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Last Mile Initiative Innovations:

Research Findings from the Georgia Institute of Technology

EDITED BY MICHAEL L. BEST

Last Mile Initiative

Innovations

Research Findings from
the Georgia Institute of Technology

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In the fall term of 2005 thirteen students from the Georgia Institute of Technology came together as USAID Last Mile Initiative (LMI) Innovation Fellows. Their job was to provide fresh and dynamic new perspectives into LMI programs in Africa, S.E. Europe, and Latin America. These student research fellows came from every major discipline represented at Tech including International Affairs, Computer Science, Industrial Engineering, Engineering Psychology, Mechanical Engineering, and Industrial Design. The results of these activities, contained in this volume, are a wide range of insightful, passionate, and often provocative research outputs, including:

- A new typology of cyber café's in Abuja, Nigeria.
- An assessment of the soft-power relationships within aid funding of LMI programs in Macedonia.
- An assessment of existing work flow networks, and the possibilities of new digital networks, for coffee co-operatives in Rwanda.
- An evaluation of ICT needs amongst rural health providers in Peru.
- An evaluation of the needs, and the independence, of telecommunications regulators within the West African region.
- A study of the prospects, and the impediments, to liberalization of the Internet market in Ethiopia.

The program's Principal Investigator was Michael Best of Georgia Tech. Michael Tetelman of the Academy for Educational Development was the project manager. The program was funded by USAID's Last Mile Initiative under the direction of Juan Belt and Bernie Mazer.

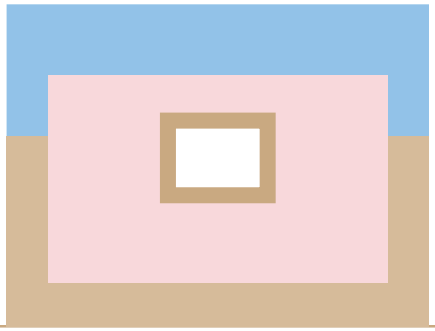
ACKNOWLEDGEMENTS

The idea to involve Georgia Tech researchers within LMI projects – the work of an "Innovation Committee" * originated with Jeffrey Cochrane working with Anthony Meyer. Initial program design was conducted by them in collaboration with Dennis Foote, Al Hammond, and Michael Best. The project, subsequently, was overseen at USAID by Juan Belt and Bernie Mazer. Direct project management and guidance was provided by Michael Tetelman of the Academy for Educational Development under the dot-ORG Program.

Each in-country activity was made possible by a long list of people all providing extraordinary help, insights, inputs, and often warm welcomes. From USAID this included Peter Lampesis, Jonathan Metzger, and Judith Payne. Since a majority of projects occurred in the African region, special thanks are due to Brian King. A number of USAID contractors also were instrumental in the success of these projects including Brian Mitchell, Timothy Schilling, and Glenn Strachan. Each student research fellow interacted with, and was facilitated by, many people; all of them get our heartfelt thanks.

The book was designed by Kaushik Ghosh and Mishta Roy.

Finally, this volume is a testament to the passion, intellect, and compassion of thirteen extraordinary students from the Georgia Institute of Technology. These students came from all of the major colleges of the Institute, came to Tech from all parts of the globe, and ranged in class seniority from a single undergraduate representative to a number of senior PhD students.



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INTRODUCTION

MICHAEL S. TETELMAN, PH.D.

The Last Mile Initiative (LMI) is a USAID-funded global program that expands access by rural citizens to information and communications technology (ICT) and related applications. LMI seeks to do this by building or extending critical telecommunications infrastructure. Former USAID Administrator Andrew Natsios launched this initiative to *"spur increases in productivity and transform the development prospects of farmers, small businesses, new startups and other organizations in rural areas presently underserved by the world's major voice and data telecommunications networks*." LMI is currently active in 25 countries, representing the four major regions where USAID works – Africa, Europe/Eurasia, Latin America/Caribbean, and Asia-Near East.

LMI programs seek to fulfill ambitious objectives such as driving the development of leading-edge technology solutions that extend connectivity from the edge of existing networks to the underserved; creating innovative business models that make the extensions of connectivity profitable; and developing innovative content and applications for users to turn their connectivity to strong advantage. Some of the LMI programs are also working directly to improve the telecom regulatory/policy environments in which they operate; other LMI programs are catalyzing positive regulatory change indirectly by virtue of creating competitive, private sector-based wireless broadband networks.

As befits a program of this scope and diversity, USAID created an LMI Innovation Committee in 2004 whose purpose is to provide cutting-edge research, analysis, and implementation support for the LMI programs. The LMI Innovation Committee's lead partners are the Georgia Institute of Technology and the World Resources Institute, and the Academy for Educational Development (AED) provides overall management of the Innovation Committee through USAID's dot-ORG Program.

Georgia Tech and AED are honored to present this edited volume of Georgia Tech's work for the LMI Innovation Committee. This compilation of ten research papers represents the collective work of thirteen student research fellows, eleven of whom traveled to the LMI countries Ethiopia, Rwanda, Macedonia, Nigeria and Peru. Principal Research Investigator Dr. Michael Best ably led the students' work.

The research papers utilize a wide range of disciplinary methodologies and many important topics that relate to LMI and the ICT-for-development community as a whole. For example, several papers provide practical strategies for improving the enabling environments in which the LMI programs operate. They do so through sharp analyses of national and regional telecom regulatory institutions (e.g. Ethiopia, or the West Africa Telecommunications Regulators Assembly - WATRA) and by exploring how one USAID Mission (Macedonia) created a vibrant and constructive environment for its ICT-for-development programs to flourish.

Other papers look at the essential intersections of ICT access and sector-specific development, here concerning LMI programs designed to strengthen rural Rwandan coffee cooperatives and Peru's rural primary health care centers. These papers offer refreshingly realistic and nuanced observations of appropriate technology solutions and business models and, in this writer's opinion, highlight the important potential offered by handheld devices (cell phones in particular).

Moreover, this edited volume makes an important contribution to our understanding of urban public communication access by exploring how cyber cafes in Abuja, Nigeria both shape and are deeply embedded within existing social and business networks and relationships. These networks and relationships produce a diverse set of cyber cafes and related business/operational models, each conforming to the needs of their users.

In sum, the LMI Innovation Committee hopes that readers will enjoy and benefit from *Last Mile Initiative Innovations: Research Findings from the Georgia Institute of Technology*. These multi-faceted research papers provide significant new evidence that successful donor-funded ICT programs depend on a host of factors, such as regulatory institutions able and willing to liberalize, donor environments that foster strong and open partnerships and communications, sensitivity to appropriate, differentiated business models and technology solutions, and concern for the demands and capacities of the end-users themselves.

ABSTRACTS

Summary: Information and Communication Needs of Rwandan Coffee Stakeholders

Authors: Kelly E. Caine, Walter E. Hargrove and Michael W. Sun

RWANDA IS ONE OF THE POOREST COUNTRIES IN AFRICA. DESPITE FEW NATURAL RESOURCES, NO OCEAN PORTS, AND SERIOUS social issues, Rwanda has the potential to flourish economically. High-end Arabica coffee beans, which command a steep price on the international market, are grown with great success in Rwanda. Our research examined the current communication network in the Rwandan coffee agribusiness and evaluated the system with an eye toward improvement. We also examined the coffee growers' familiarity with communication devices. Some of the key findings show that both high frequency domestic interaction and high cost international contact could benefit from the application of additional information and communication technologies (ICTs). We found that Rwandan farmers, despite having little experience using most ICTs, are eager to integrate ICTs into their everyday agricultural practices. In addition to these research findings, a new method of displaying interaction networks is presented.

INTRODUCTION AND MOTIVATION FOR PAPER

The purpose of this study was to perform a needs assessment for ICTs that would allow for implementation of an effective information exchange structure for all stakeholders in the Rwandan coffee business from local to international players. Specifically, the study examined the farmers' current communication interactions and assessed how they could be improved. The study also explored technology familiarity and preferences among the farmers.

FINDINGS

Key findings regarding the current communication interactions among Rwandan coffee business stakeholders and desired enhancements are depicted in Figure 1. The most significant axis of interaction is between the coffee farmers and local coffee co-op staff. At the same time, both individual coffee farmers and expert farmers expressed a desire to have direct access to information from other stakeholders. Currently, the co-op staff is serving as a conduit relaying general agriculture, governmental, and business data to the farmers.

The study results indicate that ICTs could improve communication flows and efficiencies in the business process. Most participants were familiar with some ICTs and reported that they would like to use ICTs in the future. While most participants were familiar with letters, cell

phones, desktop and laptop computers, and faxes, none were familiar with personal digital assistants (PDAs) or beepers. In terms of usefulness for business, coffee farmers rated cell phones most useful, followed by desktop computers and face-to-face communication. When coffee farmers ranked ease of use, however, computers fell well below top-ranked face-to-face communications, letters, and cell phones as a useful communication method.

While participants did rank solutions such as face-to-face meetings as easier to use than ICTs, they also noted that face-to-face communication was not always without problems. For instance, many mentioned that in order for them to meet face to face with someone, they often had to walk for many hours. If all stakeholders had access to real-time ICTs, the "meeting" could instead take place via ICTs. If a face-to-face meeting was necessary and the person was not there at the appointed time, ICTs such as cell phones would make it easy to avoid questions such as "Are they coming?" or "Should I wait?" and to coordinate next steps.

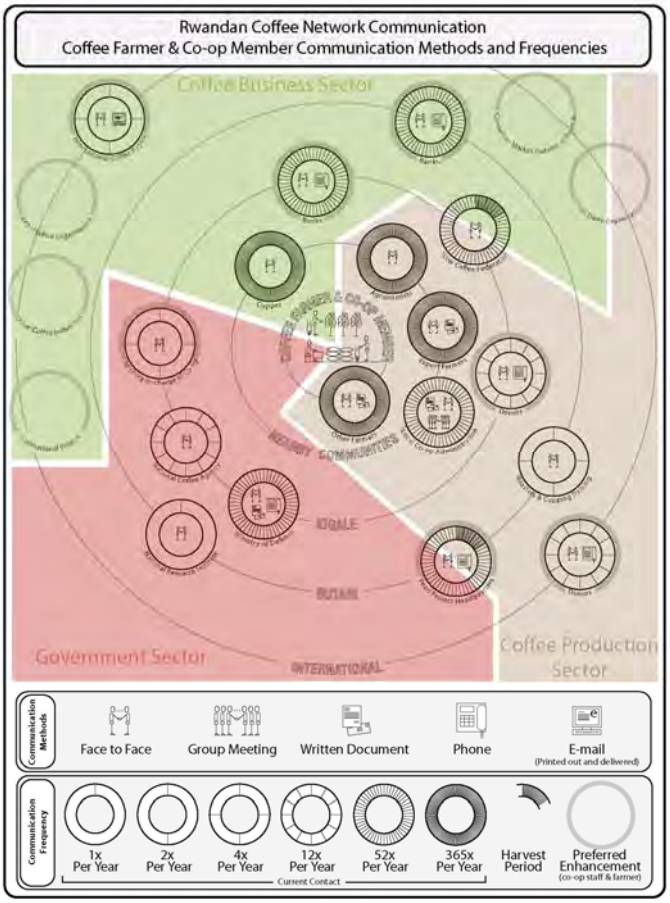


Figure 1. Rwandan Coffee Farmer Communication Methods and Frequencies

CONCLUSIONS

Most of the communication desired by coffee farmers is with stakeholders that are physically distant from them—banks, international aid organizations, the Ministry of Defense, and the new coffee federation. Reliable, easy to use ICTs could clearly help coffee farmers acquire these desired connections. Ease of use and language barriers may hinder farmers from using computers and the Internet for communication, particularly because software written in Kinyarwanda may not be available. In contrast, participants rated cell phones easy to use *and* useful in business, while also indicating a desire to use them in the future.

SUMMARY: Evaluating The Impact And Affordability Of ICTs In Rural Primary Health Care Centers Of Peru

AUTHOR: Sofia Espinoza

THIS PAPER PRESENTS THE RESULTS OF A STUDY PERFORMED IN RURAL PRIMARY HEALTH CARE CENTERS OF PERU. THE STUDY analyzes the potential impact of information and communication technologies (ICTs) on delivery of reproductive health care services, and evaluates whether the perceived impact supports the acquisition of ICT services from a local micro-telecommunications enterprise (micro-telco). This micro-telco will provide users with a basic service package that includes Internet access and voice communication services within the local network. The results show that although rural workers believe that the use of ICTs would allow them to have better access to health information and therefore, improve the quality of the health care provided, they fail to see how ICTs could satisfy more urgent needs such as the lack of qualified personnel and medical equipment. Furthermore, current health care practices (domiciliary visits to patients) and alternative and cheaper communication means (public phones) also make it difficult to capture these health centers as clients of the micro-telco.

Based on those results, the author suggests how ICTs could indeed be of use to the health facilities if they are incorporated into the health care practices and used as tools to satisfy the aforementioned needs.

INTRODUCTION AND MOTIVATION FOR PAPER

The paper assesses the potential impact of ICTs on delivery of reproductive health care at rural health care centers and evaluates the feasibility of acquiring such services. A USAID-funded ICT initiative recently developed in Peru¾o expand connectivity to rural areas¾s taken as a case study. The pilot project consists of creating a local micro-telco that will provide, in the initial phase, Internet access and voice communication services (within the local network) to a cluster of rural districts in Jauja Province. While the basic service package will cap the maximum Internet access time, voice communication within the network will be unlimited.

The study was conducted in December 2005, at which time only a small group of users had been connected to the local network, and only voice communication services were available.

FINDINGS

Results show that most of the participants (80%) are familiar with some type of ICT, with the cell phone being the most used device (by 92% of participants). In terms of computer experience, physicians tended to have more experience than non-physicians. About a third of all respondents had no experience with computers. Still, seventy-three percent of the respondents indicated that the Internet would be the most useful ICT to improve reproductive health care services. In fact, all of the participants with "10 or less years of experience" considered the Internet as more useful, while those with "more than 10 years of work experience" considered the Internet and fixed-line phones equally useful.

Participants' perceptions about the impact of ICTs on improving their work were also very positive. Nearly all (93%) responded "Yes" when asked if they thought that using ICTs at work would help them make better medical decisions and improve the quality of health care. The same proportion responded positively when asked if they thought that having better access to medical information via ICTs would help reduce medical errors related to reproductive health. Eighty-six percent of respondent also thought that having real-time access to reproductive health information would make their jobs easier.

In general, there is a consensus regarding the usefulness of using Internet or email in improving the quality of the health care services provided. Yet, the study also revealed that while health workers saw specific benefits from ICTs, such as ease of coordinating meetings with the community, they failed to see how other, indirect benefits, such as increased patient retention from better quality health care, could make ICTs profitable or cost effective overall when compared to less expensive alternatives such as pay phones or personal visits.

CONCLUSIONS

Although ICTs cannot directly address urgent needs such as lack of qualified personnel or equipment, they can help to increase the time that health workers spend in the health posts (HPs), while also improving the qualifications of the current workers. Currently, attending training courses or searching for health information outside the workplace facility requires leaving the health centre. With ICTs, online distance education could help satisfy the need for staff training yet keep needed staff at the facility. The lack of communication and cooperation among health care providers outside the community can be improved by the "unlimited local calls" feature and thus encourage the sharing of cognitive and even physical resources. Although all the HPs belong to the same category of health facility, differences in quality and quantity of equipment, personnel, and health care services were found even in HPs not more than 2 miles apart.

The positive impact of ICTs on reproductive health care delivery is clear, but it is still too early to fully know how ICTs can support health care information needs. Regarding the financial feasibility of ICTs, the potential increase in the productivity of the health posts could help to cover the expenses of acquiring such ICT services. Further in-depth studies such as detailed cost-benefit analyses are required to confirm results from the present study. Even if the health facilities are unable to afford the micro-telco services by themselves, parallel health initiatives that will assist with acquisition of ICTs by the studied health facilities seem imminent. To take advantage of these ICT tools, health workers need training as soon as possible so that their current positive perception about ICTs does not diminish.

SUMMARY: Influences on the Partial Liberalization of Internet Service Provision in Ethiopia

AUTHORS: Lynn Hartley & Michael Murphree

ETHIOPIA'S INTERNET SERVICE PROVISION (ISP) INDUSTRY IS AT A CRITICAL JUNCTURE ON ITS PATH OF PARTIAL LIBERALIZATION between deepening competitive reforms and a continuation of monopoly control by the public sector. This paper will show how the introduction of peripheral competition will likely not change the nature or quality of Internet service provision in Ethiopia. The institutional framework of the ISP sector can be modeled as a continuum of willingness to accept competitive reforms among the various actors. While there is consensus for reform, views of further liberalization and the rate of expanding competitive provision of services vary along this continuum. We found that stakeholders with the most significant institutional powers advocated sector reforms with the most significant barriers to liberalization.

INTRODUCTION AND MOTIVATION FOR PAPER

The national government of Ethiopia plans to use information and communication technologies (ICTs) to fight poverty and modernize the economy. The government is moving slowly to encourage competition in this sector. An unsuccessful attempt at partial privatization of the national incumbent, the Ethiopian Telecommunications Corporation (ETC), has left many officials at high levels of government skeptical about extensive reform. This paper explores the potential for reform in the ISP sector in Ethiopia to add increased service and quality and why the Ethiopian government prefers certain types of reform to others.

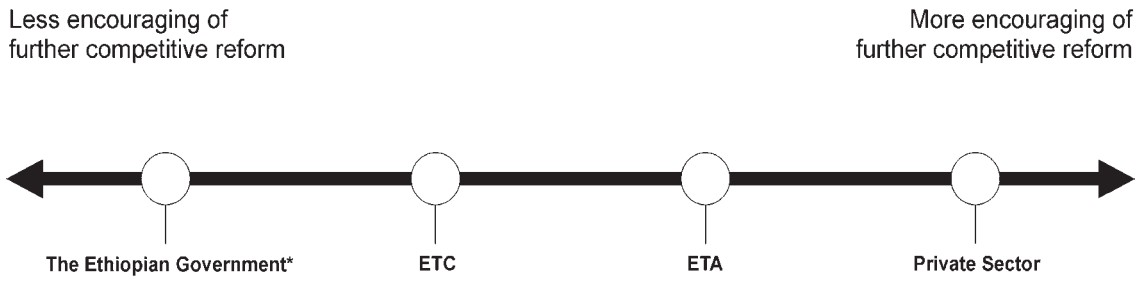
FINDINGS

The debate among stakeholders in Ethiopia is not a question of whether to reform but of how much reform, what type of reform, and when to implement it. Different groups recommend different strategies and timelines. We found that the stakeholders' level of influence was inversely related to their support of rapid and broad competitive reform in the Internet service provision sector (see Figure 1). Though the distances between points on the continuum cannot be exactly fixed, the order of the stakeholders along the continuum illustrates their stated positions relative to each other.

Two specific examples of current Ethiopian policies that create barriers to reform are:

- Limits on technology. Ethiopia's strict control over its international gateway limits the transformative power of the Internet. Currently, the ETC operates a satellite connection and does not allow other entities (aside from two international aid organizations) to operate their own international links. The power of the Internet to act as a globalizing influence on policy is limited when the entire national bandwidth is only twenty-four megabits and no alternative international gateways are available.
- Entry barriers to ISP entrepreneurship. To help realize its ambitious ICT goals, the national government approved a new directive, effective on August 16, 2005, to begin licensing of virtual Internet service providers (VISPs). These VISPs are not, apparently, facilities-based, but still may provide some semblance of competition within the sector. While allowing VISP licensing, the new directive requires certain levels of education and experience from potential licensees. Unfortunately, the stringent education and experience requirements are well beyond those of many interested providers (and well beyond those of successful small-business entrepreneurs in both developed and developing countries), severely limiting the pool of entrepreneurs able to participate. The current requirements will likely negate the chances of a successful introduction of competition.

Figure 1. Continuum of Perspectives on Competitive Reform in Internet Service Provision



*Those organizationally superior to the interviewed officials. Organizationally, this only includes the Council of Ministers and the Prime Minister.

CONCLUSIONS

Given the nature of the institutional framework in Ethiopia, immediate and full competition in the ISP sector is neither possible nor desirable. The regulatory capacity of the Ethiopian Telecommunications Agency (ETA) would be overwhelmed. Yet, reform should not be halted. In fact, continuing on the path of partial liberalization is the most likely way to effect successful reforms in the future.

However, a policy that would result in full, open competition should be applied in the ISP arena. Were the current reforms modified to lower the barriers to market entry, allow for more robust competitive participation from new entrants, and allow for broad access to the Internet, the benefits to Ethiopia would accrue far more quickly. These reforms would provide a foundation from which to test further liberalization. Four likely benefits from modifying the reform initiative are:

- Assurance that the private sector is capable of providing quality service.
- Increased service capacity in the private sector.
- Improvement in the efficiency and capabilities of the ETC as a network operator.
- Experience for ETA as a regulator and licenser of multiple operators.

Summary: Whither or Wither: Sustainability of Regional Regulatory Bodies

Author: Kipp Jones

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) HAVE CONTINUED TO HELP FUEL THE DRIVE TO GLOBALIZATION AND international interactions. The global growth of ICTs does not come without effort and requires the coordinated work of governments, businesses, and regulators to ensure both internal and external interactions can be conducted in a supportive environment. This need has been addressed around the world through various organizations that span beyond traditional country or economic boundaries to ensure that scarce resources are optimized, that competition is fair, and that policies and legislation are coordinated across national boundaries. The operation and sustainability of these international organizations is not a well-understood process and warrants further study. In particular we explore organizations that address telecommunications regulations that span international boundaries and examine the sustainability of the West Africa Telecommunications Regulators Assembly (WATRA).

Sustainability is a far reaching topic that is impacted by many factors both internal and external to an organization that influence the ability of the organization to survive over a period of time. This research explores the needs, influences, and requirements for sustainability of regional regulatory bodies.

To illustrate the need for regional coordination, we examine the possible interactions of WATRA on the critical topic of Internet Exchange Points (IXP) as an example of the interaction, utility, and possible launch point for a sustainable model of operation.

INTRODUCTION AND MOTIVATION FOR PAPER

WATRA is composed of telecommunications regulatory authorities from member countries in the Economic Community of West African States (ECOWAS) sub-region (minus Togo and plus Mauritania). Because of economic, political, and capacity constraints within the West Africa region, the long-term sustainability of WATRA presents a number of unique challenges. This paper argues that WATRA can and should address these challenges to its ongoing sustainability. For example, the authors discuss regional IXPs in detail to show how WATRA can improve its prospects for sustainability and positively impact the region by coordinating connectivity via regional IXPs.

FINDINGS

Based on review of similar organizations around Africa and the world and assessment of current practices, the authors make several recommendations, summarized in Table 1, for improving operational capabilities and the overall sustainability of WATRA.

The authors identify sufficient Internet connectivity as critical to enabling growth in the use of ICTs. Current constraints have created a slow, expensive network for businesses and consumers, greatly limiting who has access to the network and what people can do with it. The authors argue that interconnectivity achieved via regional IXPs among WATRA countries will optimize.

Table 1. Summary of Recommendations

Category	Description	Improvement/Value
Membership	Streamline membership categories, enhance associate (private sector) membership value and increase number of participants	Increases community awareness, builds capacity, increases communication, leverages scale economies, improves operational revenue for WATRA.
Organization	Hire Managing Director and establish priority task forces	Increases WATRA's capacity and ability to execute on mission.
Operation	Act like a start-up, become entrepreneurial	Increases WATRA's capacity, stretches capabilities and attracts additional talent.
Projects	Leverage unique regional capabilities, act as a neutral convener standing in community.	Focuses on impact, provides valuable cohesive force across region, improves WATRA's

Internet traffic within the region and should reduce costs and improve service. They outline how WATRA could facilitate coordination and provide resources to realize regional IXPs, in turn demonstrating its value as an institution and increasing its sustainability. These measures include:

- Providing model policies to help harmonize regulations across WATRA countries.
- Offering workshops to educate stakeholders on the issues related to creating an IXP-friendly environment.
- Facilitating expertise for ISPs and helping establish regional ISP organizations.
- Developing RFPs, innovative incentive structures, and contract agreements for establishing IXPs.

CONCLUSIONS

Prospects for local, national and regional Internet connection points in the WATRA region are numerous. WATRA can take several immediate steps to help with implementation of improved Internet connectivity, while also improving the standing of the organization within the eyes of its constituents.

Recommendations the authors believe will move WATRA towards a longer-term sustainable position include taking lessons from start-up and early-stage companies, continuously monitoring and growing the human capacity within WATRA (especially at the top management positions), initiating an aggressive membership campaign, and formulating funded projects based on a model project plan. While the recommendations do not provide specifics with respect to a financial plan or implementation details, the authors believe the recommendations implemented along with the current activities underway within WATRA provide the best path to a sustainable future for WATRA.

SUMMARY: Lessons from the Macedonia Connects Aid Model

AUTHORS: Taehyun Jung & Keegan Wade

MACEDONIA CONNECTS, AN AID PROJECT FUNDED BY THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID), has recently finished its first phase by successfully providing Internet access to the primary and secondary schools of Macedonia. In this paper, we report an interim evaluation of this project. First, we assess the outcomes of the project through three evaluative criteria: efficiency, effectiveness, and sustainability. Then, we attempt to identify the institutional and managerial features that had contributed to the success of the project. We reconfirm that institutional support and environmental harmonization are key elements to aid project success. Additionally, we found that the utilization of local resources combined with smart contracts had multiple virtues in this aid context.

INTRODUCTION AND MOTIVATION FOR PAPER

Macedonia Connects is providing high-speed Internet access to more than 450 primary and secondary schools and to rural Macedonians. The Macedonia Connects project team contracted with a local Internet Service Provider (ISP), On.net, to create a network and provide Internet service to the schools. Connection fees are paid by the contract for two years, at which time the schools will need to pay for continued connection. The first phase of the project, completed in September 2005, connected schools via high-speed wireless Internet using the Motorola Canopy technology. The next phase aims to maintain stable service quality and to expand the school network to rural Macedonians. The purpose of this paper is to evaluate the interim accomplishment, as of December 2005, of the Macedonia Connects project and to draw useful lessons from this experience to be replicated in similar international aid projects.

FINDINGS

We identified four critical success factors for this project:

- *Use of local expertise*. USAID and Academy for Educational Development, the nongovernmental organization responsible for local implementation, used aid workers experienced with the local aid environment, including during the initial design of the project.
- *Project objectives met recipient's needs.* The objective of rural Internet diffusion was what Macedonia wanted. Local ISPs were willing to provide this service if they had the capital.

- *Partnerships and cooperation among the stakeholders*. Stakeholders operated more in a complementary capacity than in a competitive one.
- *Aid project design used market leverage*. By contracting a capable but incipient local ISP, a new network was implemented efficiently, injecting competition.

Several factors contributed to smooth partnerships in this project.

- *Project-based approach*. The entire Macedonia Connects staff is made up of temporary, individual contractors. Also, some of the key personnel are career aid workers whose customers are aid agencies. To all of them, the success of one aid project is important in getting their next job.
- *Fixed-price plus incentive fee structure with distributed payment*. The design of the contract between Macedonia Connects and On.net also contributed. First, the contract amount does not reimburse the cost of network implementation but instead subsidizes user service fees. Therefore, On.net had to invest its own money building the network infrastructure in order to receive the aid money. Second, the contract includes an award connection bonus for every three rural schools connected to the Internet. This incentive for On.net worked to connect higher cost rural regions that otherwise might have been avoided.

CONCLUSIONS

The Macedonia Connects project has brought Internet connectivity to all primary and secondary schools in Macedonia and will try to provide much of the rural population with affordable connectivity. To determine how well this project has worked to date, we analyzed its components (e.g. actors, socioeconomic attributes) through the lenses of efficiency, effectiveness, and sustainability. We find that it has met these criteria thus far.

The efficiency highlights include the meeting of all project goals to date, excellent resource management, and the use of efficient communication channels. The effectiveness highlights include the lowering of Internet access price levels, enhanced exposure to information and communication technologies in Macedonian schools, and pro-competitive shifts in the Internet market. The sustainability highlights include an optimistic outlook for market, socioeconomic, and technological sustainability.

The project had the benefit of a highly motivated local project team. Not only was this team aid-savvy, they were also knowledgeable about the local environment and communicated with stakeholders on a frequent basis to ensure project success.

Macedonia Connects achieved it successes in part by building on previous development initiatives such as e-Schools and computer donations from China, in conjunction with regulatory and government reform, and a strong desire on the part of the entire nation to meet eligibility criteria to join the European Union.

One major concern is how the schools will maintain their Internet connections over the long run. The issue, however, is stimulating community-based working groups focused on finding a solution.

SUMMARY: USAID Implementing Networks: A Macedonian e-Case Study

AUTHOR: David Sibal

THIS CASE STUDY ANALYZES HOW STAKEHOLDERS OF THREE DEVELOPMENT PROJECTS IN MACEDONIA INTERACT. THE PROJECTS include Macedonia Connects (MKCon), e-Schools, and e-Biz – all of which are United States Agency for International Development (USAID) efforts. They follow a traditional USAID model where contracts are dispersed in Washington, D.C. to a non-profit organization that does most of the groundwork. In implementation, these organizations oftentimes require the assistance of other stakeholders (i.e. local government, civil society, private enterprises, etc.). By studying the relational hierarchies along with communication and information transfer, each effort is portrayed within an institutional context to create clearer understanding of interaction between actors and their implications. We found that USAID in Macedonia capitalized on their unique position as primary funder and diplomatic liaison to ensure that its contracted projects were executed on their terms, under their guidance, while maintaining a cooperative atmosphere. While not all aspects of the interaction were positive, the formula followed by USAID in Macedonia was, on the whole, successful and worth inspection.

INTRODUCTION AND MOTIVATION FOR PAPER

This case study focuses on three USAID initiatives in Macedonia that integrate information and communication technologies (ICTs) into society: e-Schools, Macedonia Connects, and e-Biz. This study focuses mainly on contract performance and evaluation of in-progress and completed work. It employs an institutional framework for studying the driving forces and relationships in aid projects. This framework accounts for non-tangible factors that influence groups working within an organization or network and allows for study on how differences are overcome. The four factors that we focus on, which are especially problematic in the aid environment, are challenges of symbolic capital (how credibility is built up through characteristics like prestige, status, authority, reputation), isomorphism (pressure for one organization working under another to change as a result of exposure), fragmentation (situations where numerous participants interact with an organization and administrative operations are complex), and external forces.

FINDINGS

All three projects have been successful to date. Creative and focused staff on the ground contributed to the efficient management and

implementation of the project. Understanding how they overcame institutional challenges provides lessons for USAID aid systems. Our findings regarding four institutional challenges follow:

- Symbolic Capital: USAID-MK (USAID's Macedonia mission) has established a high degree of symbolic capital through its strong presence on the ground and direct involvement in implementation. This presence allowed them to maximize their pay-off (i.e., being effective and receiving credit).
- Isomorphism: Initially it can be hard to distinguish isomorphic tendencies when the partnering groups share similar goals, but changes did occur gradually. Positive U.S. influences were visible from exposure to a well-functioning, non-corrupt government administration and from guidance on business operations in a competitive market.
- Fragmentation: For the most part, strong coordination by USAID-MK and strong communication by all organizations allowed specialization to be an asset not a hindrance to the project.
- External Forces: Competition for contracts in Washington can create barriers on the ground, at the expense of results. Fortunately, this was not the case in Macedonia because USAID-MK was able to gain sufficient symbolic capital. Also, the removal of communication barriers between the Academy for Educational Development and Education Development Center, the nongovernmental organizations (NGOs) responsible for local implementation, contributed to the success of the e-Schools and MKCon projects.

CONCLUSIONS

This research analyzed the ways in which ground operations are executed in an institutional context. Foreign aid networks are often convoluted and complicated. Macedonia provided a unique case study because, contrary to much aid literature, stakeholders on the ground created synergy and executed profound projects (especially Macedonia Connects and e-Schools) that had a substantive impact on the people of Macedonia and a high payoff for USAID. Open channels of communication, high levels of information transfer, strong cooperation, well-organized stakeholders, and USAID-MK support were critical success factors.

The case of Macedonia shows that many positive benefits can result from using NGOs to implement aid initiatives, but that does not remove the need for USAID to have a strong presence on the ground. In working as a partner to the contracted NGOs, USAID was able to maximize their funds for both the Macedonian and American people. Macedonia benefited from the improved status of their education system and market structure, while America won the admiration and gratitude of a Balkan country that may soon find itself as a voting member of the European Union. However, one visible weakness was a lack of institutional learning transferred between the ground and USAID in Washington, DC. Given the success of these three Macedonian initiatives, lessons learned (and transferred) could greatly help projects, at minimum, in Eastern Europe, and possibly around the world.

