment of Artel communications as a telephony over VSAT provider MTN Rwandacell awarded fixed and internet licences	Artel to become a full ISP Electrogaz (power company) to establish a utility to manage the fibre backbone MTN Rwandacell to become a data carrier using its fibre backbone as well as WiMax
Number of players	One player: Rwandatel	Two major players: Rwandatel and MTN Rwandacell	Four major players: Rwandatel, Terracom, MTN Rwandacell and Artel Terracom and Rwandatel merge operations to form one company; Terracom still operates separately in areas such as laying broadband	New entrants: Third mobile operator (Millicom/Tigo) Pay-TV provider Three new ISPs licensed
Services	Fixed telephony	Fixed, mobile and internet	Fixed, mobile and internet	New services: Pay-TV, value-added services (e.g. mobile applications)
Average subscribers	Fixed: 14,000	Fixed: 19,000 Mobile: 42,000 Internet: 1,200	Fixed: 21,687 Mobile: 304,000 Internet: 6,814	Fixed: 32,000 Mobile: 1,322,637 Internet: 120,000

Source: Desk research

3. Current status of telecommunications infrastructure and services

3.1. Services penetration

Rwanda has a relatively high level of mobile penetration. According to RURA,[19] mobile penetration increased from 7% in 2007 to 13.8% in December 2008; that is, a total national subscriber base of 1,322,637, with MTN Rwandacell securing 1,158,674 of these. The subscriber base of Rwandatel increased from 25,710 to 43,963 subscribers (CDMA), representing a 71% increase, with its new GSM subscriber base growing to 120,000 subscribers in December 2008. The number of mobile public pay phones increased from 9,023 (as of December 2007) to 9,467, representing a 5% increase. This means that Rwanda's overall combined teledensity – at 1.1 connections per 100 people – compares a little more favourably with the experience of other African countries, although overall teledensity remains extremely low by any measure.

Competition within the mobile market is anticipated to remain intense due to a number of factors, including Rwandatel's expansion plans and the newly licensed third national operator (Millicom/Tigo), which will launch at the end of 2009.

As for fixed telephony, Rwandatel's subscriber base decreased from 22,643 in 2007 to 16,770 in 2008, representing a 26% decrease. The subscriber base for all ISPs is estimated at 7,857, representing a 67% increase from 4,715 in 2007.

Table 2: Number of subscribers at the end of September 2008

Service	Licensed operators	Number of Subscribers
Fixed telephony	Rwandatel	16770
	MTN Rwandacell	82
Mobile telephony	MTN Rwandacell	1158674
	Rwandatel (CDMA)	43963
	Rwandatel (GSM)	120000
Internet service provision	Rwandatel	4187
	MTN Rwandacell	4021
	New Artel	151
	ISPA	67
	Altech Stream Rwanda	19
Pay-TV	GTV	617
	Star Africa Media	5105
	Tele 10	1543

Source: RURA Annual Report 2008

The increasingly important role of wireless telecommunications (both fixed and mobile) in providing voice telephony services in Rwanda calls into question whether it is any longer appropriate to draw

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[19]Rwanda Utilities Regulatory Agency Annual Report 2008 (Kigali: RURA, 2009)

a distinction between conventional fixed-network service provision and wireless service provision in framing policy and regulatory requirements. A more relevant distinction is probably whether the system that is in place supports the provision of voice services, data services, or both.

On the infrastructure level, some weaknesses can be identified. The existing microwave transmission network is based essentially on the layout that existed before the genocide. The same towers are used, but radio equipment has been replaced with modern units. Most high-speed multiplexed links in Rwandatel's network, for example, use digital microwave, because copper cabling and optical fibre installations require skills which are badly lacking.

3.2. New entrants

3.2.1. Artel Communications

A new private player, Artel Communications, provides fixed-telephony services over very small aperture terminal (VSAT) satellite in rural areas of Rwanda. Artel is not seen as a competitor to Rwandatel. Rather, it complements the incumbent by providing access to remote areas where lack of infrastructure is hindering telecommunications advances.

