Effective Policymaking for Developing ICT Industries: Lessons from three African governments' approaches to information and communications technology

by

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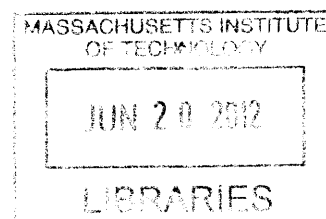PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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ABSTRACT

This thesis studies the effect of different information and communication technology (ICT) policies on the performance of the ICT industry in a given country. Many developing country governments are in the process of focusing more on developing their ICT industries as a mechanism to improve economic development levels in their country. In order to analyze effectiveness of policies, six main policy levers are compared: competition level of the industry, ICT regulatory bodies, privatization level of the industry, universal access initiatives, ICT education initiatives, and infrastructure development and coordination. By looking at each of these policy levers in the three countries of study, Rwanda, Uganda, and Zambia, certain policies seem to emerge as more important and effective than others. Competitiveness of the industry seems to be a large determinant in usage rates within the country of the internet and mobile phones, and an active regulatory body is imperative to future sustainable growth in the industry. Initiatives that address equity of access and improve ICT literacy have a small effect on usage rates; due to the fact that these initiatives are relatively recent, it is expected that these projects will have a larger effect on future usage rates in each country. In sum, this thesis contributes to a topic that has seen little academic research but has massive implications for the economic future of a country; ICT is critical to successful business in the new digital age, and proper ICT policies can help countries accelerate their economic development.

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CHAPTER 1: INTRODUCTION

Information and communication technology, or ICT, is the newest phenomenon that developing world governments are turning to as a strategy for development and technological advancement. Mobile phones, internet cafes, and personal computers are popping up across the southern hemisphere, and in many places are being touted as the next wave of development. Indeed, countries with healthy ICT industries have an advantage in business and trade in a digitized world. Access to and quality of internet and phone services is a great determinant of where businesses locate and succeed. ICT allows for greater connectivity with the world, increased innovation, and new ways to solve challenging issues in developing countries like providing better health care and creating more efficient markets.

Information and communication technologies affect development in a multitude of ways. The 2001 UNDP Human Development Report states that information and communication technologies enhance human capabilities and thus creates economic growth through gains in productivity; the authors write that "technology is a tool for, not just a reward of, growth and development"[1]. Aker and Mbiti conclude in a 2010 paper that mobile phones have lowered communications costs, improved firms' efficiencies by allowing them to better manage their supply chains, created many jobs, and have facilitated the delivery of financial, agricultural, health, and education services[2]. The benefits from having a thriving ICT industry are huge, as the development of East Asian countries has demonstrated in the past few decades.

East Asia is often touted as one of the success stories in both astronomical economic growth and great technological development. Throughout the 1980s and 1990s, many East

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1   United Nations Development Fund. *Human Development Report 2001.* Rep. July 2001. Web. 4 Oct. 2010. <http://hdr.undp.org/en/reports/global/hdr2001/>. pg 27.
2   Aker, Jenny C. and Isaac M. Mbiti. 2010. "Mobile Phones and Economic Development in Africa." CGD Working Paper 211. Washington, D.C.: Center for Global Development. http://www.cgdev.org/content/publications/detail/1424175

Asian countries saw unprecedented growth rates, significant increases in technology usage rates and innovation, and significant improvements to quality of life. Today, while these countries continue to produce world-class technological innovations and products, many other developing countries, especially in Africa, are lagging far behind. While Japan, South Korea, Singapore, Taiwan, Malaysia, and Hong Kong are all in the top 50 countries in terms of internet penetration rates, no African country is even in the top 100[3]. However, the East Asian cases have shown that rapid increases in ICT use are possible in the developing world, and that they have great positive effects.

There is a large difference in the levels of success of the ICT industries in Rwanda, Uganda, and Zambia, indicated by rates of internet and mobile phone use in each country. These African countries' ICT industries have developed very differently over time, and there continue to be significant differences in their performance. Uganda liberalized their telecom market in 1996, created an independent regulator, and now has over 45 licensed service providers and significant mobile phone coverage[4]. Rwanda, on the other hand, has only a partially competitive ICT market, and the government continues to invest heavily in better internet and mobile phone infrastructure. Zambia is somewhere in the middle, with fixed-line telephone service being a monopoly, while the mobile phone market is partially competitive, and the internet market fully competitive. The difference in the usage levels of the internet and mobile phones in these three countries is quite significant. In 2008, Uganda had 28.0 mobile phone subscriptions and 7.9 internet users per 100 people, Rwanda had 13.6 mobile phone subscriptions and 3.1 internet users per 100 people, while Zambia had 28.6 mobile phone subscriptions and 5.7 internet users per

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3   "Internet Usage Statistics of Countries Ranked by Penetration Rates." *Internet World Stats - Usage and Population Statistics.* Miniwatts Marketing Group. Web. 18 Apr. 2011. <http://www.internetworldstats.com/list4.htm>.
4   "Licensed Communications Service Providers." *Uganda Communications Commission.* Web. 6 Mar. 2011. <http://www.ucc.co.ug/licensing/ictOperators.php>.

100 people[5]. This thesis will study these three cases to provide preliminary policy guidance for developing countries in shaping their ICT industries. Additionally, these conclusions could be broadened to apply to general industrial policies in the developing world.

The focus of this paper is the examination of the different industrial policies these three governments have applied to their ICT industries. Common ICT policies include creating a regulator and licensing scheme, investment or assistance in the construction of infrastructure, introducing ICT programs into schools, and creating initiatives to promote universal access to these new technologies. Through policy, governments have the opportunity and the power to significantly alter how an ICT industry develops, and how successful it is. Good policy can overcome inequalities in development, build better infrastructure, and shape how companies approach their market and build their customer base. While many governments in the developing world struggle with the implementation and enforcement of policies, and do not focus much attention on their ICT industry, there is significant potential in using policy to improve ICT industries.

This thesis will compare the approaches of the Rwandan, Ugandan, and Zambian governments to developing their ICT industries. In doing so, I will show that policy choices have a profound effect on the performance of the ICT industry and consequentially how many people use ICT. Through this analysis, governments and other organizations can better understand the tradeoffs of different policy mechanisms in ICT industries.

The following section will provide a literature review of components of the ICT industry, the government's role in ICT industry, and policy levers for ICT growth. The third chapter will outline the methodology used in this thesis. In the fourth chapter, an overview of the ICT industries in each country will examine ICT industrial development, current ICT policies, and current industry performance. I will then examine current regulatory measures and industry structure in

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5   World Bank, *Africa Development Indicators, March 2010*, ESDS International, (Mimas) University of Manchester.

Chapter 5, followed by each country's investment in the future of their ICT industries, including education initiatives and infrastructure development. Lastly the conclusion will highlight the lesions learned from these case studies and implications for future policymaking.

CHAPTER 2: LITERATURE REVIEW

The literature review will first define the ICT industry, and will then delve into a summary of the literature on the government's role in ICT. It will conclude with a review of different ICT policy levers.

THE ICT INDUSTRY

Definitions of what exactly the ICT industry consists of vary widely according to different sources, thus making creating a holistic picture of the industry difficult. In research by the Innovation and Business Skills Australia group in 2010, they defined the ICT industry as including the following components:

- "IT services, systems integration and software support
- internet services and telecommunications
- software and digital content development
- wholesale and retail distribution of software and hardware
- manufacture of ICT products and components"[6]

Other definitions also include elements such as electronic goods used to store or communicate information, broadcasting and media tools, and even libraries and documentation centers[7]. There is clearly a broad range of definitions for the industry, some more all-encompassing than others. For the purposes of this paper, which will focus on developing country contexts, it makes the most sense to focus on telecommunications services (mobile phone, internet, fixed line phone

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6   Innovation & Business Skills Australia. *Environmental Scan 2010, Information and Communications Technologies Industries*. Rep. 2010. Web. 13 Apr. 2011. <http://www.ibsa.org.au/Portals/ibsa.org.au/docs/Research%20&%20Discussion%20Papers/Sectoral%20report%20-%20ICT%20Industry%2026%20Feb%2010.pdf>.
7   McCormick, Dorothy, and Joseph Onjala. *Methodology for Value Chain Analysis in ICT Industry Frameworks for the Study of Africa*. Publication. 15 Aug. 2007. Web. 27 Apr. 2011. <http://www.aercafrica.org/documents/ICT_project_working_papers/McCormick_Onjala_ValueChainAnalysisinICTIndustry.pdf>.

providers) and the infrastructure necessary to support those services. In the countries examined,

there is little production of either hardware or software in the country, and content development

is just beginning to occur. Thus, the ICT industry for the purpose of this paper refers mainly to

telecommunications infrastructure and service provision.

GOVERNMENT POLICY IN THE ICT INDUSTRY

In the past two decades, there has been a worldwide shift in telecommunications industry

structure, with many countries moving from a public monopoly model to a privatized, competitive

industry. Several countries still have public monopoly providers of ICT, including Costa Rica

and Honduras. However, the shift toward competitive industries has become more mainstream

policy as the success of this approach has become clearer. As Il Chong Nam writes,

> Introducing competition into the telecommunications industry has proved to be much
> more than allowing additional firms into the industry. It requires the transformation
> of a monopolistic government business into a competitive industry, which in turn
> demands the redefinition of the role of the government, creation of a proper regulatory
> regime, a new set of rules governing who can participate in what parts of the new
> business opportunity, rules to set rates and access charges, and so on[8].

Countries such as Malaysia and Korea are two countries that, in the late 1980s and early 1990s,

privatized their public monopolies and opened the industry to new firms. While establishing the

proper policies and regulations for a competitive market is an ongoing process that continues

today, the shift in industry structure has significantly altered the role of government in competitive

markets, from provider to regulator[9].

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8   Am, Il Chong. "Competition Policies for the Telecommunications Industry in Korea." *Deregulation
    and Interdependence in the Asia-Pacific Region,* NBER-EASE Volume 8. Ed. Takatoshi Ito and Anne O.
    Krueger. Chicago: University of Chicago, 2000. 351-70. National Bureau of Economic Research, Jan.
    2000. Web. 23 Apr. 2011. <http://www.nber.org/chapters/c8487.pdf>.
9   Sivalinga, G. *Network Governance in Malaysia's Telecommunications Industry.* Rep. Web. 24 Apr. 2011.
    <http://www.hks.harvard.edu/netgov/files/NIPS/Paper_G_Sivalingam.pdf>.

One of the primary roles a government can play in the ICT industry is that of a national coordinator; that is, the entity that coordinates between relevant stakeholders in ICT, and creates a broad strategy for their use and development. Nagy Hanna, a Senior Advisor for e-development at the World Bank, argues in his paper that governments should design and encourage ICT investment and help eliminate coordination failures between companies and other providers. He writes that "harnessing ICT for development requires a strategic framework that takes advantage of the various roles of ICT and that helps integrate the options made possible by this technological revolution into the design and implementation of country and sector development strategies"[10]. The benefits of creating such a government-led strategy include building public-private partnerships, helping the nation achieve an understanding and learning of the new technologies that are being introduced, and addressing coordination failures and network inefficiencies[11]. One of Hanna's most powerful arguments as to why governments should be involved in ICT planning is that by the nature of the way these networks function, they are interdependent and need to communicate with each other to provide the maximum benefit; coordination is a very powerful and appropriate role for the government to fill. Hanna overall argues for a government role that primarily involves coordination of the private sector to reduce inefficiencies and overlap, as well as creating a unified vision for ICT in the country that moves the country forward.

In many industries, government intervention is used to address inequalities that emerge. In the case of ICT, this would largely entail, especially in developing countries, creating connection points for rural areas, and creating ways for the very poor to access these resources. Mitchell and Gillis highlight the issue that in most cases, governments in the developing world do not have the capacity to finance or build a significant part of their country's ICT infrastructure, and therefore must work closely with the private sector to ensure that ICT is actually developed. They view

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10   Hanna, Nagy. *Why National Strategies are needed for ICT-enabled Development.* Working paper. Information Solutions Group, 2003, pg 8.
11   Hanna, Nagy. *Why National Strategies are needed for ICT-enabled Development.* Working paper. Information Solutions Group, 2003., pg. 27.

the government as a facilitator and regulator that should promote and create an environment that encourages private investment and competition to create a market that fulfills the demand for ICT in a country. "While ICT infrastructure requires a significant capital investment, most national governments, especially in the developing world, are unable to meet the challenges alone. With few exceptions, private businesses and organizations have funded much of the world's nonmilitary ICT infrastructure"[12]. Their argument that developing countries do not have the capacity financially or organizationally in many cases to perform the same role as might be recommended for Western democracies, is a compelling argument for allowing private companies to be the primary players in the creation of ICT networks in developing countries. It does not, however, mitigate the potential inequalities and stratifications that may occur given the number of people living in poverty in many developing countries that would not be able to access these new technologies. As the case studies in this paper will show, however, there are countries using policy mechanisms and incentives to encourage the private sector to provide opportunities for those that the ICT industry would otherwise exclude.

Beyond industry structure and the government role in provision of services, there is wide variation in ICT policy elements between countries, and there are certainly new policy tools being created constantly. UNESCO lays out the common elements of most national ICT policies by dividing them into six categories[13]. First, there are policies focusing on the development of ICT infrastructure, mainly by helping save costs on service delivery, and in some cases financing the actual building of infrastructure. Second, many policies deal with promoting the development of ICT skills, either through the education system or training programs. Third, creating legislation to handle new issues that arise from having an active ICT sector are necessary; these include

12   Mitchell, Matthew, and Bill Gillis. *Making Sense of the Relationship between Information Communication Technologies and Economic Development*. Washington State University / Center to Bridge the Digital Divide. 2002. 1 Nov. 2009. <http://dgss.wsu.edu/di/docs/ MakingSenseoftheRelationshipbetweenICTandEconomicDevelopment.pdf>. pg. 4

13   UNESCO. "General ICT Policy Elements." *ICT in Education*. UNESCO. Web. 18 Apr. 2011. <http://www. unescobkk.org/education/ict/themes/policy/guidelines/general-ict-policy-elements/>.

creating industry standards, initiating a pricing and taxation structure, and ensuring that personal data is kept private. Fourth, creating the institutional capacity to manage ICT markets is necessary, often including granting regulatory authority to a certain agency, and establishing someone to coordinate ICT development throughout the country. Fifth, many policies work to increase access to ICT, both in terms of infrastructure availability and affordability. Lastly, policies in place to monitor the ICT industries are found in most national ICT policies.

Looking at the strategies of governments of countries that have achieved great improvements in ICT provision provides insight into potentially successful policy strategies. The majority of the developing countries that have managed to successfully harness ICT are in East Asia. Hanna cites both Korea and Malaysia as countries that have used ICT-driven development strategies. According to his paper, Korea's comprehensive ICT strategy was one of the key factors in the "miracle" rebound of its economy; "the ICT industry's contribution to GDP growth rose from a mere 4.5% in 1990 to an astounding 50.5% in 2000"[14]. Malaysia created an ICT framework that had targeted investment in human resources, infrastructure, and demand-driven applications and content development[15]. Rodolfo C. Severino, Secretary-General of the Association of Southeast Asian Nations (ASEAN), stated in 2002 that there are three main roles for the government in information technologies: as an enabler, as a leader, and as a user[16]. He spoke of the necessary balance between the government leading, but not being so active that it would "stifle creativity and competition and discourage others from playing," and also suggested that laws should be

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14   Hanna, Nagy. *Why National Strategies are needed for ICT-enabled Development*. Working paper. Information Solutions Group, 2003., pg 7.
15   Hanna, Nagy. *Why National Strategies are needed for ICT-enabled Development*. Working paper. Information Solutions Group, 2003., pg. 25.
16   Severino, Rodolfo C. "Government's Role in Information Technology." Speech. ASEAN Executive Seminar on e-Government. Singapore. 12 Nov. 2002. *Association of Southeast Asian Nations*. Web. 3 Nov. 2009. <http://www.aseansec.org/13537.htm>.

rigid enough to provide continuity and predictability, but flexible enough to not constrain IT development[17].

It appears that among the success stories regarding ICT, there have been a wide variety of government strategies thus far that countries have tried. It is clear from the East Asian examples that a balance between heavy government involvement and creating sustainable growth in the private sector is important to industry success. The worldwide shift from public monopoly to private sector provision of ICT services is indicative of the changing attitudes toward strategic ICT policies. The following section will highlight more recent ideas about policy levers governments can use to encourage growth in their ICT industries.