SUMMARY: Connecting the Rwandan Coffee Cooperatives: Economic Analysis of Network Deployments for Rural Rwanda

AUTHOR: Michael Sun

UNDER THE USAID-LED PARTNERSHIP FOR ENHANCING AGRICULTURE IN RWANDA THROUGH LINKAGES (PEARL) PROJECT, A number of Rwandan coffee cooperatives now sell high-profit, specialty coffee to the international market. Essential to the project's success has been the "richness" in relationships developed between cooperatives and international buyers. As the project nears completion, management and operation responsibilities will be transferred from USAID directly to the local cooperatives. It is critical for the cooperatives to maintain and cultivate these vital business relationships. Currently however, none of the cooperatives have Internet connectivity and few have phone service. USAID wishes to deploy a low-cost, economically sustainable network to the cooperatives that will provide, at minimum, e-mail capabilities.

Ten cooperatives are to be connected with varying levels of Internet service. Some cooperatives seek high bandwidth solutions that will support cooperative-run cyber-cafés, bandwidth re-selling, and voice-over-IP, while others desire only connectivity adequate for e-mail. This work proposes several wireless network technologies and topologies capable of connecting the cooperatives. Economic models for deployments using WiFi (802.11), pre-WiMAX (proprietary OFDM), VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO, and using varied network topologies, are constructed and analyzed. Resulting from the analysis are insights on proper technology choices—fixed-link wireless versus cellular-based wireless deployments—key cost factors, and the impacts that NGOs and other external funding agencies can have on local telecom tariffs.

INTRODUCTION AND MOTIVATION FOR PAPER

Through managerial and technical support, the PEARL project has helped local Rwandan coffee cooperatives grow, process, and distribute their high-quality coffee beans to buyers worldwide. As a result, cooperatives under the program have seen their revenues quadruple and exports increase tenfold. As the PEARL project comes to a close however, all managerial and business operations must be taken over by the cooperatives. Currently, none of the cooperatives have Internet access, and telephone service is sparse. The USAID Last-Mile Initiative (LMI) aims to provide, at minimum, e-mail capabilities to the cooperatives.

This paper looks in detail at a range of potential wireless networks. Economic models incorporating deployment costs and estimated revenue streams are then constructed for the proposed network solutions.

FINDINGS

Four cooperative types were identified based on their needs and characteristics:

- The "Sub-POP" (Point of Presence) cooperative is located in a substantial business district with enough demand to support a cooperative-owned cybercafé and the reselling of capacity to local schools, health centers, and government offices. This arrangement requires fairly high bandwidth (at least 384 Kbps) and presumably a wireless local-area network (WLAN) to share Internet connectivity with neighboring entities.
- The "Telecenter" cooperative operates a cybercafé, but does not resell bandwidth to local entities. A bandwidth of 256 Kbps via a wireless wide-area network (WWAN) is sufficient.
- The "Rich" cooperative desires high quality connectivity (at least 128 Kbps), but does not run a cybercafé or resell to local entities.
- The "Minimalist" cooperative resides in a relatively isolated locale and requires minimal connectivity for e-mail use (48 Kbps).

Even with the support of LMI, connecting all of the cooperatives and providing the needed bandwidth remains economically challenging. After determining that WiFi is the lowest cost technology for WLANs and Canopy 2.4 GHz currently the cheapest for point-to-point or point-to-multipoint fixed-wireless WWAN networks, we looked at the overall economic sustainability of deployments using these technologies in addition to VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO. Table 1 shows the net present value of deployment over a 10-year period for each technology solution and cooperative type. The cheapest solution for each category is shaded.

Table 1- NPVs of various technology solutions

Technology	Net Present Value			
	Minimal Coop	Rich Coop	Telecenter Coop	Sub-POP Coop
Canopy 2.4 GHz	-$8,072	-$12,105	-$15,814	-$39,377
VSAT	-	-$29,400	-	-
GSM/GPRS	-$2,352		-	-
CDMA2000 EVDO	-$8,309	-$10,999	-$16,729	-$30,024
CDMA2000 1x	-$4,814	-$8,847	-$17,804	-$28,952

Overall, analysis of the economic models reveals two major insights:

1. Cellular-based WWAN deployments such as GPRS, CDMA2000 1x, and CDMA2000 EVDO are the preferred solutions if enough aggregate demand exists and a cell base station tower exists within the coverage area. Otherwise, fixed-link WWAN deployments using WiFi and WiMAX are more viable when specific locations must be reached and regional demand is uncertain.

2. Operating expenses such as human resources and bandwidth dominate the overall costs of these networks. Bandwidth tariffs generally rise exponentially as bandwidth requirements are increased, but the increase can display great variability across technologies. This is a result of the complex set of revenue and external funding streams telecoms receive that subsidize certain technology deployments in differing ways.

CONCLUSIONS

We have evaluated the costs for several technology deployments capable of connecting ten coffee cooperatives around rural Rwanda. Depending on the needs of individual cooperatives, various technologies offer the lowest cost solution. These choices are dictated less by actual technical capabilities and costs, but rather by bandwidth tariff structures offered by the telecoms that provide the backbone network and international connectivity. When a cooperative is not within range of an existing base station tower and latent demand in the area is uncertain, fixed-link WWAN technologies offer the most cost effective, risk averse solution.

Summary: 3G in China: A Resource-Based Examination of Telecom Firms in China

Author: Yu Tao

MULTINATIONAL AND DOMESTIC TELECOMMUNICATIONS FIRMS (TELECOMS) IN CHINA ARE ACTIVELY WORKING ON THE RESEARCH and development (R&D) of 3G, or third generation mobile communication technology, before China licenses any standard for commercial use. This paper uses a resource-based perspective of a firm's sustained competitive advantage to examine and compare the long-term competitive advantage of multinational telecom firms and Chinese telecom firms in terms of 3G strategies. It concludes by going beyond the resource-based perspective and discussing what the current 3G R&D situation means to China.

INTRODUCTION AND MOTIVATION FOR PAPER

3G is the third generation mobile communication technology that allows mobile subscribers access to high-speed data services as well as voice. This broadband capacity can support services such as video, music, and data downloading for mobile subscribers. Three international 3G standards have been approved by the International Telecommunication Union (ITU): WCDMA, widely accepted and used in Europe; CDMA2000, primarily used in the United States; and TD-SCDMA, China's homegrown standard developed by the telecom company Datang.

This paper compares the sustained competitive advantage of multinational telecom companies versus domestic Chinese telecom companies in their R&D of 3G systems, and discusses the domestic telecom firms' position as 3G enters the Chinese market. The paper examines multinational and Chinese telecom firms' physical and human capital resources and compares their long-term competitiveness in the 3G market. Both groups have been active players in the second generation (2G) voice arena, and currently are active in the R&D of 3G standards. The companies in this study are equipment and network technology providers rather than network operators.

FINDINGS

The resource-based view argues that whether a firm has a sustained competitive advantage depends on whether it is implementing a unique value-creating strategy that current or potential competitors are unable to duplicate. Based on this framework, the authors find that both the domestic Chinese and multinational groups of firms are implementing a value-creating strategy. Given that the government has not licensed any

particular standard(s), most firms are working on more than one. The strategies that both multinational and Chinese telecom firms are implementing are quite similar, as summarized in Table 1.

In terms of location, both multinational and Chinese telecom firms have been expanding their R&D activities in various cities, taking advantage of local capital resources and policies of the cities where they set up 3G R&D centers. In terms of experience with 3G operations and training, multinational telecom firms have more experience in European and American markets, though most of these 3G markets have yet to earn a profit. This greater experience in 3G R&D can be applied to training their R&D staff in China. Chinese telecom firms also currently have the capability to train their staff based on their R&D experience in China, while experience they gain from overseas market expansion will likely further enhance these abilities.

Table 1. Comparison of multinational telecom firms and Chinese telecom firms working on 3G in China

Group	Location	Experience in 3G operations and 3G training	R&D Personnel
Multinational Telecom Firms	Traditionally well developed major cities (East Coast, Changjiang River Delta, Zhujiang River Delta); the Western Region (Chengdu)	Experienced in overseas market; training in overseas centers	New graduates, most of whom are not experienced, and experienced R&D workers. This will still be true when they expand recruitment in the near future.
Chinese Telecom Firms	Similar to above locations	Some experience in the overseas market; training primarily in China	Similar to above personnel

Multinational telecom firms do not enjoy an absolute long-term competitive advantage in terms of physical and human capital resources. However, multinational telecom firms do have certain advantages. R&D personnel in multinational firms can more readily travel to Europe and other places where the firms' headquarters and major R&D centers are located to gain first-hand experience with 3G technologies. This experience is not necessarily available to staff at all Chinese telecom firms. Another factor is market share in the 2G market. Currently, one multinational, Nokia, holds about one third of the market share for 2G, while all the multinationals combined have a majority of the market. If network operators decide to upgrade their 2G networks to 3G networks in the near future, multinational telecom firms will benefit much more than domestic telecom firms.

But these factors do not mean Chinese firms cannot catch up. Those Chinese firms working on WCDMA and CDMA 2000 are gaining experiences from European and other markets. In addition, the Chinese government may offer incentives for TD-SCDMA to keep it in the mix of 3G standards, offering a small advantage to domestic firms with this R&D experience.

CONCLUSIONS

Multinational telecom firms do not enjoy a sustained competitive advantage in terms of physical and human capital resources. Chinese firms have made first steps and are showing progress.

But the current disadvantages of Chinese telecom firms are easily recognized. Those working on 3G are fewer in number and smaller in scale in general than multinational telecom firms. They also have fewer patents than their international competitors. The multinational telecom firms have embraced not only the standards they started to work on earlier, but also the Chinese standard.

SUMMARY: Relating Regulatory Independence to Telecommunications Sector Performance: A Study of the ECOWAS Region

AUTHOR: Nsikan Udoyen

A SURVEY OF NATIONAL TELECOMMUNICATIONS REGULATORY AGENCIES IN WEST AFRICA WAS CONDUCTED TO BETTER understand regulatory environments within the region and determine whether the independence of regulatory regimes could be used to explain variations in teledensity and telecommunications sector performance. The survey characterized the regulatory agencies' independence by studying their relationships with the government, the industry, and the general public. In studying responses from six respondents, no significant variation was found in terms of the regulators' relationships with the industry and the general public. Differences in the regulators' relationships with the government could not be used to explain variations in teledensity.

INTRODUCTION AND MOTIVATION FOR PAPER

This study examines the functioning, roles, and capabilities of the current regulators in six West African countries using a framework developed by Irene Wu of the Federal Communications Commission (FCC) to assess regulator independence and openness of rule-making procedures. The authors hope this information will contribute to discussions on harmonization of telecommunications policies in the Economic Community of West African States (ECOWAS) region by identifying best practices for approaching recurrent common problems.

The study also attempts to determine specific ways that the Wu framework can be augmented to more accurately identify relevant traits of telecommunication regulators in order to examine the correlation between such traits, regulator independence, and telecommunications sector performance.

FINDINGS

Six countries participated in the study by answering surveys. Table I summarizes indicators that characterize the regulators' relationship with consumers, industry, and government. The results show little variation in the relationship between the general public and regulators or industry and regulators, though there is variation in indicators of sector performance, including teledensity, across the six countries participating in the study. Similarly, no significant relationship was found to exist between teledensity and indicators describing the relationship between the government

and the regulatory agencies. However, indicators of the regulators' relationships with the government returned the most varied results, prompting deeper analysis to better understand how these indicators relate to indicators of sector performance.

One possible explanation for these somewhat surprising findings is that most regulatory agencies in ECOWAS are relatively new, and thus it is too early to use the independence of the regulatory agency to explain variations in telecommunications sector performance across ECOWAS.

Table 10. Summary of indicators

Country	Independent Leader	License issued by regulator only	Independent Funding	Private Incumbent	Little movement of staff b/w regulator and industry	Consumer office	Universal service office
Cote d'Ivoire	Yes	Yes	No	No	Yes	No	No
Gambia	No	No	No	No	No	No	No
Ghana	Yes	No	Yes	No	Yes	No	No
Guinea	No	No	No	No	No	No	No
Mali	No	Yes	Yes	No	No	No	No
Nigeria	Yes	Yes	Yes	No	No	Yes	No

CONCLUSIONS

Telecommunications regulators in six ECOWAS countries were studied based on their responses to a survey. The survey instrument attempted to characterize regulator independence by examining their relationships with the government, industry, and the general public. The responses showed that the relationships between the regulators and the general public and industry varied little across the six countries. However, variation was found in the relationship of the regulator to government across the sample countries. While this variation is present, our analysis demonstrates that it does not adequately explain differences in sector performance, for instance as indicated by teledensity, between the participating countries. It was concluded that it is too early to relate variations in sector performance across ECOWAS to regulatory independence. Furthermore, it may be necessary to develop new indicators to describe in greater detail the relationship between the regulator and other sector stakeholders if we are going to be able to fully reveal how regulatory independence and sector performance is (or is not) related.

SUMMARY: Portal, Pedagogue, Worksite: Cybercafés as Second and Third Place

AUTHOR: Arvind Venkataramani

TELECENTERS ARE FAST BECOMING A WIDESPREAD METHOD FOR PROVIDING PUBLIC ACCESS TO INFORMATION AND communications technologies (ICTs) within underserved communities. One particular version — the cybercafé — is particularly interesting because it is sufficiently mutable and adaptable to a variety of contexts. Unfortunately, however, cybercafés' status as independent stand-alone business ventures, which usually are not funded by development agencies, means that studies of such institutions tend to focus either on their function as enablers of specific communication needs, or as sites for measurement of ICT use. But cybercafés are as much an urban social phenomenon molded by the peculiarities of their context as a deliberate means of providing access to ICTs. Are there other aspects of access that need to be considered?

This paper attempts to present a more holistic picture of access through a case study of cybercafés in Abuja, Nigeria. We discuss the frames that Nigerians use for cybercafés - portal to the outside world, a pedagogue for computer skills, and an informal worksite - in light of the kinds of relationships between operator and user, the physical location, and the infrastructural, technological, and financial hurdles overcome as part of normal operation of these cafes. We then demonstrate how these interconnections explain the practices surrounding ICT usage and access patterns at the cafés, and the implications for supporting public access to the Internet.

INTRODUCTION AND MOTIVATION FOR PAPER

This paper describes the value that cybercafés provide to users in Abuja, Nigeria by examining a) technological infrastructure, b) services offered, and c) practices surrounding usage in order to distill strategies for success in the future.

FINDINGS

The paper identifies three distinct forms of cybercafés, each offering different combinations of services: the "business center", the "neighborhood café", and the "cool café". Differentiation occurs in location, services, technological infrastructure, and, to some extent, price.

The business center is the most common form of cybercafé in Abuja. It typically consists of not more than 10 or 12 computers for browsing and is distinguished by its close proximity to commercial establishments, basic interior, simplicity of technological infrastructure and an emphasis on document services. This emphasis on document services includes staff dedicated to assisting clients with creating letters, resumes, project reports, and other text documents. The only clear difference between a business center and a printing shop/document services center is the greater availability of computers set aside for Internet browsing.

The neighborhood café usually has 10 to 12 computers, and, while present in a wide variety of locations, they are, in contrast to the business center, usually near a residential area. The neighborhood café may have newer hardware than the business center and devotes more attention to comfort and privacy. While they also generally have printers and other hardware related to the provision of document services, they do not have staff dedicated to that purpose. Many of the cafés of this type were very new — most were open less than 6 to 8 months at the time this research was carried out.

The cool café is an establishment that explicitly differentiates itself by framing itself as a place for entertainment and relaxation. The cool cafés are located away from the other cafés, higher priced, and generally more luxurious. Staff spend less time assisting users because the customers are generally regular surfers comfortable using computers and the Internet. These establishments, though equipped with printers and scanners, do not emphasize these services or devote dedicated staff to supporting them. The cool café attempts to sustain itself using computer and Internet usage as the primary source of revenue. It is by far the rarest kind of cybercafé.

For most people, the cybercafé with its fixed times of operation and shared usage model is the *only* means of Internet access. They tend to use cybercafés in three distinct ways:

- A portal to the world outside Nigeria. A cybercafé has value as a place to 1) connect with people outside Nigeria and establish relationships with them and 2) find valuable information about the outside world, as well as information from the outside world about things relevant to oneself.
- A place to learn computer skills. While computers themselves are not new to Nigeria, only a small fraction of interviewed users had used a computer before they started to access the Internet. Most users did not distinguish between using a computer and going online and saw acquisition of computer skills as an economic advantage. This view was held not only by students, but also by working professionals.
- A worksite. A cybercafé serves as a worksite, either as an extension of the office, or, for users without their own offices, as an office itself. The primary use for most business people is email. However, some users rely on the operators to create, print, and manage documents—both when they are on site and when they are not. In some cases, trust between the operator and the users is strong enough that the operator takes on a quasi-secretarial role for the user, performing tasks such as checking and sending email or getting documents printed and sent.

CONCLUSIONS

Cybercafés in Abuja serve several functions simultaneously: as a place to work, learn, or relax and socialize. Operators play a critical role regarding services and access: as host, as provider of technical assistance, and as trusted provider of computing services. Operators also target their businesses geographically with those emphasizing business activities locating in commercial areas, while those emphasizing recreation tend to locate near more privileged or residential communities. Thus, we see significant specialization and differentiation among cybercafés.

FULL PAPERS

INFORMATION AND COMMUNICATION NEEDS OF RWANDAN COFFEE STAKEHOLDERS

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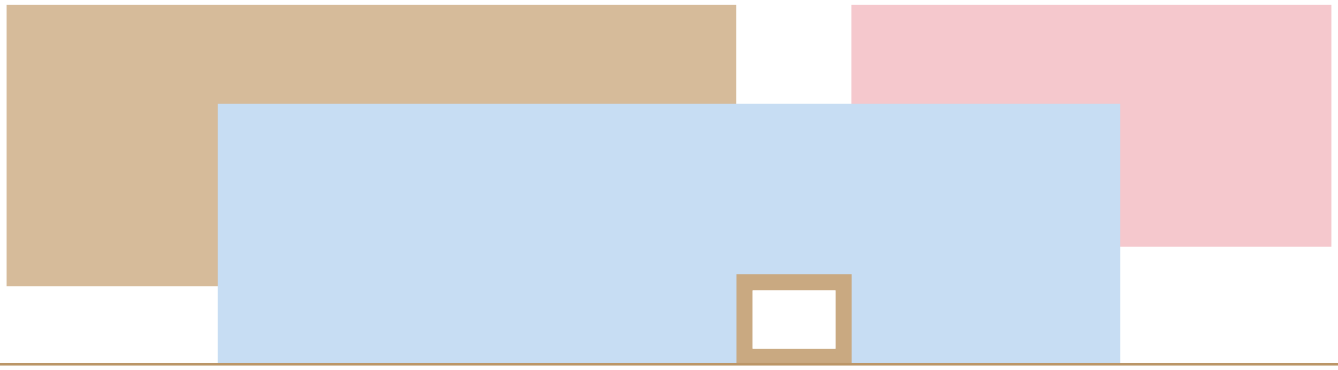

ABSTRACT

RWANDA IS ONE OF THE POOREST COUNTRIES IN AFRICA. EVEN WITH FEW NATURAL RESOURCES, NO OCEAN PORTS, AND SERIOUS social issues, Rwanda has the potential to flourish economically. High end Arabica coffee beans, which command a high price on the international market, are grown with great success in Rwanda. Our research examined the current communication network in the Rwandan coffee agribusiness and evaluated the system with an eye toward improvement. We also examined the potential user's familiarity with communication devices. Some of the key findings show that both high frequency domestic communication and high cost international contact could benefit from the application of ICT's (Information and Communication Technologies). In addition, despite having little experience using most ICT's, Rwandan farmers are eager to integrate ICT's into their everyday agricultural practices. In addition to the contribution of the research findings, a new method of displaying interaction networks is presented.

INFORMATION AND COMMUNICATION NEEDS OF RWANDAN COFFEE STAKEHOLDERS

Despite the promise of economic development through information and communications technology (ICT) most ICT projects in developing countries fail (Heeks, 2002). The failure of ICT projects in developing countries can be attributed to Design-Reality gaps which are the mismatches between Information System designs and local user realities (Heeks, 2002). For these gaps to be filled the information and communication needs and expectations of the users of ICT's need to be identified and incorporated into the design of a system before the implementation phase. The appropriate time to identify these needs is while a project is still in the planning phases. In addition to design reality gaps, the intensity of the information needs of each user may vary thus varying the type of ICT required to meet those needs (Donner, 2004).

One ICT for development project that is still in the planning phase is a program aimed at improving the communication capabilities among a group of coffee industry stakeholders in Rwanda. Over the past few years, USAID has been actively involved in providing management and technical support to coffee co-operatives in the Rwandan coffee sector. This support has allowed a trend toward developing the relationships which facilitate the sales of specialty coffee which brings much higher prices than traditional coffee. These higher coffee prices mean more profits for coffee cooperatives and farmers which may lead to increased economic development in rural areas of Rwanda. However, for the success to continue, the coffee cooperatives and farmers must begin to manage their business relationships on their own. A critical part of managing these business relationships includes communicating between customers and suppliers who are mostly European or American. These European and American customers often initially travel to meet the suppliers face to face. However, once the relationship is established, many buyers expect to be able to have instantaneous contact with the farms and co-ops via telephone and through email. To remain competitive on the global coffee market, the cooperatives need to have access to such communications technologies. USAID through its Last Mile Initiative (LMI) hopes to encourage the implementation of these technologies in the co-operatives (LMI Proposal – Rwanda). However, for the project to be successful long term the design of the information and communication technologies must not fall prey to design-reality gaps. Before a technology is chosen and implemented in Rwanda the information and communication needs of the potential users of the system must be assessed.

Background on Harvesting and Coffee Processing

The quality of the coffee bean is greatly determined by more than the genetic properties of coffee beans. The environment, cultivation methods, and post harvest processing (i.e. storage, hulling, sorting, and roasting) have additional considerable effects on the quality of the coffee. The remaining information in the *Harvesting and Coffee Processing* and *Coffee Bean Quality Assessment* is drawn from Wintgens (2002) book *Coffee: Growing, Processing, Sustainable Production. A Guidebook for Growers, Processors, Traders, and Researchers.*

Both the robusta and arabica coffee bean's basic structure made up of an external skin called the exocarp which turns red or yellow when ripe, a mucilaginous flesh called the mesocarp or pulp and two grains or beans called endosperm. There are three ways to process the coffee bean; a dry-process (natural coffee) which dries the entire cherry (most often robusta) until the whole hull is removed mechanically, wet-processed (washed coffee, primarily arabica) which requires large amounts of water to remove the exocarp and part of the mesocarp, and semi-dry process (pulped natural) which blends steps of both dry and wet- processing. The type of processing used affects how harvesting must be done.

There are two common methods of manual harvesting: selective and stripping. Selective processing produces the highest quality bean and greatly affects the quality of the final product. However, selective harvesting requires a well trained labor force to select the ripe cherry from the immature cherry on the tree. In contrast to the selective method the stripping method harvests all of the cherries in one picking round which can lead to unripe cherries being processed. To provide the best quality coffee bean, when using wet-processing techniques, all of the cherries must be ripe because cherries at other maturation levels can jeopardize the flavor of the rest of the beans.

Rwandan coffee farmers typically use selective harvesting. When most of the cherries that have been picked are ripe, as often occurs using the selective method, then many steps in processing like sifting and flotation can be skipped. The next step, pulping, utilizes small horizontal drum pulpers to separate the pulp from the parchment, or outer layer of the coffee bean. After pulping, the two remaining layers, the mesocarp and coffee bean, are placed underwater for fermentation. The beans do not actually ferment, rather the remaining mucilage ferments allowing it to be more easily separated from the bean. Once fermentation is complete the labor and water intensive process of washing occurs. During washing a wooden paddle is used to move the coffee beans through the water causing the remaining mucilage to be dislodged from the beans.

Once the beans are cleaned the next step is the drying phase. The objective of drying the beans is to lower the moisture of the bean thus allowing them to be stored without risk to the coffee quality. In Rwanda, coffee beans are dried outdoors on large porous tables using sunlight as a drying agent. Using this sun drying process, the beans must be frequently revolved to maintain the appropriate temperature. Once dried the beans are weighed and then bagged into sisal bags for storage or export. Proper storage can affect the quality of coffee and must be carefully executed. The green coffee is typically roasted in the port cities of the country of consumption.

Coffee Bean Quality Assessment

Even with recent improvements correct identification of physical defects in green coffee remains difficult. The quality of green coffee is the result of interactions between variables such as bean type, soil, climate, husbandry, latitude, altitude, luminosity, harvesting, processing, and storage. The flavor of the coffee is the most important factor in measuring the quality of the coffee bean. However, the overall bean flavor is highly susceptible to contamination by contact with spoiled beans that may occur between harvesting and storage. Rigorous methodical procedures in selecting and maintaining the ideal beans are the key to high quality coffee flavor. "Cupping" is the evaluation method used to objectively evaluate the coffee bean quality. Cupping often occurs twice in the coffee industry, once just after the coffee has been processed and then again at the destination port (usually in the United States or Europe). The Cupping scores are documented by both the sellers and buyers and then compared to determine final price per pound.

Determining Information Needs

Although there is information available about coffee production in general, there is very little information about the specific information and communication needs at each stage of the process. For an effective ICT solution to be developed to help Rwandan coffee farmers maintain contact with buyers from around the world, information about the needs of the stakeholders must be obtained. The purpose of this study was to perform an information needs assessment which would lay the foundation for the implementation of an ideal commutation structure for all stakeholders. First, we mapped the pathways through which information is currently transferred among stakeholders. This information was critical to uncovering the communication pathways through which information currently flows and was also used to understand how information should ideally flow. Second we examined types of information that was needed by each stakeholder. This information served as a basis for recommendations about the best method for transferring that information and helped us distinguish between information which may be useful to all stakeholders and information which may only be useful to one stakeholder. Finally we explored the technology familiarity and preferences of the coffee farmers and co-op members who will be asked to use this technology.

METHOD

Participants

A total of 61 participants (25 women and 36 men) ranging in age from 18 to 60 participated in the focus group portion of the study. Of these participants 29 (14 women and 15 men) were also interviewed about their technology experience. In addition, of those participants who were interviewed about their technology experience, 14 (6 female, 8 male) were also interviewed about their technology preferences. All participants were either coffee farmers or coffee co-op members living and working in rural Rwanda. For the most part participants were educated and literate (see Table 1 and Figure 1).

Table 1. Overall Demographic and Educational Characteristics of Participants

Variable	Gender	
	Male	Female
N	36	25
Age		
Mean	38.28	31.44
SE	2.07	2.1
Education		
None	2.8%	4%
Some	63.9%	32%
High School	30.6%	64%
Missing	2.8%	0%

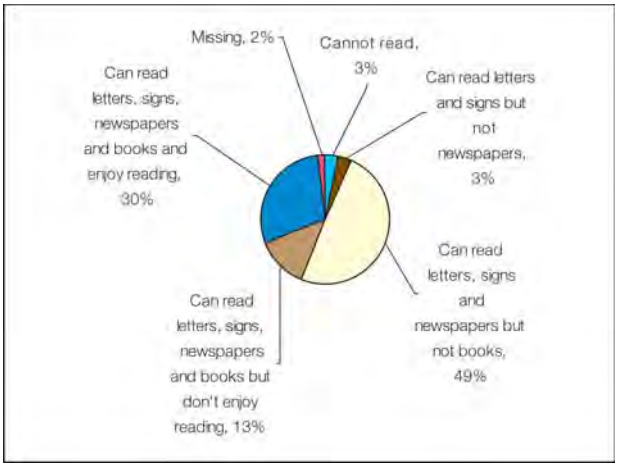

Figure 1. Literacy of Participants

Co-op's were selected on the criteria of being representative of all of the co-ops involved in the PEARL project. The selection of co-ops for this study was made by the head of the PEARL program on the basis of each co-op's geographical location, proximity to a population center and current technology situation (including power and telephone line availability). The co-ops that were selected were: Karaba, Mugombwa, Musasa, Maraba, Nyakizu and Rusenyi (see Figure 2) although no data were collected at Rusenyi due to a Gachacha hearing. Gachacha hearings are hearings where community members gather to decide the fate of neighbors who were involved in the 1994 genocide.

Figure 2. Map of Coffee Co-operatives

Participants were recruited via word of mouth. Each co-op was contacted in advance by the PEARL communications officer and asked to invite interested members to participate. Although participants were not formally compensated for their time (and were told they would not be ahead of time), members of the research team did distribute small gifts as tokens of appreciation.

Design and materials

Demographic information was obtained using a verbally administered questionnaire. A copy of this questionnaire is given in Appendix A. Current communication situation and ideal communication situation were assessed through the use of a focus group. The focus group methodology was chosen because it allows a large amount of data to be collected in a short period of time and because of the synergism that is common in focus groups. Specifically, we wanted each of the group members to be exposed to what other members were saying, hopefully triggering them to recall some communication experience or desire. The purpose of the "current communication" portion of the focus group was to identify who communicates with whom, how the communication takes place, and what the communication is about whereas the purpose of the "ideal communication" portion of the focus group was to identify who the co-op members would like to be able to communicate with and what information they would like to communicate. A copy of the focus group script is given in Appendix B.

Technology familiarity was assessed through individual interviews about the participant's technology experience. Cards illustrating common communication methods (both technological and non-technological) were used to cue participants to recall which type of communication technologies they may have had experience with in the past. The technology experience interview as well as examples of the cards used in this interview are given in Appendix C.

Technology preferences were obtained using a technology preferences interview. The same cards as used in the technology familiarity interview were used in the technology preferences interview. The technology preferences questionnaire is given in Appendix D.

All focus groups and interviews were translated into and administered in Kinyarwanda.

Procedure

The protocol for the focus group was similar but not identical at all co-ops. After giving informed consent, participants were seated in a large room or outdoor pavilion and read the introduction of the focus group script. At all but the Mugombwa co-op (which skipped this portion of the focus group due to time constraints), the groups were next asked about the current communication situation. Participants were encouraged to feed off each others answers and to come to a consensus about the types of communication used and what the communication was about before moving on to another communication type. After the group decided that they had exhausted the list of current communication methods the moderator moved on to the "ideal communication method" script (the Mugombwa co-op did do this portion of the focus group). Again participants were encouraged to come to a consensus about who they would like to communicate with and what they would like to communicate with them about. After the group decided they had exhausted the list of who they would like to communicate with the focus group portion of the study was complete.

Responses to the focus group session were recorded real-time by two of the research team members independently and later compared for consistency. Any comments recorded by one, but not both of the research team were dropped from analyses.

Immediately after the focus group portion of the study participants who were selected as representative of the group (in terms of age, gender and job (i.e. co-op president, member or farmer)) by a member of the PEARL staff, were asked if they would like to participate in the individual interview portion of the study. All participants who were asked if they would like to participate in this portion of the study did in fact participate. For the technology familiarity section participants were given a set of cards (described in the materials section) and asked to select the communication methods they were familiar with. Participant's responses were recorded by a member of the research team.

To obtain technology preferences a sub-set of participants from 3 of the co-ops (Karaba, Mugombwa and Musasa) also completed the technology preferences interview. For this section participants were asked to rank the communication technologies in terms of which they would like to use, which they thought were most useful in the coffee business and which they thought were easiest to use. Participants ranked the technologies by placing the cards in order on a table or bench. A member of the research team recorded the order of the cards.

RESULTS

Interaction network

Interaction networks were derived from the focus group data by laying out the communication stakeholders in an evenly spaced circular pattern. The current and desired interactions were plotted between the stakeholders. This graph provides a visual representation for analyzing the results. The interaction network charts demonstrates graphically how elements within the Rwandan coffee system relate. Both current Rwandan coffee interaction network (Figure 2) and the preferred enhancement of new Rwandan coffee interaction network (Figure 3) charts display communication networks.