The operator has mainly been concerned with rural telephony through its satellite communications network. The company is now shifting to internet service provision targeting big consumers. Through government funding, Artel has acquired 80 megabytes per second (Mbps) capacity over satellite from Intersat, selling bandwidth to other ISPs and government institutions at a very competitive price, according to the minister of communications and energy.

Artel has also so far installed VSAT networks covering 90 districts throughout the country. Most of these are rural districts. The Rwandan Education and Research Network project is an initiative of higher learning institutions in Rwanda to create a consortium that can support access to better internet connectivity at an affordable cost for research and academic purposes. Currently the National University of Rwanda (NUR) in Butare, the Kigali Institute of Science and Technology (KIST) in Kigali, the Kigali Health Institute (KHI), the Kigali Institute of Education (KIE) and the School of Finance and Banking (SFB) are all connected to a satellite gateway called the New Artel Satellite Gateway through optical fibre. At the same time they are benefiting from universal access subsidies to reduce the cost of connectivity as part of the government's efforts to provide internet access to educational institutions that cannot afford to pay commercial rates.

One of the latest New Artel services is a digital video broadcasting-terrestrial (DVB-T) connection. This system transmits compressed digital audio, video and other data in an MPEG transport stream, using coded orthogonal frequency division multiplexing (COFDM) modulation. New Artel also established a virtual private network (VPN) that uses public telecommunication infrastructure, with a footprint covering three quarters of Africa. The connectivity from New Artel to database servers is provided via terrestrial fibre optic network or radio link. Artel also operates iDirect 5IF, an internet protocol-based hub that uses Intelsat.

3.2.2. Star Africa Media

Star Africa Media is a Chinese pay-TV service provider that in August 2008 introduced the first TV sets that receive digital signals. Their introduction, according to Star Africa chief executive officer Ken Xie, is in line with the government's vision to digitalise broadcast media by 2012, and the fulfilment of the agreement they had with the government to help digitalise the media. The company started its operations in Rwanda in June 2008, and has so far registered over 10,000 subscribers.

Star Africa Media was issued with a broadband ISP licence on 18 July 2008.[20]

3.2.3. Altech

Altech Stream Rwanda, one of Allied Technologies Limited's African subsidiaries, was granted a licence to deliver broadband internet services in Rwandan cities in 2007. This licence provides the rights to deliver comprehensive broadband services using both Wi-Fi and WiMax, as well as dedicated spectrum usage rights in the 2.5 Gigahertz (GHz), 3.5 GHz and 15 GHz bands. It also includes the rights for Altech Stream to install its own satellite earth station for direct connection to the internet.[21]

According to Craig Venter, CEO of Altech, the company was principally attracted to Rwanda due to its market potential, efficient government agencies and the central role it could play in Altech's strategy of penetrating the East African region.

The services offered in Rwanda by Altech include access to the internet, email services and value-added ISP services. The licence provides the network operator with the right to deliver commercial internet services, use specific channels of spectrum frequency, and operate its own international gateway to gain bulk access to the internet in the United Kingdom/Europe and the United States.

3.2.4. A-Link

A-Link Technologies, a digital and technology subsidiary of China Link in Beijing, started operations in May 2008, and is assembling five different kinds of Rwandan-branded mobile phones.

The relatively cheap mobile phones are assembled from imported materials. This has made Rwanda the first country in the East African region to set up a mobile phone handset assembly plant. A-Link Technologies was registered in July 2007 by Rwanda's Investment and Export Promotions Agency, with a tax exemption on all imported materials.

The company produces a phone brand called Alira. The phone is compatible with GSM technology, and uses replaceable SIM cards. This means it can be used by any communication network that uses GSM technology. A-Link mobile phones are also the first to be programmed in the local Kinyarwanda language.

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[20] Ibid.