ICT POLICY LEVERS

As technologies evolve and more countries look to use ICT policy to drive industrial growth, there are many different strategies and types of policies that have emerged. The International Telecommunications Union (ITU), the UN agency for information and communication technologies, recently published a paper highlighting trends in ICT policies and regulations. In this paper, the ITU highlighted ten different types of policies: regulation, competition, ownership, licensing, spectrum management, infrastructure sharing, VoIP, universal access, enforcement, and dispute resolution and appeals[18]. Each of these components is important in managing an ICT industry, and below is a brief explanation of what each category entails.

Regulation: Creating a separate telecom or ICT regulator allows for a separate authority to manage the entire industry. While regulators' powers vary widely, they are often in charge of tasks such as licensing and setting industry standards.

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17   Severino, Rodolfo C. "Government's Role in Information Technology." Speech. ASEAN Executive Seminar on e-Government. Singapore. 12 Nov. 2002. *Association of Southeast Asian Nations.* Web. 3 Nov. 2009. <http://www.aseansec.org/13537.htm>.
18   ICT Regulatory News (May 2010). ICT Regulation Toolkit. International Telecommunications Union. Web. ,http://www.ictregulationtoolkit.org/en/Publication.3901.html>.

Competition: Competition can be regulated by allowing more or less companies into the market. Additionally, successful competition depends on not having a competitor with a large share of market power, and ICT regulators can help mitigate unequal market power.

Ownership: Ownership is an indicator of if the government participates in the ICT market. Governments in many countries were historically one of the providers in telecommunications services, but there is shift today toward privatization.

Licensing: Issuing licenses allows regulators to control both how many operators are in the industry and the conditions under which they can provide telecom services. In some countries, agencies other than the regulator, such as a ministry, issue licenses.

Spectrum Management: Spectrum management is important to manage limited resources, such as radio wavelengths and TV channels. Regulators may allow spectrum trading or not, or may assign spectrum resources to certain companies.

Infrastructure Sharing: Infrastructure sharing between companies (essentially one company renting infrastructure from another) can allow for better economies of scale in the ICT market given the high cost of infrastructure development. Some countries, however, choose to not allow sharing to force development of infrastructure that has enough capacity for the market it serves.

VoIP: Voice over IP services present a challenge for regulators due to the crossover between mobile phone and internet markets. Many countries have officially legalized it, and have begun to develop policies for regulating the VoIP market.

Universal Access: A common criticism of technology in development is its ability to play into existing disparities. Many governments are working to ensure that ICT can be accessed equitably by setting up universal access funds, creating initiatives for better rural provision, or incentivizing rural development.

Enforcement: While regulators can partially control the market through licensing and other indirect methods, there has been a trend toward increasing their powers to include overseeing mergers, enforcing standards and anti-trust laws, and other more direct measure of monitoring the industry.

Dispute Resolution/Appeals: Countries are increasingly creating clear guidelines for dispute regulation and appeals to certain decisions in the industry. These include arbitration and litigation arrangements.[19]

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19   All descriptions paraphrased from ICT Regulatory News 2010.

These ten trends in ICT regulation and policymaking are similar to what was found in the literature review on government ICT policies. Shifts toward new policy paradigms are an important development for emerging ICT industries; newer industries have the benefit of learning from and improving on what those who established their ICT industries earlier did. There has, however, been a dearth of literature on the efficacy of these different types of policies. This thesis hopes to contribute knowledge through in-depth case studies to help guide future ICT policy decisions.

CHAPTER 3: METHODOLOGY

Understanding the proper role of the government specifically in the ICT industry has extraordinary implications for the developing world in the upcoming decades. As developing countries continue to strive to catch up to the developed world technologically and their governments try to promote economic development and growth, ensuring that the government is as effective as possible in improving ICT provision will make a great difference in how successful a country is in the coming years. By examining three countries' approaches to their ICT industries, this thesis will explore the effectiveness of policy choices in developing ICT industries, analyzing the cases of Rwanda, Uganda, and Zambia.

The explanatory variable in this study is how the government is involved in the creation, development, and maintenance of ICT networks in a country. Essentially, with the independent variable I aim to capture how the government has approached ICT industrial policy; do they focus on promoting ICT use in schools, or do they invest heavily in infrastructure development? Do they subsidize market entry for new service providers or let the private market run its course? In order to systematically look at each case, I have selected policy elements from the International Telecommunications Union (ITU) paper "Trends in ICT Regulation 2010," where the ITU highlights different types of policies governments can use in their ICT markets. These policies were selected from the original ten areas because they better reflect the broader literature consulted while developing this metric. The six policy categories are:

- Presence of a telecom/ICT regulatory body
- Competition level of the market
- Ownership of companies in the market
- Degree of access to ICT by all

- ICT in education and ICT training programs
- Degree of Infrastructure sharing, coordination, or subsidization[20]

By looking at each of these six policy areas in each case, I will be able to conceptualize the level of government involvement in each country's ICT sectors. From there, analysis of which ICT policy areas are most effective will be fairly straightforward.

The dependent variable in this study is how prevalent the technology is in a given country. The indicators I have chosen to denote "success" of an ICT industry are the number of mobile phone subscriptions per 100 people and the number of internet users per 100 people. The World Bank has usage data available for each country for the last decade, which will allow both comparisons within a country during different policy changes, as well as comparisons of the success between different countries in the same year. Secondarily, equity of usage is an important indicator of success as well; if most usage is concentrated among urban elites, the industries is provide less overall benefit to the country and is thus less successful than one where access is more universal. In Uganda and Zambia where Afrobarometer data is available, data from these surveys will be used to assess usage patterns based on economic status in each country. The combination of looking at overall usage as well as equity of distribution of usage provides a holistic look at the success of a country's ICT market, and accurately and succinctly depicts the level of use of ICT in a given country.

As mentioned previously, this topic will be studied using three case studies: Rwanda, Uganda, and Zambia. Because this is an issue that is largely unexplored in academia, the amount of well-documented data is limited; similarly, comparing across all developing countries introduces a variety of other explanatory factors. By focusing on these three countries in a similar geographic

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20 ICT Regulatory News (May 2010). ICT Regulation Toolkit. International Telecommunications Union. Web. ,http://www.ictregulationtoolkit.org/en/Publication.3901.html>.

region with relatively similar levels of development, I control for most other factors that could

cause differences in ICT use. Through studying Rwanda, Uganda, and Zambia and the policies

their governments have used to develop their ICT industries, this thesis will perform rigorous

analysis of the different policy options government have today.

CHAPTER 4: HISTORICAL CONTEXT

This chapter provides a historical overview of each country's ICT industry, the current telecommunications and ICT policies in place, and the current industry performance. These contexts are important for understanding analysis of the policy levers in later chapters, and will highlight the general approach of each of the three selected countries.

RWANDA

History of the Industry

Prior to the Rwandan genocide, Rwanda's telecommunications network developed largely in the 1970s and 1980s, when switchboards, telex centers, and other key infrastructure was put into place. In the late 1980's and 1990's, Rwanda's telecommunication network continued to grow but was still fairly small; computers were rarely used by businesses or individuals, and there were only twelve automated telephone switchboard centers in the entire country[21]. The National ICT policy of 1992 was developed by the Ministry of Planning to drive the industry purposefully, but the genocide in 1994 put this policy on hold. Following the 1994 genocide, almost the entire telecommunications infrastructure in Rwanda had been destroyed. It was in the period following the genocide that the new Rwandan government began to focus on making the country an African telecommunications hub, and started developing focused ICT policies to spur overall economic development in Rwanda. According to a study done by Albert Nsengiyumva and Emmanuel Habumuremyi, "Rwanda is amongst the few African countries that developed an integrated ICT

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21   Nsengiyumva, Albert, and Emmanuel Habumuremyi. *A Review of Telecommunications Policy Development and Challenges in Rwanda*. Publication. Association for Progressive Communication, Sept. 2009. Web. 23 Apr. 2011. <http://www.apc.org/en/system/files/CICEWARwanda_20090908.pdf>. pg 6

policy in the late 1990s with a clear vision of making ICTs a critical part of its socio-economic development plan"[22].

Rwandatel, founded in early 1993, was the first telecommunications company in Rwanda that offered fixed-line telephone services, including voice and internet services. As the only telecommunications company in the country until 1998, Rwandatel was a government-based monopoly for many years. With little regulation of the market and almost no accountability to consumers, the telecom services in Rwanda were often inefficient and of poor quality during Rwandatel's monopoly. In 1998, MTN Rwandacell entered the market as a mobile operator. While the introduction of another company took place, Rwandatel was given a monopoly over fixed line provision, and Rwandacell a monopoly on mobile services provision.

Beginning in 1998, the government began to develop a new national ICT policy. From their initial meetings and many subsequent ones, they created Vision 2020, which is a strategic plan in four phases to make Rwanda a middle income country by the year 2020 using ICT to create a knowledge-based economy[23]. The report *An Integrated ICT-led Socio-economic Development Policy and Plan for Rwanda 2001-2005* was the first of four stages outlined by the Rwandan Information Technology Authority and other ICT policymaking groups, and it began the implementation of Vision 2020. It was through this vision that the Rwandan government began to hone in on increasing ICT use throughout the country and began heavily investing in improving ICT infrastructure.

Following this new policy release, the structure of the market began to shift. MTN Rwandacell was granted a license for fixed line service, making the fixed line market competitive. In October

22   Nsengiyumva, Albert, and Emmanuel Habumuremyi. *A Review of Telecommunications Policy Development and Challenges in Rwanda*. Publication. Association for Progressive Communication, Sept. 2009. Web. 23 Apr. 2011. <http://www.apc.org/en/system/files/CICEWARwanda_20090908.pdf>. pg 4.
23   Rwanda. Ministry of Finance and Economic Planning. *Rwanda Vision 2020*. July 2000. Web. 19 Apr. 2011. <http://www.gesci.org/assets/files/Rwanda_Vision_2020.pdf>. pg 9

2005, the government decided to privatize Rwandatel, and sold the company to Terracom, an American-based company. An additional company, Artel, was introduced, intended to help build universal access points for internet and phone service throughout the country. Following the privatization of Rwandatel, internet service provision licenses were granted to Rwandatel, Artel, and MTN Rwandacell. Rwanda Terracom (formerly Rwandatel) soon developed state-of-the-art fiber optic networks that provided wireless access to much of Kigali, the capital, and created a strong mobile phone network across the country[24].

Despite their initial move toward privatization, in July 2007 the Rwandan government announced that it would buy back Terracom, renaming it Rwandatel and creating a government-owned company. Their reasoning for this decision had several components, including that Terracom was slow in rolling out Internet connectivity to schools[25]. Today Terracom still operates separately in areas like broadband, but no longer provides phone services; Rwandatel remains one of the largest providers of mobile phone and fixed line services. For a complete list of current service providers in Rwanda, see Appendix A.

Rwanda's Telecommunications Policies

The government of Rwanda has taken an active role in ICT investment and development, as is evident from the historical development of their ICT industry. Rwanda's government has defined its ICT-led development vision to be "to modernize the Rwandan economy and society using information and communication technologies (ICTs) as an engine for: accelerated

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24 "Rwanda Digital Divide - History." *Bridging the Rwandan Digital Divide*. University of British Columbia, 21 Mar. 2010. Web. 27 Apr. 2011. <http://www.slais.ubc.ca/courses/libr500/09-10-wt2/www/S_Roncin-WWW/history.htm>

25 Farrell, Glen. 2007. "Survey of ICT in Education in Rwanda". *Survey of ICT and Education in Africa (Volume 2): 53 Country Reports*. Washington, DC: infoDev / World Bank. <http://www.infodev.org/en/Publication.423.html>. pg 7

development and economic growth; national prosperity; and global competitiveness"[26]. The first stage of the National Information and Communications Infrastructure (NICI) policies outlines the main policy objectives and commitments the Rwandan government plans to make for their "Vision 2020". It details the ambitious idea to try to transform Rwanda's economy from a mainly agricultural economy into one dominated by trading ICT services and products. There are eight main areas that the Rwandan government plans to improve to accomplish this goal: human capacity, infrastructure, e-government, community access, ICT in education, Foreign Direct Investment (FDI), regulatory and legal issues, and private sector facilitation. The government has divided this twenty-year goal into four smaller plans that cover five year periods[27]. This policy document has driven much of the creation of ICT-specific government agencies and their agenda, and the second and third installments of the NICI policy plans continue to guide ICT policy decisions in Rwanda.
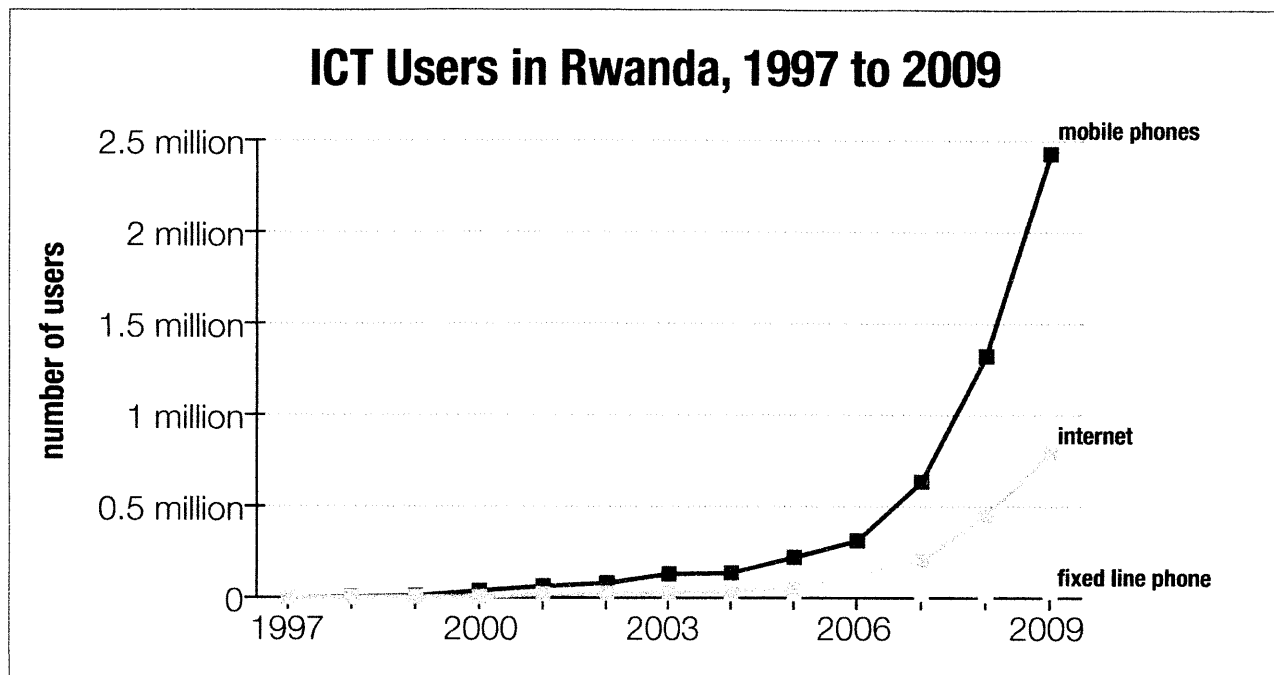
State of the Industry

The number of ICT users in Rwanda has increased significantly in the past decade, but at a slower rate than many other countries. As of 2008, approximately 3.1% of people used the internet, up from only 0.1% in 2000. Mobile phone subscriptions increased by 13.1% in the same time frame, from 0.5 subscriptions per 100 people in 2000 to 13.6 in 2008[28]. As is evident from the graph below, there has recently been a great increase in the number of mobile phone users, and a lesser but still significant increase in internet users. Today, more than 92% of the population is covered by a mobile phone network. Additionally, prices for telecom services in Rwanda are cheaper than in many other African countries. According to World Bank data, which adjusts

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26 Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010.* Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>.
27 Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010.* Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>.
28 World Bank, comp. "Rwanda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/rwa_ict.pdf>.

ICT Users in Rwanda, 1997 to 2009

number of users

2.5 million — mobile phones

2 million

1.5 million

1 million — internet

0.5 million

0 — fixed line phone

1997   2000   2003   2006   2009

average country telecom prices to US$, monthly price for cell phone tariffs in 2008 was $10.0, whereas fixed broadband internet access was $91.8 per month[29]. While these prices seem high, they are lower than the sub-Saharan African average.

Large-scale East African initiatives are underway to lay undersea fiber optic cables from Asia and Europe that would allow Rwanda, among other African countries, to have access to higher speed internet. These include the East African Submarine Cable System, and the SEACOM cable. Both of these reach Kenya and are then connected to Rwanda's infrastructure by land cables. These new cable systems have significantly increased the quality and capacity of Rwanda's networks, and have also begun to bring down costs of access[30].