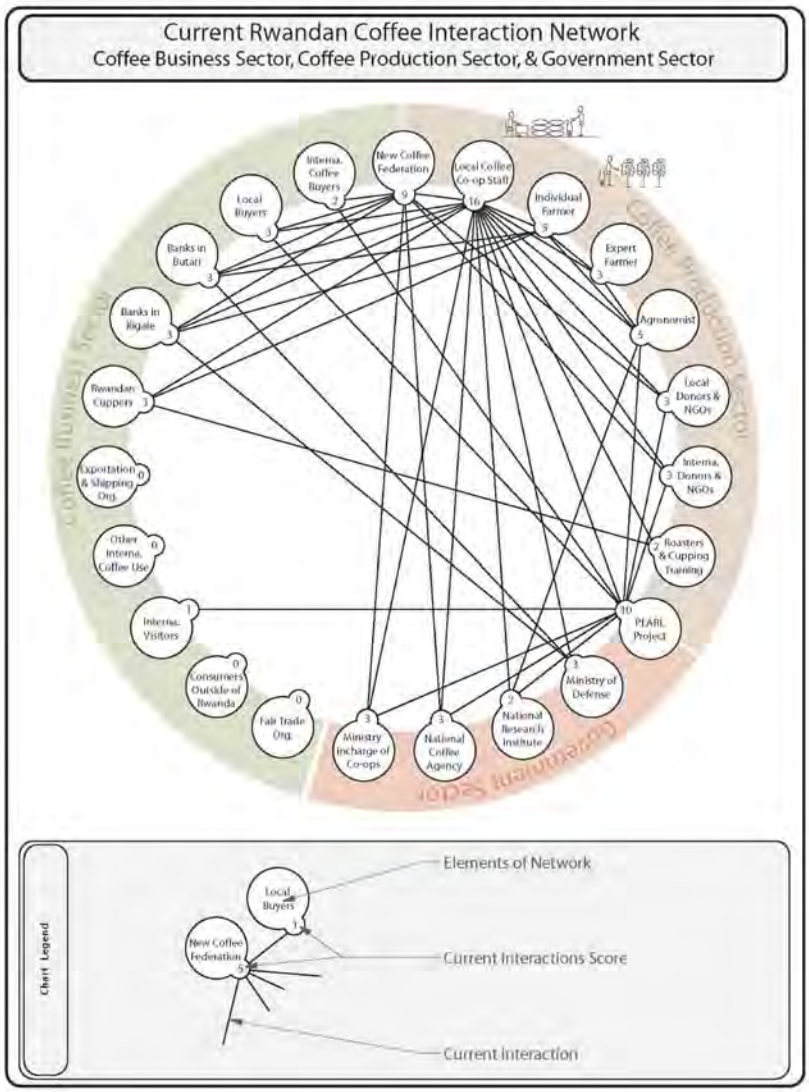

Figure 3. Current Rwandan Coffee Interaction Network

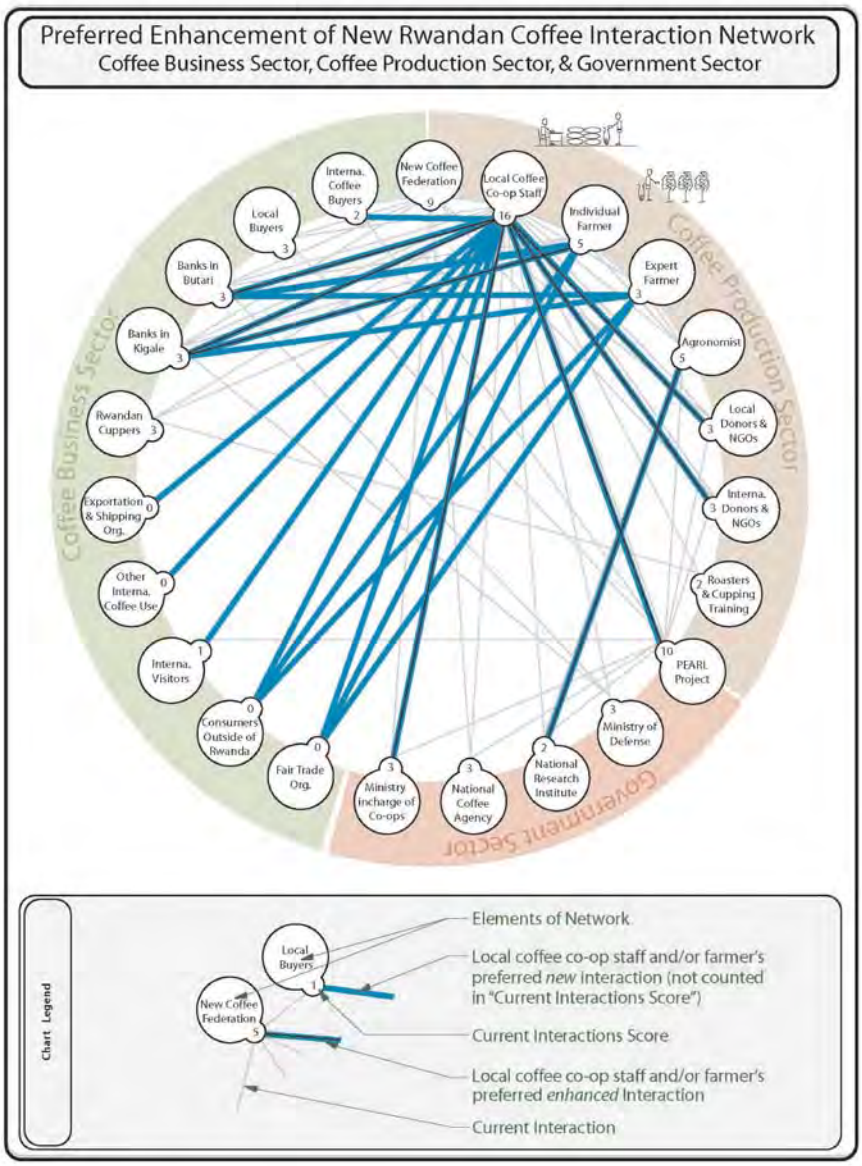

Figure 4. Preferred Enhancement of Rwandan Coffee Network

Stakeholders in those networks are divided into three categories: Coffee Production Sector, Coffee Business Sector, and Government Sectors. Category information is shown in the charts using both location and background color. The coffee production sector is shown in light brown, the coffee business sector is shown in light green and the government sector is given in light red. The New Coffee Federation and the PEARL Project exist at the intersection of two sectors, and are placed overlapping both sectors.

Current and desired communication patways are illustrated using a line from each network node to all the other network nodes where either a) current communication occurs or b) coffee farmers expressed a desired increase in communication. Current interaction is illustrated with thin black lines. A thick blue line shows desired new interactions between the local coffee co-op staff, farmers and the other stakeholders. A combination of a thick blue line with a co-linear thin black line indicates where improved communication is desired with current network stakeholders. The number of current interaction lines per stakeholder is scored by counting the thin black lines, and are given in the current interaction score for each stakeholder.

Due to the complexity and importance of maintaining the relationships between stakeholders in the Rwandan coffee industries an integrated chart was required to display all current and desired communication. The Rwandan Coffee Network Communication chart (see Figure 4) is a chart which incorporates multiple elements in the Rwandan coffee industry.

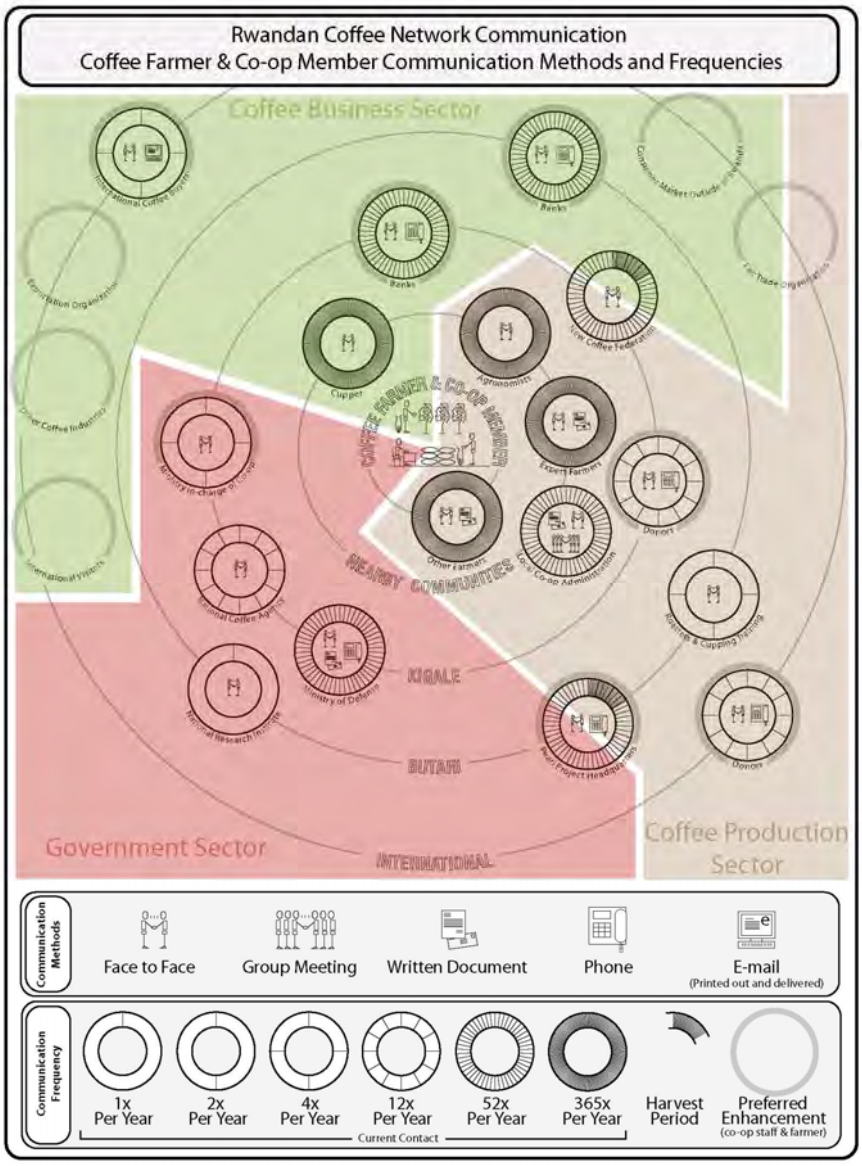

Figure 5. Rwandan Coffee Farmer Communication Methods and Frequencies

Rather than displaying a series of individual charts, where each chart depicts a different subset of data which is disconnected from all others, we designed a new visual method of visual representation which allows several data sets to be compressed into one chart. This method of visual representation allows a viewer to view multiple sets of data simultaneously so that a large variety of complex issues may be explored and integrated. In addition, these representations also effectively present key findings from a single set of data, which usually must be accomplished through the use of additional charts. To make more clear the full advantage of the integrated data represented in the charts, the following paragraphs also present a verbal explanation of the information contained in the charts.

The data sets that were used in Figure 4 were taken from six disconnected sets of data and then compiled into a single chart. These originally disparate sets were: stakeholder distances, communication frequency, communication method, current stakeholders, desired new and/or improved stakeholder connections, and sector category. The following list provides a detailed description of the primary data sets relating to the coffee farmer and Co-op member and interactions with each secondary stakeholder (i.e. Kigali banks, Rwanda Ministry of Defense, donors, etc):

- Sector Categories – This help describes what part the sector the stakeholder satellites may be involved with. The background colors on which the stakeholder satellites are resting indicate their sector. They may be a part of the business sector, government sector, or the sector of people or organizations involved with growing and processing the coffee. Some stakeholders may share roles in two sectors and they are shown overlapping both sector ground colors.

- Current Stakeholders Satellite – Represents the same stakeholders found in the interaction network charts. The current stakeholders are most critical to the Rwandan coffee industry. These are depicted as a thin solid black lined circle which includes the name of the stakeholder, typical annual communication frequency, and current communication methods. The travel distance from the coffee farmer and co-op member is based on the location on which concentric distance circles (see also Travel Distance).

- Desired New or Improved Stakeholder Satellites – Data from when the farmer and co-op member have indicated a desire to establish a new contact or improved the contact with an existing stakeholder. A desired new stakeholder is represented by an independent blue halo with the new stakeholder title. This halo is placed on the satellite relative to the physical distance from the co-ops or farmers and in the correct sector category. No other data such as frequency or method is included. For the desired interaction improvement, a blue halo is placed around an existing satellite.

- Travel Distance – Distance is critical for current face to face and written documents distribution. The stakeholders are organized on satellites (concentric circles) radiating out from the Coffee Farmer & Co-op Member center circle. The distances have been broken down into the following categories: nearby communities, Kigale, Butari, and international with each category occupying its own orbit. Each concentric circle away from the center represents a relative distance that the communication must travel to reach the stakeholder. Although the circles are not spaced to scale they do represent the data as ordinal (closer in circles are closer to the farmers and further away distances are outer) in terms of distance between the coffee farmers and the stakeholder.

- Communication Methods – These communication methods are currently used to interact with the secondary stakeholder. Symbols representing the communication methodology used for each secondary stakeholder are located within each secondary stakeholder satellite.

- Communication Frequency – Communication frequency affects the time and energy spent by the primary stakeholder to maintain the critical interaction with the secondary stakeholders. Marks around the stakeholder satellites indicate the frequency of communication per year. Evaluation of the current Rwandan coffee interaction network chart and the current interaction score show that the most significant axis of interaction is with local coffee co-op staff.

Gender Differences

Overall, male co-op members were older than female co-op members, $t(59) = 2.25$, $p = .03$. This was the case statistically overall and numerically at all but the Mugombwa co-op (see Table 2). In addition, female co-op members were better educated than male co-op members, $Ç^2 (2, N = 61) = 6.70$, $p = .03$, with over 60% (see Table 3) having obtained a high school education.

Table 2. Demographics by Co-op and Gender

	Musasa		Karaba		Mugombwa		Nyakizu		Maraba	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Gender *(n)*	13	4	3	6	8	5	4	5	8	5
Age										
mean	40.23	27.25	45.67	31.67	26.88	30.20	35.25	28.40	45.25	38.80
SD	12.09	3.78	14.57	12.94	4.05	12.91	12.84	4.40	11.65	12.48
Education										
None	1	0	0	0	0	0	0	0	0	1
Some	9	0	1	4	4	2	3	1	6	1
High School	3	4	1	2	4	3	1	4	2	3
Literacy *										
Non-readers	2	0	2	0	0	0	0	0	0	1
Intermediate	7	1	0	4	3	2	3	1	5	2
Advanced	4	4	0	2	5	3	1	4	3	2
Missing	0	0	1	0	0	0	0	0	0	0

* Non-readers were those who reported that they could not read, intermediate readers reported that they could read a limited set of materials including letters from acquaintances or periodicals, advanced readers reported that they could read books as well as periodicals and letters.

Table 3. Educational Attainment of Male and Female Co-op Members

	Gender			
	Male		Female	
Education Level	n	% of males	n	% of females
No Formal Education	1	2.8%	1	4%
Some school	23	63.9%	8	32%
High School graduate	11	30.6%	16	64%
Missing	1	2.8%	0	0%

Familiarity

Because no participants were familiar with either a PDA or beeper, these two items were dropped from the rank analysis. In addition 2 participants did not provide rankings for all items both stating that they could not rank items they were unfamiliar with.

Overall communication method familiarity was determined by calculating the number of participants who selected each communication method card. As shown in Figure 6, all participants were familiar with face to face communication, most were familiar with letters, cell phones, desktop and laptop computers and faxes, but none were familiar with PDA's or beepers.

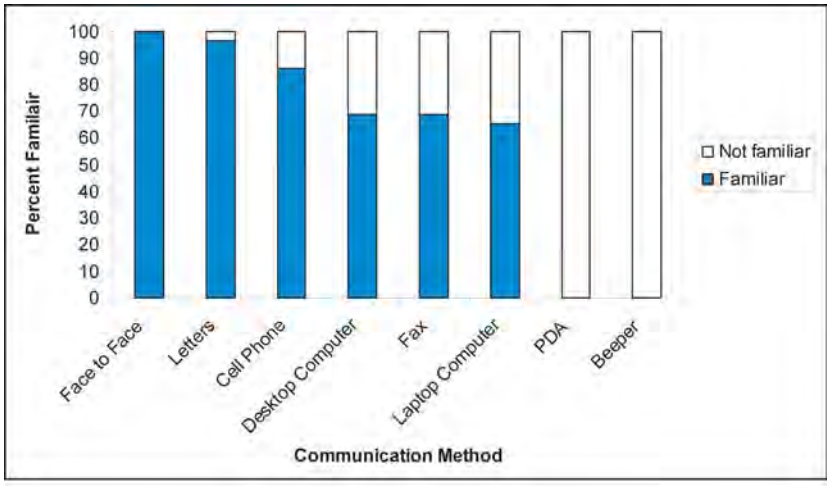

Figure 6. Percentage of Farmers Familiar with Each Communication Method

Gender was not significantly correlated with technology familiarity, $r(59) = .15$, $p = .45$ indicating that males and females had similar previous contact with these communications technologies. Age was negatively correlated with technology familiarity $r(59) = -.45$, $p = .02$ whereas education was positively correlated with technology familiarity $r(59) = .61$, $p < .001$ indicating that younger and more educated co-op members had more experience with communication technologies.

Communications Methods Rank

The mean rank for each communication method was calculated by summing the rank assigned to the method by each participant and dividing by the number of participants who ranked that method. Participants ranked "cell phones" the lowest (low numbers mean most desired, useful or easy to use) in both usefulness and desired future use, but ranked face to face communication as the easiest to use (see Figures 7, 8 & 9).

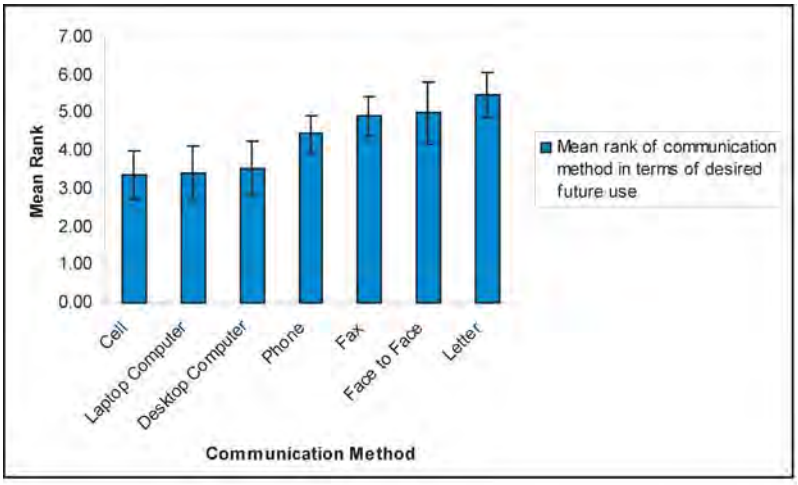

Figure 7. Communication Methods Ranked in Order of Desired Future Use

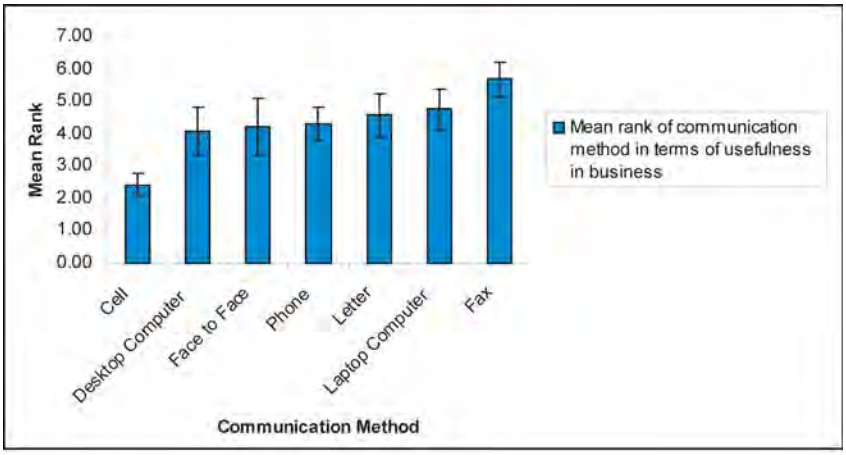

Figure 8. Communication Methods Ranked in Order of Usefulness to Business

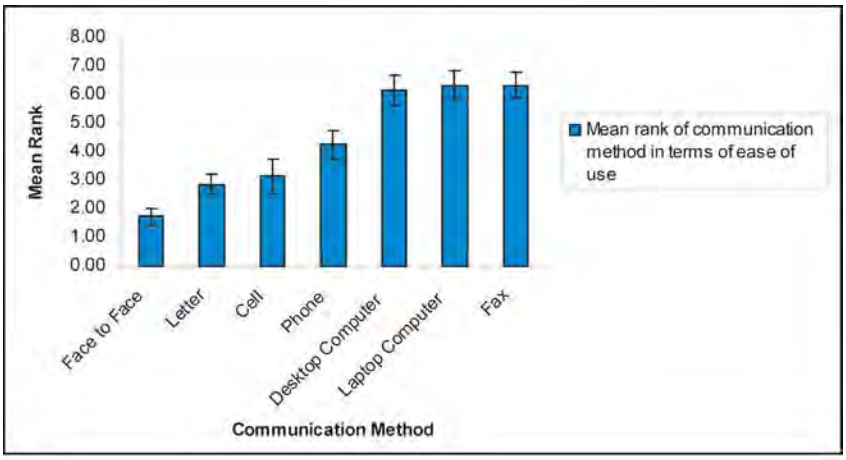

Figure 9. Communication Methods Ranked Order of Ease of Use

DISCUSSION

The overall intent of this study was to inform our understanding of the information and communication needs of Rwandan coffee farmers. Specifically, the study examined the farmers' current communication situation and how the current situation could be improved. The study also explored the technology familiarity and technology preferences among the farmers in hopes that a technology solution could be matched to this specific user group to improve the information and communication situation.

Overall the results indicate that a technology solution could improve the communication situation. The majority of participants were familiar with some ICT's and reported that they would like to use ICT's in the future. However, participants did rank non-technological solutions as easier to use than ICT's. Participants mentioned that although face to face communication is "easier to use" it's not always "easier." For instance many mentioned that in order for them to meet face to face with someone, often they had to walk for many hours. For example, we heard the following story recounted:

> After hours of travel the farmer or co-op member would finally reach an assembly point where they were expecting to meet face to face with another stakeholder. However, upon arrival, the farmer would come to find the person they were intending to meet was not there. While waiting for the other person to come, they would question to themselves, 'Are they not coming at all? Are they just a little bit late? Have they already been here waiting and have decided to return? Have they just stepped out for a quick bite to eat? Have they forgotten? Have I wasted my time walking all the way over here?'

This process could often take a whole day, with the possibility of a missed meeting quite real. However, problems such as this could be avoided if only stakeholders could communicate real time. After evaluating the frequency of these types of meetings, and considering the importance of maintaining the personal relationships between stakeholders future ICT's would be a remarkable and frequent benefit to all stakeholders.

In retrospect, to better evaluate with quantitative data it would have been better to have designed the question of ease of use with an additional location component. As it is, it seems that participants answered this question in terms of using the communication method with others who are co-located (where face to face communication is possible), rather than for communication with those who are a great distance away.

All desired communications mentioned in the interviews are in the coffee business sector. Both individual coffee farmers and expert farmers expressed the desire to have access to information directly from existing stakeholders. Currently, the co-op staff is fulfilling this role specifically in regard to relaying general agriculture, governmental, and business data to the farmers. However, much of the co-op staff's time and effort could be saved or better utilized if farmers had independent access to this type of specific information (especially personal banks accounts, a crop peculiarity found in their field, etc).

The appraisal of the preferred enhancement of new Rwandan coffee interaction networks showed a surprising interest of many of the stakeholders in the Coffee Producer Sector who are interested in improving connections with stakeholders in all three sectors.

An assessment of the relative distance in the Rwandan coffee network communication identified that the most desired future contacts are also the stakeholders at the greatest physical distance from the coffee farmer and co-op member. Most of the high frequency contacts are co-located or nearby other stakeholders. The banks, PEARL project headquarters, The Ministry of Defense, and the new coffee federation, because of the high frequency of communication, could benefit from the use of ICT's.

Limitations

Regrettably we did not collect data on the language(s) the participants spoke. However based on observation as well as a casual interview with our translator none of the participants we met with spoke fluent English, and in fact probably spoke only Kinyarwanda fluently, although some may have spoken some French. The language issue, although not explored in this study, may be a significant barrier to the successful use of ICT's in Rwanda. Others are attempting to overcome this barrier (Felix? Do we have a ref for his work on this?). Another possible addition to this study that would be useful would be the classification of interactions, in terms of which interactions require personal relationships to be maintained.

CONCLUSIONS

Most of the desired communication is with network nodes that are physically distant from the farmers. It is in just such situations where distance rather than desire prevent communication that ICT's can be of the most use. Our recommendation of type of device would be a cell phone because of participants ratings of cell phones as easy to use, useful in business and desire to use them in the future. In addition the language barriers mentioned in the limitation section may dissuade many farmers from using software that is not written in Kinyarwanda for communication.

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APPENDIX A

Demographics Questionnaire

Gender: Male ☐ 1 **Female** ☐ 2

Age: _____

1. What is your highest level of education?

☐ 1 No formal education
☐ 2 Less than high school graduate
☐ 3 High school graduate/GED
☐ 4 Vocational training
☐ 5 Some college/Associate's degree
☐ 6 Bachelor's degree (BA, BS)
☐ 7 Master's degree (or other post-graduate training)
☐ 8 Doctoral degree (PhD, MD, EdD, DDS, JD, etc.)

2. Please check all that apply.

☐ 1 I do not know how to read
☐ 2 I can street signs
☐ 3 I can read letters
☐ 4 I can read newspapers or magazines
☐ 5 I can read books
☐ 6 I enjoy reading

APPENDIX B

Current Communication Situation

The purpose of this set of questions is to assess your current communication situation.

1. Who do you *currently* communicate with about the coffee business? (list in chart below)

2. How often do you communicate about the coffee business with each of the people you mentioned above (e.g., co-workers, roasters, Perl members, academics, etc.)? (list in chart below)

3. What do you communicate about? (please list all things you discuss) (list in chart below)

4. How do you communicate with this person (by what method - in person, via postal mail, phone, email, fax, internet chat)? (Ask for each person) (list in chart below)

Who do you communicate with?	How often?	About what?	Method of communication?	What do you communicate about?

Ideal Communication Situation

The purpose of this set of questions is to assess the ideal communication situation.

1. Who *would you like* to communicate with about the coffee business? (list in chart below)

2. What *would you like* to communicate about with this person? (list in chart below)

Who would you like to communicate with?	About what?

APPENDIX C

Pen & Paper

Telephone
(land line)

Fax

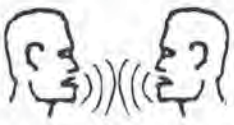
Pager

Cell Phone

Desk Top

Lap Top

PDA



Face to Face

Technology Experience Questionnaire

1. Please select the communication methods you are familiar with.

APPENDIX D

Technology Preferences Questions

1. Please rank these communication methods in terms of which you like to use in the future.
   a. Why?
2. Please rank the communication methods in terms of which you think would be most useful in the coffee business.
3. Please rank the communication methods in terms of which you think would be the easiest to use.

ACKNOWLEDGEMENTS

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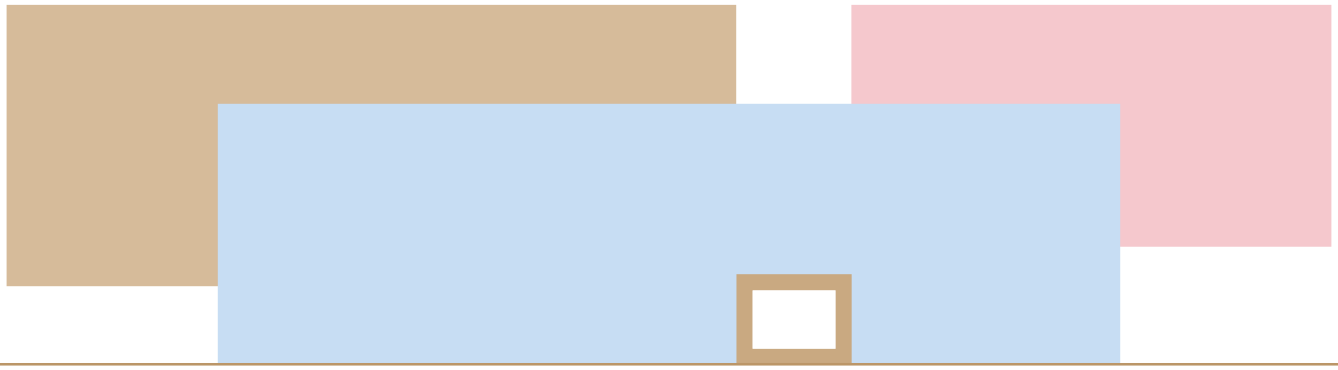
EVALUATING THE IMPACT AND AFFORDABILITY OF ICTS IN RURAL PRIMARY HEALTH CARE CENTERS OF PERU

SOFIA ESPINOZA



ABSTRACT

THIS PAPER PRESENTS THE RESULTS OF A STUDY PERFORMED IN RURAL PRIMARY HEALTH CARE CENTERS OF PERU. THE STUDY analyzes the potential impact of information and communication technologies (ICTs) in the delivery of reproductive health care services, and evaluates whether the perceived impact supports the acquisition of ICT services from a local micro-telco. This micro-telco is a local-based micro-telecommunications enterprise that will provide users with a basic service package that includes Internet access and voice communication services within the local network. The results show that although rural workers believe that the use of ICTs would allow them to have better access to health information and therefore, improve the quality of the health care provided, they fail to see how ICTs could satisfy most urgent needs such as lack of qualified personnel and medical equipment. Furthermore, current health care practices (domiciliary visits to patients) and alternative and cheaper communication means (public phones) also difficult the capture of these health center as clients of the micro-telco.

Based on those results, the author suggests how ICTs could be afforded by the health facilities if they are incorporated into the health care practices and used to satisfy the aforementioned needs.

INTRODUCTION

Information and communication technology (ICT) in the health sector is the application of information technology to facilitate the delivery of appropriate health services to the populace (Mechael, 2005). ICT contributes to health education, knowledge sharing, health monitoring, statistics, the delivery of care and in meeting internationally agreed health targets, with respect to a number of diseases (UNDP, 2003). Its impact in health care has been particularly significant in developing countries and in rural settings, where long distances and the quality of the infrastructure hinder the movement of physicians and patients (Geissuhler, Ly, Lovis, & L'Haire, 2003), reducing the quality of the health services delivered.

However, despite of the potential contributions of ICTs to health services, some constraints exist that prevent their widespread implementation. Some of the more obvious constraints, common to developing countries, include: the limits of physical access to new technologies, the high cost of providing such access for the less well endowed, and the exclusion from access due to the inadequate capabilities of large sections of the population (Chandrasekhar & Ghosh, 2001).

The focus of this paper is to assess the potential impact of ICT services in the delivery of reproductive health care in rural health care centers and to evaluate the feasibility of acquiring such services. A USAID-funded ICT initiative recently developed in Peru – to expand connectivity to rural areas – is taken as a case study. The pilot project consists on creating a local micro-telecommunication enterprise (micro-telco) that will provide, in the initial phase, Internet access and voice communication services (within the local network) to a cluster of rural districts in Jauja Province. While the basic service package fee will include a maximum time of Internet access, voice communication within the network will be unlimited.

METHODS

The study was conducted in December 2005. At that time, only a small group of users had been connected to the local network, and only voice communication services were available. Twelve health establishments located in the districts under the coverage of the micro-telco were selected. Of the twelve establishments, only ten were found open at the time of the visit. Due to the small number of health workers available at each health center, all of them were approached and asked to voluntarily participate in the study. A total of 15 surveys were personally administered by the author.

A questionnaire was designed to identify the reproductive health information needs of rural health workers and how ICT could help to satisfy those needs. The questionnaire included structured (multiple-option) and unstructured (open-ended) questions. Specifically, the questionnaires gathered information on three topics: 1) Information needs on reproductive health: what kind of reproductive health information the health workers need during their everyday activities and how they currently satisfy those needs; 2) Perceptions about the quality of the existent reproductive health services provided; 3) Perceptions of the impact of ICTs: what they think would be the impact of having/using ICTs in the provision of reproductive health care services.

An additional small survey was designed to identify similarities and differences among health establishments in the management of their health care services. Only the head of each establishment or the person in charge at the moment of the visit responded this additional survey.

Grounded theory approach was used to analyze the qualitative data. The data was small enough (15 surveys) to be coded and categorized manually. No more than 5 categories were used to categorize each question. The analysis of questionnaire data was conducted using the MINITAB v14.2 statistical software application. Non-parametric (Mann-Whitney) and chi-square tests were conducted to investigate differences across groups and associations between variables – whenever the sample size allowed it.

MAIN FINDINGS

Characteristics of the health facilities

The health facilities visited belonged to the category of health posts (HPs), which provide basic health care services such as health promotion, disease prevention and patient recovery. They serve communities with 600 to 3000 inhabitants. Only three of the HPs visited had one full-time physician each, who usually does programmed short visits (2 hours per week) to the closest health posts.

Regarding the use of ICTs, eight HPs had one cell phone each, mostly used to contact a physician, an obstetrician or the hospital in Jauja during health emergencies. However, due to the price of the cell phone calls, most health workers preferred using the public cabins, as indicated by this participant: *'We have the HP' cell phone but we prefer to use the public phone because it's cheaper and we can explain the (medical) problem better.'* Text-messaging was also an option, although it also had limitations: *'We prefer using text messaging because it's cheaper than making phone calls; however, it's difficult to give many details that way. . . .'* For non-emergency cases, personal visits were the preferred choice. Reproductive health promotion and education activities are usually coordinated with key community members and groups, such as mother's committees, school teachers and the municipality. The communication among them also occurred face-to-face. About two thirds (65%) of the HPs' patients are female. The most common reasons for their visits are family planning and prenatal care. For the latter, personal visits play a crucial in the delivery of health care. These patients are scheduled to come for their prenatal controls, but whenever they fail to show up, the nurse or obstetrician has to visit the patient at home. This, in turn, leaves the health posts unattended, and incoming patients waiting and leaving without being attended.

Characteristics of the respondents

The average age of the respondents was 37 years old (SD=8.12) and the average years of experience in their current profession was 10.6 years

(SD=6.52). Table 1 presents the distribution of the sample according to profession, gender and the position occupied at the health facility. About seventy-five percent of the total sample was female.