[21] Craig Venter "Altech Granted Broadband Licence in Rwanda" Altech corporate news 25 June 2007 altech.dev2.amorphous.net/Y2k8/news_corporate_display.asp?sCompanyName=altech&

The company has a capacity to assemble about 600 mobile phones a day. The firm was to invest USD 2 million more by the end of 2008 and there are plans to establish a radio assembling plant as well.[22]

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[22] Craig Venter "Altech Granted Broadband Licence in Rwanda" Altech corporate news 25 June 2007 altech.dev2.amorphous.net/Y2k8/news_corporate_display.asp?sCompanyName=altech&

3.3. Summary of key players

Table 3: Status of the telecommunications sector as of 2008

Fixed lines	• Rwandatel has been the major telecom operator in Rwanda providing voice telephony and internet services. MTN Rwandacell has also been licensed to offer fixed-line services. • Artel was a "universal access" base company providing fixed-line telephony and internet service over satellite mainly in remote areas. The government is investing in Artel to make it a wholesale internet company servicing government institutions as well as other ISPs by offering bandwidth at a low price.
Mobile services	• MTN Rwandacell, established in 1998, is the main private mobile phone company and has recently surpassed one million subscribers. • Rwandatel has recently launched its new GSM mobile services. The CEO of Rwandatel recently announced that the company had registered 150,000 subscribers three weeks after its launch. • Millicom/Tigo is a newcomer in the mobile services arena and was expected to launch its services in 2009.
ISPs	• Rwandatel is the major ISP. Three other players are in business: MTN Rwandacell; New Artel, licensed to provide voice and internet particularly in underserved areas; and ISPA, a small ISP launched in 2005 with a focus on wireless connectivity for corporate customers.
Cybercafés and community centres	• 500 cyber cafés are estimated to be operational throughout the country, with 75% located in the capital Kigali. There is no licence required to operate a cybercafé. • Community Information Centres (CICs) are being deployed in remote areas and are supported by both the government and international organisations.
Call centre services	• MTN Rwandacell and Electrogaz, the power company, operate call centres for their own customers. In addition, Business Communication Service (BCS) has a call centre which is used to service Tuvugane and its own taxi business as internal clients. It is looking for other companies locally to develop a larger customer portfolio for the call centre.
VSAT	• 20 broadband VSATs are operational in Rwanda. The major owners are international organisations, ISPs and higher educational institutions. The licence fee is USD 5,525 per year plus 15% of the monthly satellite segment fee. • Around 400 narrowband VSATs have been deployed by Artel in the countryside.
Voice over internet protocol (VoIP)	• VoIP is not legal. The current licences allow MTN Rwandacell and Rwandatel to use and offer VoIP services as their licences are all-encompassing. However, the potential legalisation of VoIP by the regulator is still at the preliminary stage.

3.4. Socio-economic significance of telecommunications in Rwanda

3.4.1. Job creation versus investment

Telecommunications investment in the country has generated revenue as well as created jobs. Based on the data collected from MTN Rwandacell and Rwandatel, the level of investment in the telecommunications sector has been significant, especially in the expansion of the mobile backbone network, as well as the reinforcement of the base stations in main cities like Kigali. On the other hand, as Table 4 indicates, the companies are making a significant return on investment, despite power shortages that have negatively affected the telecommunication infrastructure around the country, especially between 2000-2006.

Table 4: Socio-economic performance of the telecommunications sector in Rwanda

Socio-economic Indicators	2003	2004	2005	2006
1. Total investment (Rwanda francs)	3,723,085,000	2,306,143,000	5,665,153,000	5,026,461,000
2. Annual revenue (francs)	15,663,469,000	20,056,201,000	18,812,518,000	33,144,313,000
3. Taxes (francs)	3,735,804,213	6,512,211,986	6,607,008,574	9,121,399,468
4. Direct job creation	428	481	545	352
5. Indirect job creation	N/A	N/A	N/A	5,820
6. Universal Access Fund contribution (francs)	N/A	171,774,695	166,202,866	295,344,085

Source: Desk research

3.4.2. Universal access

The main issue for operators today is the low level of service penetration, especially in semi-urban and rural areas. The mobile penetration rate was 13.8% in December 2008,[23] behind the average rate in the region, and countries like Uganda and Kenya. Kigali records a subscriber rate of 60%; however, it only accounts for about 10% of the population. So-called Tuvugane ("Let's Talk") public phones were used as a strategy to open up access in remote areas using mobile technology, but 90% of Tuvugane dealers operate in the major cities or semi-urban areas.