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29 "World Bank, comp. "Rwanda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/rwa_ict.pdf>.
30 "SEACOM Cable Coverage." *SEACOM*. SEACOM. Web. 29 Apr. 2011. <http://www.seacom.mu/network>

UGANDA

History of the Industry

Established in 1977, the Uganda Posts and Telecommunications Corporation (UPTC), was a government-run monopoly in the telecommunications market and the main provider of phone services for many year. The UPTC was the only service provider for almost 16 years, and the service was poor and the industry did not evolve much. In 1993, however, the Ugandan government decided to begin the process of liberalizing and privatizing the telecom market, and allowed Celtel Uganda to be the first private company to enter the market. While Celtel was severely restricted by the Ugandan government in what they could do, their success in providing cell phone services and the great increase in cell phone use seen early in Celtel's entrance to the market emphasized the deficiencies of the UPTC, and motivated ammore drastic change in policy in 1996.

Encouraged by Celtel's performance and committed to making telephone services affordable and accessible to all across the country, the government created the National Telecommunications Policy of 1996. This early telecommunications policy set up the industry structure that largely remains in place today; it separated the UPTC into the Uganda Post Limited (UPL) and Uganda Telecom Limited (UTL) and privatized UTL. UTL remains one of the main telecom service providers today. Additionally, the policy stated that a regulatory body should be established, and that the industry should be privatized. The Communications Act of 1997 fleshed out what the National Telecommunications Policy began. It officially established the Uganda Communications Commission (UCC) as the regulatory body for the industry, incorporated and privatized UTL, and licensed a second operator in fixed telephone line services, creating competition in that industry. Notably, the Communications Act also established a fund for rural

communications development, showing the Ugandan government's committment to working toward telecommunications access to all.

Following the establishment of the UCC, Mobile Telecom Networks (MTN) Uganda acquired a liscense as the second telephone service provider as outlined in the National Telecommunications Policy. The UCC license agreement with MTN and UTL established them as the only telecom service providers until 2005. After 2005, several new phone companies have also received licenses. Warid Telecom recieved their services and infrastructure licenses in late 2006[31], i-Tel in 2006[32], and Orange (a subsidiary of France Telecom) in 2009. With MTN and Celtel providing predominantly cell phone services, there was a certain lack of attention to the more rural areas, since cell phone service is easier for companies to implement in densely populated areas. In 1999 Uganda became the first country in Africa where the number of mobile subscribers surpassed the number of fixed line subscribers[33]. As such, the government established the Rural Communications Development Fund in 2001 which provides funding to improve universal access to ICT and build better telecommunications in rural areas. This fund is administered by the UCC, and will be discussed in more detail in a later section.

Internet service in Uganda developed later and more organically than the telephone service sectors. Makerere University in Kampala created the first connection in 1993, and the first domain name with a .ug (Uganda's domain name) was detected in 1994. By late 1995, several groups were providing email services, including Makerere University[34]. It was not until the Communications Act of 1997 that internet service provision was regulated by the government, when they introduced a licensing scheme to be managed by the UCC. The internet market took longer than the mobile

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31 Warid. "About Us." 2008. Web. 18 Apr. 2011. <http://waridtel.co.ug/corporate.php>.
32 I-Tel. "About Us." Web. 18 Apr. 2011. <http://www.itelug.com/about_us.html>.
33 Njihia, Mbugua. "The Uganda Connection, a Mobile Perspective." Weblog post. 29 June 2010. Web. 29 Apr. 2011. <http://www.mbuguanjihia.com/2010/the-uganda-connection-a-mobile-perspective.html>.
34 International Telecommunications Union. The Internet in an African LDC: Uganda Case Study. Rep. International Telecommunications Union, Jan. 2001. Web. 29 Apr. 2011. <http://www.docstoc.com/docs/10152781/Uganda-THE-INTERNET-IN-AN-AFRICAN-LDC-UGANDA-CASE>.

phone market to significantly grow, largely due to connectivity and infrastructure issues, as well as the steeper learning curve associated with computers. In July 2009, SEACOM completed and launched its undersea fibre optic cable that connected East Africa to faster networks in Europe and India, which greatly increased the capacity and speed of networks across East Africa[35]. Up until MTN introduced their 3G internet service in 2010, customers had to first pay for landline usage, and then for the internet service, which was both inconvenient and restricted the number of people who could actually afford to have access to the internet. To date, internet service in Uganda is still quite expensive compared to many other countries.

Uganda's Telecommunications Policies

The Ugandan government's various ICT policies have had an enormous impact on how the market has developed, and have determined its successes and failures. The Telecommunications Act of 1996 remains one of the main pieces of legislation in the ICT industry. Following the creation of the UCC, the government has allowed them to regulate the industry and has not created any overarching visions for the ICT industry in Uganda. As a more private sector-oriented system, the Ugandan government has allowed many companies to compete for customers. Much of the infrastructure has also been built by private companies. The Ugandan government does have some initiatives to increase rural access to ICT and for the development of ICT curricula, but in general they have focused on private sector development and regulation.
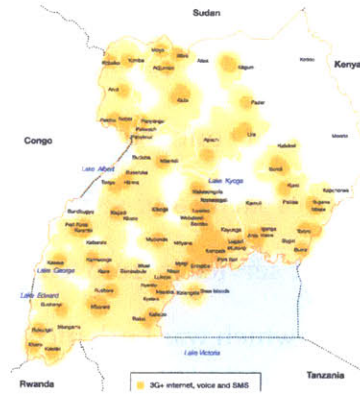
State of the Industry

While Uganda's mobile phone penetration rate was on par with the African average in 2008 at 27.0 subscriptions per 100 people, the number of internet users per 100 people was
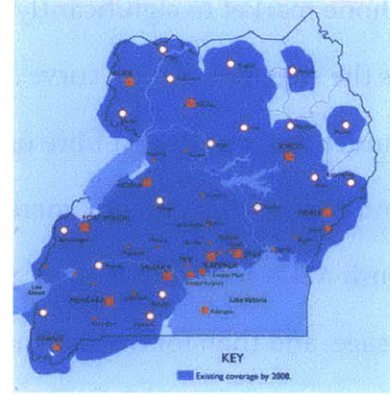
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35 "Seacom Connects East Africa with the World." *Africa News.* 23 July 2009. Web. 29 Apr. 2011. <http://www.africanews.com/site/Seacom_connects_East_Africa_with_the_world/list_messages/26116>.

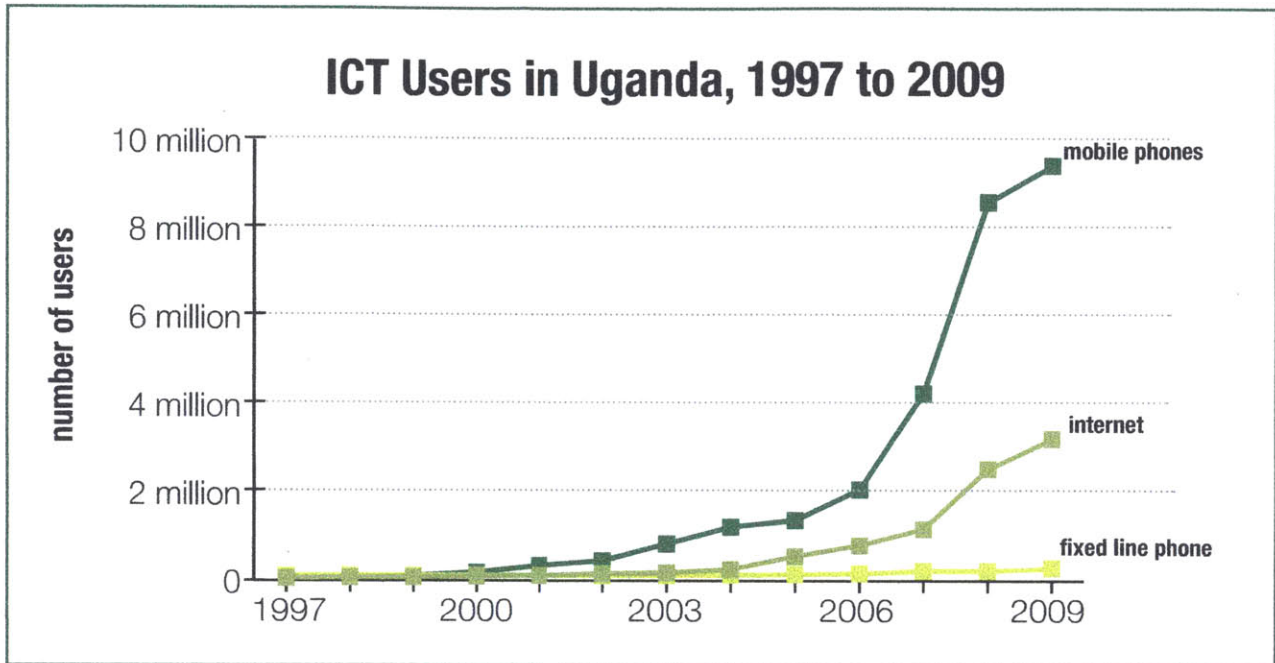| MTN Uganda Coverage Map | Orange Uganda Coverage Map | UTL Uganda Coverage Map |
| *(source: MTN Uganda website)* | *(source: Orange Uganda website)* | *(source: UTL Uganda website)* |

actually above the sub-Saharan African average at 7.9%[36]. It is clear that there has been significant progress in ICT provision in Uganda, especially in the past 15 years. The number of cell phone users has skyrocketed from a mere 3500 in 1996 to 987,456 in 2004[37]. As is evident from providers' coverage maps, coverage in Uganda is quite good, and only a few areas in the north of the country remain without cell service. Investment in and popularity of the internet has also increased dramatically, and it is now common to walk through Kampala and see signs for an internet cafe or computer center. The number of internet users per 100 people has increased from only 0.2% of the population in 2000 to 7.9% in 2008[38].

Both the cellular phone and internet markets have continued to grow rapidly in recent years, an indication that there is going to continue to be increased demand for ICT services in the coming years. The price of a mobile phone subscription in Uganda is about US$10.4 per month, which is slightly lower than the rest of sub-Saharan Africa (it should be noted that this figure is

36   World Bank, comp. "Uganda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/uga_ict.pdf>.

37   "The Uganda Knowledge and Information Society: Early Lessons from ICT Projects." *At the Crossroads ICT Policy Making in East Africa.* Chicago: East African Educ. Publ., 2005. 225-39. <http://www.idrc.ca/ openebooks/219-8/>.

38   World Bank, comp. "Uganda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/uga_ict.pdf>.

ICT Users in Uganda, 1997 to 2009

number of users

10 million
8 million
6 million
4 million
2 million
0

1997   2000   2003   2006   2009

mobile phones

internet

fixed line phone

before the significant price slashing that occurred in late 2010)[39]. However, the price of internet in Uganda is astronomical compared to both other sub-Saharan African countries and compared to rates in the developed world: in 2008, internet was estimated to be US$170 per month[40].

ZAMBIA

History of the industry

Like many other African nations, telecommunications in Zambia began under colonial rule, when the first telephone was installed in Livingstone in 1913. From that point until the early 1990s, the entire communications industry (postal services and telephone services) remained

39   World Bank, comp. "Uganda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/uga_ict.pdf>.
40   World Bank, comp. "Uganda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/uga_ict.pdf>.

a state monopoly[41]. It was in the early 1990s that many international banks and organizations were pushing privatization of state-owned industries, and Zambia was no exception. As both government interests in industry privatization and innovation in the telecommunications sector grew, the Telecommunications Act in 1994 outlined the liberalization of the communications industry. This act split up what was previously the Post and Telecommunications Corporation (PTC) into the Zambia Postal Services Corporation (ZAMPOST) and the Zambia Telecommunications Limited (ZAMTEL)[42]. Though the Telecommunications Act outlined steps towards a privately owned and more competitive ICT industry, the industry still is not fully competitive or private; the government-run ZAMTEL is still a service provider in the fixed line, mobile phone, and internet markets, and ZAMTEL has a monopoly of the Public Switched Telephone Network (PSTN) and the International Gateway (IGW). The 1994 act did, however, create a new regulatory agency, the Communications Authority of Zambia (CAZ), to act as a regulatory body for the telecom industry as an issuer of licenses and other necessary regulatory activities.

Following the liberalization of the telecom sector, and the increase in interest in ICT as a development tool and government priority, the Zambian government saw the need to create a vision for the industry and strategies to help the industry grow. Working with many other development agencies, such as the United Nations Development Program (UNDP), the Zambian government developed a National ICT Policy, intended to help Zambia bridge the digital divide and move Zambia towards an information centered society[43]. This national strategy, enacted in 2006, is still in effect today as the guiding document for the development of the ICT industry.

41   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT
     Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_
     Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20
     Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.
42   Zambia. Fifth National Development Plan, 2006 - 2010. Government of Zambia, Dec. 2006. Web.
     <http://www.undp.org.zm/joomla/attachments/033_zambia_fndp.pdf?8e2474a80d13c9785641fc2923161
     380=wnpfzqni>.
43   Zambia. Ministry of Communications and Transport. *National Information and Communication
     Technology Policy*. Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/
     unpan032690.pdf

Despite all of these reforms to the Zambian ICT market structure, progress in terms of both forward-thinking policies as well as movement towards real change remains slow. Today, ZAMTEL still has a monopoly over fixed line service provision, and there are only three mobile phone companies (including ZAMTEL). Zain Zambia is the dominant mobile phone service provider, with about 79.3% of the market share in 2010; MTN had about 13.3%, while the government-owned CelZ (run by ZAMTEL) had a mere 7.4%[44]. The internet market, however, is the most competitive, with many internet service providers having licenses and about 20 ISPs currently operating[45]. Internet access remains poor despite being one of the most competitive sectors, at least in part due to the government monopoly on fixed line services, thus limiting for many years the infrastructure available to provide broadband internet[46].

Zambia's Telecommunications Policies

There are three key pieces of legislation in Zambia governing the telecommunications industry; the National ICT Policy of 2006, the Fifth National Development Plan, and the ICT Act of 2009. The Telecommunications Act of 1994 was the first significant piece of legislation in Zambia, which moved the industry towards privatization and competition. The other pieces of legislation built on the 1994 Act, and helped create a greater regulatory and policy environment for the ICT industry, and set out goals for improving the industry for the government.

The National ICT Policy, written in 2006, highlights the major goals and focus areas for the Zambian government in the ICT industry the coming years. The vision for this National ICT

44 Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>., pg 11
45 "Internet Service Providers Zambia - Directory." Web. 17 May 2012. <http://www.ostamyy.com/ISPs/Zambia.htm>.
46 Souter, David. *ICTs and Development in Zambia: Challenges and Opportunities*. Publication. Panos London, Oct. 2010. Web. <http://panos.org.uk/wp-content/files/2011/01/panos-london-zambia-policy-brief-web.pdf>.

Policy is "a Zambia transformed into an information and knowledge-based society and economy supported by consistent development of, and pervasive access to ICTs by all citizens by 2030"[47]. In order to accomplish its goal, the document outlines thirteen pillars of the ICT policy, and subsequent objectives and strategies. These pillars include human resources development, education, health, e-Government, a better legal and regulatory framework, and creating a competitive location ICT industry[48]. While the document highlights many of the challenges facing the ICT industry in Zambia, including the lack of availability of ICT service in rural areas, lack of access to capital by entrepreneurs to help the industry grow, and sub-par infrastructure development, the National ICT Policy does little to create a real implementation plan to improve these issues. Though there is a section on strategies for each of the thirteen pillars, most of the strategies are relatively vague and do not assign the implementation to any one agency or group; instead, an entire strategy can be as simple as "develop partnerships with private sector and other stakeholders in the quest for increased ICT literacy"[49]. Compared to other countries' ICT policies, the document did not provide specific implementation strategies or direction as to who would be implementing these goals, which has in turn led to very little action by the government towards accomplishing them.