	Gender		Position at the H.P.		
Profession	F	M	Manager	No Manager	Total
Physician	1	2	2	1	3
Obstetrician	1	2	0	3	3
Nurse	4	0	4	0	4
Health Technician	5	0	0	5	5
Total No of respondents	**11**	**4**	**6**	**9**	**15**

Table 1. Sample distribution

Chi-square tests - conducted to find associations between characteristics – found associations between profession and position (Chi-Sq=12.2, P-value= 0.007) and between profession and gender (Chi-Sq=8.2, P-value=0.004). For the latter, profession were combined into 2 levels: physicians (physicians and obstetricians) and non-physicians (nurse and technicians).

Reproductive health information needs

The most frequent information needs on reproductive health that the respondents encountered at work are: family planning (40%), pre-natal care (27%) and care of high-risk obstetric patients (20%). Health workers were asked to indicate their most frequent sources of information about reproductive health. Figure 1 shows the results regarding the information sources used. We can observe that two thirds of the respondents' information sources – including written sources and colleagues – are found within their health institutions (written sources and clinicians). No significant differences were found across respondents grouped by gender, profession nor position.

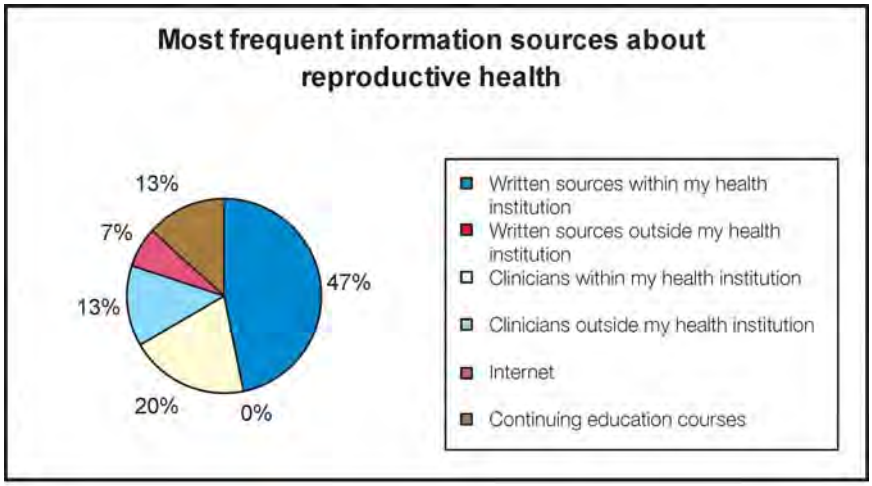


Figure 1

Regarding the obstacles to obtain access to reproductive health information, most of the respondents (80%) indicated 'lack of time' as the first

biggest obstacle, and 'not updated information' and 'difficult access to health information' as the second and third biggest obstacles. The same proportion of respondents reported that training courses, if offered, were offered about twice a year at the health network offices, the health regional offices or in the capital country. All clinicians 'would like to receive more courses', especially in topics such as 'care of high risk pregnancy and emergency births' (40%) and 'pre-natal care' (20%). Their own health facility was the location of choice (80%) for the training courses, and those who still preferred to travel indicated that it was because of the opportunity to interact with other clinicians when the training was in the Network or Regional offices. Figure 2 shows that the main reason for not attending training courses.

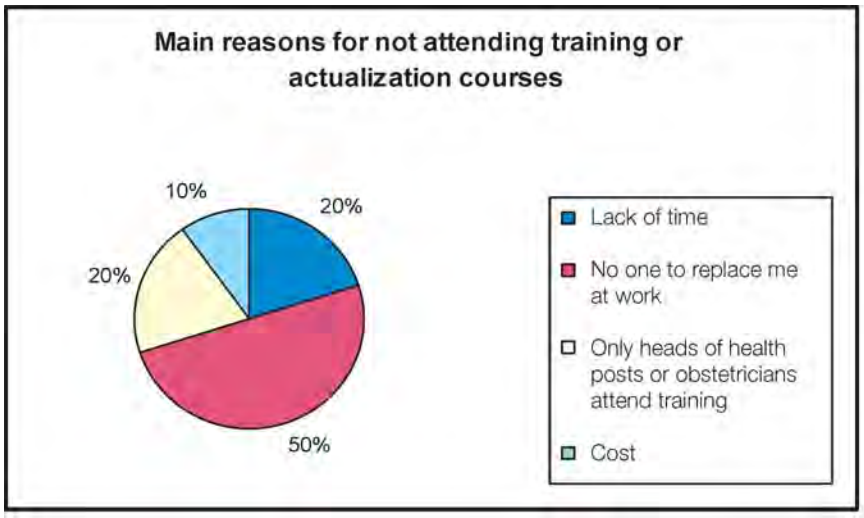


Figure 2.

The frequency of access to information is displayed in Figure 3. From the responses, we can infer that although the health information health workers receive is usually useful, it does not always arrive on time nor contain the latest information.

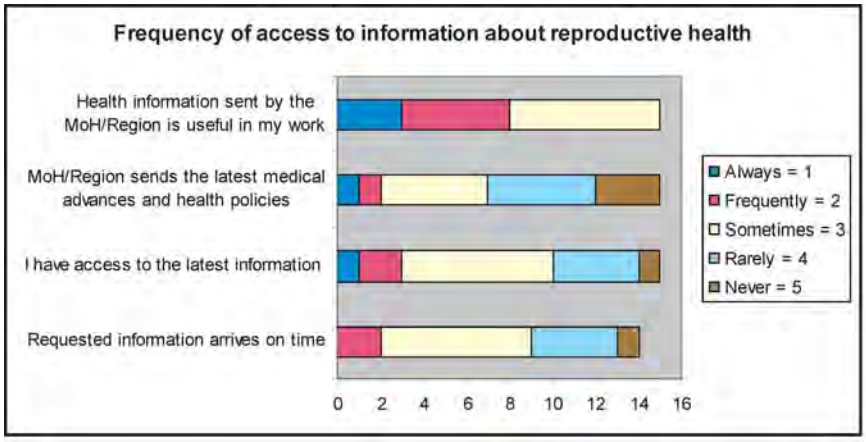


Figure 3.

Perception of the quality of the existent Health Services

In the following section of the survey, participants were asked to give their perceptions about the existent reproductive health services provided by their health establishments.

About eighty percent of the respondents considered that the current services satisfied the needs of the community. The quality of the services provided was indicated as 'good' by 53% and 'acceptable' by 40%. 'Family planning' and 'STDs and uterine cancer prevention' were indicated as the most and the least utilized reproductive health services. Figure 4 shows the health workers perceptions about what is needed to improve the existent health care services.

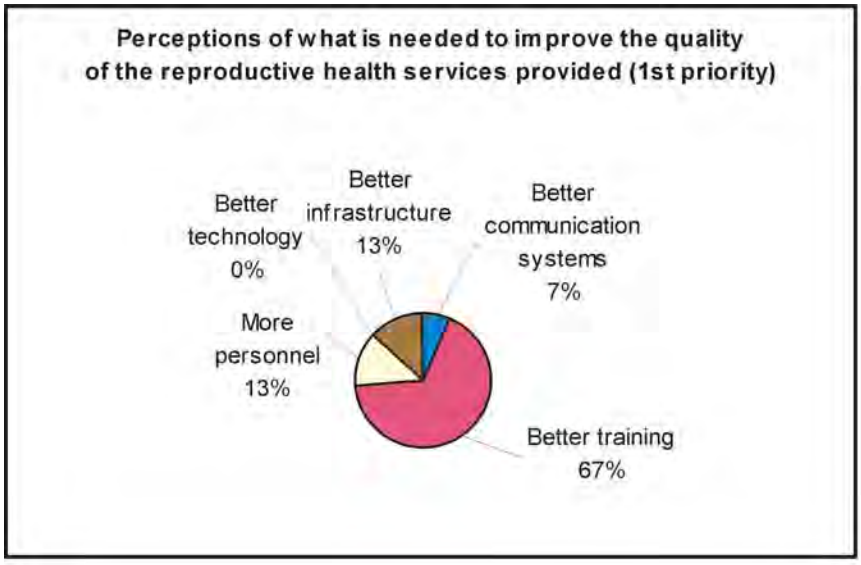


Figure 4.

Perceived impact of ICTs on the reproductive health services

The next section of the survey focused on gather information about the health workers' perceptions regarding the impact of ICTs in the reproductive health services provided.

Results show that most of the participants (80%) are familiar with some type of ICT, being the cell phone (92%) the most used device. Figure 5 shows how experienced health workers are with computers.

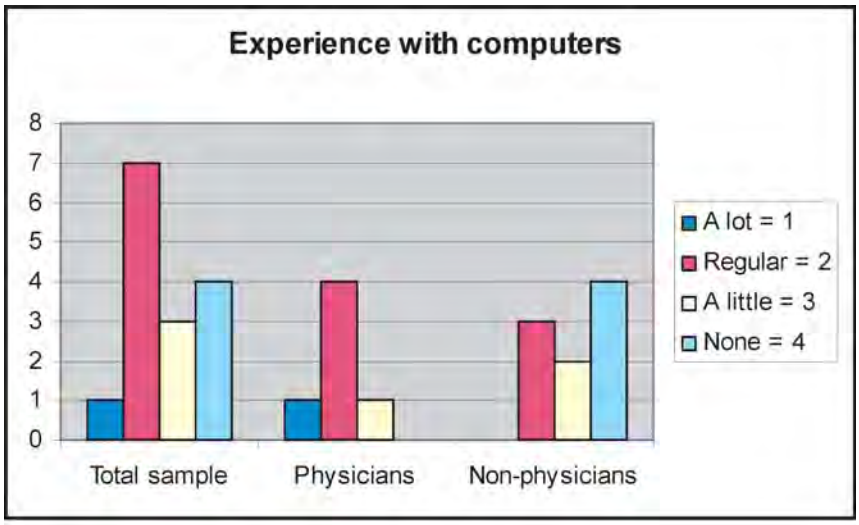


Figure 5.

A non- parametric test (Kruskal-Wallis) to identify significant differences among groups was conducted. Significant differences were found between the "Physicians" and the "Non-Physicians" group (DF=1, P-value= 0.032 – corrected for ties). The first group had a tendency to be more experienced with computers (Mdn=2) than the second one (Mdn=3).

Of those who had at least "a little" experience with computers, about half of them (55%) were familiar with MS Office-type applications. Disregarding their experience with computers, all participants answered that they "would like to learn more about computers and the Internet". This enthusiasm was explained by the seventy-three percent of the respondents who indicated that the Internet would be the most useful ICT to improve the reproductive health care services. Nonetheless, a K-W test found significant differences between groups with different years of work experience. All of the participants with '10 or less years of experience' considered Internet as more useful, while those with 'more than 10 years of work experience' considered Internet and fixed-line phone equally useful (see figure 6).

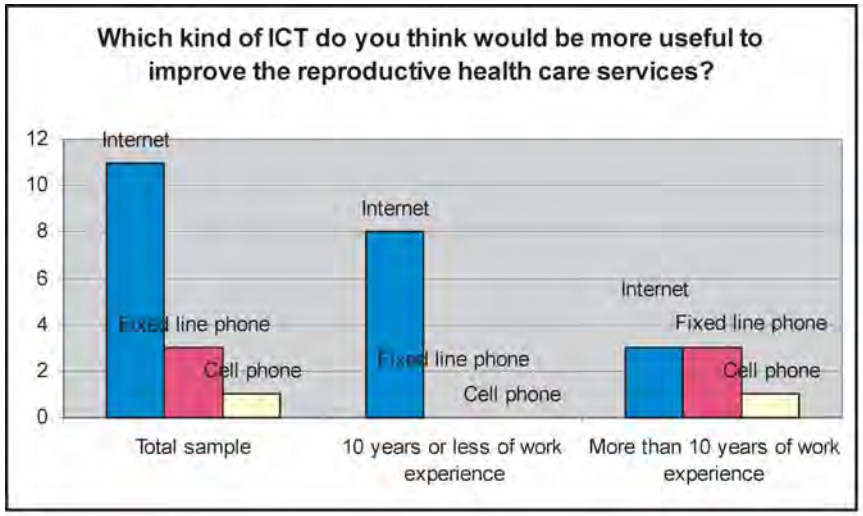


Figure 6.

Figure 7 shows results about how comfortable health workers would feel using the telephone and the Internet in different tasks. No significant differences were found across sample groups.

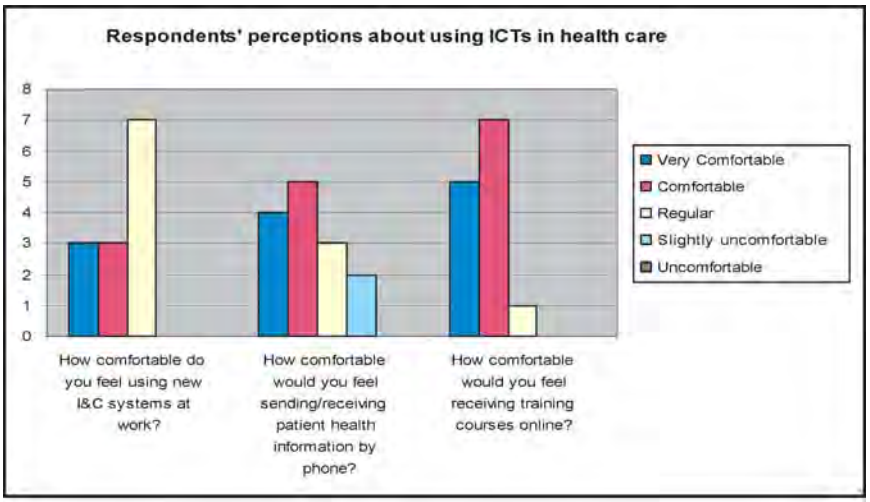


Figure 7.

Participants' perceptions about the impact of ICTs in improving their work were also very positive. Almost all (93%) responded "Yes" when asked if they considered that using ICTs at work would help them take better medical decisions and improve the quality of health care. The same proportion responded positively when asked if they considered that having better access to medical information due to ICTs would help to reduce medical errors related to reproductive health. Eighty-six (86%) of respondent also thought that having real-time access to reproductive health information would make their works easier.

DISCUSSION

Results indicated that the big majority of health workers in the rural health facilities were female, especially the nurses and the health technicians. In consequence, gender-specific constraints on medical education and continuing professional development impact disproportionately on these specialties (Geyoushi, Matthews, & Stones, 2003), and affect the quality of the health care services provided. The opposite, lack of professional development of health workers and its impact on women's development, also becomes a valid concern. In terms of the feasibility of acquiring the services of the micro-telco, the presence of alternative inexpensive communication means, such as public phones and personal visits, appear as obstacles for the acquisition of the aforementioned services. However, unrecognized benefits of the new ICTs, such as increase in patient retention due to better quality of health care services, were not incorporating into the calculations. For instance, health workers are aware of the general benefits of using the telephone to coordinate activities with members of the community, but fail to see how this can be profitable or cost-effective for the HPs. Decision-makers should not forget that the effect of ICTs on health differs from its impact on other sectors. Achieving some of the benefits of ICTs requires that health workers are reached and not necessarily the final beneficiaries (Chandrasekhar & Ghosh, 2001), which reduces the investment.

Attending training courses or searching for health information outside the workplace facility implies abandoning the health facility. In this case, online (or offline) distance education would help satisfy this important need. Providing access to reliable health information for health workers in developing countries is potentially the single most cost effective and achievable strategy for sustainable improvement in health care (Pakenham-Walsh, Smith, & Priestley, 1997) and this can be achieved by the Internet. The micro-telco, as a local provider, can help to design and tailor ICT applications to satisfy specific local health information needs. Feedback from local health workers would be crucial in designing application with 'relevant' content. If, for example, an information source indicates a diagnostics test that is not available or affordable in a given setting, then the information given was not relevant (Godlee, Pakenham-Walsh, Ncayiyana, Cohen, & Packer, 2004). Designers have to be careful with this issue, because the frustration that can be caused by continuous access to information that is not relevant can drastically reduce the demand for such services. The lack of communication and cooperation among health care providers outside the community can be improve by the 'unlimited local calls' feature and thus, encourage the sharing of cognitive and even physical resources –although all the HPs belong to the same category of health facility, differences in quality and quantity of equipment, personnel and health care services were found even in HPs not more than 2 miles apart.

Although ICTs can not directly address urgent needs such as lack of qualified personnel or equipment, it can however, help to increase the time that the personnel spend in the health establishment and improve the qualifications of the current workforce. Furthermore, policy and decision makers can get a better idea of the current situation of the HPs by having direct interaction with the rural health workers. Thus, the information generation process and policy making could become an interactive process (Tessa & Torres, 2000).

In general, the perceived impact of ICTs is positive. There is a consensus regarding the usefulness of using Internet or e-mail in improving the quality of the health care services provided; although, at this point, the specifics of how it would be done are not fully understood. A few health initiatives to improve health care through the use of ICTs are currently being developed in Peru with successful results (InfoDev, 2003; Martinez, Villarroel, Seoane, & Pozo, 2005). As we can gathered from the results of this survey, willingness to learn and use ICTs is not a problem, on the contrary, is probably one of factors leading to the projects successes.

Another advantage of the micro-telco project is the ample experience that its current manager (Puyhuan Group) has in conducting ICT-related projects. Currently, the Puyhuan Group is in conversations with a hospital in Lima to develop a telemedicine project involving the hospital in Jauja

and the health facilities visited during this study[1]. At the same time, the Regional Health Directorate of Junin is also working on the design of a health database network to interconnect all the health facilities under its jurisdiction[2]. Apparently, even though the health facilities for themselves are not able to afford the micro-telco services, current projects might make it a reality very soon. Thus, part of the micro-telco sustainability is ensured by the health institutions of the region.

CONCLUSION

This study was undertaken to assess the current health information needs of rural health facilities in the area of reproductive health care; however, similar analyses can be conducted to assess more general health care needs. The positive impact of ICTs in the reproductive health care delivery is clear, but it is still to find out how to accurately address the specific needs identified by this research. Regarding financial feasibility of ICTs, the potential increase in the productivity of the health posts could help to cover the expenses of acquiring such ICT services. Further in-depth studies such as detailed cost-benefit analyses are required to confirm results from the present study. Even if the health facilities were not able to afford the micro-telco services by themselves, parallel health initiatives involving the use of ICT tools make seem imminent the acquisition of ICTs by the studied health facilities. Therefore, it will be important to keep in mind that current ways of conducting health care activities will have to change in order to better take advantage of the benefits of ICTs. Health workers need to be aware of this fact and be correctly and timely trained, so their current positive perception about ICTs does not change –change to seeing ICTs as interfering and disrupting of their workflow.

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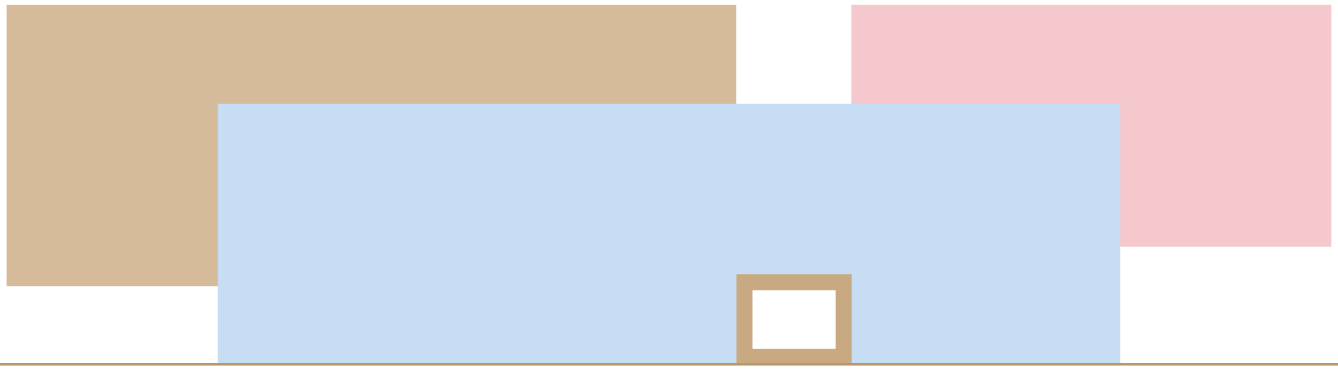
[1] *From interview with the President of the Puyhuan Group during the fieldwork in Jauja.*

[2] *From interview with the Director of the Regional Health Directorate in Huancayo, Junin.*

INFLUENCES ON THE PARTIAL LIBERALIZATION OF INTERNET SERVICE PROVISION IN ETHIOPIA

LYNN HARTLEY
& MICHAEL MURPHREE



ABSTRACT

ETHIOPIA'S INTERNET SERVICE PROVISION INDUSTRY IS AT A CRITICAL JUNCTURE BETWEEN DEEPENING COMPETITIVE REFORMS and continuation of the status quo in its chosen path of partial liberalization. This paper will show how the introduction of peripheral competition will likely not change the nature or quality of Internet service provision in Ethiopia. The institutional framework of the Internet Service Provision sector can be modeled as a continuum of willingness to accept competitive reforms among the various actors. While there is consensus for reform, views of further liberalization and the rate of expanding competitive provision of services vary along this continuum. We find that in accordance with their institutional powers and perceptions, the stakeholders with the most influence generated ISP reform with barriers to effective partial liberalization.

INTRODUCTION

Declarations by the government of Ethiopia made the development, expansion, and access to Information and Communication Technologies (ICT) a national priority (EICTDA Interview, 2005). Carefully orchestrated deregulation and partial opening of the telecommunications industry to greater participation by the private sector, was intended to increase access and quality of service. Research has shown deregulation of state-owned industries and competitive provision of services to be a powerful boon to economic growth and expansion of the telecommunications industry (Wallsten, 2001). Such reformist moves are viewed with a mixture of excitement, skepticism or outright mistrust by the Ministry of Transport and Communication, as well as the incumbent, regulator and private sector actors in Ethiopia. We explored the potential for reform in the Internet service provision (ISP) sector, within telecommunications in Ethiopia. Perspectives on liberalization conflict among stakeholders, and those with the most power are also the most wary of further Internet service provision liberalization.

The first section of this paper briefly presents background on the country and our research methodology. Second, we discuss the historical relationship of the operator and the regulator. The third section discusses the current theories of liberalization, competition, monopoly provision and reform. Fourth, we present Galperin's theory of new institutionalism and model it for Ethiopia using a continuum of perceptions and influence. Fifth, we discuss the implications of ideology, interest groups and technology and show how these pillars fail to account for the policy outcomes in Ethiopia. Sixth, we show how the continuum explains the influence and outcome of Internet policy in Ethiopia. We conclude with two illustrative short case studies of Ethiopian Universal Access policy and the value-added service and virtual Internet service provider reform before postulating on the efficacy of reform and the future of Internet service reform in Ethiopia.

BACKGROUND AND METHODOLOGY

As a country of 70.5 million, Ethiopia lags behind the rest of the world and even much of sub-Saharan Africa in its economic and technological development. Per capita income remains only $116 per year (US Department of State, 2004). According to the Ethiopian Telecommunications Agency, there are now 171 licensed Internet cafes in Ethiopia of which no less than 75% are located in Addis Ababa. The Ethiopian

Telecommunications Corporation reports that Internet network capacity exists for 100,000 connections in Addis Ababa, but less than 20,000 are in use ("ETC to make," 2005). Telephone and other ICT density rank among the lowest in Africa with .01% of the population having an Internet connection (Ethiopian Privatization Authority, 2003).

The national government plans to use an ICT-led development strategy to fight poverty and modernize the economy (EICTDA, personal communication, December 21, 2005). According to the International Telecommunications Union, as cited in Meso et al (2006), "Information and Communication Technologies have the potential to improve all aspects of our social, economic and cultural life." More specifically, Ethiopia's ICT-led development strategy hinges on creating an effective nationwide fiber-optic network and providing universal service to rural areas of the country. This network will expand vital connectivity to rural areas while also improving the quality of domestic and international links within more developed cities. In the cities, the demand for faster, cheaper and more reliable Internet is undisputable. One surveyed entrepreneur said that the current unreliable levels of service cost him a 40% reduction in business in the last six months during the ETC's attempt to switch to broadband (Internet Café Entrepreneur, personal communication, December 14, 2005).

To gather information and perspectives on the Internet in Ethiopia for this paper, we conducted interviews and surveys in Addis Ababa. We concentrated on interviewing high level officials in the Ethiopian Telecommunications Corporation, the Ethiopian Telecommunications Agency, the Ethiopian Information and Communication Technology Development Authority, and the Ministry of Transport and Communications (see Appendix A for further information on the structure of telecommunications governance in Ethiopia). Our semi-structured interview instrument was based Irene Wu's 2004 survey of independent telecommunications regulators (Wu, 2004). We gained guidance about which actors to interview through interviews at the World Bank, the College of Telecommunications and Information Technology of Ethiopia, the US Agency for International Development and the United Nations Development Programme. The interviews were initiated based on interviewees' access to the policy development and implementation process.

We also conducted oral surveys of Internet Café entrepreneurs and employees in Addis Ababa on the main roads to enable us to survey a maximum number of cafes, given time constraints. Although the non-random survey participants may impact the results by introducing geographic or relational bias, the uniformity of their responses indicates that the opinions gathered could be considered representative.

RELATIONSHIP OF THE ETC TO THE ETA

The Operator: Ethiopian Telecommunications Corporation (ETC)

Telecommunications reforms began with the 1996 establishment of the Ethiopian Telecommunications Corporation (ETC). Since then, the ETC has been a state-owned corporation operating for profit and without direct governmental budget assistance. The ETC receives a monopoly license from the Ethiopian Telecommunications Agency (ETA). In exchange for allowing the ETC to remain a monopoly, it must meet government requirements for efficiency, quality and infrastructure expansion targets (Ministry of Transport and Communication, personal communication, December 21, 2005). Each year the ETC must submit a performance and business report to the ETA and the ETC Board of Directors. The government does not directly intervene in the day-to-day operations of the ETC, but the ETC must implement all policies and planning targets initiated by the Ministry of Transport and Communication and drafted by the ETA.

There is no tradition of private or competitive provision in this sector. Under the monarchy, socialist and post-socialist regimes, the government has pursued a state-led development strategy. In 2002-2003, the Ethiopian government attempted a partial privatization of the ETC through offering a sale of 30% of ETC equity. Despite hiring an international consulting firm to assist in this privatization effort, the ETC received no suitable bids for partnership. Since this failed attempt at partial privatization, the national government's policy has been to make the ETC into an efficient and profitable state-owned corporation. They continue to proceed without introducing full-scale competition into the system. The ETC has begun a series of initiatives including forms of small-scale subcontracting and limited private resale of services in order to increase profitability and make greater use of its network infrastructure.

The government has intended to use the regulator in lieu of competition as a means of enforcing efficiency and quality of service targets. According to the Ministry of Transport and Communication, the purpose of the ETA and other regulatory bodies is to look at the constitutional goals and industry standards, and create regulations that would cause the operator to become more efficient. Essentially, the ETA acts to make the ETC internationally competitive (Ministry of Transport and Communication, personal communication, December 21, 2005). However, such an attempt cannot realize the same benefits as genuine competition. According to Levi-Faur (2003), the creation of independent regulatory authorities actually reinforces state control over the economy.

Ethiopian Telecommunications Agency (ETA)

The 1996 declaration that created the ETC also created an independent regulatory agency – the Ethiopian Telecommunications Agency (ETA). Its mission includes licensing of Internet service providers, monitoring and spectrum allocation, tariff approval, customer protection, adjudication of disputes, and assistance in drafting policy. During the first six years after its creation, the ETA concentrated on capacity building, acquisition of technology, and training of staff. Current initiatives with NetTel@Africa and the World Bank have secured two million dollars in financing and training assistance to build the capacity of the ETA (ETA, personal communication, December 14, 2005). A majority of government interviewees outside the ETA stated that the Agency should be ready to regulate a more complex market in two to three more years. The ETA, however, claims that the timeline for further opening of the sector and increased duties for the Agency could be much shorter.

Since 2002, the ETA issues licenses to resell value added services (VaSP) and operate Internet Cafes. Another role the ETA fulfills is drafting new directives and policy documents for the Ministry of Transport and Communications. The Ministry creates a general framework for new policy directions and the ETA completes the drafts providing the detail and legal terminology to make the directives into binding policy statements. This process involves contact and consultation with the Ministry, the ETC, and EICTDA.

Defining Liberalization, Monopoly and Reform

Though there are many nuances to the definitions for competition and liberalization, we use David Souter's (2001) definition of competition as "a market in which different suppliers of a service compete to provide customers with the service they require – the normal circumstance for most products and services in most countries". Further, he describes liberalization as "the process of establishing a competitive market out of circumstances in which service was provided by a monopoly." These definitions do not include discussion of privatization, where ownership of a service provider and its assets are transferred to private parties through a variety of mechanisms (Savas, 1999).

Neither competition, and associated liberalization efforts, nor ownership transfers, and associated privatization endeavours truly exist as absolute ideals. Rather, they both exist along spectrums as elaborated by Figure 1 below. In this paper, the progression from the bottom left to top-left square is being discussed. However, a range of options exists in the space between no competition and full competition, and the discussion should not be limited between either extreme, but explore the possibilities for gains from the intermediate areas.

		Privatization / Ownership Spectrum	
		Public ⟷ Fully Private	
Liberalization / Competition Spectrum	Full ⇕ None	Incumbent operator exists, with competition from second or multiple network operators and service providers in all arenas within the sector.	Neo-classical market model, government does not own a player and does not interfere with actors entering or exiting the market
		Government monopoly operator exists unchallenged, dominates all sectors of industry	Monopolistic private actor – not government owned

Fig.1. Patterns of Liberalization and Privatization Matrix

Until the 1990's, it was common to view telecommunications in general as a natural monopoly, where only one operator could be supported at a market equilibrium. According to Wolcott and Çailtay (2001), the traditional arguments include the "economies of scale and capital investment requirements that make single centralized providers the most effective means of delivering a service." It is believed that natural monopolies arise when there is a high fixed cost to providing a good and a negligible marginal cost. In competitive markets, price equals the marginal cost – making the price of each additional unit negligible. An initial market entrant might be able to set the price and recoup the investment expense of high fixed costs. However, other market entrants might drive down the price, and make the market unappealing for all actors. However, governments can choose to allow at least one firm to operate while excluding others from the market, and have the authority to set the price equal to average costs. The ability to set the price equal to average cost instead of marginal cost creates a potentially profitable situation. Governments frequently chose the option of operating these single firms themselves, and public infrastructure utilities are textbook examples of this practice. Utility or infrastructure monopoly rights are also frequently attached to universal service objectives. These are viewed as strategic assets for economic and national security as well (Urey (1995) cited in Wolcott and Çailtay (2001)). As a monopoly that can set its price high enough to recover costs and turn a profit, it can also provide a source of revenue that governments are reluctant to lose, particularly without an obvious candidate for its replacement.

However, monopoly service provision does have significant weaknesses that many scholars and economists claim outweigh the arguments for it. Jerome (2004) notes that public utilities are vulnerable to market failures where "public monopolies may allow cost to rise above efficient levels or offer services of inferior quality; information failures such that consumers are unable to assess the quality of the service they are paying for; externalities with implications for controlling environmental standards, public health and safety; and social concerns since many infrastructure services are considered essential to life." Wallsten (2003) agrees and states that "a monopoly provider, whether state-owned or private, faces fewer incentives to improve service and lower prices than firms operating in a competitive environment do." Additionally, he asserts that a telecommunications sector which is not living up to its potential can create problems in the arena of economic development and growth. Quality and penetration of telecommunications infrastructure can serve as an engine of economic growth, making the country more attractive to foreign investment (Wolcott and Çailtay (2001)), and lack of these can also perpetuate low incomes (Wallsten (2004)). Milne (1998), in her discussion of stages of telecommunications network development, notes that the hope is that competition will allow "developing economies to condense or even jump a stage" of development. Evidence from India, another developing state, has also shown that ICT industries can provide a source of economic growth and modernization (Sachs, 2005).

In the last 25 years, states began to recognize the benefits of competition in the telecommunication sector, and many countries began full liberalization processes. Successes have further encouraged the move to the market model from state-led policies. According to Levy and Spiller (1996), "Competition can be a powerful spur to innovation and technical efficiency." Further, they claim "When a country's major telecommunications company fails to develop an adequate communications network, the normative case is strong for opening up the sector to competition." In the local exchange section of the telecommunications sector, it has been confirmed that competition was a significant factor in causing the geographical penetration of the U.S. telephone market throughout early stages of the technology's development (Jayakar, 1999).

Wallsten (2001) analyzes the efficacy of different telecommunications reform strategies by breaking them down into three components – regulatory capacity, competition and privatization. The best results involve increased regulatory capacity paired with competitive reforms and privatization of the incumbent. However, he also states that positive results occur when increased regulator capacity is included with increased competition, and that competition itself is the most significant factor affecting service.