The government plans to decrease the average distance to a public phone from fifteen kilometres to two kilometres within the next five years as part of its contribution to universal access obligations. In addition, it has decided that all ICT equipment (including electrical equipment/generators and solar panels) will be exempted from import taxes.

New Artel is Rwanda's sole licensed satellite operator amongst the beneficiaries of the country's Universal Access Fund (UAF). It receives money from the UAF to provide telecom services in areas that MTN Rwandacell and Rwandatel do not cover. The main services that are provided by New Artel include internet and voice services. New Artel has so far connected more than 130 sites, and has mainly targeted decentralised public entities, hospitals and health centres, as well as schools across the country.

[23] RURA Annual Report 2008

3.5. Introduction of broadband

3.5.1. Regional context

East Africa has experienced tremendous growth in ICTs over the past ten years that has translated into relatively higher rates of economic growth and foreign investment. As nations work to create open and competitive ICT markets and to facilitate continued growth, many key issues remain for policy makers to address in their bid to expand broadband connectivity in the region. These include interconnection and cross-border pricing policies and ensuring competitive and non-discriminatory access. As connectivity grows, the cost of voice and internet services will drop, and have direct developmental benefits for students, small and mid-sized businesses, educational institutions and health care providers, as well as leading to enhanced government services becoming available.[24]

Besides COMESA, Rwanda's membership in the East African Community (EAC) is also important. EAC member states, including Rwanda, are encouraged to adopt new approaches that can enable interconnectivity between all operators and service providers within the region, promote universal service/access, encourage competition in the sector through the removal of barriers to entry, and establish an appropriate licensing regime that is transparent and conducive to investment in the sector. These official efforts towards developing harmonised policies and integrated markets have been pre-empted by commercial initiatives to remove roaming charges in the East African region and treat all calls in the region as local calls.

As part of its admittance to the EAC, Rwanda will be required to negotiate with members on key areas such as market access. One of the major ICT initiatives that is supported in the EAC is the EASSy submarine cable.

3.5.2. National context

Broadband connectivity is one of the priorities of the NICI II Plan, which serves as an ICT sector policy for Rwanda. The Rapid National Broadband Backbone Development Facilitation Initiative is an expression of this priority. This initiative aims to promote the rapid development of an advanced broadband communication backbone infrastructure for Rwanda through private investment.[25]

Broadband initiatives in Rwanda were initiated by Terracom. The company deployed a more than 140-kilometre broadband backbone fibre network including a Kigali ring and a national backbone link connecting Kigali, Gitarama and Butare. By the end of the NICI I Plan timeframe in 2005, the company had planned to roll out a national fibre backbone network totalling 256 kilometres.[26] Other telecom companies followed this move. The government has entered into a partnership with Korea Telecom to roll out wireless broadband services in Kigali using WiBro, a Korean version of WiMax.

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[24]US Embassy in Kigali "Press Release: U.S. Government and Government of Rwanda Open East Africa Broadband Connectivity Workshop" 8 May 2007 rwanda.usembassy.gov/may_8_2007.html

[25] Republic of Rwanda NICI II Plan (Kigali: RITA, 2006)

[26]Ibid.

Figure 1 shows the planned physical network design for the Rwandan backbone.