The Fifth National Development Plan is the fifth in a series of documents produced by the Zambian government designed to give direction and set goals for the country for the following five years. The fifth plan includes the years 2006-2010, and its broad goals, intended to help achieve the National Vision 2030, are "broad based wealth and job creation through citizenry

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47 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf>. pg 19
48 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf
49 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf pg 28

participation and technological advancement" with a strategic focus on "economic infrastructure and human resources development"[50]. In the section on ICT development, the government highlights infrastructure development, human resource development, and creating new legal and institutional frameworks for regulating and monitoring the industry. Other suggested policies include promoting access to ICT for youth, women, and the disabled, and establishing an ICT Enterprises Development Revolving Fund to help mitigate the lack of funding for new technology ventures in Zambia[51]. Overall, the section on ICT in the Fifth National Development Plan seems to be a summary of the National ICT Policy in terms of recommended policies for the ICT industry; it does acknowledge, however, the ICT plays a large role in moving Zambia towards accomplishing their National Vision 2030.

The Information and Communication Technology Bill of 2009 repealed the 1994 Telecommunications Act, and changed the name and some of the functions of what was formerly the Communications Authority of Zambia, now called the Zambia Information and Communication Technology Authority (ZICTA). This authority was given more autonomy than the CAZ had, and changed what its responsibilities and powers are. The Act also highlighted several other areas for government action, including universal access initiatives and increasing ICT use in education.

State of the Industry

Despite seeing significant growth in the past decade in ICT users, the growth rate for both internet and mobile phone use in Zambia is lower than most other sub-Saharan African countries. As has been a trend throughout the developing world, fixed line telephony has actually

50   Zambia. *Fifth National Development Plan, 2006 - 2010*. Government of Zambia, Dec. 2006. Web.
     <http://www.undp.org.zm/joomla/attachments/033_zambia_fndp.pdf?8e2474a80d13c9785641fc2923161
     380=wnpfzqni>. pg 20
51   Zambia. *Fifth National Development Plan, 2006 - 2010*. Government of Zambia, Dec. 2006. Web.
     <http://www.undp.org.zm/joomla/attachments/033_zambia_fndp.pdf?8e2474a80d13c9785641fc2923161
     380=wnpfzqni>.pg 73

shrunk between 2000 and 2009, with fewer fixed telephone subscriptions per 100 people[52]. The mobile phone market has exploded, increasing from 0.9% of the population having mobile phone subscriptions in 2000 to 34.1% of the population in 2009. It is important to note that this usage rate is still lower than the sub-Saharan African average of 37.3%; however, Zambia's immense growth in the mobile sector in a very short period of time is encouraging[53]. There is still significant room for this industry to grow, as only 50% of the population was covered by the mobile phone network in 2009[54]. The number of internet users in Zambia currently stands at about 6.3%, which is also below the sub-Saharan African average of 8.8%, but the sector has seen much growth in recent years. The number of internet subscribers per 100 people has stayed relatively constant over the past decade, suggesting that people are using services such as internet cafes to access the internet instead of subscribing themselves.
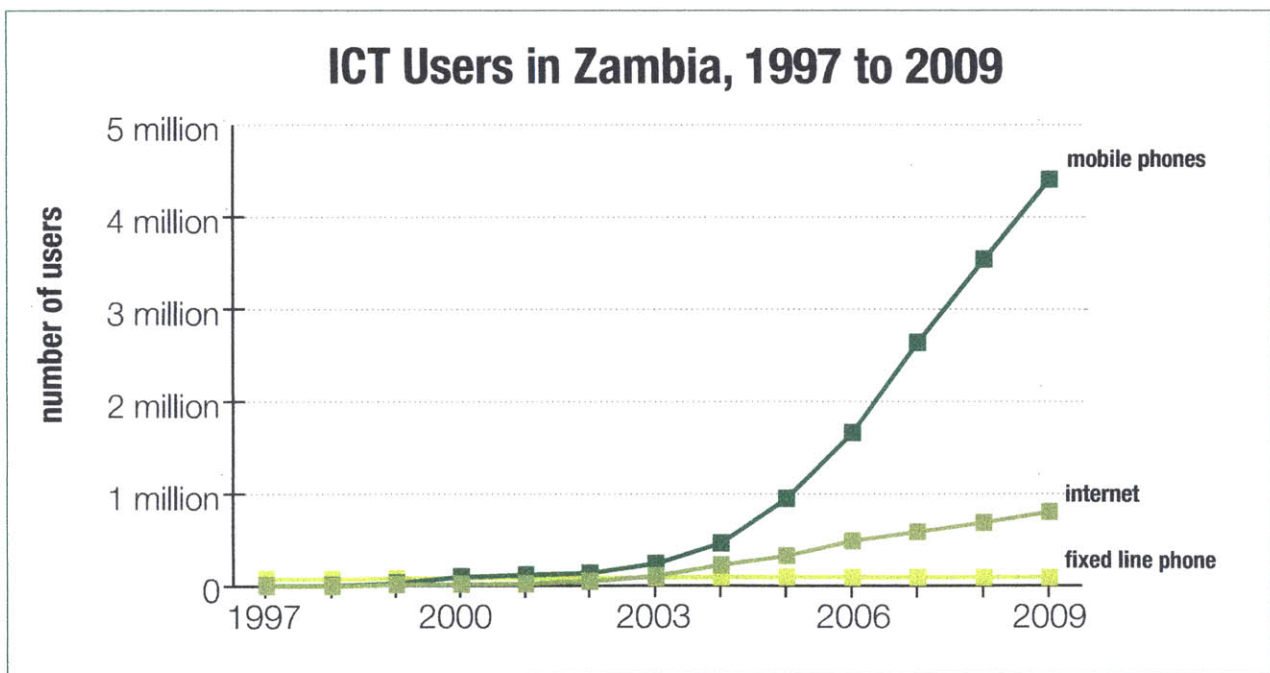
ICT Users in Zambia, 1997 to 2009

52 World Bank, comp. "Zambia ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/zmb_ict.pdf>.

53 World Bank, comp. "Zambia ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/zmb_ict.pdf>.

54 World Bank, comp. "Zambia ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/zmb_ict.pdf>.

Zambia has struggled in recent years to successfully build up infrastructure for the ICT industry to lower prices and increase coverage. Though many fiber optic cables terminate at Zambia's borders, there has not yet been investment either by the government or by the private sector to create a larger scale fiber optic backbone for the country, which would both improve the quality of service and significantly decrease the price if they were to connect to larger African networks of cables. The government has stated that better ICT infrastructure is indeed one of their priorities and identified the lack of infrastructure as one of the biggest challenges to the industry, but has yet to take significant action toward changing this[55]. Cost of mobile phone service is Zambia is on average $12.70 per month, which is higher than the sub-Saharan average. The cost of access to broadband is $51.40 on average, which about two thirds of the price of most other African countries[56]. Lack of ICT educational programs has also contributed to the slower increase in ICT use in Zambia. In 2008, there were only 300 people with graduate qualifications in ICTs in Zambia, and there is a significant need for better ICT training options to increase the usage of ICTs[57].

CONCLUSION

The ICT industries in Rwanda, Uganda, and Zambia all started from similar places: a publicly-owned monopoly provider. As each country has seen significant growth in their ICT industries and new technologies are introduced, their governments' policies have evolved in very different ways. These policy choices have also led to very different usage rates of ICT services.

55   Zambia. *Fifth National Development Plan, 2006 - 2010.* Government of Zambia, Dec. 2006. Web. <http://www.undp.org.zm/joomla/attachments/033_zambia_fndp.pdf?8e2474a80d13c9785641fc2923161 380=wnpfzqni>.pg. 72
56   World Bank, comp. "Zambia ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/zmb_ict.pdf>.
57   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010.* Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_ Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20 Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.

The graphs below compare mobile phone usage rates over time in all three countries and internet users over the same time period.

Percent of Population that are Mobile Phone Subscribers

Percent of Population that are Internet Users
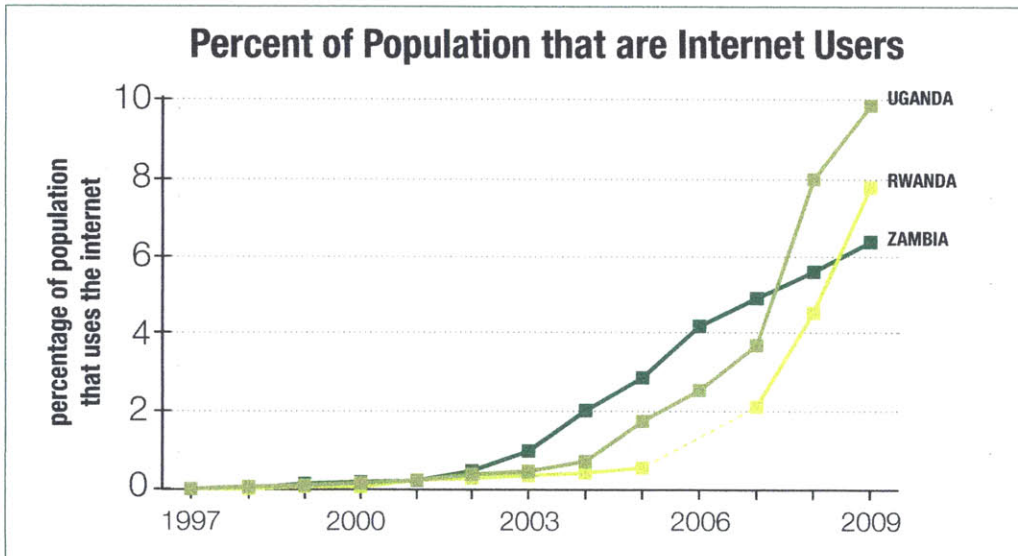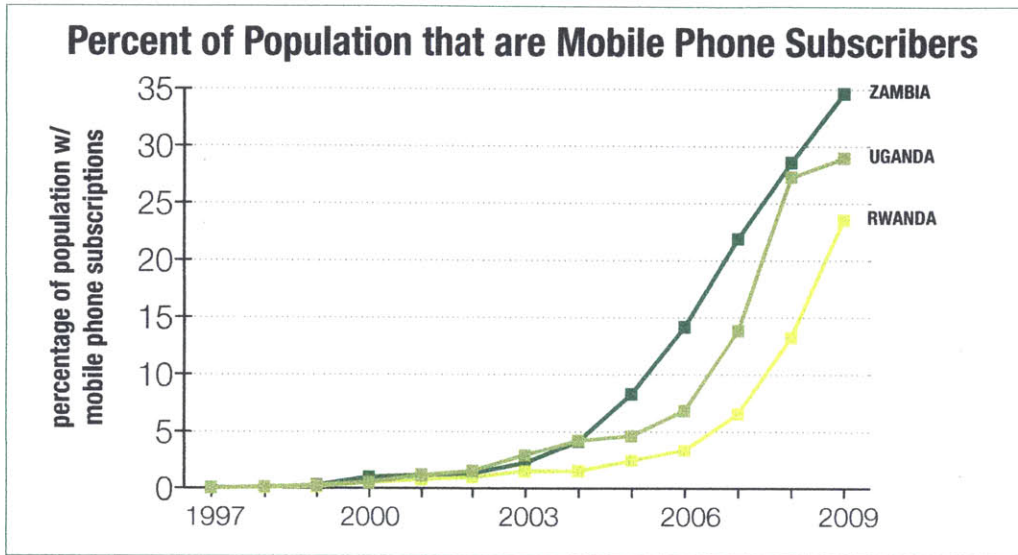
As is evident from these graphs, industry performance is notably different in Rwanda, Uganda, and Zambia. The following two chapters examine differences in policy that have driven the variation in usage rates between these three countries.

CHAPTER 5: REGULATION AND INDUSTRY STRUCTURE

The regulation of ICT industries can determine their path of development, and will determine the struture of the industry as well. Having active regulators and a competitive, privatized market creates an environment that will encourage innovation an industry growth, led by the private sector. In this chapter, we examine three key regulatory policy elemens: the telecommunications or ICT regulatory body, competition level of the industry (monopoly, partially competitive, or fully competitive), and ownership in the market (publically or privately owned operators).

TELECOM REGULATORY BODY

An ICT/telecommunications regulatory body is a key policymaker and decision-maker in the industry that often performs duties such as issuing licenses and ensuring fair competition. The UN Task Force on Financing ICT writes that "the introduction and strengthening of independent, neutral sector regulation has helped to reinforce investor confidence and market performance, while enhancing consumer benefits"[58]. This section evaluates the performance of Rwanda, Uganda, and Zambia's ICT regulatory body.

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58 InfoDev, and International Telecommunications Union. "Rationale for an Effective and Independent Regulator." ICT Regulation Toolkit. 24 Apr. 2012. Web. <http://www.ictregulationtoolkit.org/en/section.3106.html>.

Rwanda

Rwanda has several agencies that act as policymakers and regulators. The Rwandan NICI plan resulted in the creation of two main commissions in the Rwandan government: the Rwanda Information Technology Authority (RITA), and the National Information Technology Commission (NITC). The NITC is headed by the President, the main visionary for this project, and monitors RITA among other smaller organizations relating to ICT investment and development. RITA is a slightly more autonomous entity that is not as directly linked to the rest of the government, and most directly works on implementing the projects outlined in the NICI plan and coordinating the ICT initiatives in Rwanda. It is also the main group that fosters country-wide education on information and communication technologies and develops the standards and guidelines for ICT implementation. These two new bodies in the government not only indicate the strong interest of the government in ICT programs in Rwanda, but also ensure that the government of Rwanda will play a significant role in any ICT development programs that are implemented in Rwanda.

The Rwandan Utility Regulatory Agency, or RURA, was established in January 2003 as the main regulator of telecommunication network and service providers (among other industries)[59]. RURA has thirteen essential functions, including rule-making and enforcement, licensing, monitoring performance of service providers, ownership and control of utility sector infrastructure, overseeing competition and interconnection, and dispute resolution[60]. Specific to ICT, RURA has three main roles. First, they monitor the development of ICT infrastructure rollout and operations, and formulate infrastructure development guidelines. They also enforce the operators' license conditions on quality of service. Additionally, they manage scarce resources,

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59   Nsengiyumva, Albert, and Annet B. Baingana. 2007 *Rwanda Telecommunications Sector Performance Review.* Publication. Research ICT Africa, 2007. Web. 5 Apr. 2011. <http://www.researchictafrica. net/publications/Telecommunications_Sector_Performance_Reviews_2007/Rwanda%20 Telecommunications%20Sector%20Performance%20Review%202007.pdf>.
60   Rwanda Utilities Regulatory Authority. "RURA Essential Functions." *Rwanda Utilities Regulatory Authority.* 2010. Web. 18 Apr. 2011. <http://www.rura.gov.rw/index.php?option=com_ content&view=article&id=170>.

which include frequency spectrum management (radio) and number resource management (telephone numbers)[61]. Lastly, the ICT Applications and Cybersecurity department at RURA works to help advance the use of ICT-based networks, services and applications, and promotes cyber security. These duties make RURA a very powerful ICT regulator compared to others, and they are also a very hands-on regulator, and step into the market when they see fit. However, there have been complaints by companies and others in the industry that RURA lacks the capacity needed to make it an effective regulator due to understaffing and slow response time[62].

The licensing structure in Rwanda set by RURA has many different categories that each has a unique set of requirements. There are licenses for national TV and radio stations, amateur radio, and for a private radio network that people must apply for through RURA. Additionally, there are licenses for internet service providers (ISPs), internet cafes, and others for signal service provision. However, as the next section will touch on, the Rwandan mobile phone and internet markets are only partially competitive, meaning that any company cannot simply apply for a license and be granted permission to provide ICT services. RURA also collects hefty fees on the airtime offered by companies, and on infrastructure use and licensing fees. Rwandatel, MTN Rwanda, and Tigo Rwanda recently came out with a joint paper presented to the Rwandan government stating that these fees are a significant barrier to their operations and improving their services[63].

61 Rwanda Utilities Regulatory Authority. "ICT Scarce Resource Management and Monitoring." *Rwanda Utilities Regulatory Authority.* 2010. Web. 18 Apr. 2011. <http://www.rura.gov.rw/index. php?option=com_content&view=article&id=64&Itemid=134>.

62 Nsengiyumva, Albert, and Annet B. Baingana. *2007 Rwanda Telecommunications Sector Performance Review.* Publication. Research ICT Africa, 2007. Web. 5 Apr. 2011. <http://www.researchictafrica. net/publications/Telecommunications_Sector_Performance_Reviews_2007/Rwanda%20 Telecommunications%20Sector%20Performance%20Review%202007.pdf>. pg. 25.

63 Hitimana, Bosco. "Telecoms Question Govt Internet Fibre Optic." *All Africa.* 21 June 2010. Web. 29 Apr. 2011. <http://allafrica.com/stories/201006211765.html>.