Privatization is generally the most unappealing option to Ethiopian governmental stakeholders. The lack of political will for this prong of reform could stem from the lesson of the failed 2002-2003 effort, from the loss of control that privatization would necessitate, or from other, less distinct, causes. However, we concur with Wallsten's assessment that even without privatization, significant gains could be realized in the Internet service provision sector. According to Wallsten (2001), in the telecommunication sector, "competition is associated with increased mainline penetration, payphones, connection capacity and lower prices for local calls. Privatization by itself, meanwhile is associated with few benefits."

Ethiopian leadership intends to liberalize downstream services without having to first divest itself of ownership. In their view, the Ethiopian government could continue to operate the ETC and benefit from the stimulus of other entrants into the value-added market. They would not have to give up control of the network, backbone or connection to the international gateway to other market entrants. In the partial liberalization framework, these would remain the exclusive domain of the ETC. Research has thus shown both why governments opt for monopolies, and why they choose to reform them. This paper explores why the Ethiopian government prefers certain types of reform to others.

NEW INSTITUTIONALISM AND ETHIOPIA'S PARTIAL LIBERALIZATION CONTINUUM

Hernan Galperin (2004) begins to address the question of why certain policies are adopted through a framework of new institutionalism. He defines new institutionalism as a means of understanding "why certain stakeholders are consistently favored over others, why certain governments are capable of passing reforms and others are not, or why diffused interests are represented in some cases and not others, it is necessary to examine the institutional fabric that underlies the making of information and communication policies." He proposes that the interest group, ideological, and technology-centered approaches cannot account for the outcomes of policy formulation. Galperin does not dismiss the assumptions and contributions of these frameworks, but rather combines their influence under the rubric of his general theory. Specifically, new institutionalism accounts for change by looking at multiple levels of institutional constraints from structure of the government itself down to individuals within given agencies.

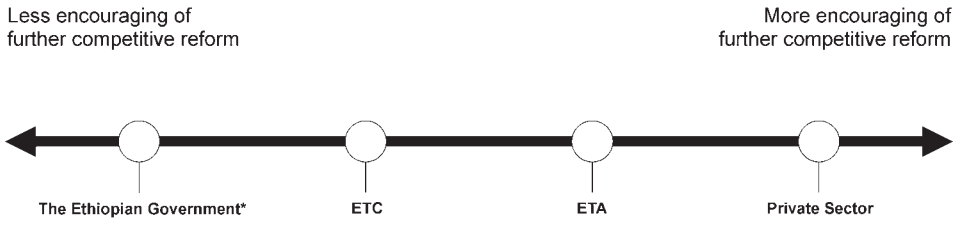
At the most general level institutionalism explains how the form of the government itself such as parliamentary or presidential system, unitary or federal presents certain policy options (Peters, 2005). New institutionalism, however, looks at lower levels and informal channels such as procedures of review and influence as well as links between organizations. It thus has the ability to account for informal influence, institutional norms, and path dependency. Through this theoretical examination of the procedures by which policy is formulated and the actors who have significant influence over policy, new institutionalism is best able to explain the varieties of outcomes in ICT policy.

The new institutionalist framework is one of several models for how Ethiopia arrived at the decision to allow peripheral competition with certain caveats. The example of ISPs in Ethiopia is a perfect illustration of the new institutionalist framework in practice. To satisfy the demands and interests of more powerful actors, less influential stakeholders were forced to accept or initiate compromises regarding the extent and pace of reform.

PREFERENCES REGARDING PARTIAL LIBERALIZATION IN ETHIOPIA AS A CONTINUUM

The debate among stakeholders in Ethiopia is not a question of whether to reform. It is a question of how much reform and when. We discovered that perspectives on reform can be modeled along a continuum according to a new institutionalist framework. Each set of actors has a unified consensus within its own organization. However, despite the universal acceptance of the need for reform, different groups recommend different strategies and timelines.

Figure 1. Continuum of Perspectives on Competitive Reform in Internet Service Provision



*Those organizationally superior to the interviewed officials. Organizationally, this only includes the Council of Ministers and the Prime Minister.

To create this continuum, we arranged the stakeholders for liberalization efforts according to their preferences as stated during semi-structured interviews regarding:

- Speed of liberalization – we classified those with longer, indefinite timelines as less inclined to accept competitive reform.
- Type of liberalization – those organizations favoring tightly limited and specific peripheral sectors to be liberalized were classified as less inclined to accept competitive reform
- Increased role for regulator – organizations favoring a smaller or negligible policy role for the regulator, or expressing confidence in its capacity to regulate a more competitive sector were classified as less inclined to accept competitive reform
- Increased role for private sector – those groups opposing a more expansive role for the private sector in Internet provision were classified as less inclined to accept competitive reform

We found that as the stakeholder's influence increased, the less likely they were to encourage rapid and broad competitive reform in the Internet service provision sector. Resistance to reform directly correlates to power and influence with respect to policy design. Though the distances between points on the continuum cannot be exactly fixed, the order of the stakeholders along the continuum illustrates their stated positions relative to each other.

LEAST ENCOURAGING OF COMPETITIVE REFORM

High level interviewees frequently referred to "The Government" as the most powerful policy actor, and the entity responsible for determining the rate and nature of any potential reform. Organizationally, the superior levels to the interviewees only included the Council of Ministers and the Prime Minister, assuming that these actors accurately represent the attitudes of their respective government ministry and minister.

According to the interviewees, "The Government" favors largely preserving the state monopoly on telecommunications services. It does not favor allowing multiple telecommunications providers, and is particularly wary of potential foreign market entrants. However, in the interest of utilizing the full network capacity, they will allow limited competition in value-added areas of Internet Service Provision. As long as the supremacy and profitability of the ETC is not challenged, The Government is comfortable choosing which downstream and peripheral services within the sector will be liberalized. However, it has not demonstrated any urgency or set timelines for further reform. Prime Minister Meles Zenawi has stated that full competition is not on the horizon at all (Internet Café Entrepreneur, personal communication, December 20, 2005 and USAID, personal communication, December 21, 2005).

LIMITED ENCOURAGEMENT OF COMPETITIVE REFORM - ETHIOPIAN TELECOMMUNICATIONS CORPORATION

The ETC, while cognizant of its limitations and weaknesses in provision of certain services, seeks to retain its position within the sector. All officials we interviewed agreed that the ETC is too burdened with other responsibilities to offer exceptional quality service or to handle customer service, web hosting, email, and other Internet-related value-added services. They also agreed that provision of these services would be an excellent entry point for the private sector into Ethiopian telecommunications. They did not agree, however, on the time-frame for the introduction of private sector actors. As the next most influential actor in Ethiopian Internet service provision and policy, the ETC has an interest in continuing its established dominance. It favors a competitive reform policy that grants it sufficient time to increase efficiency and quality of service under the supervision of the ETA. The timeline given by an ETC official for allowing fully open, totally market-driven, competition in the telecommunications sector was five to ten years (ETC, December 16, 2005).

In the long run, the ETC plans to divest itself of all value-added and downstream services and serve as an infrastructure and network operator. They do, however, recognize and prepare for a situation that would include a second network provider at some indefinite point in the future. For the time being, however, the ETC seeks to maintain the cross-subsidies and monopoly privileges it enjoys.

MODERATE ENCOURAGEMENT OF COMPETITIVE REFORM - ETHIOPIAN TELECOMMUNICATIONS AGENCY

Although inclined to support greater and greater reform and opening of the sector, the Agency stops short of advocating a true competitor for the incumbent, one that would provide network, infrastructure, international connectivity as well as value-added services. As a regulatory agency, the ETA understands the importance of regulatory capacity in administering a competitive telecommunications industry. At this point in time, the ETA admittedly lacks the capacity to oversee full competition and liberalization. However, it supports an acceleration of partially liberalizing reforms to utilize the regulatory capacity already built and to encourage further maturity. Over a period of two to three years, the ETA would be fully capable of managing a fully competitive value-added service and Internet Service Provision sector. In their view, this could naturally progress and segue into further, and possibly complete, liberalization as the ETA gained the ability to further regulate more actors and services.

However, the ETA scores poorly as an independent regulator in comparison to other nations, based on the Irene Wu's criteria for regulatory independence (2005). It remains too tightly bound to the national government through funding, hiring and firing procedures, and procedural methods. This lack of independence may affect their ability to effect their desired changes as evidenced by the ultimately restrictive nature of the directive. Despite their intentions, the ETA lacks the institutional influence to accelerate the reforms they desire.

MOST ENCOURAGING OF COMPETITIVE REFORM – PRIVATE SECTOR INTERNET CAFÉ ENTREPRENEURS

These actors share an interest in fully opening the ISP sector. Internet Café operators all seek better and more reliable service at lower costs. Furthermore, as entrepreneurs, many are interested in the potential opportunities to enter this market. The hopes of the private sector include the creation of multiple network operators but more generally relate to competition among Virtual Internet Service Providers (VISPs) and Value-Added Service Providers (VaSPs).

Private sector actors in the existing VaSP sector feel their interests would be best served if they had alternatives to the monopoly ISP. Internet Café employees and entrepreneurs reported general dissatisfaction with the ETC, as they felt the ETC, having no competition was not forced to change. Like with all operators of value-added telecommunications services worldwide, Internet Café entrepreneurs want lower overhead costs, faster access, more bandwidth and better customer service. 88% of respondents stated that they were not satisfied with the speed of their internet. 71% were unsatisfied with customer service and 67% were unsatisfied with the cost for basic connectivity. In cases where technical or service problems arose, many café operators chose not to contact the ETC because "they never listen." (Internet Café Entrepreneur, personal communication, December 14, 2005) One respondent stated that having more ISPs would lower costs. A second commented that the private sector would be better able to get the Internet into homes through expanding ISP competition. A third directly referenced the ETA stating that it needs to begin licensing private provision of Value Added Services in order to improve service quality.

This group fervently believes that increased competition will lower connection prices and supports all moves in that direction. Still, Ethiopia's private sector is largely undeveloped and has not yet developed capacity to effect policy change.

This continuum of perspectives and influence places the actors in Ethiopian Internet provision and reform in a structure based on their institutional positions. As an illustration of Galperin's new institutionalism, it is able to account for and incorporate group interests, ideology and technological considerations.

THE ROLE OF INTEREST GROUPS AND IDEOLOGY

The interest groups in Ethiopian Internet service provision have formed along ideological lines. Foreign governmental and multi-lateral organizations (particularly US AID, the World Bank, and the UNDP) as well as private sector actors favor a neo-classical, market-oriented direction for the economy. Neo-classically influenced market and private sector interests view competition and reduced government involvement in the economy as intrinsically good.

Entrenched institutional interests within the Ethiopian government are wary of these positions. In our interviews, officials communicated their distrust of motives and ability within the private sector, as well as distrust of foreign investment in sensitive sectors. According to the officials interviewed, the ETC believes that telecommunications services are too important to be cast aside and perhaps ruined by the private sector. Several voiced fears that some would-be entrepreneurs who enter the market would be unable to provide the services asked of them. Officials at the UNDP, the Ministry of Transport and Communication and Ethiopian Information and Communications Technologies Development Agency all noted the current weakness of the private sector, though the UNDP is more optimistic about its promise in the short-term than the others. According to one government official, "(The private sector) is in an embryonic state…As long as we [don't] see…a potential private sector that is directly ready to go forward for provision of the Internet, I say it's good that the government (takes) the share of the burden". According to the current policy, it is the role of the ETA and ETC to investigate firms to make sure they are competent "acceptable partners," ready for the responsibilities of service provision (EICTDA, personal communication, December 14, 2005).

The private sector actually may overestimate its readiness to take on competitive provision of services; however, there is a desire to participate in this arena. Unfortunately, the requirements for entry into this sector, as set in the VaSP and VISP initiative, preclude many prospective applicants (see Appendix B for selection from the English-version of the directive). The regulatory barriers to entry contrast with the assumptions of the neo-classical framework; namely, that anyone who wants to enter a market should be able to, or at least without government obstruction. The neo-classical perspective allows those who cannot compete to fail and exit; the market itself determines who stays and who leaves. The more statist perspective on competition would allow government actors to make that determination before granting permission to compete in order to reduce the potential for failure.

THE ROLE OF TECHNOLOGY

The Internet has long been trumpeted as creating a borderless society, as the routers, switches, and cables that form the Internet do not readily recognize political borders. However, Ethiopia's strict control over its international gateway has limited this aspect of the technology. Currently, the ETC operates a satellite connection and does not allow other entities to operate their own international links. The only exceptions it makes are for two international aid organizations that share a separate satellite link. Permission to operate a separate international link was negotiated through the ETC (UNDP, personal communication, December 19, 2005). The power of the Internet to act as an independent and globalizing influence on policy is limited when the entire national bandwidth is only twenty-four megabits (UNDP, personal communication, December 19, 2005) and there are effectively no alternative international gateways available. The transformative power of the Internet is limited when access must pass through a government-controlled gateway.

INFLUENCES AND THE EFFECTS OF THE CONTINUUM ON PARTIAL LIBERALIZATION STRATEGIES

According to Williams' view of institutionalism (1998), governments shape and determine how markets function and can greatly influence economic growth. Moreover, "An institutional approach does not ignore ideological factors or interest group pressure as important determinants of policy outcomes. It nonetheless suggests that a complex web of institutions mediates between these and government officials filtering ideas and pressure in specific ways" (Galperin, 2004). The structure of the Ethiopian telecommunication bureaucracy directly influences the manner in which policies are formulated by systematically reducing the influence of certain actors while increasing that of others. In Ethiopia, the web of institutions is best understood as a continuum. The most powerful actors are also those least inclined toward competitive reform. More recent entrants to the system such as the ETA and the private sector have fewer points of access and much less influence. As a result, policy initiatives remain cautious so as not to risk major changes in the status quo.

The most influential actor on the continuum is "The Government". Given the centralized nature of the Ethiopian government, those actors closest to the Council of Ministers hold the greatest influence. "The Government" controls the budget of the ETA, determines which policy initiatives from the Ministry of Transport and Communication will be pursued and outlines the general targets and plans for the ETC. "The Government" views

its perceptions and policy proscriptions as pragmatic. From its perspective, there is no currently viable alternative worth investigating that could convincingly provide telecommunications services, including Internet service, on a nationwide scale. Thus, any liberalizing reforms are small-scale and incremental. To this actor, allowing peripheral competitive services is a pragmatic means of opening the sector and improving services. These initiatives are to be highly specialized and limited so that if they fail, it will not lead to major national setbacks in telecommunications. Yet, if successful, they will provide opportunities for entrepreneurs to enter the telecommunications sector and assist in development. As the most powerful actor and the one the least inclined to competitive provision of services, "The Government" can largely determine the extent of reform.

Some actors, such as the ETC, do not actually have a direct role in policy formulation yet, as predicted given their location on the continuum, persuade decision makers to resist policy initiatives detrimental to their interests. New institutionalism explains the resistance of status quo actors through the influence of "sunk costs." In Ethiopia, the ETC has spent large amounts of capital developing its monopoly network. Significant investment of time, financial and other resources along a given developmental path encourages risk-aversion and promotes sustaining the status quo (Galperin, 2004) In this case, such investment makes fully liberalizing change politically unpalatable. The national government may be unwilling to risk losses on such a significant investment and is inclined to reject policies that may place their "sunk costs" at risk. As predicted by the continuum, the ETC, as a powerful actor with vested interests holds great risk aversion and proceeds cautiously with changes to the status quo.

The ETA, although directly responsible for drafting policy, lacks the influence to effect strong changes to the status quo without expending significant political capital. Even though the ETA continues to take on more responsibilities, it remains fully dependent on the state for its funding. It must wait for other state agencies or actors to request its services in policy formulation or regulation development. Thus, despite its desire for greater change it cannot challenge those in power above it who control access to resources and determine the future viability of the ETA. Thus, although the ETA acknowledges the challenges, and potential for reform, it lacks the position within the governmental institutional framework to effect the changes it desires.

DISCUSSION

Two examples of Ethiopian ISP policy illustrate how this continuum of institutional interests has limited prospects for reform: the approach to universal access and to VaSP and VISP initiatives. "The Government" and the ETC believe that the monopoly method, while perhaps not the most efficient, is the most dependable manner of extending basic connectivity to every region of the country.

Governmental stakeholders want to require connection of all 15,000 kebeles and completion of the national fiber optic cable network before expanding beyond partial liberalization. This has the effect of creating a tremendous delay. One interviewee ventures that, "after… the kebeles are finished and universal access and everything completed… we'll really expect some [liberalizing] changes, definitely" (EICTDA, personal communication, December 21, 2005). Only after this momentous project is completed will the stakeholders with the most influence begin full competitive reforms. This runs directly counter to what neo-classical proponents argue would be one of the key benefits of full competition: that expanded competition would actually improve rural access.

However some officials in multiple organizations fear that full competition will force the immature ETC to abandon any rural connectivity efforts in order to remain competitive in urban areas. Full competition would effectively end its ability to cross-subsidize. This status quo arrangement has strong institutional and ideological backing. Reform of public telecommunications services is commonly seen as a threat to the universal provision goals of the state (Mustafa et al., 1997). When asked whether alternatives to monopolistic rural service provision models such as reverse subsidy auctions (Raja, 2003) or concessions in exchange for meeting rural access targets were considered, officials repeated their previous statements regarding the necessity of the monopoly provision model. An official provided this representative view: "The government thinks that if the private sector comes in, they only would be involved where they can get more money, rather than getting attention to the rural areas" (ETA, personal communication, December 20, 2005). This is based on two assumptions: that rural service is inherently unprofitable, and that there are no

mechanisms by which the private sector could be induced to provide rural access. These assumptions are institutional doctrine underlying the actions of the Ethiopian actors with the most power.

In order to help realize their ambitious ICT goals, effective on August 16, 2005, the national government approved a new directive to commence licensing of VISPs (see Appendix B). However, the restrictions that it has put on this downstream competition largely negate its chances of success. To satisfy the unique demands and interests of major stakeholders and to convince them to lend their support to partial liberalization, compromises were made. Such compromises actually represent concessions to various interests. The one-off result allows all stakeholders to be at least partially satisfied; however, raising barriers to entry to satisfy certain groups also raises barriers to success.

Within the ETC, there is a fear of unscrupulous private actors who may take payment and fail to provide service (ETC, personal communication, December 15, 2005). The new directive allows competition in downstream services, but requires certain levels of education and experience from potential alternative providers. Unfortunately, this compromise of including stringent education and experience requirements creates requirements that are well beyond those of the hopefuls with whom we spoke, and well beyond those of successful small-business entrepreneurs in both developed and developing countries (Colombo and Delmastro, 2001). Even a VISP that does not plan to lease equipment or set up its own networks must employ trained computer scientists or engineers with two years experience. Such a requirement will severely limit the number of acceptable applications and restrict the pool of entrepreneurs able to participate in this new initiative. The compromise VISP initiative will not create the competitive environment that increases Internet penetration, that utilizes the full capacity of the ETC network, or that will relieve the ETC of service provision burdens. It is doubtful that these restrictions would allow a critical mass of entrepreneurs to accumulate.

Second, given the influence of the ETC, interconnection of networks is not allowed. This barrier prevents any market entrant from gaining too much benefit from potential network effects. The network effect for telecommunications states that the value of the network is proportional to the square of the number of nodes in the network. Were the small VISP networks able to directly interconnect, the benefits would accrue much more rapidly than through the centralized links at the ETC – much like the manner in which the Internet itself was created. A partnership or coalition of interconnected VISPs could be formidable competition for the ETC.

The current restrictions in the VISP directive serve the institutional interests of the ETC by allowing it to maintain a dominant market presence. The private sector continues to pose no threat to the incumbent, and the VISP initiative relieves pressures for reform from international and domestic sources. Preventing interconnection is a protective mechanism for reducing the potential power of market entrants, but it disadvantages prospects for economic growth. Levy and Spiller (1996) argue that the opportunities for competition "can be realized only if ready interconnection among providers and services is guaranteed." Accordingly, the benefits of competition to the country would only be realized with interconnection. By creating a reform that yields to the interests of the ETC, the VISP initiative will fail to achieve its full potential benefits.

A similarly impaired reform took place in South Africa where liberalization led to competition in the ISP sector, but "with restrictions on their operations (for example, they are not permitted to do voice and are required to acquire their facilities from the fixed-line monopoly provider)" (Gilwald, 2005). This arrangement allowed for deregulation in name only. When all ISPs are required to purchase services and use facilities of the incumbent/monopoly provider, the benefits of competition are stifled. Everyone must still buy from the same source, even if the intermediaries have changed. In Ethiopia, issuing a directive with the limitations of monopoly control of the international gateway and a monopoly right on interconnection has serious drawbacks. It does little to encourage potential entrepreneurs or increase the quality and speed of Internet connections.

CONCLUSION

We understand that given the nature of the institutional framework in Ethiopia, immediate and full competition in the ISP sector is neither possible nor desirable. The regulatory capacity of the ETA would be overwhelmed. The ETA has only just begun preparations to license and regulate

limited peripheral competition.[1] Matters of interconnection and disputes among a plurality of networks are well beyond the experience of the regulator at this time. This does not mean, however, that conditions in Ethiopia suggest that reform should be halted; rather, continuing on the path of partial liberalization is the most likely way to effect successful reforms in the future. However, instead of nominally competitive reform, a policy that would result in real peripheral competition should be applied in this case. Were the reforms modified to lower the barriers to market entry, the benefits to Ethiopia would accrue far more quickly. These reforms would provide a foundation from which to test further liberalization.

There are four likely benefits to the initiative even with its current limited scope. First, this first reform initiative will prove that the private sector is indeed capable of providing quality service, helping to alleviate doubts about the viability of competition. If services improve significantly and the rate of use on the ETC infrastructure increases, this would forcefully demonstrate to those in favor of state-led growth that competition truly is a powerful driver for development of Ethiopia's telecommunications sector.

Second, these reforms will assist in building the capacity of the private sector itself. They will increase the knowledge base among entrepreneurs in operating high-tech businesses. Additionally, entrepreneurs will gain experience cooperating with the regulator through legal licensing procedures and with the incumbent through contract agreements. This may assist in bringing a measure of competitive business knowledge to Ethiopia, which could have positive influences in other sectors of the economy.

Third, for the ETC itself, deepening of reforms should continue to improve their efficiency and capabilities as a network operator. Specialization leads to improvements in efficiency and the greatest good for all consumers (Frankel, 2000). Through specializing in network operation and divesting itself of all downstream services, the ETC can begin to become a truly efficient operator.

Fourth, the Ethiopian Telecommunications Agency views the VISP initiative as an opportunity to test its capabilities as a regulator and licenser of multiple operators. This initiative gives the ETA a chance to regulate in a partially liberalized system and will reveal the degree to which previous capacity-building efforts have been successful. The ETA will gain valuable experience and further insight as the initiative is implemented over the next two to three years. Success in this environment could have normative effects on the views of the ETC and the Ministry towards the capabilities of the private sector and the regulator.

There are risks to the current partial liberalization initiative. Should it fail, it will provide ammunition for opponents of greater liberalization. In the same way that the failed equity-sharing agreement ended efforts at privatization, failure of partial liberalization could lead to retrenchment and monopolistic control. While it might fail, it would be representative of the failings of a restrictive partial liberalization, not partial liberalization in general. Herein lays the danger in this initiative. As written, the chances for success are limited, but interests that favor the status quo may try to extrapolate from it an indictment of all partial or full liberalization initiatives.

A second risk in this initiative is that it could trap the national government in a state of indefinite partial liberalization. Having allowed private provision in a limited range of services, the ETC and government may see no reason to push for further reforms. A new status quo could materialize where the potential benefits of liberalization are only partly realized. Under such circumstances, the nascent reforms could stagnate into a state of inertia where "next year" never comes.

Our research set out to understand the institutional explanation for the types of reform adopted in Ethiopian telecommunications. Our research was limited by time and the number of interviews we were able to conduct. In the future, a more comprehensive survey of the actors introduced in this paper in addition to representatives from each department within the organizations in Ethiopian telecommunications would create a richer data set and more clearly express the views held by the different actors.

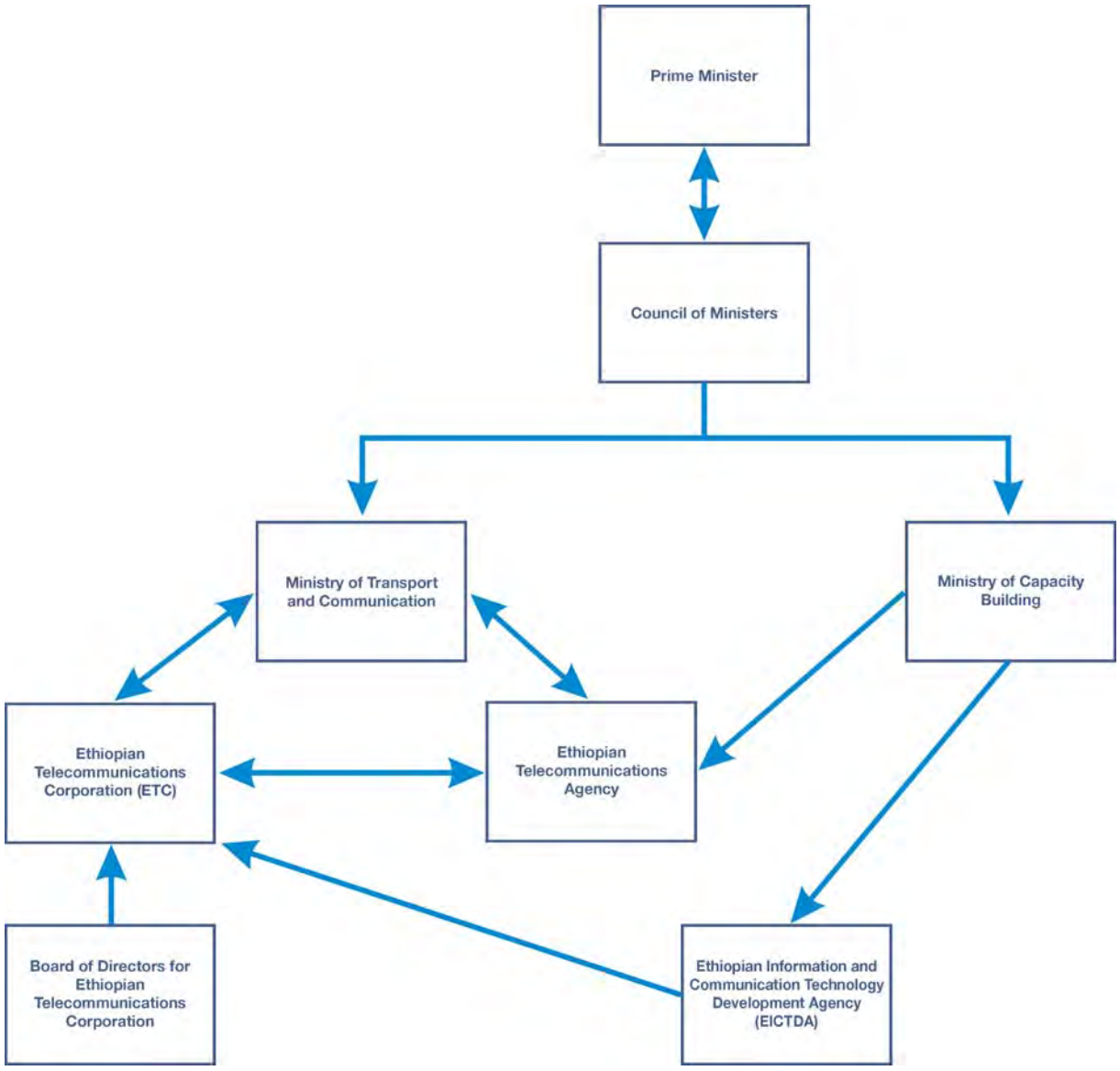
Nonetheless, our research sheds light on the manner in which institutions can directly impact the types of Internet service policy adopted in developing states such as Ethiopia. Understanding why Ethiopia's reforms have developed as they have will help explain policy choices in similar

[1] *As of 12/21/2005, the ETA had not yet received any VISP license applications.*

states throughout the developing world. Even in developed states institutions can predispose certain outcomes in the policy making and implementation process. For that reason, understanding institutional causality is critical to understanding policy formulation.

In conclusion, each of the major stakeholders in Ethiopian telecommunications believes that liberalization will benefit the Ethiopian people and improve the quality and scope of Internet access. The ability to reform is sharply limited by the institutional framework of Ethiopian Internet service provision modeled by the continuum presented here. Without significant institutional reforms that change the perspectives and power ratios modeled on the continuum, any potential for competitive reform and the benefits it promises will remain underdeveloped.

APPENDIX A: AGENTS AND INFLUENCE IN ETHIOPIAN INTERNET SERVICE PROVISION



I. Major Agents

a. *Prime Minister:* In the Ethiopian parliamentary system, the Prime Minister is the head of government. His signature is necessary for acts of parliament including significant changes in telecommunications policy.
b. *Council of Ministers:* The heads of Ethiopia's government ministries meet in the Council of Ministers. This body consults and approves or rejects policy initiatives, budget requests and plans. The ETA must submit its budget plans and annual report to the Council of Ministers.
c. *Ministry of Transport and Communication:* This Ministry outlines the general policy framework and sets targets for the telecommunications operator (ETC). This Ministry works with the ETC, ETA, World Bank and others to draft new policy initiatives. It oversees the ETA and ETC. This Ministry also appoints the director of the ETA.
d. *Ethiopian Telecommunications Corporation Board of Directors:* This advisory board supervises the state-owned ETC. The board approves or appoints managers and senior level staff from within the Corporation.
e. *Ethiopian Telecommunications Corporation (ETC):* The ETC is the incumbent operator in Ethiopia. Its monopoly rights are granted under a contract issued annually by the ETA. The ETC is independent of government funding (although it enjoys privileged access to foreign exchange) and generates its own funding through service provision. Its monopoly license is contingent on meeting major rural access, rollout and quality of service targets set by the Ministry of Transport and Communication.
f. *Ethiopian Telecommunications Agency (ETA):* The ETA is the regulatory agency of internet service providers and wireless spectrum in Ethiopia. The ETA collects fees for its licenses, but receives its budget from the central government. Its director is appointed for an indefinite term by the Ministry of Transport and Communication. It continues to improve its capacity through ongoing relationships with the World Bank, the Ministry of Capacity Building and NetTel@Africa.
g. *Ministry of Capacity Building:* The Ministry of Capacity Building carries out the task of assisting regulatory agencies with increasing their human and technical capabilities to monitor their respective industrial structures. The Ministry of Capacity Building works directly with the ETA and EICTDA.
h. *Ethiopian Information and Communication Technology Development Agency (EICTDA):* EICTDA promotes the use of ICTs in government agencies, education and in the private sector. EICTDA does not directly promote policies but acts as an enabler and a ready client for the ETC by encouraging the spread and providing a dedicated customer for telecommunications services (such as SchoolNet). As an agency within the Ministry of Capacity Building, EICTDA has worked with the World Bank and the Ministry of Transport and Communications to develop a national telecommunications development program.

II. Major Influence Channels

a. *Ministry à ETC:* The Ministry receives targets, goals and plan objectives from the Council of Ministers and relays these to the ETC. The ETC, as an operator, has little formal influence on the Ministry. The ETC could lose its monopoly license if it failed to meet targets set by the Ministry.
b. *Ministry à ETA:* The Ministry controls the appointment of the Director of the ETA and must approve its annual report. The Ministry sends general policy initiative frameworks to the ETA for drafting.
c. *Council of Ministers à ETA:* The Council of Ministers controls the ETA's budget. ETA budgets must be approved by the Council who also reviews the annual ETA performance.
d. *ETA à ETC:* The ETA regulates the ETC and has the right to adjudicate in disputes between the ETC and customers. The ETA uses its licensing procedure to hold the ETC responsible to international standards of efficiency and service quality. The Ethiopian government attempts to use effective regulation and service targets as a surrogate for competition. The ETA is also responsible for licensing new VaSPs (see Appendix B) and ensuring fair contracts are signed between the ETC and individual VaSPs.

APPENDIX B: EXCERPTS FROM THE 8/8/2005 VALUE ADDED SERVICES DIRECTIVE

(Translated from the Amharic Version)

ARTICLE TWO

DEFINITIONS

Without prejudice to the application to this Directive of the Definitions of the Telecommunication Proclamation No. 49/1996 (as amended) and Council of Ministers Regulations No. 47/1999, in this Directive, unless the context requires otherwise:

1. "**Agency**" means Ethiopian Telecommunication Agency.

2. "**Call Center Service**" means information provisioning service which is useful for a customer or potential customer by the initiation of the person providing the information himself or through a request made by the customer or potential customer by a telephone call or using internet, regarding the business or service the person is providing, or the business or service of another person, or on other similar issue.

3. "**Corporation**" means an entity defined as the sole telecommunication service provider under Article 2 sub-Article 3 of the Telecommunication Proclamation No. 49/1996 (as amended).

4. "**Licensee**" means a person licensed to provide Value Added Services.

5. "**Value Added Service License**" means Virtual Internet Service license or Call Center Service license.

6. "**Virtual Internet Service (V-Internet)**" means the provision of dial-up internet access service, web hosting service, e-mail and other similar services to customers by leasing internet bandwidth or internet network equipment of the Corporation.