Figure 1: Backbone network design

Source: Rwanda Development Board/Information Technology (RDB/IT)

The cost of the EASSy cable is USD 300 million, with an additional investment of USD 300 million to connect fifteen inland countries. The Rwandan government has agreed to commit USD 10 million to the project. The volume of international bandwidth connected to Rwanda is expected to rise more than three times, and the price of connectivity to fall by over 50%.[27]

New Artel, supported by the government, is likely to be the main counterpart for EASSy, especially since the company's main focus is the development of network infrastructure and its deployment to government and non-government institutions on a wholesale basis and at affordable prices.

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[27]Rogers Kayihura Regional Communications Infrastructure Program to make broadband networks accessible and affordable (Washington: The World Bank, 2008) go.worldbank.org/VHI7K6ZW10

4. Review of current challenges in the telecommunications sector

4.1. Affordability

The cost of telecommunications is a factor that constrains growth. The private sector cluster joint sector review report 2008 shows that Rwanda still has low access levels for both internet and mobile services. Less than 2% of the population has access to the internet, while 5% has access to mobile phones. This compares badly to other countries in the region, particularly regarding mobile phone penetration in Kenya and Tanzania and internet penetration in Kenya and Uganda, as illustrated in Figure 2.[28]

Figure 2: Access to the internet and mobile telephony in the East African Community (EAC)
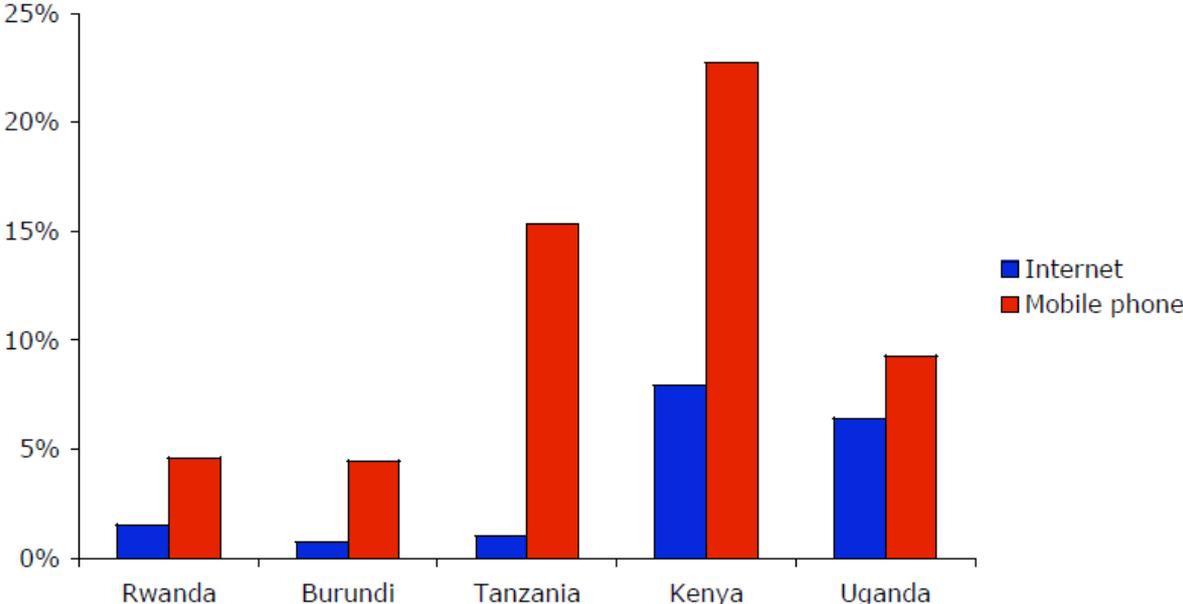
Source: Republic of Rwanda, March 2009

According to a ScanICT report,[29] service charges have undermined the benefit of internet services. The waiting time for connection and uploading/downloading documents is long, especially during peak hours. The main challenge for mobile communications is also the cost of usage.

The main beneficiaries of broadband services are the private sector, particularly banks and insurance companies that have established branches across the country. The public sector is still underserved due to the high cost of access, as well as the low level of usage.