Uganda

Following the passing of the Communications Act of 1997, the Uganda Communications Commission became the official regulator of the telecom and postal industry in Uganda. According to an ICT Sector Review prepared by Research ICT Africa,

> The regulator (UCC) has been granted by law a number of powers, including arbitration of disputes, institution of levies on gross annual revenue of operators, confiscation of apparatus, institution of inquiries and imposing fines for various breaches like illegal operations and breach of license. The UCC has employed these (although minimally in the case of imposition of fines) in the execution of this mandate[64].

In 2006, the Ministry of Information and Communication Technology was created, and now acts as an overseer to both the UCC and the Broadcasting Council. While the UCC is the official regulator of the ICT market, they have largely only acted when necessary, and have not taken an active role in shaping the industry. They have, however, established a licensing regime, and manage the radio spectrum. While having a less involved regulator has allowed the private sector to develop immensely, it has also meant that opportunities for intervention to benefit the consumer have been missed.

The licensing structure set by the UCC is fairly simple. There are two types of telecommunications licenses, a public service provider license (PSP), and public infrastructure provider license (PIP). Within the PSP license, there are two different types of licenses: public voice and data licenses and capacity resale licenses. The public voice and data license "permits holders to provide telephony and data services of any kind (mobile or fixed or both) using any technology of choice (cellular, satellite, Internet Protocol, traditional wired networks)"[65]. Capacity resale licenses, on the other hand, allows the holder to resell leased telecommunications services or

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64   Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_Sector_Performance_Reviews_2010/Vol%202%20Paper%2013%20-%20Uganda%20ICT%20Sector%20Performance%20Review%202010.pdf.pdf>.

65   "Licensing." *Uganda Communications Commission.* Web. 29 Apr. 2011. <http://www.ucc.co.ug/licensing/default.php>.

capacity, such as calling cards or bandwidth for telecommunications companies' services. PIPs allow a holder to build, operate, and maintain infrastructure relating to communications services. In Uganda, a company may either have both a PIP and PSP, thus allowing them to maintain and use their own infrastructure, or a PIP holder can sell their services to a PSP. Lastly, there is a "general license" that covers those such as pay phone operators and internet cafe owners.

In addition to being the licensing organization in the telecommunications sector in Uganda, the UCC also leverages operating and infrastructure fees from the telecom companies and acts as an overall regulator and policy driver for the industry. The fees depend on factors such as bandwidth and type of radio or television frequency and stations. There are also annual fees associated with each type of license on top of a one-time entry fee. The UCC is able to revoke licenses from providers, and establish rules to provide fair competition and make the best industry possible. From its beginnings as an organization that was overshadowed by other government agencies, the UCC has established their presence in the ICT industry in Uganda; however, there is more that the UCC could do to actively improve the industry through decreasing inefficiencies and advocating for smaller companies in an extremely competitive market.

Zambia

The Zambian Information and Communications Technology Authority (ZICTA) is the main telecommunications regulatory body for Zambia. Established by the Information and Communications Act of 2009, the authority manages phone, internet, radio, and television services throughout the country. ZICTA's stated vision is "an efficient and competitive ICT sector that provides quality, reliable and affordable goods and services that are universally accessible to and meet the needs of the Zambia community"[66]. Their responsibilities range from managing

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66 *The Zambia Information and Communication Technology Authority* Website for the People. Web. 17 May 2012. <http://www.zicta.zm/>.

scarce resources such as radio frequencies to protecting the interests of both consumers and service providers to promoting "the provision, in urban and rural areas, of such information and electronic communication services that meets all reasonable demand"[67]. ZICTA is also the agency that issues licenses for service providers in Zambia. In 2009, Zambia moved to a unified licensing scheme[68]. Unified licensing allows operators to provide multiple services under one license, such as mobile phone and internet services, allowing for things like 3G service and better mobile internet to be possible, and according to many increases competition in all sections of the industry.

Important changes were made with the creation of ZICTA in the ICT Act of 2009, most notably a better framework for dispute resolution in the sector. There have been many instances in the past of lawsuits and large disagreements about licensing and participation in the market, and the new ICT Act addressed many of the previous issues. There have, however, been issues with certain parts of ZICTA's responsibilities. For example, ZICTA is responsible for regulating tariffs and interconnection fees between service providers; with the extremely unequal distribution of market share in the mobile phone market, Zain has the ability to engage in "discriminatory and predatory pricing to stifle competition, especially from MTN Zambia", charging extremely high rates for calling from Zain to MTN, who Zain views as their main competitor[69]. Despite an official complaint being filed in 2010, there has yet to be any resolution of this issue or regulation of the interconnection fees (despite announcements by ZICTA that they would intervene on the issue of interconnection fees).

67   Zambia. *The Information and Communication Technologies Act, 2009*. Government of Zambia, Aug. 2009. Web. <http://www.zicta.zm/index.php?option=com_jdownloads&Itemid=74&view=finish&cid=4 0&catid=14&m=0>. pg 15
68   Fripp, Charlie. "SADC Countries Lure ICT Investors." *IT News Africa*. 11 June 2009. Web. <http://www. itnewsafrica.com/2009/06/sadc-countries-lure-ict-investors/>.
69   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_ Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20 Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>. pg. 25

Conclusion

Rwanda, Uganda, and Zambia each have an ICT regulatory body that has similar responsibilities: licensing, dispute resolution, and some level of consumer protection. In practice, however, these regulatory agencies exercise their power very differently. Uganda's UCC and Zambia's ZICTA choose not to intervene in issues of pricing or competition where it would be advantageous to have the regulator step in. RURA in Rwanda, on the other hand, charges hefty licensing fees and has greater ability to intervene in the industry, which has hindered private sector development in Rwanda. Connected to these regulatory issues in each country is the structure of the industry, which is discussed in the next section.

COMPETITION LEVEL OF THE INDUSTRY

Competition level of an industry can have drastic effects on its performance. In the case of the ICT industry, the number of service providers is sometimes restricted to a certain number of companies, or in some cases is unrestricted. In increasingly rare cases, there is a monopoly in a given ICT sector, often a publicly-owned provider. The level of competition of the ICT industries varies significantly between Rwanda, Uganda, and Zambia, and perhaps explains a good portion of the variation in ICT use.

Rwanda

The World Bank categorizes Rwanda's telecom market as "partially competitive", meaning that the market is not fully open to new entrants, but there is not monopoly provision of either

telecom or internet[70]. According to Miller, Esselaar & Associates, "there are probably less than a dozen companies of significance in this sector"[71]. Until recently, Rwandatel had a monopoly on fixed line provision, and MTN Rwandacell had a monopoly on mobile services; however, the government has since allowed both to compete in both the fixed line and mobile phone industries. There are currently 12 licensed internet service providers, the major companies being MTN Broadband, Rwandatel, Rwandatel S.A., and ISPA. There are also three fixed line/mobile phone licensed service providers: MTN Rwandacell, Rwandatel, and Tigo[72].

Within the NICI-2010 plan, the second phase of a Vision 2020 Rwanda, little mention is made of increasing competition as a driver for increased quality and coverage of ICT services. While there is a goal within their plan for 2006-2010 to help the private sector develop more, the majority of the proposed policy initiatives focus on increasing the ICT services and goods made within Rwanda, and encouraging greater investment in the private sector[73]. There is no mention of or aim to increase competition and open the market to new companies for phone service provision or internet services. Instead the government is focused on bringing in computer manufacturing and repair services and other IT businesses. The lack of attention by the government to increasing competition in their telecom market is a great barrier to better provision of ICT, since the demand for better and more mobile phone and internet service exists but is not being met by the current companies. According to RURA's annual report for 2009-2010, there are a number of companies that have been issued licenses but have not yet begun to

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70   World Bank, comp. "Rwanda ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata. worldbank.org/ict/rwa_ict.pdf>.

71   Miller Esselaar and Associates. *A Country ICT Survey for Rwanda*. Rep. Miller Esselaar and Associates, Nov. 2001. Web. <http://www.schoolnetafrica.org/fileadmin/resources/rwanda.pdf>. pg 11

72   *Report January 2009 To June 2010*. Rep. Rwanda Utilities Regulatory Authority, June 2010. Web. 20 Apr. 2011. <http://www.rura.gov.rw/docs/Report_Jan_2009_June_2010.pdf>. pg 43

73   Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>. pg 243.

operate; hopefully, these companies will soon provide internet and phone services in the country and allow more consumers to access ICT use.

Uganda

The Ugandan telecommunications market is highly competitive, and has become much more so in the last five years. After the market was opened to new companies in 2005, many companies have entered both the phone and internet markets. Currently, the UCC lists 47 licensed companies in the PIP and PSP categories combined, which is an extremely large jump from the two operators in 2005[74]. The simplification of the licensing structure in 2006 also significantly reduced some barriers to entering the market, and this change has also contributed to the increase in competition in recent years. It is important to note that 2005 and 2006 were the beginnings of a huge upturn in the number of mobile phone subscribers and internet users in Uganda, and given the success of new companies entering the market, this growth was largely driven by the increase in available phone services and more competitive rates. Warid entered the market in early 2007, and had great success despite many skeptics.

> Many thought any new entrant into the market would have to struggle for customers since the market was considered saturated. But in less than three years of its operation; Warid has done well and overtaken some of the telecom companies who had been in the market for over five years[75].

The entrants to the market since have had similar experiences, only adding to the competition for customers in the market.

The Communication Regulations of 2005 is the main document put out by the UCC to ensure that fair competition in the telecommunications market. One of the main objectives

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74 "Licensed Communications Service Providers." *Uganda Communications Commission.* Web. 6 Mar. 2011. <http://www.ucc.co.ug/licensing/ictOperators.php>.

75 "Warid Sets Off Storm in Uganda, Kenya." In 2 East Africa. 28 Sept. 2010. Web. 29 Apr. 2011. <http://in2eastafrica.net/warid-sets-off-storm-in-uganda-kenya/>.

of these regulations is "to promote and maintain a fair and efficient market conduct and effective competition among all persons engaged in commercial activities connected with the communication sector in Uganda"[76]. The regulations prohibit anti-competitive agreements, anti-competitive mergers, abuse of a dominant position, and predatory price-cutting among other things[77]. They also give the UCC the power to investigate any breach of the regulations, and impose financial penalties if the allegations are found to be true. However, as was previously mentioned, the UCC has not leveraged this power often, and have in most cases left the powers of the market to work instead of ensuring fair and open competition. There are also gaps in the current laws that have allowed companies to expand into new areas without consulting the UCC. "Traditional ISPs, fixed telephony operators and mobile operators all hold the same license and can expand into each of these markets without having to revert to the regulator," according to the Research ICT Africa group[78].

More recently, reports from telecom operators and other news agencies have noted that since late 2010 the Ugandan telecom market has seen even greater competition through price wars. Edouard Blondeau, the current CEO of Orange Uganda, one of the major telecom companies, says that "the market is quite competitive...this is an environment with one of the most competitive rates in Africa. Firstly, the taxes are very high. Excise duty at 5% and VAT at 18%, while operators end up paying 30% taxes on any income after expenses. Secondly, there are limitations with energy and infrastructure which push the cost of doing business the wrong

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76   Uganda. Uganda Communications Commission. *The Communications (Fair Competition) Regulations, 2005.* 2005. pg 3

77   Uganda. Uganda Communications Commission. *The Communications (Fair Competition) Regulations, 2005.* 2005.

78   Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_Sector_Performance_Reviews_2010/Vol%202%20Paper%2013%20-%20Uganda%20ICT%20Sector%20Performance%20Review%202010.pdf.pdf>.

way"[79]. Beginning in October 2010, a price war began between the main telecom companies, starting when Warid slashed mobile phone call prices and the other main networks, including MTN, Orange, and UTL all cut their prices even lower. While these slashed prices mean that it may be possible for more people to access these services, most companies saw a huge drop in revenues as a result, thus jeopardizing the sustainability of the industry.

Zambia

Competition in the Zambian ICT industry varies significantly depending on which segment of the industry is observed. Up until 1994, the entire industry was run by the government-owned ZAMTEL, who first provided fixed line services, and then developed mobile phone services (run under the brand CelZ) and also began providing internet services as the technology developed. The 1994 Telecommunications Act officially liberalized much of the market, but implementation of this policy has varied in practice. ZAMTEL still maintains a monopoly on international fixed telephone services due to the fact that they are the only providers of PSTN, thus requiring that other mobile phone companies to use their services for directing calls outside of the country. Research ICT Africa states in their 2010 review of Zambia's ICT industry that "in spite of its monopoly status, at the end of 2009 ZAMTEL had fewer than 100,000 fixed and fixed-wireless subscribers over the last 40 years and, since 2006, it has lost over 10,000 subscribers"[80].

The mobile phone market is labeled by the World Bank as fully competitive, but only has three companies currently licensed to provide services. These companies are ZAMTEL, Zain (a Kuwait-based telecom company that operates in many African countries) and MTN (a South

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79 "Filling the Telecoms Gap: an Interview with Orange Uganda's Chief Executive." *Summit Business Review.* 9 July 2010. Web. 29 Apr. 2011. <http://www.sbreview.net/index.php/blog/item/416-filling-the-telecoms-gap-an-interview-with-orange-uganda%E2%80%99s-chief-executive?tmpl=component&print=1>.

80 Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010.* Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.pg 13

African company). Zain holds a large majority of market share in mobile communications, leading to less than ideal conditions for competition. Because Zain has over 70% of the market share, it is incredibly difficult for MTN or ZAMTEL to compete, as Zain can either lower their prices or make it more expensive to call their competitors from a Zain phone. In 2009, the government issued a statutory instrument to keep the number of players in the mobile phone market at three for the next five years, which many see as a way to make the privatization of ZAMTEL a more attractive investment (more in the "Ownership in the market" section)[81]. Zambia's mobile phone market has high prices despite relatively low network coverage; this is likely due to the limited amount of competition in the mobile phone markets, which in turn leads to little incentive for price cutting.

The internet market is the most competitive market in Zambia, with 14 operators currently listed on ZICTA's website as having market share[82]. It is important to note that Zambia's average price for fixed broadband internet access per month ($51.40) is significantly lower than both the sub-Saharan African average ($88) and the low income country group ($89.90), according to the World Bank[83]. This is likely due in part to the competition in the market driving price down; according to ZICTA, no company has more than 21% of the market share in the internet market[84]. However, when looking at pricing data, it appears that costs can vary significantly depending on use, and that perhaps the low cost is due to the low usage and low penetration of broadband internet. The Research ICT Africa paper cites tariffs ranging from $50 per month to

81   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT
     Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_
     Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20
     Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.pg 11
82   *ICT Sector Statistics for Period Ending December 2011*. Zambia Information and Communication
     Technologies Authority, Dec. 2011. Web. <http://www.zicta.zm/index.php?option=com_
     content&view=article&id=165:ict-sector-statistics-for-period-ending-december-
     2011&catid=22:er&Itemid=41>.
83   World Bank, comp. "Zambia ICT-at-a-Glance." World Bank. Web. 13 Oct. 2010. <http://devdata.
     worldbank.org/ict/zmb_ict.pdf>.
84   *ICT Sector Statistics for Period Ending December 2011*. Zambia Information and Communication
     Technologies Authority, Dec. 2011. Web. <http://www.zicta.zm/index.php?option=com_
     content&view=article&id=165:ict-sector-statistics-for-period-ending-december-
     2011&catid=22:er&Itemid=41>.

$1250 per month, depending on bandwidth usage[85]. They also write that "the broadband/internet market is highly unregulated and lacks uniform pricing, which makes comparative price analysis difficult"[86]. Despite these issues, it is clear that the internet market in Zambia is by far the most competitive, and the limitations on the industry have largely been issues with infrastructure. Improvements in the industry should come as more private companies are able to build their own fiber optic cable networks; Copperbelt Energy Company and ZESCO have notably began building their own networks and resell excess capacity for other companies' use[87].

Conclusion

Having a highly competitive ICT market has many benefits, namely that competition leads service providers to cut prices and to provide higher quality services to have customers. In these three countries, more competitive markets seem to have significantly higher usage rates than those that are monopolies or only have a few service providers. In addition, the liberalization of the Ugandan and Zambian mobile phone and internet industries correlate strongly with huge growth in usage rates. Making an ICT industry more competitive seems to have a large impact on the performance of that industry.

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85   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_ Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20 Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.pg. 25
86   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_ Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20 Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.pg. 25
87   Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy*. Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/ unpan032690.pdf pg 9

OWNERSHIP IN THE MARKET

Ownership of service providers in the ICT market has been trending strongly toward privatization and away from publicly-owned providers, as in many other industries. Regulating an industry with a public operator can often lead to a conflict of interest, and running a telecom company is quite time and money intensive. Public ownership does, however, allow more flexibility and control over provision. The Zambian and Rwandan governments still run at least a partially public telecommunications company, while Uganda has been fully privatized from many years. The following sections examine the evolution of ownership in each country.