ARTICLE THREE

REQUIREMENT OF A LICENSE AND TYPES OF LICENSES

1. **Requirement of a license**

   A person who desires to provide a Virtual Internet Service or a Call Center Service shall obtain a license from the Agency in accordance with this Directive.

2. **Types of Value Added Service licenses**

   Types of Value Added Services are:-

   a. Virtual Internet Service
   b. Call Center Service

ARTICLE FOUR

REQUIREMENTS FOR OBTAINING A LICENSE

1. Subject to fulfilling the requirements applicable to all licenses which are set forth under sub-article 2 of this Article, a person shall also fulfill the following before obtaining a license for each type of Value Added Service described under sub-article 2 Article 3 of this Directive:

A. Virtual Internet Service

A Virtual Internet Service license applicant shall at least have:

i. two graduate professionals with first degree in computer science, electrical or computer engineering or in related fields and having two years experience in the information and communication sector;
ii. one technician having a diploma from a recognized educational institution in electronics, electricity or related fields and
iii. one separate or integrated router and one access server applicable for dial-up service only.

B. Call Center Service

A Call Center Service license applicant shall at least have:

i. two graduate professionals with first degree in computer science, electrical or computer engineering or in related fields and having two years experience in the information and communication sector;
ii. automatic Call distribution switch and
iii. two call agents.

C. Use of professionals to apply for different Value Added Services Licenses.

An applicant may secure a license for both Call Center and Virtual Internet Service, by employing the professionals mentioned under sub-article 1 (A) (i) and (ii) of Article 4.

2. Without prejudice to the provision of sub-article 1 of this Article, any person that applies for a license shall submit the following:

a. Principal Registration Certificate from the concerned office as per Article 5 sub-Article 1 of Business Registration and License Proclamation No 67/1997.
b. Memorandum and Article of Association, if it is a Business Organization.
c. Evidence showing that the applicant is of Ethiopian national or if the applicant is a foreign national of Ethiopian origin, an identification card to this effect.
d. Evidence showing the educational background and work experience of its professional workers and if the professional workers are employed, their contract of employment made with the owner or the business organization.

ARTICLE FIVE

CONTRACT BETWEEN THE CORPORATION AND A LICENSEE ON SERVICE DELIVERY AND, ON SETTING THE LEVEL OF STANDARD AND QUALITY OF SERVICE

5. The Corporation may cancel the contract; if the Agency cancels the Licensee's license; if the Licensee fails to perform its payment obligation to the Corporation within the time limit indicated in the contract for service delivery; if the Licensee clearly breaches the security guideline of the Corporation when it is using the equipment which links it to the Corporation's network or when sharing an equipment with the Corporation; or when force majeure occurs.

ARTICLE SEVEN

LICENSE FEE, VALIDITY PERIOD FOR A LICENSE, RENEWAL OF A LICENSE AND SERVICE FEE

3. Service Fees

   a. The service fee charged by the Corporation for the service it provides to a licensee shall be consistent and shall encourage a Licensee to expand the service penetration. It shall also be based on a price specifically determined for the use by the Value Added Service provider.
   b. Before the issuance of a license as per this Directive, the Corporation shall determine and make public the service fee it charges a Licensee.
   c. If there is a change on service fee, the Corporation shall inform the Licensees in writing and also the public using mass media 30 days before the change becomes effective.

ARTICLE EIGHT

OBLIGATIONS OF A LICENSEE

10. A Licensee shall ensure that Equipment connected to the network of the Corporation or shared with the Corporation shall follow security and safety guidelines prescribed by the Corporation.
11. The Licensee shall only take and use Internet and public switched telecommunication services from the Corporation.
13. Virtual Internet Service Licensee shall obtain a domain name on the basis of a procedure employed by the Corporation or other entity empowered by law to assign a domain name.
14. Equipment of a Call Center Service Licensees shall not be interconnected with each other or the equipment of other similar Licensees.

ARTICLE ELEVEN

CRIMINAL LIABILITY

A person who commits an offence as per Article 25 of the Telecommunication Proclamation No.49/1996 (as amended) shall be criminally liable for the offence.

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WHITHER OR WITHER: SUSTAINABILITY OF REGIONAL REGULATORY BODIES

KIPP JONES

ABSTRACT

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) HAVE CONTINUED TO HELP FUEL THE DRIVE TO GLOBALIZATION AND international interactions. The global growth of ICT does not come without effort and requires the coordinated work of governments, businesses, and regulators to ensure both internal and external interactions can be conducted in a supportive environment. This need has been addressed around the world through various organizations that span beyond traditional country or economic boundaries to ensure that scarce resources are optimized, that competition is fair, and that policies and legislation are coordinated across national boundaries. The operation and sustainability of these international organizations is not a well-understood process and warrants further study. In particular we explore organizations that address telecommunications regulations that span international boundaries and examine the sustainability of the West Africa Telecommunications Regulators Assembly (WATRA).

Sustainability is a far reaching topic that is impacted by many factors both internal to an organization as well as external forces that influence the ability for an organization to survive over a period of time. Financial sustainability is one ultimate source for longevity, but the attainment of financial stability is itself influenced by a myriad of choices, actions, and needs of a body's constituents. Exploring these needs, influences, and requirements for sustainability of regional regulatory bodies is the essence of this research.

To illustrate the need for regional coordination, we examine the possible interactions of WATRA on the critical topic of Internet Exchange Points (IXP) as an example of the interaction, utility, and possible launch point for a sustainable model of operation.

INTRODUCTION

The telecommunications industry faces many obstacles in reaching the majority of people in developing regions. It has largely been recognized that national regulations and policies have a large impact on how, when and where information and communication technology reaches people. With the continued expansion of international exchange of information, goods, and people, it is now ever more important to have coordinated international policies and cooperation especially within regions which are undergoing continued development and suffer from inadequate infrastructure.

The West Africa Telecommunications Regulators Assembly (WATRA), while having some unique requirements due to its geographic location and mission, shares some commonalities with other not-for-profit organizations that work on a regional, national or international basis. These similarities should be leveraged to help identify organizational structure, financial capabilities, membership, and project formulations that have been shown to be successful in other organizations. A number of organizations are examined including; the International Telecommunication Union (ITU), the Telecommunication Regulators Association of South Africa (TRASA), the Association of Regulators of Information and Communication for Eastern and Southern Africa (ARICEA), the Organization of East Caribbean States (OECS) and the Asia-Pacific Economic Cooperation (APEC).

A case is first made for the need for an organization such as WATRA to coordinate activities across national and economic boarders due to the growth of globalization. We then explore a set of similar international organizations. The following section details sustainability needs and changes required for WATRA. We then illustrate the potential for impact on the region by exploring the possible influence of a body such as WATRA on the development of local, national and eventually, regional Internet Exchange Points (IXPs).

GLOBALIZATION

Before describing the WATRA organization itself, this section illuminates the need for a regional body to assist in the deployment and coordination of ICT within a geographic region such as West Africa.

ICT has been recognized at the top level of the international community as a means to improve economic conditions. This is supported by one of the Millennium Development Goals established by the United Nations in 2000 (Nations, 2000) which states:

"Make available the benefits of new technologies – especially information and communications technologies."

The realization of this goal is no mean feat. With technical, financial, human, economic, infrastructure, political and regional challenges to confront, it will take a sustained coordinated effort to overcome these issues. This is especially true in the domain of telecommunications networks, which, by default must cross political, technical, and physical borders to meet the need for broad access to communications technologies.

Brewer (Brewer *et al.*, 2005) posits that there are four main technology needs: connectivity, low-cost devices, appropriate user-interfaces, and power. Of these, connectivity is by far the technology in highest need for international coordination and cooperation. Certainly the other areas are in need of further research, but much of the deployment can be considered within the eminent domain of a single country.

Connecting local and national networks to the international grid requires coordination to solve technical, financial, policy and law related issues. To stimulate and facilitate these efforts, geopolitical regions throughout the world have turned to regional bodies to help. Regional bodies such as those mentioned above have been able to ease the introduction and growth of ICT in their respective regions through a combination of policy harmonization, education, human development, and project coordination. In particular, issues such as spectrum management, naming and numbering standards, competitive and cooperative agreements, legal and policy frameworks supporting competitive offerings and interconnection rights, licensing, enforcement, and funding are in need of a comprehensive regional approach.

Beyond the need for cooperation on these issues and the Millennium Development Goals, there are global forces that are increasing the need for international coordination. These global forces are generally termed globalization, which can be defined as:

> *The worldwide phenomenon of technological, economic, political and cultural exchanges, brought about by modern communication, transportation and legal infrastructure as well as the political choice to consciously open cross-border links in international trade and finance. It is a term used to describe how human beings are becoming more intertwined with each other around the world economically, politically, and culturally. Although these links are not new, they are more pervasive than ever before.*[1]

As Blunden (Blunden, 2005) discusses in her analysis of Geoffrey Vickers' *Responsibility: Its Sources and Limit*, there is a need for more "coupling in the sense of more effective international institutions to help regulate an increasing complex and potentially unstable world and more decoupling, in the sense of local participation, community and commitment". Although originally authored over 25 years ago, this statement rings true in the ICT arena of today, where complexity rules the day but there is a very real need for local and community participation for sustainable improvements.

[1] *From Wikipedia, http://en.wikipedia.org/wiki/Globalization*

Unfortunately, not all problems are technical in nature. The complexity and scope of the issues demands a highly competent set of skills that range from political, financial, legal, marketing, project management, to technical. Without the human resources and capacity, these problems remain intractable for regions such as West Africa. Indeed, as Goulden (Goulden, 2005) describes it, "Capacity building and human resource development are key to the implementation of liberalization policies and programmes, and to the development of regulatory agencies". He continues by illuminating several issues that have affected the South Africa Development Community (SADC) and are present in the WATRA region as well. In particular the paper highlights two issues: 1) the member states find difficulty in attracting and maintaining capable staff for the regulator, and 2) organization and institutional capability affect the member state's capacity. A regional approach to building these capacities can be effective as has been demonstrated within the SADC region.

WATRA

WATRA, the West Africa Telecommunications Regulators Assembly, is composed of independent National Regulatory Authorities (NRAs) and departments for the regulation of telecommunications services established by governments of member states in the Economic Community of West African States (ECOWAS) sub-region plus Mauritania. Figure 1 gives a map, population and land mass information for the ECOWAS region.

	Population 2005 (million)	Land area (Thousand km²)
Benin	8.4	111
Burkina Faso	13.2	274
Cape Verde	0.5	4
Côte d'Ivoire	18.2	318
The Gambia	1.5	10
Ghana	22.1	228
Guinea	9.4	246
Guinea Bissau	1.6	28
Liberia	3.3	96
Mali	13.5	1 220
Niger	14.0	1 267
Nigeria	131.5	911
Senegal	11.7	193
Sierra Leone	5.5	72
Togo	6.1	54
TOTAL	260.6	5 032

Sources: United Nations (2005); World Bank (WDI, 2004)

Source: Sahel and West Africa Club (2005)

Figure 1. ECOWAS Region

All members of ECOWAS are also members of WATRA except Togo (see Table 1 for membership details). The constitution was completed November 20, 2002 and the organization holds semi-annual meetings, the most recent held September 2005 in Accra, Ghana.

Table 1. WATRA Membership

ß	WATRA Member	ECOWAS Member	Regulatory Body
Bénin	✓	✓	Directorate within Ministry
Burkina Faso	✓	✓	Autonomous
Cape Verde	✓	✓	Autonomous
Cote d'Ivorie	✓	✓	Autonomous
Ghana	✓	✓	Autonomous
The Gambia	✓	✓	Directorate within Ministry
Guinéa	✓	✓	Directorate within Ministry
Guinée-Bissau	✓	✓	Autonomous
Liberia	✓	✓	In process of creation
Mali	✓	✓	Autonomous
Mauritania	✓		
Niger	✓	✓	Autonomous multi-sector
Nigeria	✓	✓	Autonomous
Sénégal	✓	✓	Autonomous
Sieraa Leone	✓	✓	In process of creation
Togo		✓	Autonomous

Sanou Brahima and Mpatwa Asenath (Brahima & Asenath, 2004) include a map of the regulatory bodies within Africa as of the end of 2003. As can be noted in Figure 2, the WATRA region consists of countries that have regulatory bodies in various states of maturity, including several that are in the process of being created. Table 1 includes the state of the regulatory bodies for each country within the WATRA region except for Mauritania. The diversity of development of regulatory bodies within the region adds to the burden of WATRA in bringing the region's policies and regulations to a harmonious level.

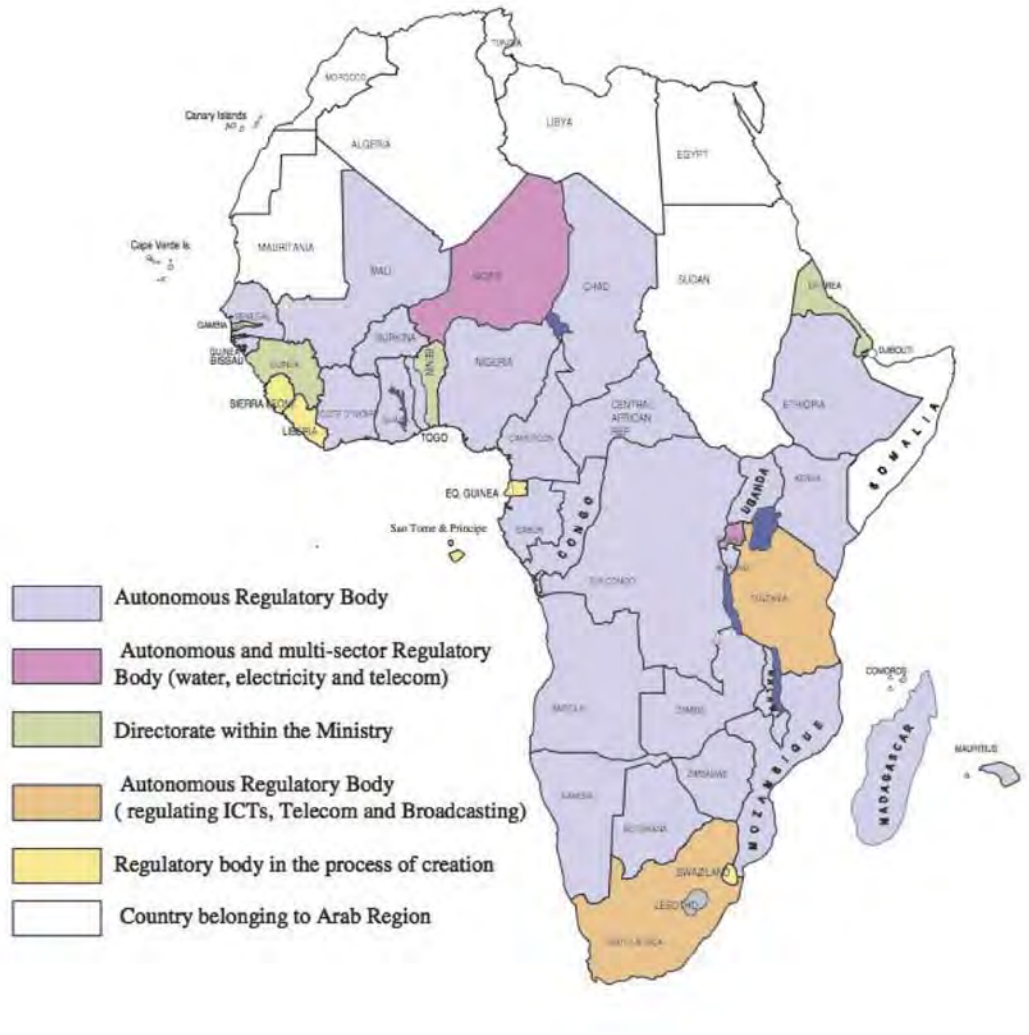

Figure 2. Regulatory Bodies In Africa

The organization has its headquarters in Abuja, Nigeria in office space provided by the Nigerian Communication Commission (NCC). Mrs. Lolia Emakpore currently serves as the Executive Officer of the Secretariat. Organizationally, WATRA consists of the following:

- Conference of Regulators (CoRs) – this is the highest decision making body and is responsible for binding decisions defining policy framework and guidelines for implementation;
- Executive Committee – comprised of a Chairman and two Vice Chairmen, this group oversees the implementation of the WATRA programs and activities;
- Secretariat - responsible for the implementation of WATRA programs and activities in concert with the Executive Officer as Head of Secretariat;
- Membership – voting members consist of the regulatory bodies and have equal voting rights at meetings on all subject matters. An additional class of membership includes Associate Members which have no voting rights but are invited to participate at open meetings and is open to private organizations; Lastly, Observer status may be conferred on other stakeholders such as funding agencies and Non-Governmental Organizations (NGOs).

WATRA OBJECTIVES

The following summarizes the WATRA objectives, refer to (Ezani, 2002) for details:

- Encourage the creation of a viable, homogeneous telecommunications marketplace in West Africa;
- Establish conditions that will allow any operator to provide trans-national or global services, in line with the principle of non-discrimination;
- Ensure that commitments entered into in dealings with the WTO are not at variance with ECOWAS objectives;
- Establish a conducive framework within which Member States of ECOWAS can evolve a common stand regarding international telecommunications agreements, conventions and treaties;
- Allow joint management of certain scarce or limited telecommunications facilities and resources such as the radio frequency spectrum;
- Enable application of uniform rate and tariffs for ICT services;
- Implement mutual recognition of equipment and terminal type approval processes;
- Provide ECOWAS with the legal instruments regulating network interconnection;
- Define a framework of the functions and purposes of Member State regulatory bodies.

This list of objectives is very ambitious and sweeping. As such, it indicates the need for an organization that is sufficiently funded and staffed with extremely well qualified individuals that can span international, regulatory, business, technical, funding, operational, and management needs.

CURRENT FUNDING SOURCES

There are two primary sources of funding, the first being membership dues and the second coming from organizations such as USAID that have provided initial and ongoing funding. It is unclear the level of commitment and the duration to which these funding organizations are willing to continue to support WATRA. Thus it is imperative that WATRA find the means to become self-sustainable in the very near future.

The annual membership fees are currently set forth in the following manner:

Members -	Group A – $40,000,	Group B-$30,000,	Group C -$20,000,	Group D-$10,000,	Group E- $5,000
Associate Members -	Platinum-$50,000,	Gold $40,000,	Silver-$20,000,	Bronze-$10,000.	

The 'Memebers' consist of the regulatory bodies from each member country with the grouping based on the country's ability to pay. The 'Associate Member' class is designated for private and commercial organizations' participation with the membership levels providing differing levels of benefits from exhibitions discounts, event participation, and database access. Associate Members do not have voting privileges however Table 2 indicates the current list of benefits.[2]

[2] *Internal communications indicating proposed Associate Membership benefits received from Lolia Emakpore, December 2005*

Table 2. WATRA Associate Member Benefits

Member-ship Level	Annual Dues	Online Database Access	Exhibition	Capacity Building Intervention Programs	Regulatory and Policy Contri-butions	Accred-itation as Sponsor	CEO Forum	WATRA co-hosted Events	Awards
Platinum	50,000	Full Access	100% discount	2 Free participation for General Programs	Unlimited	All Events	Free Partic-ipation	Up to 20% discount	ECOWAS ICT Development Partner Recognition on Platinum Plaque
Gold	40,000	Partial Access	70% discount	60% discount	Limited	At OGM and 1 workshop	Free Partic-ipation	Up to 20% discount	ECOWAS ICT Development Partner Recognition on Gold Plaque
Silver	20,000	Partial Access	50% discount	40% discount	Limited	2 workshops		Up to 10% discount	Commendation Certificate
Bronze	10,000	Read-only Access	30% discount	30% discount	Limited	1 workshop		Up to 10% discount	Commendation Letter

At present, there are no paying Associate Members, thus Members provide the only membership funding. This puts a large burden on the funding agencies and leaves WATRA in an unstable financial situation. The following sections will further explore the nature of WATRA and recommend changes to help improve the likelihood of the organization self-sustaining.

THE STUDY

This study was conducted by combining personal, electronic and telephone based interviews with an extensive literature review and several weeks of on-site collaboration with WATRA. The interviews were informal and tailored to expose different areas of expertise and perspectives from the participants.

We examined a number of strategic frameworks for analyzing WATRA's prospects. The primary framework chosen is based on the work of Osborne and Gaebler in "Reinventing Government: How the Entrepreneurial Spirit Is Transforming the Public Sector" (Osborne & Gaebler, 1992) which included 10 major guiding principles:

1. Catalytic. Steering rather than rowing.
2. Community-owned. Empowering rather than serving.
3. Competitive. Injecting competition into service delivery.
4. Mission-driven. Transforming rule-driven organizations.
5. Results-oriented. Funding outcomes, not inputs.

6. Customer-driven. Meeting the needs of the customer, not the bureaucracy.
7. Enterprising. Earning rather than spending.
8. Anticipatory. Prevention rather than cure.
9. Decentralized. From hierarchy towards participation and teamwork.
10. Market-oriented. Leveraging change through the market.

While WATRA is itself not a government agency, it has many of the earmarks of an agency and must deal with governmental agencies on a daily basis. The principles outlined above are, we believe, directly applicable to the WATRA organization.

With these principles as a backdrop along with some ideas presented in Cote's piece (Cote, 1999), we examine the landscape of West Africa, the telecommunications industry, other similar organizations, and the current makeup of WATRA to devise a recommended approach to sustainability. Appendix A includes a list of the key individuals that were consulted as part of this study.

REVIEW OF SIMILAR AGENCIES

In order to understand the expectations and possible models for running an organization such as WATRA we examined a number of international organizations that share some similarities to WATRA. Many of these are regional regulatory bodies or have oversight and influence over regulatory agencies and the guidance of ICT adoption within a region. Several of the bodies are from the African region while others are not, allowing us to analyze how potentially differing strategies, approaches, and issues drive the success of the organizations.

In this section, we explore similar organizations and attempt to extract relevant methods and means which have helped lead to sustainability in those organizations. These methods are then applied to WATRA as examples of best practices. The study was, of necessity, a fairly short but intensive look at WATRA and it's organizational needs, thus, the recommendations below are by no means complete nor final. However, based on the experience and understanding of the authors, these are areas that can be improved to enhance WATRA's long-term sustainability.

International Telecommunication Union (ITU)

> *Since its establishment more than 135 years ago, ITU has grown to become one of the most widely-represented organizations in the world, with 189 Member States along with some 660 Sector Members and more than 40 Associates who, between them, represent all the major players from all sectors of the telecommunication industry.*[3]

ITU represents a very well established global organization that has shown long term sustainability. Our analysis of ITU was primarily focused on two elements: membership and services and their relationship to financing.

ITU's main source of financing comes from the contributions of its Member States, which account for 66.1% of the overall budget. Sector Members contribute 13.3% of the overall budget. The other sources of financing include:

- Income from cost recovery for services like the sale of publications, project execution, satellite notifications (17% of total funding)
- Other income, such as income from interest (3.6% of total funding).

[3] *International Telecommunications Union, http://www.itu.int/aboutitu/index.html*

For the years 2004–2005, the budget of the Union stood at around $255[4] million USD.

Table 3. Breakdown of ITU 2004-2005 Income

Income Category	USD (in millions USD)
Member States	$169
Sector Members	$34
Cost Recovery	$43
Other	$9

ITU's membership comprises some 189 Member States, represented by their respective government administrations, and over 620 Sector Members, which include private and public sector entities such as operators, manufacturers and regulators as well as telecommunications-related organizations such as NGOs and research and training institutes. In addition there are over 100 Associates. Associates within ITU are note eligible to vote for Recommendations however they are generally entitled to:

- take part in Study Groups
- participate in the preparation of recommendations
- access to Study Group documentation
- server as Rapporteur within the selected Study Group

ITU membership represents a cross-section of the telecommunications and information technology industry, from the world's largest manufacturers and carriers to small, innovative new players working in new fields like IP networking.

An example of an involved community can be seen in Figure 3 below which indicates the type of organizations that are members of ITU. Figures released by ITU indicate that in 2001 they realized a 7.8% growth in sector membership and a 4.9% increase in Associates.

Figure 3. ITU Membership Distribution [5]

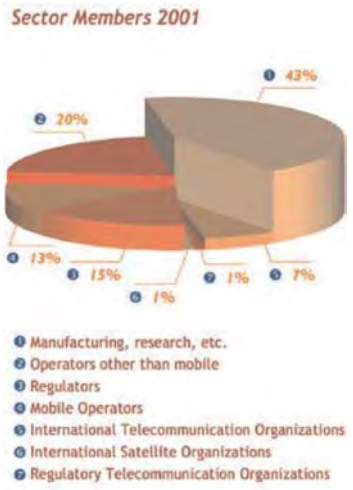

Figure 4. ITU Sector Membership

[4] *ITU reports income in Swiss Francs, values were converted to USD with the exchange rate as of April 6th, 2006. http://www.itu.int/aboutitu/budget.html*

[5] *ITU 2001 Annual Report: http://www.itu.int/aboutitu/annual_report/2001/c_r.html*

Figure 4 illustrates the distribution of ITU members within various sectors. This diversity of membership ensures a wide perspective on any proposed or developing standard and contributes to the total capacity and knowledge of the organization.

LESSONS LEARNED: FOCUS ON MEMBERSHIP AND MEMBER SERVICES TO BUILD COMMUNITY AND REVENUE BASE

Telecommunication Regulators Association of South Africa (TRASA)

The Southern Africa Development Community came about in April 1980. It now includes a total of 14 sovereign countries: Angola, Botswana, Democratic Republic of Congo, Lesotho, Namibia, Malawi, Mauritius, Mozambique, Seychelles, Swaziland, South Africa, Tanzania, Zambia and Zimbabwe. This group of countries represents some 187 million people as well as a large geographic area.

TRASA was formed in late 1997, taking over the role of the regional telecommunications regulatory body from the Southern Africa Telecommunications Administrations (SATA) Conference. TRASA has a familiar set of goals:

- To co-ordinate regulatory matters and to exchange ideas, views and experiences on all aspects of regulation of the telecommunications sector throughout the Southern Africa region.
- To promote the establishment and operation of efficient, adequate, and cost-effective telecommunications networks and services in the Southern Africa region which meet the diverse needs of customers while being economically sustainable.
- To facilitate a uniform level of understanding of regulatory matters;
- To maximize the utilization of scarce resources in specialist areas of telecommunications.

What is of interest is the success that TRASA has had, particularly in the area of capacity building. Through the use of "regulatory competition", the region has been able to move aggressively towards policy harmonization. In 1996, prior to the creation of TRASA, the coordinated effort was given a boost by the adoption of the SADC Protocol on Transport, Communications and Meteorology[6]. This was a forward looking document which begins with the statement that "transport, communications and meteorology functions have a regional and global character and are a prerequisite for the promotion of economic growth and development and the improvement of the quality of life and social interaction of all their citizens within the region, continentally and internationally."

Brian Goulden depicts the growth of the TRASA organization and, in particular how the regional cooperation helped to build capacity within the region (Goulden, 2005). He points out that capacity reaches beyond the 'hard' components of funding, technology and human resources, and speaks to the need for knowledge and understanding. The organization itself was founded with the objective of "coordinating regulatory matters…ideas, views and experiences on all aspects of the telecommunications sector…"

It has proven through its work on issues such as interconnection, numbering and spectrum management, that focusing on the regional model provides the ability to share consultants, training, and learnings. Goulden argues that the regional approach also reduces the communication barriers between regulators, reducing the friction and the delays associated with coordinating regulation between countries.

ITU has recognized these accomplishments, stating that TRASA (Brahima & Asenath, 2004):

> *"has contributed to acceleration of the policy reforms in the telecommunications sector by providing a forum for discussions, exchange experiences and learning from each other in the process of drafting a model policy, model legislation, etc. for the sub-region."*

[6] *Available online at http://www.transport.gov.za/library/docs/misc/sadc.html*

LESSONS LEARNED: A REGIONAL APPROACH CAN REAP BENEFITS IN COMMUNICATION AND CAPACITY BUILDING

Association of Regulators of Information and Communication for Eastern and Southern Africa (ARICEA)

The Association of Regulators of Information and Communication for Eastern and Southern Africa brings together regulators and associated actors in the ICT sector in the Eastern and Southern African (ESA) region. ARICEA was organized and launched in January 2003 under the auspices of COMESA (Common Market for Eastern and Southern Africa). Their objectives echo other regional organizations[7]:

- Exchange ideas, views and experiences among members on regulatory matters;
- Promote the sustainable development and application of efficient, adequate and cost-effective ICT networks and services in the ESA sub-region
- Coordinate cross-border regulatory issues on ICTs
- Contribute to the achievement of regional integration
- Promote the optimum utilization of scarce resources in the ICT sector

ARICEA is composed of 20 member states with a population over 374 million. The member states include: Angola, Burundi, Comoros, D.R.Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

While ARICEA is one of the younger regional bodies studied, it has done an effective job of leveraging other initiatives and previous work by others. A case in point is a recent (February 2006) report, "Guidelines on Satellite and Other Wireless Services Regulation" (Adam, 2006). This document has been largely built on top of others such as WATRA's "Guidelines on Satellite and Wireless Regulation" which itself also leveraged previous work.

It was noted in Patrick Mwesigwa's (Uganda Communication Commission) presentation during the COMESA High Level Policy Forum, that ARICEA had benefited from "substantial good will from cooperating partners towards the Association e.g. USAID, CTO," but that "the key issue is Capacity building for regulators." In addition, there were noted difficulties in raising enough funds from members to undertake the programs included in the action plan. The summary being that ARICEA had a good start, but there are still struggles ahead for the organization and its members.

These sentiments are echoed in a communication from ARICEA to the Executive Secretary of the World Summit on Information Society on September 9, 2003 (Marawa, 2003). In this document, the members of ARICEA make a plea for:

1. **Capacity Building** "is urgently required for regulators and other stakeholders."
2. Development of national and regional infrastructure requires "concerted effort" to bridge the divide within Africa and "between Africa and the rest of the world."
3. **"Innovative ways and means of mobilizing resources for investment"** is required for countries that are far behind in ICT development.
4. There is a need to raise the awareness of "the people's rights to communicate" and the promotion of access to ICT "especially for rural areas."

These issues are consistent with a majority of the published documents regarding ICT development in Africa.

[7] *ARICEA Presentation (2004): http://www.uneca.org/aisi/nici/Documents/ARICEA%20PRESENTATION.ppt*

LESSONS LEARNED: FUNDING AND CAPACITY ARE CRITICAL ISSUES THAT NEED INNOVATIVE THINKING TO SOLVE

Organization of East Caribbean States (OECS)

The OECS, originally founded in 1981, consists of nine member states: Antigua and Barbuda, Commonwealth of Dominica, Grenada, Montserrat, St Kitts and Nevis, St. Lucia and St Vincent and the Grenadines. Anguilla and the British Virgin Islands are associate members of the OECS. We are particularly interested in one institution within this umbrella group, namely the Eastern Caribbean Telecommunications Authority that is responsible for promoting liberalization and competition in the telecommunications of the member states. ECTEL is composed of a subset of the OECS states, comprised of: Commonwealth of Dominica, Grenada, Saint Christopher and Nevis, Saint Lucia, Saint Vincent and The Grenadines.

ECTEL, which was established in 2000, has as its main purpose to promote[8]:

a. Open entry, market liberalization and competition in telecommunications of the Contracting States;
b. Harmonized policies on a regional level for telecommunications of the Contracting States;
c. A universal service, so as to ensure the widest possible access to telecommunications at an affordable rate by the people of the Contracting States and to enable the people of the Contracting States to share in the freedom to communicate over an efficient and modern telecommunications network;
d. An objective and harmonized regulatory regime in telecommunications of the Contracting States;
e. Fair pricing and the use of cost-based pricing methods by telecommunications providers in the Contracting States;
f. Fair competition practices by discouraging anti-competitive practices by telecommunications providers in the Contracting States;
g. The introduction of advanced telecommunications technologies and an increased range of services in the Contracting States;
h. Increased penetration of telecommunications in the Contracting States; the overall development of telecommunications in the Contracting States;
i. National consultations in the development of telecommunications.

ECTEL is unique in that it doesn't simply coordinate regulations for the region; it is the independent regulatory body for the constituent member states. Member states retain sovereign power over licensing and regulation, but ECTEL provides the technical expertise, advice and support to implement region-wide harmonized regulatory environment (DeFreitas *et al.*, 2002).

In fact, ECTEL appears to be at least somewhat energized by the ruling in Dominica that the monopoly held by the incumbent provider Cable & Wireless and challenged by Marpin Telecoms was found to be unconstitutional. This ruling paved the way for a wave of competition and the need to assist and manage the process across the region.

DeFreitas et al. estimate that the bare-bones minimum operational budget for a national telecommunications regulatory authority would be around US$2 million per year. Rather than require each country to support this burden, it was decided to cooperate and consolidate the operations under one single authority. This is possible primarily because the 5 member states operate under similar constitutions and share the same Appeals Court, which ruled on the constitutionality of the monopoly provisions.