Development partners are also among the major broadband customers as they have various sites around the country that need to share common data and/or applications using broadband

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[28]Republic of Rwanda Private sector cluster joint sector review report 2008 (Kigali: Ministry of Trade and Industry, 2009)

[29]Emmanuel Gatera ScanICT Baseline Survey Report: ICT Indicators - Measuring usage and penetration (Revised version) (Kigali: NISR, NUR, RITA, 2008)

technologies. The key challenges for broadband services to expand and attract more customers also include the high cost of access and the low level of ICT usage for business transactions.

4.2. Challenges related to the regulatory environment

While broadband is becoming popular, the main challenge remains the lack of a clear broadband policy in Rwanda that can guide its development. This is also necessary to provide regulatory guidelines for RURA to take appropriate measures to support broadband expansion within the country.

According to RURA's 2008 annual report, the infrastructure requirements for data networks (backbone and broadband access), including investment needs, have been under consideration. Operations and quality issues with both the access and core networks of licensed operators have led to regulatory challenges, coupled with issues faced with wireless networks and satellite broadband access. These have all been subjected to critical assessment by RURA in the course of 2008.

4.3. Interconnection

Interconnection regulation is essentially aimed at encouraging and promoting the orderly development of telecommunications networks in Rwanda by ensuring and maintaining any-to-any connectivity, and safeguarding against the abuse of market power in the provisioning of telecommunications services. In this regard, and with a view to promoting cooperation and fair competition between licensed operators, guidelines governing interconnection negotiation processes were established to prevent conflicting relations between operators. Moreover, according to RURA's annual report covering 2008, basic principles for standard interconnection offers are incorporated into individual licences to prevent disputes over interconnection charges.

However, considerable additional work is likely to be required by RURA before it is ready to decide on the specific issues raised in any interconnection dispute regarding terms and pricing.

Establishing a framework that allows free and fair competition in the market for international calls will be especially important. Particular attention must be given to:

- The interconnection terms set by Rwandatel
- The terms on which operators terminate incoming calls that originate on competing operators' international networks
- The provisions made to allow subscribers on particular networks to select a preferred international carrier to complete outgoing international calls.

5. Recommendations

For broadband services to expand and reach out to the majority of Rwandans, we have identified a number of key issues that need to be addressed.

5.1. Cost of access and usage

The most critical issue for broadband development in Rwanda is associated with the cost of access and usage. It is critical that appropriate regulatory measures are taken to make sure that potential customers such as government entities, small and mid-sized businesses (SMEs), civil society organisations and, wherever possible, households can get access to broadband at an affordable price. This will ultimately increase access and usage of ICTs within the country, and will provide opportunities for private businesses to increase online services that target the general population.

5.2. Quality of services

In most cases, broadband services are lacking service-level agreements that can allow the monitoring and evaluation of performance in order to take necessary actions for better service. In this regard, the main challenge is related to the lack of technical capacity at the service providers. It is therefore critical to increase the technical know-how in the country to maintain and manage broadband technologies. One way of addressing the current shortage is for telecom operators to work closely with training providers in order to develop hands-on technical training programmes. These could be targeted at young graduates, especially in areas related to telecommunications and engineering.

RURA has drafted quality of service guidelines for broadband internet services, and a consultation paper has been developed. Research into equipment and software that can be used for monitoring quality of service of broadband internet has been conducted, and a research report identifying tools is now available.[30]

5.3. Geographical coverage

Broadband services are exclusively available in Kigali and other major cities across the country due to the concentration of potential users in those cities. There is a need to increase broadband access to other areas – especially rural areas – as a way of encouraging businesses and non-profit organisations to set up their offices in remote areas.

5.4. Lack of awareness

The need to raise awareness is also critical, as potential customers (especially in the private sector) are not informed about the benefits and/or potential benefits offered by broadband technologies. It is therefore critical to initiate awareness campaigns to inform and sensitise the general public on the benefits of broadband, including general cost savings.

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[30] RURA Annual Report 2008

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