Rwanda

Though the market has been partially privatized, and at one point was fully privatized (after the government sold Rwandatel to Terracom), the government continues to own the majority shares of Rwandatel and to intervene heavily in the market. As part of Vision 2020 and the NICI plan, the government states that they will engage in "initiatives to liberalize the communication sector", but have yet to make significant changes to their market structure[88]. Rwanda does have a privatization program, as established by Law No. 2 on Privatization and Public Investment, dated 11 March 1996[89]. The goals of this program included relieving the financial and logistical burden on the government from being a partial owner of Rwandatel, increasing efficiency and decreasing the size of the government in the market. However, the government is still highly involved in the market in a variety of capacities, and enough so that telecom operators have been vocal in asking the government to step out of the market. In a paper submitted to the government, telecom operators wrote that the "government through the regulator should guide the operators on

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88   Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>.
89   Nsengiyumva, Albert, and Emmanuel Habumuremyi. *A Review of Telecommunications Policy Development and Challenges in Rwanda*. Publication. Association for Progressive Communication, Sept. 2009. Web. 23 Apr. 2011. <http://www.apc.org/en/system/files/CICEWARwanda_20090908.pdf>. pg. 8.

providing the best quality service without its direct involvement in providing telecom services"[90]. Despite several attempts at privatization, the government has never fully committed to privatizing the entire industry and minimizing their involvement in service provision.

Uganda

The Ugandan telecom market was privatized by the government in the late 1990's, and since then has remained fully private. Uganda Telecom Limited, or UTL, was the first phone service provider, and remains a part of the market today providing fixed line services, mobile phone services, and internet access. They began as a state-owned monopoly provider of telecommunications services, and following the Communications Act of 1997, became a private actor in the market alongside other companies. The Communications Act mandated that UTL be privatized and incorporated, and though it took longer than originally anticipated, became a private company in 1999. While UTL has remained the largest provider of fixed line services in Uganda, capturing 75% of the market in December 2008, it has been a private company competing in the same market as every other company for over a decade now. While many other countries still have state-owned companies acting in their telecom market, Uganda has had a fully private market since 1999 which has allowed their telecommunications sector to expand without having to compete against a government-funded company.

Zambia

ZAMTEL, currently an operator in the fixed line, mobile telephone, and internet markets, is a government owned operator, thus making the Zambian ICT markets only partially privatized. The internet and mobile phone markets have other private operators who compete with the public ZAMTEL. Though it is not ideal from a market efficiency point of view, and there is

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90 Hitimana, Bosco. "Telecoms Question Govt Internet Fibre Optic." *All Africa*. 21 June 2010. Web. 29 Apr. 2011. <http://allafrica.com/stories/201006211765.html>.

significant potential for foul play in the market when one company is publicly owned, up until very recently, having one public actor does not seem to have significantly impacted the mobile phone and internet markets. The fixed line telephone market, however, has seen significant decline, partially due to the more convenient mobile phone, and partially due to poor market development by the government.

The Zambian government announced in December 2008 that it intended to partially privatize ZAMTEL in an effort to promote Zambia's international competitiveness with a fully liberalized telecommunications market. The government opened bids for 51% to 75% of shares in the company's equity, and after going through several rounds of due diligence (both by potential bidders and the Zambian government), three bidders remain: VimpelCom of Russia, Unitel of Angola, and Libya's LAP Green Networks. LAP GreenN won a 75% stake in ZAMTEL in 2010, helping to alleviate much of the debt that had accumulated when ZAMTEL was publicly owned[91]. Much of the attraction of this deal was a monopoly on fixed line services, as well as access to Zambia's mobile phone market, which will have only three operators until 2015, giving new ownership significant potential to help develop the market further and also increase their market share[92]. While some note certain attempts of the Zambian government to "sweeten the deal" by restricting the number of mobile phone operators and also transferring much of ZESCO's fiber optic assets to ZAMTEL before the sale, the privatization of this company will likely lead to much better ICT outcomes in the long term.

91   Fripp, Charlie. "Zamtel Privatization, an African First." *IT News Africa*. 6 Aug. 2010. Web. 17 May 2012.
       <http://www.itnewsafrica.com/2010/08/zamtel-privatization-an-african-first/>.
92   Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT
       Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_
       Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20
       Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>.pg 14

Conclusion

Ownership in the Rwandan, Ugandan, and Zambian ICT industries vary significantly. Uganda has a privatized market, and has had one for over a decade. Zambia is essentially privatized, with ZAMTEL now only 25% government owned, and the results of this privatization are yet to be seen. Rwanda's government has flip-flopped on the issue, first privatizing Rwandatel and then buying it back. It appears, however, that privatization has had less of an effect on ICT usage rates, likely due to the fact that the public providers in Zambia and Rwanda did have private competitors. Where government-owned companies have monopolies, such as in the Zambian fixed line market, usage rates were lower due to poor service provision.

CONCLUSION

The regulatory environment of a country's ICT industry has a large effect on its success, as we saw in this chapter. Having an active ICT regulatory body can ensure that service providers are acting fairly and help coordinate infrastructure building and other share resources. Fully privatizing the ICT industry also helps ensure efficiency and allows the government to focus fully on regulating the industry. It is creating a competitive ICT industry that seems to have the greatest effect on ICT use. This is logical as competition contributes to many actions by companies attempting to capture more users, like lowering prices and adding service in areas where there previously was none. Greater involvement by the regulator is needed in Uganda and Zambia to ensure fair competition and keep the industry economically sustainable. As competitive markets become the norm in the developing world, the ability of regulators to address industry imbalances and deal with private sector biases, the more likely it is that the industry will have long term success.

CHAPTER 6: INVESTMENT IN THE FUTURE

Regulatory policies can have a great effect on the current ICT industry in a country, but in order to continue growth in ICT usage rates, governments must invest in the future. This chapter examines Rwanda, Uganda, and Zambia's policies working toward universal access, greater use of ICT in the education system, and their investment in long term infrastructure improvements. These three areas are central to sustainable success in a country's ICT industry.

DEGREE OF ACCESS

Universal access to ICT is a difficult problem, even in the more developed countries. This issue is exaggerated in the developing world, where lower incomes make consumers more sensitive to prices. There are also still only a few densely populated areas in most of these countries, making it expensive to roll out new infrastructure. This section looks at what governments in the three countries of study are doing to try and increase use among those less likely to be able to access ICT, such as rural areas and those living in poverty.

Rwanda

The Rwandan government has prioritized universal access initiatives in their ICT strategy. This is especially necessary in Rwanda due to the large number of people living in rural areas, the hilly terrain that makes laying infrastructure more difficult, and the high poverty rates in the country. In March 2004, a Presidential order was released that requires every telecom operator

to give 2% of their revenue to the Universal Access Fund (UAF)[93]. Despite these efforts, Rwanda still has one of the lowest penetration rates for mobile phones and internet users in East Africa; however, the mobile penetration rate reached 28% in 2010, up significantly from 11.2% in 2008.

There are several government agencies that design and implement universal access initiatives in Rwanda, a testament to the amount of resources Rwanda is investing in increasing access throughout the country. RURA is one of the main government entities that carry out universal access projects. In partnership with the telecommunications company Artel, RURA is subsidizing bandwidth cost for telecenters and other access points in rural and semi-urban areas. With this project, they have provided affordable internet access to many schools, police stations, army bases, hospitals, and other institutions in rural areas. The NICI policies also highlight future government projects and actions to help increase rural access to ICT, and the government lists over 30 action items to help address these issues. One of their main goals is to empower rural women through access to ICT, and to accomplish this the government plans to involve rural women in ICT policymaking, promote employment of women in the IT sector, and to develop internet content that is relevant to Rwandan women's lives and is engaging[94]. The government also aims to ensure that ICT is pervasive in rural areas by facilitating the development of Multipurpose Community Telecenters (MCTs) and Information Access Points (IAPs) in rural areas. While the government report has many plans for building new MCTs and IAPs, creating businesses in the rural areas that will teach ICT skills, and building affordable phone networks among other projects, it remains to be seen if the lofty goals and plans are realized. There has been almost no impartial analysis of the accomplishments of the NICI plans thus far, making it difficult to assess their success.

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93   *Report January 2009 To June 2010*. Rep. Rwanda Utilities Regulatory Authority, June 2010. Web. 20 Apr. 2011. <http://www.rura.gov.rw/docs/Report_Jan_2009_June_2010.pdf>. pg 36.

94   Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>. pg 277.

While the government has focused many of their policies on this issue, the private sector has also found provision in rural areas a market opportunity. MTN Rwanda runs a program called Tuvugane, which are public GSM phones run by individual operators. To use these phones, customers can purchase call times by the second, and operators are stationed both in Kigali and in rural villages. According to Nsengiyumva and Baingana, "it was established with the main objective of bringing mobile communication to rural communities...This project became more successful than anticipated in terms of revenues collected...It has over 4 000 payphones and is the only company offering this service in Rwanda"[95]. MTN also has a Village Phone program that places phones in remote locations that can operate off of car batteries and have signal boosters to get service in areas with little infrastructure[96]. Artel, one of the newer companies in the telecom market, also works to provide phone access in remote areas using very small aperture terminal (VSAT) satellite networks to reach areas with no telecommunications infrastructure[97]. Additionally, Artel has a license to provide low-cost internet connections in rural areas[98].

Uganda

Throughout the Ugandan ICT sector's development, there has been a focus on ensuring universal access for all Ugandans. Because Uganda's population is very poor, with 75.6% of the population living on less than $2 a day, and 50% of the population living in rural areas, Uganda is a country where technology access could easily play into existing inequalities[99]. In the

95   Nsengiyumva, Albert, and Annet B. Baingana. *2007 Rwanda Telecommunications Sector Performance Review*. Publication. Research ICT Africa, 2007. Web. 5 Apr. 2011. <http://www.researchictafrica. net/publications/Telecommunications_Sector_Performance_Reviews_2007/Rwanda%20 Telecommunications%20Sector%20Performance%20Review%202007.pdf>. pg. 21.
96   "MTN Village Phone." *MTN*. 2009. Web. 29 Apr. 2011. <http://www.mtn.co.rw/index/mtn-village-phone>.
97   Nsengiyumva, Albert, and Emmanuel Habumuremyi. *A Review of Telecommunications Policy Development and Challenges in Rwanda*. Publication. Association for Progressive Communication, Sept. 2009. Web. 23 Apr. 2011. <http://www.apc.org/en/system/files/CICEWARwanda_20090908.pdf>.
98   *Report January 2009 To June 2010*. Rep. Rwanda Utilities Regulatory Authority, June 2010. Web. 20 Apr. 2011. <http://www.rura.gov.rw/docs/Report_Jan_2009_June_2010.pdf>., pg 37.
99   World Bank, *Africa Development Indicators, March 2010*, ESDS International, (Mimas) University of Manchester.

Communications Policy of 1997, the Universal Service Fund became a fund to be used by the UCC to help ensure equitable access to communications technologies. The Rural Communications Development Fund (RCDF) is what the USF is now called, and began in 2003. Its objectives are to "provide access to basic communications services within a reasonable distance to all the people in Uganda, leverage investment into rural communications development, and promote ICT usage in Uganda"[100]. The RCDF policy initiatives are funded from many sources, including a tax leveraged on telecommunications service providers and government funding; the Ugandan government is also hoping in coming years to engage international development institutions more.

The RCDF Policy of 2001 governed the program from 2003 to 2007, and set out ambitious goals for the fund. These included having an internet cafe and ICT training center at every district headquarters, public pay phones for every 2500 inhabitants, and building multi-purpose community telecenters in strategic rural areas[101]. All the targets set by the 2001 policy were met, if not exceeded; over 4000 public pay phones and over 100 internet cafes have been either commissioned or are under development. More detailed descriptions of achievements can be found in Appendix B.

In December 2009, a new RCDF Policy was written, and is effective until 2014/2015. The new Rural Communications Development policy builds upon the successes of the earlier policy, and is adapted to fit the changing communications environment in Uganda. "The Policy aims at increasing the coverage of communications facilities and services to more underserved areas and people of Uganda and also to deliberately enhance the usage of ICT services in the country"[102]. More specifically, the policy has eleven objectives, which include increasing the

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100 "Rural Communications Development Fund." *Uganda Communications Commission.* Web. 29 Apr. 2011.
    <http://www.ucc.co.ug/rcdf/index.php>.
101 "Rural Communications Development Fund." *Uganda Communications Commission.* Web. 29 Apr. 2011.
    <http://www.ucc.co.ug/rcdf/index.php>.
102 Uganda. Uganda Communications Commission. *RCDF Policy 2010/11 – 2014/15.* Dec. 2009. Web. 29 Apr.
    2011. <http://www.ucc.co.ug/rcdf/rcdfPolicy2011_2015.pdf>.

coverage and range of basic ICT services, ensuring broadband connectivity to all learning, health, and governance institutions, enhancing national ICT literacy, and encouraging local innovation in the deployment and use of ICT for rural development[103]. The policy outlines action steps as well, which are ambitious but targeted; they include having one pay phone per village by 2015, supporting the establishment of an IT laboratory in at least 100 schools, and increasing the use of renewable energy sources for these projects[104]. The rural communication development policy, if implemented as planned, will demonstrate great initiative by the government to ensure that people in rural areas and who live in poverty are not excluded from the ICT transformation. Universal access has been a priority of the Ugandan government from the outset, as the liberalization of the market occurred primarily to help drive down prices and make phone subscriptions more affordable.

Zambia

Access to ICT technologies is far from universal in Zambia due to a variety of factors, including poor coverage by providers and high prices compared to GDP per capita. Research ICT Africa states that "there have never been any universal service obligations imposed on operators in Zambia"[105]. It was not until the ICT Act of 2009 that universal access to ICT was even addressed by the government. The Act established a Universal Access and Service Fund, the funding for which comes in part from fees on service providers[106]. The previous National ICT Policy of 2006 also recognized the importance of extending access to a greater proportion of Zambians. The

103 Uganda. Uganda Communications Commission. *RCDF Policy 2010/11 – 2014/15*. Dec. 2009. Web. 29 Apr. 2011. <http://www.ucc.co.ug/rcdf/rcdfPolicy2011_2015.pdf>.
104 Uganda. Uganda Communications Commission. *RCDF Policy 2010/11 – 2014/15*. Dec. 2009. Web. 29 Apr. 2011. <http://www.ucc.co.ug/rcdf/rcdfPolicy2011_2015.pdf>. pgs 25 & 26.
105 Habeenzu, Shuller. *Zambia ICT Sector Performance Review 2009/2010*. Publication. Research ICT Africa, 2010. Web. 17 May 2012. <http://www.researchictafrica.net/publications/Policy_Paper_Series_Towards_Evidence-based_ICT_Policy_and_Regulation_-_Volume_2/Vol%202%20Paper%2017%20-%20Zambia%20ICT%20Sector%20Performance%20Review%202010.pdf>. pg 33
106 Zambia. *The Information and Communication Technologies Act, 2009*. Government of Zambia, Aug. 2009. Web. <http://www.zicta.zm/index.php?option=com_jdownloads&Itemid=74&view=finish&cid=40&catid=14&m=0>.pg 51

universal access fund has thus far prioritized spending on ICT infrastructure development, and secondarily accessibility in rural and underserviced areas[107]. One of the larger focuses of universal access activities has been the creation of telecenters across the country to provide points of access for rural areas that do not yet have access to telephone and internet services.