Tariffs, interconnection agreements, numbering and spectrum management are all elements that ECTEL has been actively addressing. According to preliminary reports, the progress has been noticeable with sharp reductions in rates charged by the incumbent operators, stating that[9] "average prices for calls from the region to the United States have been reduced by more that 70 percent since the start of the liberalization process." As is pointed out though, the means to provide a highly competitive environment relies on a strong regulatory system. ECTEL and the OECS should continue to be examined as a good case study in international coordination for regional regulatory bodies.

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[8] *ECTEL: http://ectel.int/ectelnew/about.html*

[9] *According to the ECTEL Fifth Anniversary Magazine, 2005. http://ectel.int/ectelnew/latesnewsdoc/ECTEL%20Mag%20HIGHRES.pdf*

LESSONS LEARNED: CREATIVE ORGANIZATION AND EFFICIENT OPERATION ARE NECESSARY INGREDIENTS

Asia-Pacific Economic Cooperation (APEC)

APEC was formed in 1989 to promote economic cooperation in the Asia-Pacific region. Members include: Australia, Brunei, Canada, Chili, China, Hong Kong China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, the Philippines, Singapore, Chinese Taipei, Thailand and the USA. Peru, Russia and Vietnam became members in 1998. The APEC member represent a different cross-section than what can be seen in the WATRA region, representing some 55% of the world income and 46% of the global trade.

Nonetheless, it can be illustrative to examine how the region tackled ICT regulatory and infrastructure issues. The key to their success was in the establishment and operation of a working group in 1990 called APEC TEL to focus on telecommunications in the region (Saga, 1999). While having their fair number of disputes, notably the 'heated' discussion regarding the establishment of a liberalization project group, APEC TEL has successfully assisted in harmonizing and growing the ICT development in the region.

One of the keys for them has been the establishment and operation of focus groups on particular areas. Initially, this consisted of four groups:

a. Data Compilation Project Group – responsible for data compilation of telecommunications policy, regulatory environment and state of telecommunications infrastructure.
b. Human Resource Development Project Group – responsible for improving the human capacity in the region.
c. Electronic Data Interchange Project Group – later to become the Electronic Commerce Project Group, responsible for promoting and introducing trade and tourism among member economies.
d. Teleport Project Group – responsible for development of telecommunications infrastructure in strategic development areas.

As priorities and the regional economics shifted, so to did the structure of APEC TEL. By 1995, they had organized into the following Steering Groups: Liberalization, Business Facilitation, Human Resource Development, and Development Cooperation. APEC TEL helped organize and drive the implementation of pilot projects and test beds for the Asia-Pacific Information Infrastructure (APII), a strategic initiative bent at expanding the infrastructure and liberalizing the constituent telecommunications markets.

Since that initiative, many of the member states have developed their own National Information Infrastructure plans, leveraging APEC TEL as a forum to exchange information and infrastructure plans.

While the region has undergone many economic and political shifts in the intervening 16 years, APEC TEL has adjusted its priorities to help guide the member states on a path towards a regionally harmonized and effective ICT infrastructure.

LESSONS LEARNED: PRIORITIZE BUT REMAIN FLEXIBLE IN ORDER TO MEET THE BROAD AND CHANGING NEEDS OF A REGION

Focus on West Africa

An analysis of these organizations as well as the current WATRA organization illuminates just how broad the issues facing the region are, even within the scope of the telecommunications arena. This section draws out the key issues and roles that regional bodies have attacked and identify those issues that we feel are critical to address within the scope of WATRA's current mandate.

According to WATRA's draft Strategic Action Plan for March 2005-March 2008; the following table depicts the top-level goals for the organization. These are indicated along the top of the table as column headings. The rows indicate key critical issues within the region that need to be addressed along with which strategic goals are furthered by resolving these issues.

The key issues were drawn from the mandates and goals of the various organizations studied, including WATRA. In addition, scholarly work has brought to light several of these issues such as the critical need for capacity development and training in the region.

Many of the regional organizations have made impressive progress in creating guidelines that their member states can use to implement policies and procedures that fit within their constitutional framework. TRASA, ARICEA, and WATRA have all developed guidelines in: licensing, interconnection, competition, tariffing and universal access (Masambu, 2005).

Table 4. Strategic Goals and Impact on Issues

Goal / Issue	Institutional, Legal and Organizational strengthening for WATRA	Harmonization of Policy and Regulatory Frameworks towards establishing a common telecoms market	Provide adequate market information for West Africa	Develop Regulatory Capacity in the Sub-region	Promote Sub-regional ICT Development Project
Capacity and Human Development	X		X	X	X
Independent Regulatory Bodies	X	X	X	X	
Interconnection and Infrastructure	X	X			X
Naming and Numbering		X	X	X	
Spectrum Allocation and Management		X	X	X	
Liberalization, Competition and Pricing		X	X	X	X
Investment and Business Development	X		X		X

All of these organizations share some similarities: international scope, limited resources, rapidly changing environments, and dedicated people. The following section applies the lessons learned to provide some guidance for improving WATRA's chances to continue to provide regional capacity and guidance.

A PRESCRIPTION FOR SUSTAINABILITY

There are a number of general principles that are necessary to create an organization that has long-term sustainability and relevance. These are general principles which drive some of the more specific recommendations provided below.

In particular, relevance is a critical factor for the sustainability of an organization such as WATRA. Without relevance, there will be no funding from external sources and even internal, regulatory body members, will begin to look elsewhere for an organization to meet their expectations. Thus relevance should be an underlying and driving factor in decisions within and on behalf of WATRA.

Underpinning all of this is a need for WATRA to scrupulously maintain a balanced, fair and unbiased position in identifying and dealing with regional and national issues. It is this stance that enables WATRA to provide value to all constituents within the ICT ecosystem.

The following sections highlight specific changes that are recommended to enable WATRA to become, and continue to be, a positive force within West Africa. The recommendations fall into four primary categories: membership, organization, operation, and projects.

MEMBERSHIP

Membership within the organization is critical both for accomplishing the mission as well as a source for continuous funding. It is expected that the members of the body are interested in the activities and have the ability to apply economic measures to ensure their return on investment. This is not always clear, and must be an area where WATRA has the necessary tools to convince the members that the investment is a sound one. Here we examine the membership of ITU and apply this to WATRA's membership needs.

According to ITU records available online, their funding comes from a number sources:

- 66% from State Members
- 13% from Sector Members
- 17% from Cost Recovery Services
- 4% from interest income and other sources

These ratios may not be appropriate for WATRA at this point in the organization's cycle, but these are indications of what the major sources of funding are for such organizations.

It is not known the exact revenue ratios that support WATRA today, but it is believed they are primarily from external funding support (e.g. USAID) and from membership fees to a lesser extent. Clear financial commitment and payment from the members must be obtained to ensure the operational viability of the organization at its minimum. This is indeed the minimum and is likely not sufficient for the financial stability of WATRA due to the economic constraints of the nations within its membership.

As indicated above, WATRA maintains two membership levels: Members and Associate Members. The country regulators fall into the Member level. This level is further subdivided into groups and we assume this segmentation is based on the size and revenue of the member country or regulatory body. This type of segmentation is common in organizations such as this, where the various constituents vary widely in their ability to pay membership dues.

The Member category is fairly straightforward and represents the only class of voting member in the organization. All ECOWAS nations are currently members excepting for Togo.

Associate members have visibility and influence, but no direct voting privileges. This category of membership should be marketed and leveraged in order to gain a greater membership level.

Associate members provide a number of benefits that can make the WATRA organization a stronger body:

- More participation amongst industry experts and participants. This participation can increase the amount of information sharing and establishment of best practices within the region.
- Better transparency and cooperation in creation and formulation of policies and regulations by encouraging industry participation in the process.
- Increase the revenue base for WATRA and diversify the reliance on any particular revenue stream.
- Develop better and closer relationships amongst industry participants in working towards a harmonized telecommunications environment in which trust can be established and maintained.

MEMBERSHIP BENEFITS

To date, there has been very little industry involvement in WATRA other than at an informal basis. The Associate membership is currently limited to a single U.S. based organization. It is critical that industry become more actively involved in WATRA and the associated projects in which WATRA participates.

As noted, not only will the participation of industry provide a much-needed source of revenue, it will provide a number of additional benefits. The actions, policies and projects which WATRA undertakes will have a more complete representation and provide a deeper understanding of all aspects and perspectives from the participants in industry as well as government and public institutions. It is also likely to speed the adoption and implementation of policies as the process starts with the initial participation and is no longer taxation without representation.

WATRA currently has proposed a 4-tier structure for their Associate Members (see Table 2 for details). While this structure is reasonable, it is recommended that the membership structure be simplified and streamlined to enable participation by more members of the community. The structure would provide for two levels of membership, differentiated by the revenue of the member organization. It is also possible to require OECD organizations to participate at the upper level with other organizations differentiated based on their revenue.

The two membership levels and recommended participation are detailed in Table 5. Note the benefits for both levels are identical, but the fees are reduced for members within developing countries. This provides representation within the region and stimulates participation. All members will have the right to participate in the preparation and comments regarding recommendations but will not be eligible for voting on the adoption of these recommendations. It is important that the community beyond the regulatory bodies become involved in the process through a program of active engagement. Membership privileges provide a route for this participation and should be emphasized and encouraged.

Additional sponsorship and activity participation can be achieved by those members who wish to invest more in WATRA activities, allowing those members with the resources and desire to extend their presence beyond the basic membership benefits. This can include event sponsorship, additional access to published material, and project participation. These additional services are covered in more detail in the following section.

Table 5. Recommended Associate Membership

Member-ship Level	Annual Dues[10]	Online Database Access	Exhibition	Capacity Building Intervention Programs	Regulatory and Policy Contri-butions	Accred-itation as Sponsor	CEO Forum	WATRA co-hosted Events	Awards
Standard	$10,000	Partial Access	30% discount	30% discount	Unlimited	1 work-shop	Free Partic-ipation	Up to 20% discount	Commendation Certificate
Developing	$2,500	Partial Access	30% discount	30% discount	Unlimited	1 work-shop	Free Partic-ipation	Up to 20% discount	Commendation Certificate

MEMBERSHIP SERVICES - COST RECOVERY SERVICES

A sizeable portion of ITU's revenue is derived from what they term 'Cost Recovery Services'. These services provide value to the community, drive the organization's mission and provide additional sources of revenue. In fact the ITU derives 4% more annual revenue from these services than their equivalent of Associate Membership fees. The identification, management, and execution on these additional services are critical for the sustainability of WATRA as well as the ability of WATRA to maintain relevancy within the ecosystem.

Many of these revenue-generating activities have been recognized and promoted within WATRA's Strategic Action Plan and are reiterated below:

- Standards, Best Practices and Guidelines publications;
- Conferences and related activities;
- Non-conference events such as training and workshops;
- Research reports, surveys and studies;
- Support services for regulatory agencies.

Each category identified above should have a distinct execution plan and budget targets to help drive development of these services.

WATRA should look to increase the focus on what are referred to as Associate Members and should continue to extend the range of 'Cost Recovery Services' such as conferences, publications, and projects that support involvement and return value to both Members and Associate Members.

ORGANIZATION

The internal management of an organization such as WATRA is critical for the ability to execute and operate across such a wide dispersion of needs, cultures and laws. In particular, WATRA has an added challenge of crossing official language barriers as well, having countries with both French and English as primary languages. Blunden's (Blunden, 2005) work supports this in her discussion on the *Law of Requisite Variety* which, paraphrased, prescribes the need for the regulator to have diversity and capacity equal to that of its members and that the price of increasing human capabilities is increasing human regulation. Blunden (Blunden, 2005) and Vickers (Vickers, 1980) both discuss the burden that the increase in human capabilities put on political regulation and regulators to become more capable in order to deal with these changes.

[10] *Fees are represented in U.S. dollars.*

As noted in Eldridge and Goulden (Eldridge & Goulden, 2003), there is evidence that indicates failures in regulatory processes may be the result of "ineffective internal systems geared towards converting political and legislative intent for regulation into the necessary actions." While these authors are primarily focusing on individual regulatory bodies, this is ultimately true for an international body such as WATRA and thus the "dire need of regulatory agencies…to be sharper in internal performance than the market suppliers that they are dealing with and be crucially aware of how to handle the multiplicity of stakeholder influences and needs" can be applied to WATRA as well as to the individual regulators.

This research indicates that the internal structure and management of the organization, especially at the strategic level, be of sufficient capability and capacity to both lead and drive the organization beyond the ability to manage situations "out of their own heads" but rather through a systematic, open and transparent process. The authors present such a framework, the Supplier-Input-Process-Output-Customer (SIPOC) Model and apply it to the regulatory process. Such a model that provides both visibility and feedback amongst the participants can help strategic development.

In studying other similar organizations such as the Telecommunications Regulators Association of South Africa (TRASA) and the Association of Regulators for Information and Communication in Eastern and Southern Africa (ARICEA), it was clear that adequate human capacity is required especially at the top of the organization. Interviews with participants in these organizations repeatedly indicated how critical the Chief Executive of an organization such as WATRA is to its overall success or failure.

Traditional management roles are often split between the Chief Executive Officer (CEO) and the Chief Operating Officer (COO). This split allows the CEO to focus on strategy, community, people, vision, and politics. The COO, on the other hand, provides daily focus and drive to complete the mission of the organization as currently envisioned. They are generally responsible for the delivery of results on a day-to-day, quarter-to-quarter basis. They play a critical leadership role in executing the strategies developed by the top management team. It is recommended that WATRA increase its internal capacity by creating a position to complement the role of the Executive Secretariat. This position, envisioned as a Managing Director, would provide this capacity within WATRA and extend the organization's ability to execute on its mission.

In addition, the organization should establish focus or steering groups to guide programs and implementations in specific areas. For example, the APEC TEL group (Saga, 1999) established four steering groups: the Liberalisation Steering Group (LSG), the Business Facilitation Steering Group (BFSG), the Human Resource Development Steering Group (HRDSG), and the Development Cooperation Steering Group (DCSG). In addition, it may be possible to recruit some strong leaders from the membership to help lead these efforts, with likely candidates from Ghana, Nigeria, Senegal, and Cape Verde.

It is not recommended that WATRA approach this in the same manner as APEC TEL, as the resource capabilities and particular needs of the region differ. However, it is recommended that WATRA prioritize the needs of the region and focus the necessary resources to move those particular areas forward while participating as a guiding hand in those activities that are not as high a priority.

OPERATIONS – ENTREPRENEURIAL APPROACH

Experience with startup and early-stage companies leads to very high respect for cash. As a former Chairman and CEO uttered, "The only thing – the ONLY thing – that causes a business to fail is lack of cash!" Many other obstacles can be overcome, but if the business lacks the money to keep its doors open, it fails.

With this in mind, WATRA should embrace this and, to a certain extent, attempt to operate as a startup company. This does not mean that WATRA needs, in any way to adjust its mission or goals. It simply means that every dollar that gets spent should be looked at with suspicion, the response to every question about spending money should be "no". Then and only then, if there is sufficient argument to overcome the objection, should the request be granted.

It is not simply in the area of costs that WATRA should 'think' like a startup, it should also look to daily operational, organizational, communication, and execution techniques that extend the capabilities of the limited staff by taking advantage of ICT to improve efficiencies and change the way an international organization operates.

PROJECTS

Project funding is an additional route to achieving financial sustainability and regional relevance. ICT projects that cross international borders require a body that can negotiate and coordinate across these complex boundaries. WATRA is uniquely positioned to play this role in very significant sub-regional projects.

PROJECT INITIATION, FEASIBILITY AND FUNDING

Projects should be used to drive focus and execution around particular activities that have high impact and large potential pay-offs for the region. WATRA should focus on projects that require cross-country cooperation but remain aware of internal activities within each constituent country.

Projects also develop a number of capabilities and human capacity within the WATRA organization and the region, including:

- Project management and coordination capacity
- Cross-country cooperation at all levels of the industry
  - Policy makers
  - Regulatory bodies
  - Industry experts
  - Operators
  - Funding sources
  - Monitoring agencies
- Revenue
  - Feasibility studies
  - Facilitator
  - Funding coordinator
  - Project management
  - Project measurement and verification
  - Arbitrator
  - Documentation
  - Training and Capacity Building

In order to minimize the financial risk to WATRA, these projects should be formulated such that each phase can be independently funded and yet provide for continuity throughout the duration of the project.

PROJECT SPONSORSHIP

Beyond traditional funding strategies, alternate funding approaches should be considered. For example, it may be possible to bring commercial, governmental and international sponsors on board to support programs and projects that further the regions infrastructure and ICT capabilities.

There are dangers to this approach in that it could be seen or it could come to pass that a funding source would gain undue influence over the

project and thus sully the integrity of the entire organization. Legal and management means would be required to ensure the benefits do not unduly accrue to the funding source.

Project sponsorship could be used to provide resources other than cash, in the form of goods and services, which may provide other tax incentives to commercial entities. Sponsorship could provide additional marketing through the continued communication of the project by highlighting the sponsor's role in the project.

RECOMMENDATION SUMMARY

Below, we summarize the recommendations for improving the operational capabilities and the overall sustainability of WATRA.

Table 6. Summary of Recommendations

Category	Description	Improvement/Value
Membership	Streamline membership categories, enhance associate membership value and increase number of participants	Increases community awareness, builds capacity, increases communication, improves operational revenue for WATRA.
Organization	Hire Managing Director and establish priority task forces	Increases WATRA's capacity and ability to execute on mission.
Operation	Act like a start-up, become entrepreneurial.	Increases WATRA's capacity, stretches capabilities and attracts additional talent.
Projects	Leverage unique regional capabilities, act as a neutral convener.	Focuses on impact, provides valuable cohesive force across region, improves WATRA's standing in community.

It is also recommended that the following philosophies become a part of the culture of WATRA in order to create an environment in which relevance and sustainability is more likely:

1. **Transparency** – Transparency ensures that information is available that can be used to measure performance and to guard against any possible misuse of powers. Transparency serves to achieve accountability, which means that authorities can be held responsible for their actions.
2. **Innovation** – WATRA must strive to be innovative in its choice of staff, its operational model, its project choices, and its implementation plans. Innovation can help change the cost structure, the types of projects, and the capabilities of the organization to make a change.
3. **Member Involvement** – WATRA must strive to encourage broad participation of the public and private members of the communications industry. All events, projects, policies, and activities should have this goal in mind – increase membership and industry participation. Members should be recruited from all aspects of the ICT ecosystem – policy makers, lawyers, regulators, industry practitioners (small to large), ISPs, cyber café owner/operators, satellite service providers, service industry professionals, consultants, international corporations, public and private funding sources, customers and users, value-added service providers, equipment providers, software providers, design specialists – all relevant and impacted sectors of the ecosystem should be sought for their participation.
4. **Model Citizen** – WATRA should strive in everything it does to exemplify an organization of the utmost innovation in the use of ICT in its operation. Use of ICT can provide many benefits including operational understanding, cost savings and real-life experience. The use of ICT will also help attract top tier talent into the organization.
5. **Relevance** – WATRA must strive to maintain and create relevance in an environment that has many organizations striving towards the same goals. Overlapping and or counterproductive projects should be identified, cataloged and any risks identified. Methods to mitigate the risk must be put in place where possible.

Table 4 maps the recommendations against WATRA's stated strategic goals. This configuration is focused on creating a sustainable environment in which WATRA can play an important role. These priorities should be adjusted as the organization and the region grow and mature, putting ever more emphasis on executing projects, harmonizing policies and growing the regional capacity and infrastructure. It is important that lower priority issues are not ignored, but are included as monitoring activities, distributing responsibility to other parties where possible.

Table 7. Recommendations and Strategic Goals

WATRA Sustainability	Institutional, Legal and Organisational strengthening for WATRA	Harmonisation of Policy and Regulatory Frameworkstowards establishing a common telecoms market	Provide adequate market information for West Africa	Develop Regulatory Capacity in the Sub-region	Promote Sub-regional ICT Development Project
Membership					
Organization					
Operation					
Projects					

These recommendations focus on organizing WATRA and the execution of its directives. The next section attempts to take these recommendations and apply them to a particular issue that is important for the overall ICT development in the region, that of Interconnection.

WATRA PROJECT INVOLVEMENT

The following sections delve deeper into a particular project that is of interest to many within and without the region and one that is relevant to WATRA. This project is used to illustrate how an organization such as WATRA can establish itself, provide a valuable service, and increase the likelihood of a sustained operation.

We focus on the issue of Internet access. The WATRA region has limited Internet access. As indicated in Figure 5, Internet penetration in Africa is over 3 times lower than the next least penetrated region. A paltry 2.6 percent of the population within Africa has Internet access according to 2004 ITU statistics.

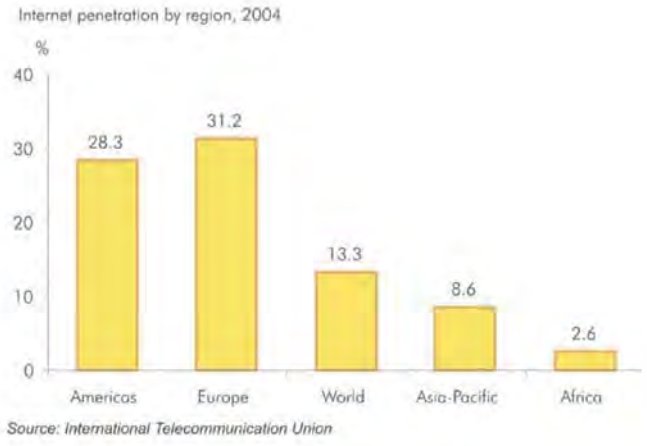


Figure 5. Internet Penetration by Region

Table 8 provides a more detailed look at the status of the Internet within the West African region. In particular, you will notice that the actual percentage of the total population that has Internet access is actually less than 1.5%, significantly below the 2.6% shown in Figure 5 for the African continent in general. This data may not be a complete picture of the true Internet access within the region, but it certainly indicates that access is far from common.

Table 8. Internet and Population Statistics for West Africa[11].

Country	Internet Users per 100 Inhabitants 2004	Internet Users (000's) 2004	Population (CIA World Factbook, 2005-2006)
Bénin	1.38	100	7,460,025
Burkina Faso	0.40	53	13,925,313
Cape Verde	5.30	25	418,224
Cote d'Ivorie	1.78	300	17,298,040
Ghana	1.72	368	21,029,853
The Gambia	3.35	49	1,593,256
Guinéa	0.53	46	9,467,866
Guinée-Bissau	1.99	26	1,416,027
Liberia	N/A	N/A	3,482,211
Mali	0.45	50	12,291,529
Mauritania	0.47	14	3,086,859
Niger	0.19	24	11,665,937
Nigeria	1.39	1,769	128,771,988
Sénégal	4.66	482	11,126,832
Sieraa Leone	0.19	10	6,017,643
Togo	4.41	221	5,681,519
Average (excluding Liberia)	**1.52**	**254**	**16,750,061**

One key method that has been identified as a means to help reduce the cost of bandwidth, increase the penetration of Internet access, and promote economic advancement is through a means called network interconnection. This and the surrounding issues will be detailed in the following sections.

INTERCONNECTIONS – AN ISSUE FOR WATRA

Contrary to popular western ideas regarding bandwidth, Internet connectivity is not always free, in fact in developing regions it is quite expensive. The causes of this have largely been blamed on the cost of connecting to the International network and the lack of local and regional interconnectivity and infrastructure. The lack of network interconnectivity forces all communication traffic to flow over the international network. While the cost savings and reasoning behind Internet Exchange Points (IXP) has been documented from several perspectives (Bezzina, 2005) (Southwood, 2004) (infoDev, 2005) (Ndukwe, 2004) (Walubengo *et al.*), all of these have assumed that copper and fiber connections are the only valid transmission

[11] *Internet ICT indicators retrieved from ITU, http://www.itu.int/ITU-D/ict/statistics/ for 2004.*

method for ISPs to reach these interconnection points.

This section argues that there are several policy and technical developments that may provide an alternate route to creating local, national, and even regional IXPs. Policies aimed at keeping local traffic local provide a means of introducing additional financial incentives. New wireless technology provides a means to quickly and cost effectively connect networks over reasonable distances. These two forces combine to provide an even more compelling business incentives for creating IXPs via a combination of wireless, satellite and fiber connections. This alternative may have implications on how IXPs are initiated and the speed with which local traffic can begin to 'stay local', providing immediate returns on investment for ISPs as well as content and service providers.*Background*

During an interview with Kevin Kelly (Kelly, 1993) in Wired magazine, George Gilder had this to say when asked what the technology of the day was telling him (emphasis added):

> *My thesis is that bandwidth is going to be virtually free in the next era in the same way that transistors are in this era. It doesn't mean there won't be expensive technologies associated with the exploitation of bandwidth - just as there are expensive computers employing transistors; but it does mean that people will have to use this bandwidth; they'll have to waste bandwidth rather than economize on bandwidth.* ***The wasters of bandwidth will win rather than the people who are developing exquisite new compression tools and all these other devices designed to exploit some limited bandwidth.***
>
> ***One of the key ways you economize on bandwidth is switching. Switching has been the whole foundation of our communications systems.*** *You run narrow-band wires to some switch and then switch the data to its destination in order to avoid using lots of bandwidth to broadcast signals to every terminal.*

There are three key points that are salient to this section. First, the idea that bandwidth is becoming free. Over the last 12 years, Gilder's predictions haven't exactly come true, but access to and capacity of broadband has certainly grown dramatically within the United States and other developed countries (see Figure 6) during this span of time.

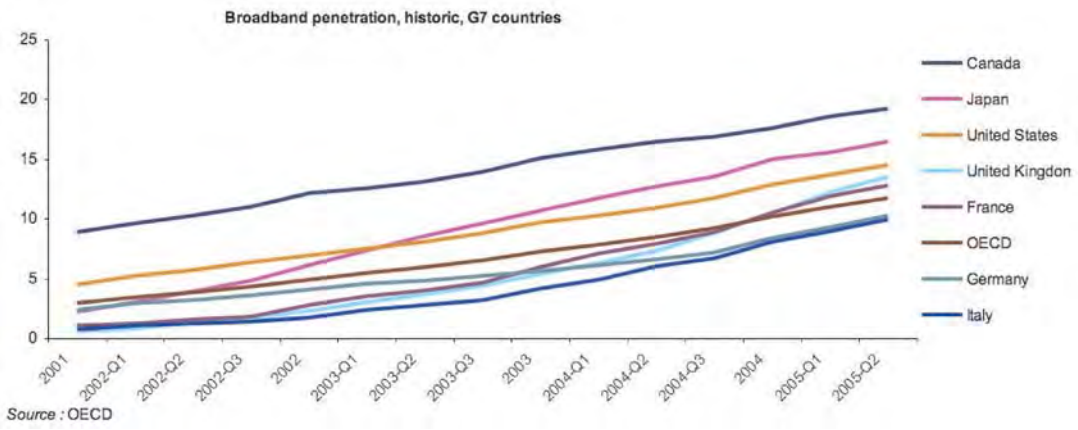
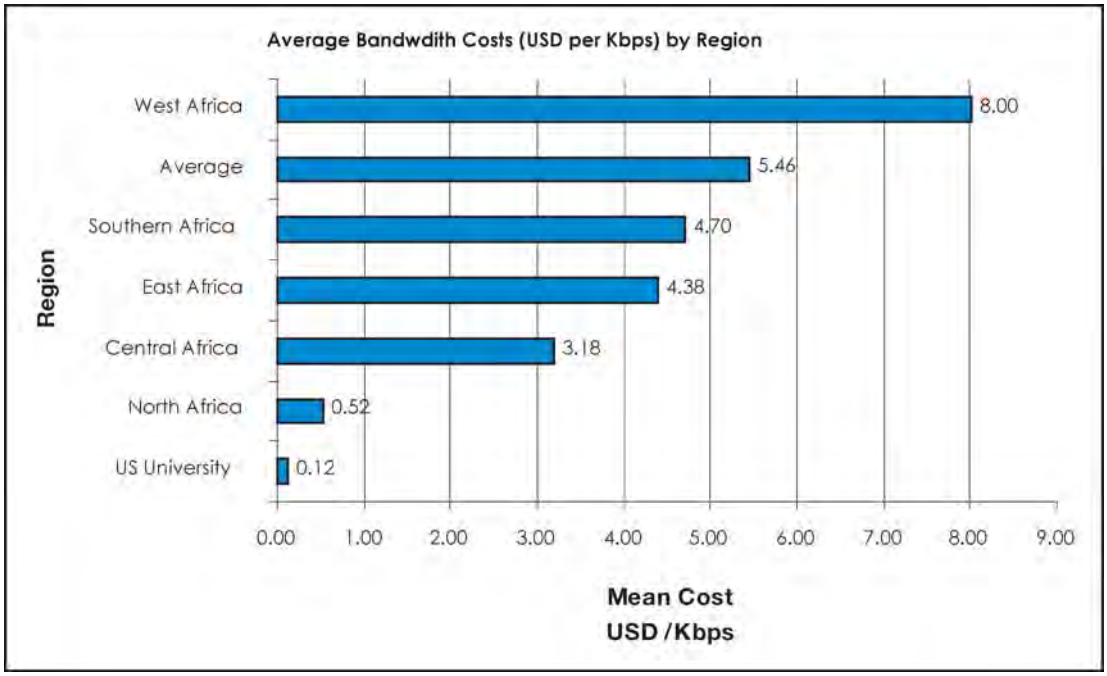


Figure 6. G7 Broadband Growth

This growth has occurred in developed regions, but the cost for bandwidth in the West African region has not allowed for this type of growth. The cost for connectivity in West Africa is by far the highest in the African region. Figure 7 indicates that West Africans pay some 67 times as much as U.S. universities.



Source: ATICS 2005

Figure 7. Average Bandwidth Costs/Kbps by Region

Second, Gilder indicates that winners will be those that waste bandwidth – meaning those that exploit bandwidth rather than attempt to conserve it as a scarce resource. This phenomenon can be seen by growth of those Internet companies that have exploited the easy and prevalent access to the networks such as Google and eBay.

The third point is that one of the key enabling technologies that provides this cheap (virtually free) bandwidth is the switching fabric that exists within the United States and other developed countries. This switching enables routing and interconnections between many different networks, supporting distribution of bits to all edges in an efficient, cost effective and bandwidth friendly fashion.

Alas, the state of affairs in the United States does not represent the reality in many other locations throughout the world. In particular, the West Africa region looks drastically different when viewed from the perspective of the network. The countries in this region lack the basic switching fabric that allows the cost effective movement of information from one network to another. They also lack the fiber backbone network that enables the long distance transportation of vast quantities of information from one edge of the country or region to another.

Lacking these critical resources, the networks are constrained to sending their signals under the ocean or into the atmosphere, bouncing these signals through Europe or the United States in order to make the transit even when the sender and ultimate receiver are within a single country. These circuitous routes of information exacerbate the problem; they utilize the very limited bandwidth represented by the submarine fiber and the satellite networks, thus reducing the available bandwidth even while traveling to places and countries where the data is not destined.

In addition to consuming what is still a scarce resource in the region, the cost of using these networks is incredibly expensive compared to bandwidth in developed nations, where, compared to West Africa, bandwidth **is** virtually free. And since many of the networks in the region are independent, the region recognizes no economies of scale. Each network pays the full retail price, the bandwidth is fragmented, and the region suffers.

But that is not where the issues end. Because the information travels internationally over constrained bandwidth, the latency and reliability of the networks severely suffer. For example, an Internet user in Abuja communicating via satellite switched through the United States with a person in Lagos would experience a delay some 500 times greater than over a network connecting Abuja directly to Lagos[12]. And this does not account for the degradation in quality of service (reliability, congestion, lost packets, etc.) that is often associated with current shared bandwidth satellite service.

These network constraints do more than create slow, expensive networks for businesses and consumers, it sorely limits who has access to the networks and what people can do with the networks. In addition to consumption, the ability for businesses to offer services over these networks is asymptotically zero. The services and information that is offered is often housed on foreign soil where network connectivity and costs are more reasonable. But this means that 'local' content and services are often made available on an international network; yet another factor forcing communications to travel across international boundaries, snowballing the impact of costs and traffic.

What then, is a country or region to do? The easy answer (in the sense that it's easy to propose) is to lay fiber. Put fiber backbones in each country across the major areas and between the major cities. Connect each country to its neighbor via high-speed fiber. And voila – cheap, reliable, switched network with locally routed traffic!

But clearly this is not the route that is likely to be taken or can be reasonably proposed. The cost to lay fiber throughout this region of more than 6 million square kilometers would be expensive to say the least. With a land mass roughly 1.6 times this area, the United States has been able to create an interconnected fiber network, but the United States has a GDP some 38 times that of the entire West Africa Region[13]. And the infrastructure was not built during the course of a single year, the U.S. has been investing and building the national network infrastructure for the last 130 years[14]. Clearly it will take more than an idyllic declaration to solve this problem for the West Africa region.

NETWORK INTERCONNECTIONS

The Internet is based on the interconnection of many different networks or subnets. These individual networks connect to form a latticework of networks that makes up the Internet as we know it. Where and how these networks interconnect is an important aspect of the architecture and underlying efficiency of the network. With only one interconnection point, the topography of the network would form a star, causing network traffic to travel long distances to a single point – adding to latency delays, expenses, bandwidth constraints, throughput issues, and degradation of reliability. This can be visualized using a simple graph structure as described by Brown (Brown *et al.*, 2000) and depicted in Figure 8.