Though these activities are all contributing to better access for rural and underserved areas in Zambia, there is still much work to do, and at the pace that these projects are currently being finished, it could take quite a number of years for there to truly be universal access (strictly in the sense of physically having the infrastructure; affordability is another question entirely). As is show below, cell phone service is still minimal, and is largely around urban areas and main rail lines where mining activity is prevalent. If the Zambian government truly wants to create universal access, there needs to be much more urgency to their work and more incentives in the private sector to provide these services that are not as economically attractive. Additionally, one of the biggest challenges to ICT adoption in Zambia is the high price of services; to drive costs down, a more competitive cell phone market is needed, and more incentive for broadband internet development. Lastly, addressing the level of education is critical to uptake of ICTs, as is discussed in the following section.
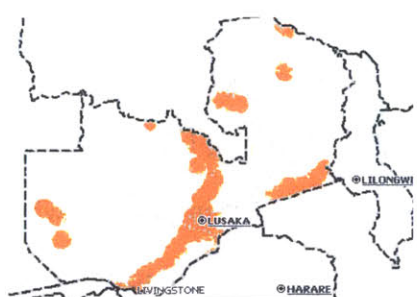
Zain Zambia Coverage Map
(source: Zain Zambia website)
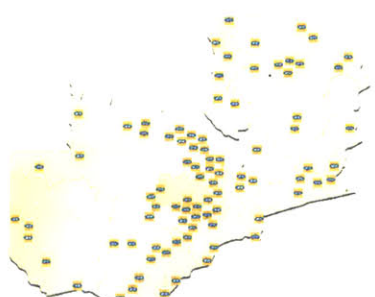
MTN Zambia Coverage Map
(source: MTN Zambia website)
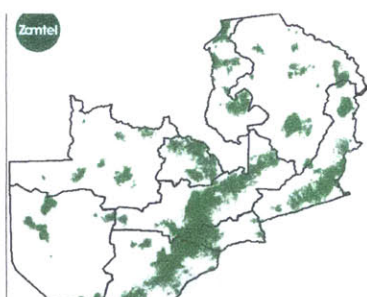
ZAMTEL Coverage Map
(source: ZAMTEL website)

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107 Mulozi, Dean, and Mwendabai Sinyinda. *Report on Government Stakeholder Engagement Workshop.* Rep. Connect Africa Zambia, 24 Sept. 2009. Web. <http://www.connectafrica.net/pdfs/Stakeholder_engagement_REPORT_(November_16).pdf>. pg 8
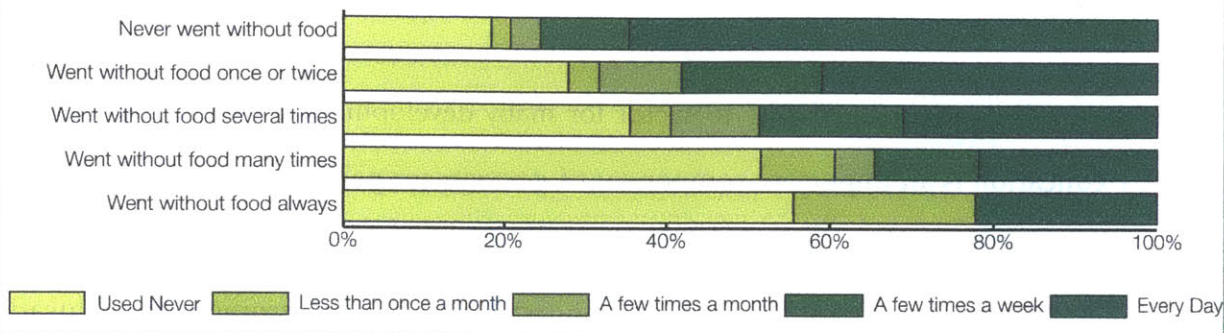
Conclusion

The Rwandan government has developed a bold and unique strategy to increase access in rural and poor areas. The government has run some of their own projects, but the private sector in Rwanda has also found niche markets in the rural regions of the country that were conceptualize without a profit motivation. Uganda has also had a successful program through their fund for universal access, though their approach is less sophisticated and primarily involves building access points. Zambia's government has been the least involved in universal access initiatives, and perhaps as a result their mobile phone coverage is the lowest of the three countries studied. Universal access initiatives are important in the long term to ensure that the entire population has access to the benefit of ICT use and the technologies do not play into and increase existing inequalities in the country.
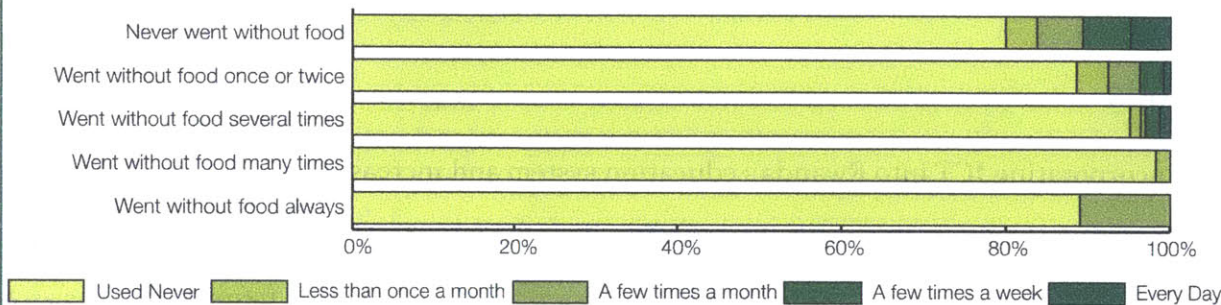
In order to assess the relative successes of the Zambian and Ugandan governments' universal access initiative, Afrobarometer data was used to create the charts below. Breaking out respondents by how often per month they go without food (an indicator of relative poverty level), and comparing the respondents' use of mobile phones and internet technologies within these groups, an idea of how universal access is begins to emerge. Though this is not a perfect measure of success of universal access initiatives, and data is only available for Uganda and Zambia, it already appears that there are higher usage rates in Uganda among those who have had to go without food more often and are likely thus poorer. This is consistent with the finding in the previous section that the Ugandan government has been quite active in universal access initiatives, while the Zambian government has yet to implement significant programs. The examination of this data is encouraging and suggests that perhaps more focus on universal access initiatives would lead to even more equitable use of ICT.
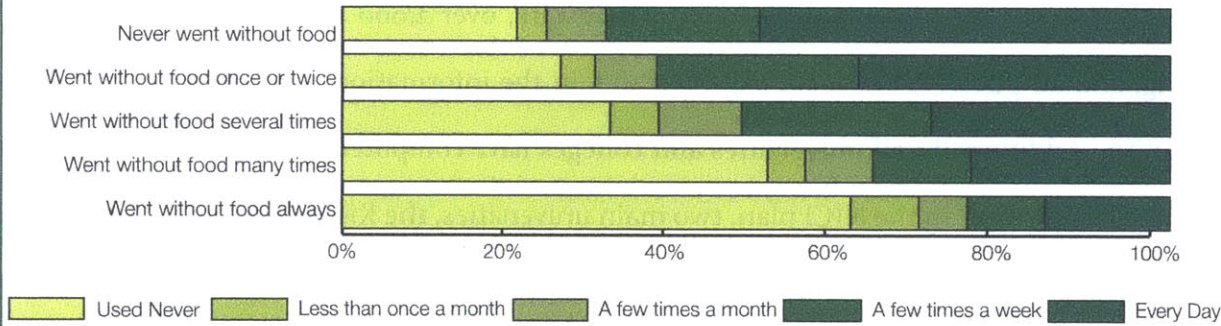
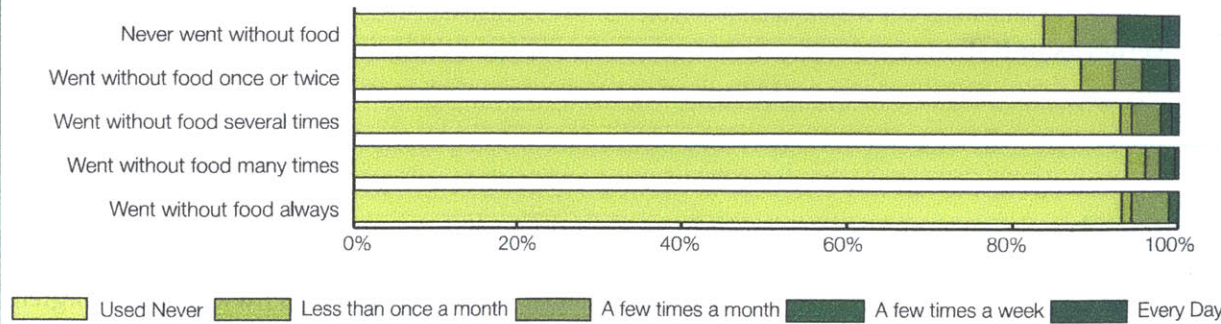## Zambian Mobile Phone Use, Sorted by How Often Respondent Went Without Food

Never went without food
Went without food once or twice
Went without food several times
Went without food many times
Went without food always

0%   20%   40%   60%   80%   100%

Used Never | Less than once a month | A few times a month | A few times a week | Every Day

Zambian Internet Use, Sorted by How Often Respondent Went Without Food

Never went without food
Went without food once or twice
Went without food several times
Went without food many times
Went without food always

0%   20%   40%   60%   80%   100%

Used Never | Less than once a month | A few times a month | A few times a week | Every Day

Ugandan Mobile Phone Use, Sorted by How Often Respondent Went Without Food

Never went without food
Went without food once or twice
Went without food several times
Went without food many times
Went without food always

0%   20%   40%   60%   80%   100%

Used Never | Less than once a month | A few times a month | A few times a week | Every Day

Ugandan Internet Use, Sorted by How Often Respondent Went Without Food

Never went without food
Went without food once or twice
Went without food several times
Went without food many times
Went without food always

0%   20%   40%   60%   80%   100%

Used Never | Less than once a month | A few times a month | A few times a week | Every Day

ICT IN EDUCATION

Education initiatives are the go-to sector for many development projects, and including more ICT education is an important component of government policy. By using computers in classrooms, governments can ensure that the next generations are ICT literate. In addition to using ICT in education systems, this section also examines other government-run education initiatives such as adult learning classes.

Rwanda

Incorporating ICT into Rwanda's education system and increasing ICT literacy throughout the country is one of the pillars of Rwanda's ICT policy made by the NICI, and the government has shown great dedication toward this goal. According to a report of ICT in Education in Rwanda, "In 2000 just one school in the country had a computer. Six years later over half of primary and secondary schools have been equipped with hardware, over 2,000 teachers have received ICT training, and all public schools are expected to join the information superhighway by the end of 2008"[108]. Additionally, all universities and colleges have computers and are connected to the internet in some way. In the NICI plan, two main universities, the Kigali Institute of Science and Technology (KIST) and the National University of Rwanda (NUR), were selected to be the leaders of ICT improvements in the country. Increasing both awareness of ICT and its uses and teaching computer and ICT literacy has been a cornerstone of the government of Rwanda's efforts toward improvements in ICT.

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108 Farrell, Glen. 2007. "Survey of ICT in Education in Rwanda". *Survey of ICT and Education in Africa (Volume 2): 53 Country Reports.* Washington, DC: infoDev / World Bank. <http://www.infodev.org/en/ Publication.423.html>. pg. 7.

The One Laptop per Child (OLPC) program in Rwanda is one of the strongest in the world, and exemplifies the government's commitment to introducing ICT into the education system. President Paul Kagame has been working with OLPC for some time, and has committed to saturating all primary schools in the country by 2012 (meaning that every child would have his or her own laptop)[109]. Rwanda is the African hub for the OLPC projects, and there are already 110,000 XO laptops deployed in the country[110]. These computers will help improve the education systems, provide access to more resources, and get children ICT literate and interested in technology at an early age.

The NICI-2010 plan included many programs for increasing the use of ICT in education. The government planned to train primary and secondary school teachers in using computers and the internet, and they are working to improve both formal education on ICT and to integrate ICT more into the formal education system. By improving education about ICT, the government hopes to build a technologically savvy and innovative generation to create businesses related to ICT production and services and drive research and development. More informally, the government aims to encourage the use of ICT for lifelong learning, increase content relevant to Rwanda and also create materials in Kinyarwanda (one of the national languages).

Beyond simply increasing education around ICT, the government is also working on many programs and initiatives to build capacity among the current working-age population to encourage the integration of ICT into businesses today. Projects include e-Learning projects targeted at the Rwandan workforce that provide them with improved ICT and organizational skills, encouraging small and medium enterprises to train their staff in ICT, and developing training programs for ICT skills for both the public and private sectors[111]. Many of these human resource development

109 "Rwanda." *One Laptop per Child*. Web. 29 Apr. 2011. <http://laptop.org/map/rwanda>.
110 "OLPC Rwanda." *One Laptop per Child Wiki*. 29 Apr. 2011. Web. 29 Apr. 2011. <http://wiki.laptop.org/go/OLPC_Rwanda>.
111 Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>. pg 84.

projects have been integrated into other ICT business creation projects, as the government aims to make Rwanda a hub of both ICT services and exports in the coming years.

Uganda

Many different government agencies, including the ICT ministry, UCC, and the Ministry of Education and Sports have worked to increase ICT literacy in Uganda. While these efforts have been largely uncoordinated and piecemeal, they have nonetheless made some headway in their goals to use ICT more in education and to increase the technological literacy of the entire population. The National ICT Policy includes some goals about ICT literacy and education, and the Ministry for Education has sponsored or cooperated on many smaller projects aimed at incorporating ICT into different parts of the education system.

The Ministry of Education fully believes in the power of ICT in development and in transforming the Ugandan educational system. In the 2005-2006 sector review, it was reported that guidelines on the use of ICT in schools were developed, training teachers in ICT skills had begun, and it was now required that all secondary schools have an ICT budget[112]. Additionally, there have been many more studies and proposed policies to develop teachers' ICT competencies and to help schools deal with the high cost of ICT equipment. The Ministry of Education and Sports oversees a number of initiatives bringing ICT into the education sector. One such project is Connect-ED, a project supported by USAID that works to bring ICT teaching skills into Primary Teacher Colleges, thus supporting teachers' professional development and promoting their use of ICT as an education tool[113]. The New Partnership for Africa in Development is another initiative that works to provide ICT skills to primary and secondary school students, and to provide

112   "The Education Sector Annual Performance Report 2005 – 2006." Education Planning Department, Ministry of Education and Sports. <www.education.go.ug/Final%20ESAPR%202006.htm>.
113   "The Education Sector Annual Performance Report 2005 – 2006." Education Planning Department, Ministry of Education and Sports. <www.education.go.ug/Final%20ESAPR%202006.htm>.

teachers and school managers with ICT skills[114]. These programs have great goals, but are only very loosely coordinated by the Ministry of Education, leading to overlap and a lack of targeted work in strategic areas and regions.

As a part of the National ICT Policy Framework approved in December 2003, the government included improving ICT literacy and building human capacity as one of its objectives[115]. In order to do this, they aimed to integrate ICT into education curricula, provide incentives to the public and private sector to promote ICT skill development, and to create ICT Centers of Excellence to provide ICT training. With these and other goals in mind, the ICT Policy had big goals that were unfortunately implemented in an uncoordinated way, which led to limited success. Researchers at Research ICT Africa found that "although the coordination framework proposed for the implementation of this policy was never established, the provisions of the policy have been picked up by respective sectors, in particular the ministries"[116]. As such, in the 2005 recommendation for a new telecom policy, increasing the ICT literacy in all sectors was one of the main goals[117]. New strategies, including promoting low cost ICT technologies and using youth as a driving force in increasing ICT use, were identified, and the UCC has integrated many of these ideas into their RCDF programs and other initiatives.

The Ugandan government has produced many policies and initiatives designed to improve the ICT literacy of the country. However, the projects have, in most cases, not been implemented

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114   Uganda. Ministry of Education and Sports. *Status of ICT in the Education Sector.* Web. 29 Apr. 2011.
       <http://www.education.go.ug/Status%20of%20ICT%20in%20the%20Education%20Sector.pdf>.
115   Uganda. Ministry of Works, Housing, and Communications. *National Information and Communication Technology Policy.* Oct. 2003. <www.ucc.co.ug/nationalIctPolicyFramework.doc>.
116   Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_Sector_Performance_Reviews_2010/Vol%202%20Paper%203%20-%20Uganda%20ICT%20Sector%20Performance%20Review%202010.pdf.pdf>. pg. 19.
117   Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_Sector_Performance_Reviews_2010/Vol%202%20Paper%203%20-%20Uganda%20ICT%20Sector%20Performance%20Review%202010.pdf.pdf>.

as elegantly or efficiently as they could have been. Additionally, issues of infrastructure and high costs of ICT equipment have been barriers to achieving the government's goals. The Research ICT Africa group notes that, "The main challenges to the achievement of these goals remain the lack of equipment in schools, lack of electricity, mainly in the rural areas, the lack of sufficient ICT infrastructure in a number of areas and the currently high cost of internet access"[118]. There has been attention drawn to the issue of incorporating ICT into education and job training in Uganda, but more time needs to be spent on the implementation of the strategies identified for them to have a marked effect on ICT literacy.

Zambia

Improving ICT use in education is critical to increasing Zambia's use of information and communication technologies and to accomplish the National Vision 2030 given the current low rate of ICT literacy and education. The National ICT Policy states that "the Zambian education system especially in public schools is characterized by low ICT adoption rates...in 1998, the Ministry of Education started an initiative to introduce computer studies in selected secondary schools. The results have not been as expected...private schools are promoting ICT literacy though only a small percentage of the pupils are ICT literate by the time they leave secondary school"[119]. Improving ICT education programs both in schools and for adults is a key way for the ICT industry progress, and the government has recognized this in all of its policies for the ICT industry.

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118 Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_ Sector_Performance_Reviews_2010/Vol%202%20Paper%2013%20-%20Uganda%20ICT%20Sector%20 Performance%20Review%202010.pdf.pdf>. pg. 20.
119 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/ unpan032690.pdf pg 3

The National ICT Policy of 2006 highlights "promoting ICT in education, research, and development" as one of the pillars of the ICT Policy[120]. They state that their policy goal is to "integrate ICTs in the education system and develop the nation's Research and Development capacity to support, facilitate, and contribute to the development of key sectors of the economy including the development of appropriate local ICT products and services"[121]. Their strategies for accomplishing this goal focus on increasing the presence of science and technology, and more specifically ICT in the education system, developing better programs and centers for university level students to focus in ICT, and to increase investment in research and development to encourage more focus on ICT research. As mentioned previously, however, there is no clear implementation plan for these policies, nor is there a designated agency to implement them.

Despite more attention on the issue of ICT in education in recent years, there are still significant challenges to making Zambia an ICT literate and proficient country. The high cost of technology acquisition and limited local ICT industry make it difficult to implement education initiatives in the country or to operate companies that utilize and thrive on these services. The government also cites "brain drain" as an issue in Zambia, where many skilled personnel are either educated abroad and stay to work abroad, or simply move abroad to work in other countries[122]. With support from many international development agencies, Zambia released an ICT in education policy in early 2007, and though it outlines a great vision and implementation plan for including better ICT education in Zambia, much of the plan has been caught in bureaucracy and has yet to be implemented.

120 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/ unpan032690.pdf pg 27
121 Zambia. Ministry of Communications and Transport. National Information and Communication Technology Policy. Apr. 2006. Web. http://unpan1.un.org/intradoc/groups/public/documents/unpan/ unpan032690.pdf. pg 27
122 Isaacs, Shafika. *ICT in Education in Zambia.* Rep. 2007. Print. Survey of ICT and Education in Africa. pg 7

Conclusion

The Rwandan government has made ICT education a cornerstone of their ICT policy, while the Ugandan and Zambian governments made it more of a part of a larger vision. This may be due to the fact that the public school system in Rwanda is stronger, while Uganda and Zambia rely more on private schooling. However, without more of a focus on ICT literacy, Uganda and Zambia's growth will likely slow in coming years relative to Rwanda if Rwanda's programs are truly increasing ICT literacy.

DEGREE OF INFRASTRUCTURE SHARING AND DEVELOPMENT

Infrastructure development and coordination is imperative to better ICT services. Though infrastructure development can primarily be done by the private sector, there are several roles for the government related to infrastructure. First, having each provider build out their own infrastructure is economically inefficient and undesirable for the government. The ICT regulator can both mandate infrastructure sharing and help finance common infrastructure. Second, laying a communications infrastructure backbone can drastically improve service quality but is generally too large of a capital expense for one company. The governments in many countries are starting to invest in backbone infrastructure to promote a better ICT industry.

Rwanda

Through investment by the Rwandan government and generous financing and investment from many countries and multilaterals, the Rwandan telecommunications infrastructure has improved significantly in recent years. RURA is the main overseer of infrastructure development,

and regulates the rollout of infrastructure by any telecom company and sets industry standards. They are also the regulators of interconnection between companies. In Rwanda, interconnection (where one company pays another to use the former's infrastructure) is common, and companies may enter into interconnection deals with whichever company they want and at any time. "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" according to Nsengiyumva and Habumuremyi [123]. RURA has released a set of interconnection guidelines and requirements, but have yet to stringently enforce regulation in this part of the industry.

As was mentioned previously, there has been significant investment by the government in undersea fiber optic cables and other infrastructure, which private companies feel is hindering their ability to develop infrastructure at a similar pace. The government continues to focus heavily in building better ICT infrastructure despite these complaints, as the government states that they are "committed to the rapid development, upgrade, improvement and deployment of the necessary infrastructure in all key areas"[124]. The NICI Policy outlines the many actions the government plans to take for infrastructure improvement, including enhancing ICT infrastructure in the public sector and improving electric power supply throughout the country. They hope to reduce the costs of many services by reducing the taxes on ICT infrastructure, and to bring low-cost PCs to poorer areas. The government is also working to increase private participation in infrastructure building, formulate standards for the infrastructure, and improve local internet

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123   Nsengiyumva, Albert, and Emmanuel Habumuremyi. *A Review of Telecommunications Policy Development and Challenges in Rwanda*. Publication. Association for Progressive Communication, Sept. 2009. Web. 23 Apr. 2011. <http://www.apc.org/en/system/files/CICEWARwanda_20090908.pdf>. pg 22.
124   Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>. pg 109.

bandwidth[125]. These goals set out by the NICI plan are ambitious, and many projects have been started but are not yet completed. However, expensive ICT infrastructure and poor electricity provision remain some of the main barriers to ICT market entry and better provision of services.

Uganda

The development of a cohesive policy on infrastructure sharing and overall infrastructure development has been largely lacking from Uganda's ICT policies. While there has been some effort by the UCC to increase access to the internet by establishing internet points at all district headquarters, and by building pay phones in many locations, infrastructure remains one of the main roadblocks to better ICT provision in Uganda. Internet is incredibly expensive in Uganda, primarily due to the high costs of putting connective infrastructure in place. Fiber-optic cables such as SEACOM, which came to the Kenyan coast, have significantly increased access to high speed internet, but the financing for these projects was largely private. Fiber optic cables between cities that create a backbone of the transmission network are generally service provider-specific; that is, UTL, MTN, and other companies have each laid their own cables. The Uganda Electricity Transmission Company Limited has a fiber optic network that has been commercialized, allowing new entrants into the market to use this infrastructure to avoid initial investment costs, but the capacity of this network is limited.

The lack of coordination and infrastructure sharing has led to both unnecessary overlap in infrastructure and also exclusionary practices by many of the larger companies. The UCC is responsible for regulating interconnection (calls between networks), but has largely left companies to negotiate between themselves. These agreements can be both time consuming and have often played into power dynamics of the market, with larger carriers having the upper

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125 Rwanda. *An Integrated Socio-economic Development Plan For Rwanda 2006-2010*. Government of
      Rwanda, 2006. Web. 29 Apr. 2011. <http://www.ist-africa.org/home/files/Rwanda_NICI2010.pdf>. pg
      110-111.

hand. The UCC says it is preparing to develop policies for this gray area, but has yet to do so. Another infrastructure issue currently is the leasing structure of lines to offer internet access. While some of the larger service providers are required in their licenses to provide leased lines to customers and other operators, the price they charge is high enough to make it difficult for these other operators to offer competitive rates while leasing from these service providers[126]. The UCC again claims that they are working on new policies to remedy this problem, but have yet to create any sort of price cap or other regulation. Overall, infrastructure is an area where the Ugandan government has not paid as much attention to as it deserves, and the lack of policy and regulation in this domain has led to many inefficiencies and a bottleneck in provision of internet access especially.

Zambia

Zambia's telecommunications infrastructure is minimal, given that ZAMTEL is the only fixed line provider and has struggled to lay basic fixed lines in most of the country. The country's geography makes creating infrastructure difficult, as urban centers have quite dense populations, but outside of these few main urban areas the population is very disbursed, requiring heavy investment per household served to provide services. The National ICT Policy says that "over time the infrastructure capacity has deteriorated due to technology changes and system inadequacies"[127]. Though many policies have focused on improving infrastructure in Zambia, there has been little actual investment by the government in improving it thus far.

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126 Mulira, Nora, Apolo Kyeyune, and Ali Ndiwalana. *Uganda ICT Sector Performance Review 2009/2010.* Rep. Research ICT Africa, 2010. Web. 4 Apr. 2011. <http://www.researchictafrica.net/publications/ICT_Sector_Performance_Reviews_2010/Vol%202%20Paper%2013%20-%20Uganda%20ICT%20Sector%20Performance%20Review%202010.pdf.pdf>.
127 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy.* Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf pg 8

One of Zambia's greatest current challenges is the creation of a national fiber optic backbone. Many neighboring countries have these modern backbones in place and they terminate at Zambia's borders, but Zambia has yet to implement this critical piece of technology. In addition to providing much higher quality services, "the possibility of reducing telephone and internet costs can be achieved by interconnecting the proposed national Fiber Optic network to the under-sea cable running along the African coast"[128]. The National ICT Policy states that the government will facilitate the creation of this infrastructure backbone, but to date significant progress has not yet been made. The policy also states that ZICTA should put in place guidelines for infrastructure sharing, network interconnection, and tariff setting as part of the licensing framework[129]. It does not appear that significant action has been taken in this area, and most providers are simply building their own infrastructure or renting extra bandwidth on another provider's infrastructure. Improving infrastructure sharing guidelines would significantly improve the efficiency of improving the infrastructure of the country as a whole.

Conclusion

The Rwandan government has invested heavily in country-wide infrastructure, while Uganda and Zambia have not invested significantly in infrastructure or coordination. In Uganda, a strong private sector has been able to overcome the lack of government leadership, but in Zambian, ICT provision is severely limited by the lack of and quality of infrastructure. Especially in the early stages of ICT industry development, infrastructure leadership from the government can help jump start the industry, helping companies overcome high capital startup costs and bringing services to consumers more quickly. Once an industry is more developed,

128 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy*. Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf pg 9
129 Zambia. Ministry of Communications and Transport. *National Information and Communication Technology Policy*. Apr. 2006. Web. <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan032690.pdf pg 34

helping regulate infrastructure sharing can create a fairer, better run industry with up-to-date technology.

CONCLUSION

Infrastructure development and coordination, ICT education policy and universal access initiatives are all policymaking areas that are investment by the government in the future of the ICT industry. Each one is incredibly important to helping increase usage rates in parts of the population that may otherwise take a long time to start using ICT. Infrastructure investments by the government can enhance current industry performance by introducing higher quality technologies and securing access for areas where infrastructure is sparse. However, ICT education and universal access initiatives are highly effective ways for governments to accelerate the use of ICT because they help overcome barriers to access that the private sector has little capacity to address. The Rwandan government has excelled in this area, with extensive initiatives in both education and universal access. This has, however, come at the expense of the private sector in some cases. Uganda has done a good job balancing private sector development and universal access projects. As time goes on, I would expect Rwanda and Uganda's ICT industries to grow even more rapidly as the effects of these initiatives are reflected in usage rates.

CHAPTER 7: CONCLUSION

The cases of Rwanda, Uganda, and Zambia offer three very different policy approaches to developing an information and communication technology industry. Rwanda's government has a strong presence in the industry, keeping the number of service providers low in each market, investing in better ICT infrastructure, and integrating ICT into their national education system. Uganda, on the other hand, has taken a more hands-off approach by allowing many companies to operate in the market without much interference, and simultaneously has invested in universal access and education projects to deal with inequities in use that have arisen. Zambia's government tightly controls some parts of the industry while allowing other sectors to operate without government intervention. While none of these solutions is perfect, it appears, judging by both the current percentage of mobile phone and internet users in each country and their trends, that the Ugandan and Zambian model of a more liberalized, competitive market has been much more successful. In both the mobile phone and internet markets, Uganda and Zambia have almost double the usage rates of Rwanda.

In this thesis, I examined three countries' approaches to ICT policy, focusing on six different elements of policy. First, the telecommunications or ICT regulatory body was studied, looking at its powers and how they used them to monitor and improve the industry. Second, the competition level of the ICT industry was analyzed in each country. Third, the paper looked at ownership in the industry, and how that has evolved as the industry developed. Fourth, universal access initiatives and what they entailed were studied. Fifth, we assessed the ICT educations of each program. Lastly, this paper looked at infrastructure regulation and coordination. From this in-depth analysis, there are several conclusions to be drawn.

Within regulatory policies, it appears that the level of competition in an ICT industry is one of the most important drivers of use. The highly competitive mobile phone and internet industries in Uganda and Zambia have driven prices down and service quality up since both of these countries made their markets competitive. Rwanda's mobile phone and internet usage rates are almost half of those in Uganda and Zambia, and industry structure is a large factor in this difference. Ownership of companies in the ICT industry is a factor in industry performance, but the worldwide trend toward privatization seems to indicate that privatized industries are accepted as the most effective policy. The roles of telecommunications regulatory bodies is going to become hugely relevant in the coming decade as ICT industries become more complex and have more players. There is a delicate balance for the regulatory body between over-regulating the industry and inhibiting private sector growth and under-regulating the industry and having companies benefit at the cost of the consumers. None of these three countries has an ideal regulatory situation, as was highlighted in the section on telecommunications regulators. Increasing competition and having a functioning, active regulator are two key elements of a successful ICT policy.

In designing future-oriented policies for the ICT industry, successful strategies need to include universal access projects, improving ICT education, and developing infrastructure and coordinating between companies. These elements that are focused on increasing usage of ICT in the future and ensuring the sustainability of the industry are critical in the developing world where the barriers to using ICT are more exaggerated. Issues such as lower literacy rates, lower income levels, and less start-up capital available for companies are prohibitive to both individual use and the creation of ICT businesses. From the study of Rwanda, Uganda, and Zambia, it does not appear that focusing more on education for ICT or on universal access initiatives is significant in actual usage rates of the country. A lack of sophisticated infrastructure, or simply infrastructure that can handle the demand in the country, does have a critical effect on ICT usage as additional

users cannot get access to services. This is shown in the case of the Zambian internet market, where the government monopoly on fixed line service has led to poor overall broadband service and low growth rates in internet users. As ICT industries become more established, focusing on future-oriented policies are going to become more and more relevant as only the hardest to reach remain non-ICT users.

Looking ahead, this thesis opens up many new areas of research, especially given the relatively few papers that directly address ICT industrial development in the developing world. One of the main questions that remain is how applicable these conclusions are to a wider range of cases. By doing a broader study, additional best practices can be identified, and stronger conclusions about how certain policy choices affect outcomes of the industry could be developed. This thesis has found that the policy choices of three African countries significantly impacted how much ICT is used in those countries, meaning that developing more refined policy suggestions could help increase the use of ICT across the developing world, and provide policy guidance for the development of other industries.

APPENDICES

APPENDIX A: COMPANIES OPERATING IN TELECOMMUNICATIONS INDUSTRY, RWANDA[130]

Service	Licensed Operators	Number of Subscribers	Market share (%)
Fixed Telephony	Rwandatel	16,770	99.5%
	MTN Rwandacell	82	0.5%
	Artel International	0	0%
Mobile Telephony	MTN Rwandacell	1,158,674	87.6%
	Rwandatel	163,963	12.4%
Internet Service Provision	Rwandatel	4,187	49.5%
	ISPA	67	0.79%
	MTN Rwandacell	4,021	47.6%
	New Artel	151	1.78%
	Altech Stream	19	0.22%
	Rwanda	0	0%
	Value Data Rwanda	0	0%
	Star Africa Media	0	0%
	Greenmax	0	0%
	Augere Rwanda	0	0%
	Comium*		

130 Usengumukiza, Félicien. "Overview of Rwanda's ICT Context." Lecture. Rwanda, Kigali. 28 July 2009. Web. <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/FELICIEN%20 -%20AfDB%20ICT%20Situational%20analysis%20in%20Rwanda.ppt>.

APPENDIX B: UGANDA RURAL COMMUNICATION DEVELOPMENT FUND PROJECT STATUS[131]

as of October 1st, 2009

PROGRAMME AREA	OPERATIONAL PROJECTS	OUT OF SERVICE PROJECTS	TERMINATED PROJECTS	PROJECTS UNDER INSTALLATION	TOTAL
Internet Points of Presence	22	12	18	53	105
ICT Training Centres	31	16	17	1	65
Telecentres	12	1	0	0	13
Web Portal	40	38	0	0	78
Internet Points of Presence	74	2	0	0	76
Postal Centres	18	7	0	0	25
Postal Telecentres	0	20	0	0	20
School ICT Laboratories	97	11	0	100	208
Health ICT Laboratories	20	0	0	23	43
Payphones (Incl. CICs)	3349	0	0	750	4099
Wireless Communications Sites (Base Stations)	60	0	0	0	60

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131 "Rural Communications Development Fund." *Uganda Communications Commission.* Web. 29 Apr. 2011. <http://www.ucc.co.ug/rcdf/index.php>.

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