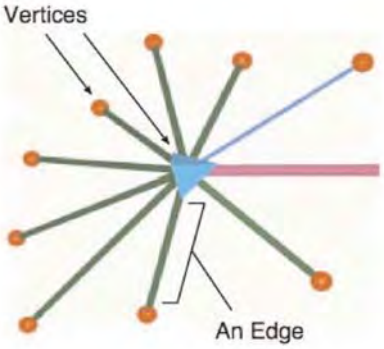


Figure 8. Simple star network

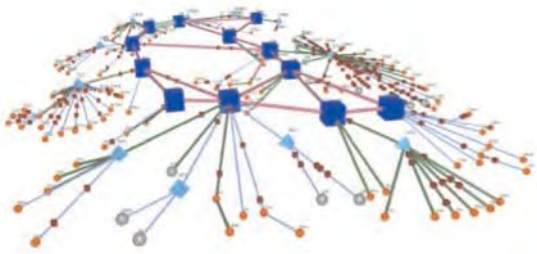


Figure 9. Multiple networks connected

[12] *Assuming no switch latency and double hop satellite transfer through a switch in the United States. Direct connection over 336 miles would take light about .002 seconds to go from Abuja to Lagos. It takes light about .119 seconds to travel to a geosynchronous orbital satellite 22,241 miles above the equator, and that's just for a one-way trip.*

[13] *GDP based on CIA World FactBook using purchasing power parity. Estimated 2005 GDP for the 15 countries in the region is $327 billion while U.S. GDP is estimated at $12.41 trillion for the same period. Land mass of the United States is approximately 9.6 million square kilometers while the WATRA region covers some 6.1 million square kilometers, also based on data from the CIA World FactBook.*

[14] *From the history of AT&T (http://www.att.com/history/history1.html)*

These individual networks need to connect to the overall fabric of the Internet. They do this through an interconnection point. The more connections, the 'closer' to the center of the network, providing better connections to the other networks with fewer interim networks to traverse. This fact drives networks to interconnect on a local basis with larger networks interconnecting between them (Figure 9), and scaling up to international interconnection points. Eventually these interconnected networks form the Internet as we know it, a visualization of which can be seen in Figure 10. Lack of these interconnection points forces the suboptimal network topology mentioned above, forcing Internet traffic to travel further than necessary to reach its destination, decreasing the response time and increasing the congestion.

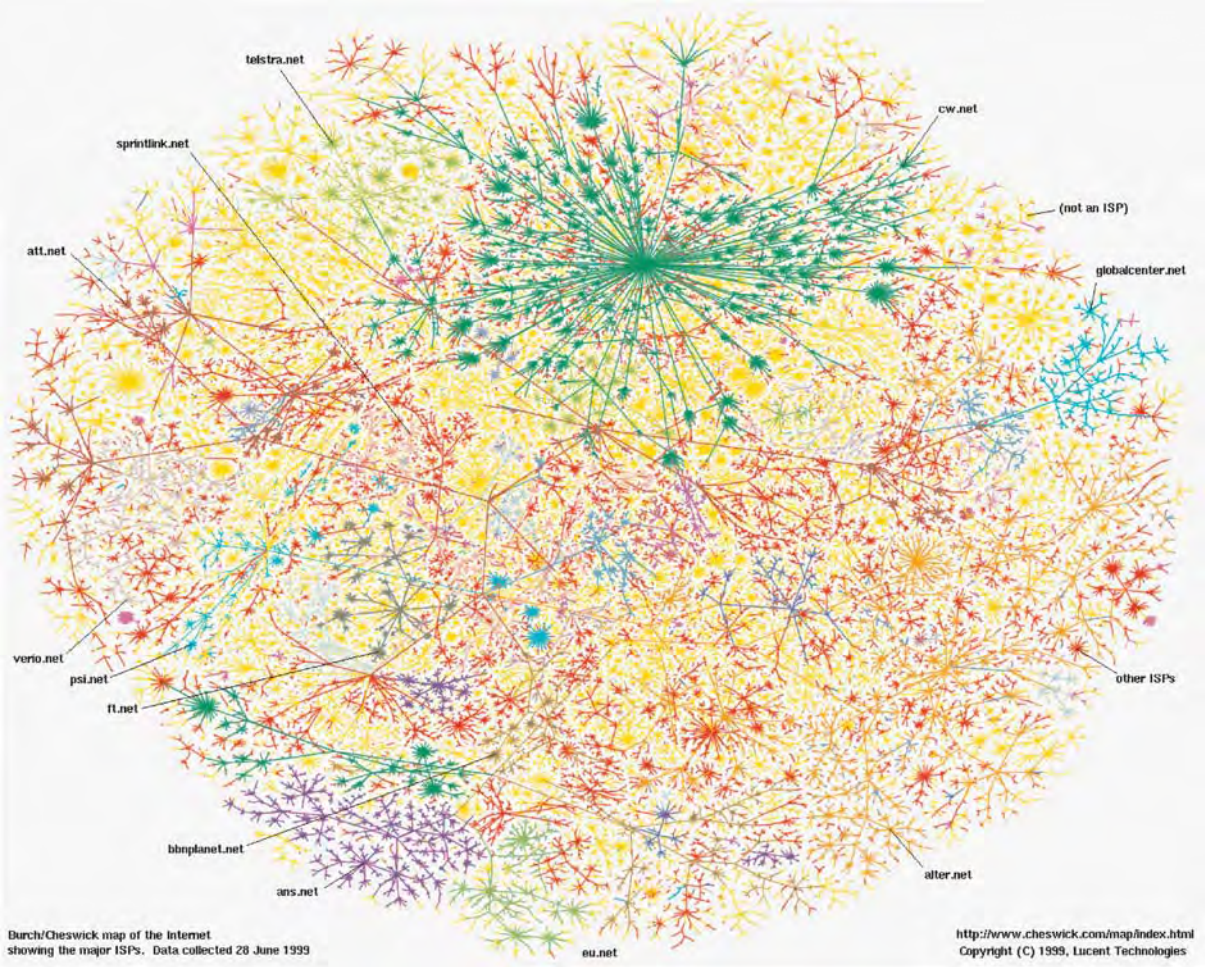


Figure 10. Visualization of the Internet

According to the July 12, 2000 proposed European Commission Directive on access and interconnection:

> *"Interconnection" means the physical and logical linking of public electronic communications networks used by the same or a different undertaking in order to allow the users of one undertaking to communicate with the users of the same or another undertaking, or to access services provided by another undertaking. Services may be provided by the parties involved or other parties who have access to the network. (Article 2- CEC(200d)).*

INTERCONNECTION BENEFITS

Interconnections provide a number of benefits. These include the ability for network, access and ISP providers to:

- Efficiently route traffic between members
- Lower cost by reducing international traffic
- Lower congestion by routing traffic only between nodes that are necessary
- Improve delivery of service:
  - Speed, latency of transmission
  - Cost, not going international
  - Easier access to regional content
- Improve scalability by providing the ability to increase local bandwidth without incurring international expense
- Provide regional ICT statistics
- Introduce new services

According to the ITU Telecommunications Handbook:

> *Increasing network interconnection will continue to improve the convenience and utility of telecommunications service for users around the world in the next decade. Inadequate interconnection arrangements not only impose unnecessary costs and technical problems on operators – they also result in delays, inconvenience and additional costs for businesses, consumers and, ultimately, for national economies.*

Engr. E. C. A. Ndukwe echoes the advantages of a regional IXP with his list, which includes:

- Quality of Service advantages
- Reduction in transit costs
- Lower latency
- Healthy cooperation among competitors
- Scaling of bandwidth
- International cooperation
- Enablement of point of presence activities
- Creating new business models for ISP services
- Increasing quantity of local Internet traffic

While some of these benefits can be estimated and quantified, others are harder to calculate and are very dependent on the market, the provider, and the existing infrastructure. Often, the argument against interconnections, especially at the regional level, is that the amount of traffic flowing between the connected networks is minimal and thus does not justify the expense of connecting. Several counter-arguments can be made including the benefits listed above in addition to the fact that traffic patterns change with economics and capabilities. Thus, it is unfair to conduct a cost/benefit analysis based solely on the current communications statistics.

WHAT IS A REGIONAL IXP?

A Regional Exchange Point (RXP, Regional IXP or Regional Exchange Point (EP)) is a physical location in which multiple networks interconnect or 'peer'. These RXP's provide a point at which traffic between these networks can be exchanged directly rather than being routed outside of one

network and back into the other network. A Regional Exchange Point allows countries to create interconnection between their independent networks, allowing communications to flow between the two.

The idea behind building regional exchange points is to keep local traffic local, thus optimizing both time and money. A case study of an RXP was presented by Alan Levin, ICANN GAC, Regional Forum on November 31, 2004. This case study revealed a vast difference in latency of Internet traffic internationally versus locally routed traffic (Figure 11).

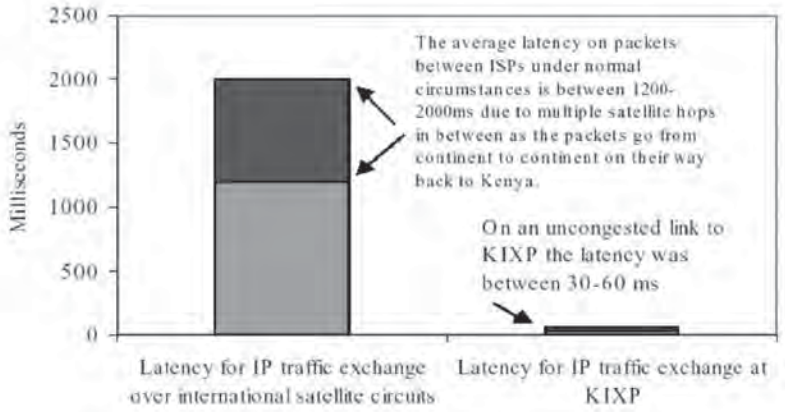


Figure 11. Quality of service and exchange of domestic Kenyan IP traffic.

IMPACT OF INTERCONNECTIONS

As Lishan Adam notes:

> *There are a wide variety of economic and non-economic reasons for a horizontal cooperation among countries in Africa. The increasing digital divide, the unsatisfied demand for ICT services, and the capacity limitations of individual countries all necessitate its presence. A horizontal cooperation makes capitalizing on combined productive capacity, economies of scale and scope possible. It makes dealing with regional disparity easier.*

It is economically critical that the region have sufficient Internet connectivity to allow the growth in the use of ICT. Regional IXP's provide a method to manage and optimize the Internet traffic in and around the region, providing the infrastructure necessary to grow the use of ICTs in the region.

The figure below gives an indication in the cost differential between local and international traffic (Walubengo et al.):

Bandwidth	International	Local
64K	$1687	$190
128K	$2386	$274
256K	$3375	$378
512K	$4773	$535
1 MB	$6750	$757

(Source: Telkom Kenya Bandwidth Tariffs December 2001)

Figure 12. Local versus International bandwidth costs.

The cost for Internet traffic to traverse the international network is nearly an order of magnitude greater than that required to route local traffic. But, as indicated above, this is not the only measure of economic consequence. Locally provided and connected networks allow the growth of locally provided content and services, something which is difficult to provide based on international network pricing.

Network interconnections are not limited to the Internet. Standard telephone networks have also had to deal with the interconnection of disparate networks for many years, the complexity of these interconnections increased as the need to interconnect land line based phone networks with mobile-based phone networks. The ITU and others have created extensive documentation on the nature of telephony interconnection points, policies that support these, technical requirements, international, local and national interconnection issues.

Interconnections can also be the result of different levels of geographic coordination. These range from citywide interconnections, through state, country and even international peering relationships. As the scope of the geographic area grows, so does the coordination and logistical issues. The need for legislative and enforcement oversight becomes a critical issue especially as the region expands beyond administrative boundaries.

It is imperative that IXPs be the product of and for the ISPs and not an externally enforced directive in which ISPs are forced to participate. Attempts to provide a local interconnection as a commercial business have not been successful. These failures result from a number of factors, but ultimately stem from a fear of paying for other provider's bandwidth. In addition, an attempt by an entity to make a commercial success will drive up the barriers for participation in an environment that is already faced with numerous obstacles. Any attempt by an existing provider, for example the incumbent, is also doomed to a long-term failure due to the issues cited above plus the possibility of anti-competitive behavior. There are instances in which the initial facility is provided by the incumbent with a transition plan to provide autonomy of the facility over time, but these are generally experiments in progress without a verifiable outcome.

Understanding this dynamic forces the regulatory bodies to fully understand the reasons, complexities and regulatory requirements that drive ISPs to *desire* to enter into interconnection agreements with their competitors. This in turn drives the need for continued education through workshops, meetings, and regulatory participation in the process, driving the interconnections through a combination of facilitation and education.

It is important that the ISPs fund, control, and police the IXP as a community. It is critical that ISPs do not (in actuality or in perception) subsidize the traffic of other ISPs as this would be antithetical to the process and would likely instigate the departure of the ISP.

This leads to the question: What are the critical aspects of creating an Internet Exchange Point?

IXP ISSUES

1. Education – all parties involved, especially the ISP owners themselves must be educated about the benefits, issues, and possibilities for creating an Internet exchange. Regulators must understand the policy implications and legislators must learn about the potential need for laws and enforcements.
2. Ownership – one of the keys to a successful IXP is the configuration of the ownership of the IXP itself. Some believe the *only* way to make these work is if the ISPs are the ultimate owners of the IXP.
3. Funding – IXPs require funding for the establishment, operation, and maintenance. Also ISPs require investment and a continuing financial commitment to enable each independent ISP to connect to the IXP.
4. Location – location is often contentious as there is a need for the location to be located at a neutral site such that no member of the IXP has a dominant (perceived or actual) position in the operation of the IXP.
5. Incumbent – the incumbent provider may be reluctant to interconnect with smaller ISPs for competitive or protectionist reasons. They may also attempt to use their financial resources to influence issues such as ownership and location.

6. Regulations/Regulator – regulators must ensure that the operating environment is conducive to creating and maintaining peering relationships. The regulators can also play an important role in facilitating peering relationships and educating all parties.
7. Peering agreements & Compensating Charges – each ISP must negotiate a peering agreement with each of the other ISPs in order to create a fully connected network. It is not always necessary that all parties be completely connected; however this is recommended. How each party is compensated is one of the most difficult issues in establishing IXPs.

Beyond the local issues, there are a number of issues when dealing with interconnection especially at the regional level. These can generally be broken into the following categories:

- Framework and Procedural Issues
- Commercial Issues
- Technical and Operational Issues

The creation of a regional IXP is not a simple process. It requires a lot of coordination in time, effort and money. Involvement is needed by:

- National government bodies
- National regulatory bodies
- Telephony and Internet Service providers and operators
- Funding agencies
- Regional regulatory and economic groups
- Private industry
- NGO's

Many of these issues are discussed in the ITU Telecommunications Regulation Handbook and have been solved many times over around the world, but are unique to each country and region. There is, however, a wide amount of literature and knowledge available on solving these problems. According to one study (Walubengo et al.), there were over 264 active IXPs as of July 2004, indicating that the issues can and should be tackled.

infoDev sums up issues in their proposal for a feasibility study in this way:

> *The Economic Community of West African States (ECOWAS) region is characterized by a lack of functional terrestrial international links between countries, scarce interconnection between national terrestrial microwave and fiber circuits and poor quality and insufficient capacity of existing international links. Due to the lack of significant international communication infrastructure, much of the international voice and data traffic (both within and between countries) is routed either directly by satellite or transited via Europe or North America. This lack of regional backbone infrastructure generates a scarcity of cheap international bandwidth that discourages interregional trade and impedes Africa's participation in the inter-national economy on a more global level. Traffic between countries in the West Africa region transit the international backbone and incur the cost of this transit. The ability for a nation to increase its bandwidth is very limited and congestion is not within their control. Delays due to this routing can also be incurred, causing a reduction in the consumer experience and a likely reduction in the usage of the resources.*

A regional IXP can be built up as member countries join and connect to the peering point. This could provide a certain amount of flexibility with timing and investment in creating the RXP. In fact infoDev has proposed to do a feasibility study and a pilot project within the ECOWAS region to prove just this point (infoDev, 2005).

Location and network connectivity to the chosen location remains a critical issue. West Africa does not currently have an abundance of fiber optic connectivity. Lack of connectivity options as represented in Figure 13 is a major obstacle to creating interconnections at a regional level.

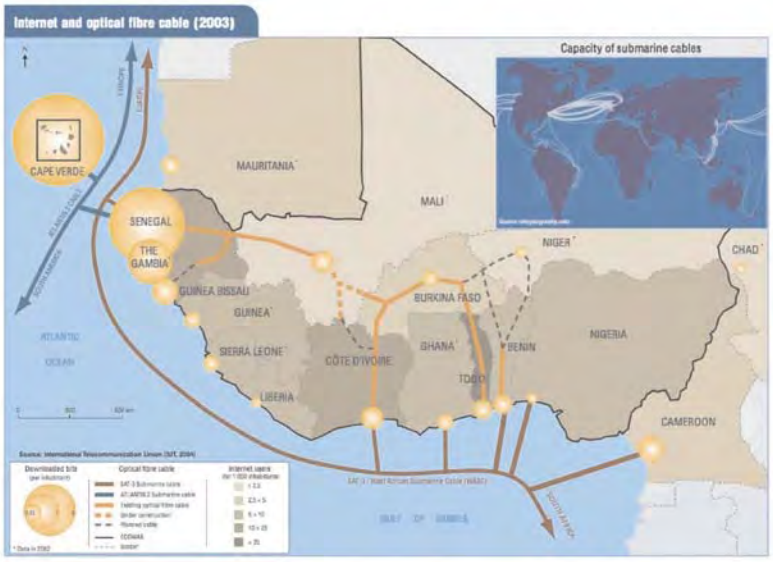


Figure 13. Internet and Fiber in ECOWAS

EXISTING INITIATIVES

Where possible, WATRA should participate in and coordinate amongst existing initiatives. Interconnections are a topic of continued interest throughout the African region, with many parties interested in participating. Several of these activities have been identified and include:

- infoDev has initiated a feasibility study and a pilot project for first/second quarter of 2006 (infoDev, 2005).
- AfrISPA has active initiatives in IXP creation with their Halfway Proposition[15] (Walubengo et al.).
- INTELCOM II has the objective to totally interconnect the Telecommunications Networks before the end of 2007 in the ECOWAS region.

There are likely other local initiatives that should be brought into coordination with these regional activities.

WATRA'S INVOLVEMENT

Thus far, we have discussed the issues, the benefits, and some of the possibilities for establishing local, national and regional Internet Exchange Points. The question remains: How can WATRA help? This section will outline some areas where an organization such as WATRA can provide valuable coordination and resources in these efforts.

First, WATRA can begin to pave the way by harmonizing the region's policies regarding interconnection agreements. They can provide model policies for member states and assist countries in modifying the policies for the specifics of the country's legal and operating environment. An analysis of current policy and legislative barriers should be pursued to understand the existing environment and devise routes that can help eliminate barriers and enhance the ability for providers to peer. The independent regulators within each country will need to understand the issues and the level of knowledge about IXPs must be raised throughout the region.

[15] *Full details available at http://www.afrispa.org/Initiatives.htm and http://afix.afrispa.org/*

WATRA can provide workshops and working sessions to help educate the legislators and regulatory bodies regarding the impact, requirements, needs, and issues that are associated with creating an IXP friendly environment. Case studies and relevant sample legislation and policies can be presented, dissected and questioned in an effort to raise the awareness and capacity within the region.

WATRA can play a role as teacher and facilitator in bringing knowledge to the ISPs and helping establish regional ISP organizations that can support the creation and operation of IXPs on a regional basis. Human resource development can be accomplished during establishment of local and national exchanges such that both the ISPs and WATRA (and others) learn first-hand by overcoming issues on a smaller, local scale before conquering these at an international level.

It is at the regional level that an organization such as WATRA can play an even larger role. Since the organization operates at an international level and is composed of national independent regulators throughout the region, they are in a unique position to coordinate learning and execution at a regional level, not just a national level. This cross-border capability is critical as is the ability to help bring funding sources and the necessary resources into the region to support developments of this magnitude. WATRA can assist by helping craft RFPs for the establishment of IXPs and working with it's Associate Members and other private entities to bring the right resources to bear. It may be possible, for example, to establish a regional IXP by offering a provider some set of incentives in exchange for helping finance the establishment of a regional backbone. An organization such as WATRA could help coordinate the creation of incentives and negotiating appropriate policies and laws that would help ensure that such an entity could survive without fear of retribution or adverse business practices from other organizations in the region.

Peering agreements are a critical issue when establishing connection points, and this is doubly true when these agreements must cross international boundaries. WATRA can provide a critical leadership role by helping create not only policies that promote these agreements, but also by establishing best practices and model agreements from which individual agreements can be created. Workshops and conferences should be established to help train and teach all interested parties in the intricacies of these agreements and associated compensating charges.

Clearly, there is an expanding role for regional organizations to help establish, maintain, and grow international cooperation for the creation and deployment of ICT. A large part of this is the need for an organization that has the skills, knowledge and the ability to impart this knowledge on all of the interested parties within the region.

FUTURE RESEARCH

The need for continued effort to extend the reach and impact of ICT in West Africa is an important issue that requires local, national, regional, and international attention. Internet interconnection is one of the critical elements of the infrastructure that will enable ICTs to become an effective tool for economic development in the region but much research is still needed to fully understand the implications and issues.

Examining the economics of interconnections could lead to better models regarding the cost/benefits and return on investment for all parties involved. Previous financial models should be reviewed and updated based on experiences in other regions of developing countries. These models can then be used as an educational and business tool to facilitate the adoption and participation in interconnection efforts.

The introduction and inclusion of caching and replication technology should be explored along with the interconnection efforts. Introducing caching services can greatly reduce the amount of Internet traffic that must traverse international and even national networks.

One key issue that has plagued efforts in the past is increasing the participation of ISPs in the interconnection efforts. One suggestion is to use game theory to model the motivations and drivers of the various participants to try to understand how to improve the incentives or help change the motives of the ISPs to increase participation.

It was noted earlier that new wireless technologies such as WiMax might have a significant impact on the creation of Internet exchange points in the future. Wireless technologies as local-loop can provide a cost effective method for ISPs to interconnect. The Ghana IXP was one of the early efforts that included wireless technologies as a primary method for connecting to ISP networks. The use, design, and economics of this technology in IXPs should be explored further.

Lastly, the regulatory requirements that drive and sustain interconnections needs further research and review. Understanding what are the key drivers and ramifications for legislation and participation are critical to a sustainable network. Regional issues that drive cooperation beyond traditional state boundaries need further research, an area that WATRA can help facilitate in the future.

SUMMARY

Due to the economic, political and capacity constraints that exist within the West Africa region, the long-term sustainability of an organization such as WATRA presents a number of unique challenges.

First and foremost is determining methods to create sustainable revenue sources. An underlying prerequisite for this capability is the ability of WATRA to maintain relevance in a rapidly changing political and technical environment. Relevance in this instance is based on the ability of WATRA to initiate and sustain projects that deliver value to the industry, government, and the public at large. Relevance to the various constituents will vary based on their motives, but all parties' motives must be understood in order to ensure activities are appropriately formulated with respect to relevance.

A number of recommendations have been made which we believe will move WATRA towards a longer-term sustainable position. These include taking lessons from start-up and early-stage companies, continuously monitoring and growing the human capacity within WATRA and especially at the top management positions, initiating an aggressive membership campaign, and formulating funded projects based on a model project plan.

While these recommendations do not provide specifics with respect to a financial plan or implementation details, it is believed these recommendations implemented along with the current activities underway within WATRA provide the best path to a sustainable future for WATRA.

Within the framework of WATRA, we have analyzed the prospects for local, national and regional Internet Connection Points and proposed several means by which the process can be pushed closer to reality. Several immediate steps can be made within the organization to improve the overall state of Internet connectivity, provide a return on investment for WATRA, and improve the standing of the organization within the eyes of its constituents.

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WEB SITES

The following web sites provided additional research material.

12 Manage. Strategy. Methods, Models and Theory. http://www.12manage.com/i_s.html
An Atlas of Cyberspaces, http://www.cybergeography.org/atlas/topology.html
Association of Regulators of Information and Communication for Eastern and Southern Africa (ARICEA), http://www.aricea-comesa.org/
ARICEA Presentation. http://www.uneca.org/aisi/nici/Documents/ARICEA%20PRESENTATION.ppt
Catalysing Access to ICT in Africa (CATIA), http://www.catia.ws/
Common Market for Eastern and Southern Africa (COMESA), http://www.comesa.int/
East Africa Telecommunications Regulators Association (EARPTO)
Global Internet Policy Initiative, http://www.internetpolicy.net/telco/
International Telecommunications Union, http://www.itu.int/aboutitu/index.html
International Telecommunication Union (ITU) Article 28 (http://www.itu.int/aboutitu/basic-texts/constitution/chapter5/chapter05_28.html)
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Telecommunications Regulators Association of Southern Africa, http://www.trasa.org.bw/ http://trasa.acreg.org/
United Nations Millenium Development Goals (2000). http://www.un.org/millenniumgoals
WATRA web site: http://www.watra.org/en/index.html

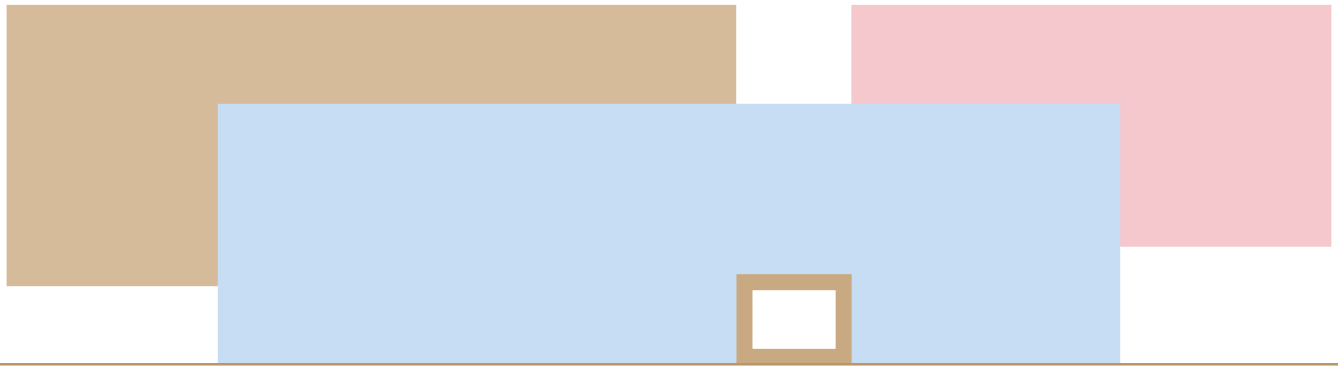
APPENDIX A – INTERVIEWEES

The following individuals were interviewed or engaged in a dialog during the course of the study:

Name	Position
Dr. Raymond Akwule	CEO NetPost
Jerome Bezzina	The World Bank
Mrs. Lolia Emakpore	Executive Secretariat, WATRA
Brian Goulden	Institute for Development Policy and Management, University of Manchester, UK
Charles Kenny	Senior Infrastructure Economist, Global ICT Department, The World Bank
Andrew McLaughlin	Senior Policy Advisor for Google and Senior Fellow at the Berkman Center
Jessica Mitchell	Project Manager, Office of Information Technology, Duke Univeristy and former GeekCorps member working with Ghana ISP Association (GISPA)
Ernest Ndukwe	Executive Vice-Chairman and Chief Executive, Nigerian Communications Commission (NCC) and Chairman of WATRA
Dr. Olasupo Ogunfemi	Digital Bridge Institute (DBI)
Phil Thomas	New Era Systems
Bill Woodcock	Packet Clearing House

LESSONS FROM THE MACEDONIA CONNECTS AID MODEL

TAEHYUN JUNG
& KEEGAN WADE



LESSONS FROM THE MACEDONIA CONNECTS AID MODEL

MACEDONIA CONNECTS, AN AID PROJECT FUNDED BY THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT, HAS RECENTLY finished its first phase by successfully providing affordable Internet access to the primary and secondary schools of Macedonia. In this paper, we report an interim evaluation of this project. First, we assess the outcomes of the project through three evaluative criteria: efficiency, effectiveness, and sustainability. Then, we attempt to identify the institutional and managerial features that had contributed to the success of the project. We reconfirm that institutional support and environmental harmonization are key elements to aid project success. Additionally, we found that the utilization of local resources combined with smart contracts had multiple virtues in this aid context.

INTRODUCTION

The provision of affordable rural Internet access has been problematic for many developing economies (Gasmi, Laffont, & Sharkey, 2000; ITU, 2003). Although many have adopted different types of universal service models, most of them have done so with limited success. Inhibiting factors include shortages of technology and skills, immature markets to induce private investment, the lack of fundamental communication infrastructure and the insufficient or misplaced institutional support, and the lack of funds to build infrastructure with. Although some companies and public initiatives have successfully constructed access infrastructure, they are oftentimes unsustainable due to managerial and financial failures. International aid can remedy this situation by providing financial support and by helping eschew sustainability failure through the transfer of both managerial and technological know-how.

This is what was done in Macedonia recently. Macedonia Connects - a project funded by the United Agency for International Development (USAID) - provided low-cost high-speed Internet access via a market mechanism to more than 450 primary and secondary schools plus rural Macedonians. Instead of providing funding to the Macedonian government or letting the incumbent provider do this, the Macedonia Connects project team took a more market-friendly and pro-competition strategy: it contracted with a nascent local ISP to pay the Internet fees borne by the schools for two years. By doing it this way, the nascent ISP could build its own backbone networks and customer bases to help them compete with the incumbent.

The first phase of the project was to build a country-wide network backbone and to connect schools via high-speed wireless Internet, which was completed in September 2005. The next phase is to maintain stable service quality and to expand the school network to rural Macedonians. This is planned to be done by September 2007.

The purpose of this paper is to evaluate the interim accomplishment – as of December 2005 - of the Macedonia Connects project and to draw useful lessons from this experience to be replicated in similar international aid projects.

By analyzing the project through the three lenses of efficiency, effectiveness, and sustainability, we find that the project has thus far been a success - success as defined in terms of project goal completion to date, and the marked improvement in the quality of life of rural Macedonians. Several unique features in project design and management seem to be most responsible for the project's success, the most critical ones being 1) Macedonia Connects' understanding of the aid environment, 2) the organization of the aid delivery, and 3) most stakeholders sharing common goals.

The organization of the rest of the paper is as follows. We first take a brief look at the universal service literature. Then, in the Analytic Framework section, we introduce the efficiency, effectiveness, and sustainability lenses through which we will analyze the model. In order to provide some structure to this analysis, we look through each lens at several factors which are important in the context of aid consistent with Elinor Ostrom's (1996) Institutional Analysis and Development framework. In the Methods section, we describe the techniques we used to get our data for our analysis, which mostly consisted of interviews. Following this we present a bird's-eye view of the Macedonia Connects Aid Model by describing the state of each of the factors from Ostrom's (1996) framework. This includes environmental factors and the actors and their basic interrelationships. We then evaluate the project using our forementioned lenses (effectiveness, efficiency, and sustainability). Lastly, we attempt to identify some of the critical success factors, and make conclusions.

UNIVERSAL INTERNET SERVICE IN DEVELOPING COUNTRIES

There are several socioeconomic benefits that may potentially accrue from universal Internet access, especially for poor rural citizens. For instance, it can provide business opportunities, access to education opportunities, healthcare information, and access to news and email. It is, however, difficult to build up a country-wide network infrastructure to facilitate this, especially in rural areas. Some countries – specifically the richer ones – have successfully implemented universal service policies that bring affordable telecommunications services to the homes of most citizens, including those in rural communities. But for many of the poorer nations, universal service has been unobtainable. Some of the more notable reasons for this are a large rural population, a powerful and entrenched monopoly telecom operator, the lack of a proper regulator and regulatory expertise, and the seeming monetary impossibility of allowing competitors.

In order for nations to supply telecommunications to rural citizens, regulation and government intervention is crucial because the liberalized telecom market alone often will not provide connectivity to rural markets (Gasmi, Laffont, & Sharkey, 2000; Gruber, 2001; Hills, 1993). Copper wire and telecom services are prohibitively expensive to bear and make for low if not negative net overall costs for telecom providers who will never knowingly pursue such unprofitable revenue avenues. So, governments have until recently been limited to providing subsidies to connect rural communities.

At any rate, the best way to go is through competition and the market (Best & Maclay, 2002). In order for a universal service plan contingent on these mechanisms to function properly, however, the appropriate institutions and market conditions must be in place. As we mentioned, telecom providers and ISPs need to look at the rural market as a profitable market sector. Unfortunately, there is usually a high initial investment barrier due to the costs of building one's own infrastructure. Therefore, without sufficient energy or resources to overcome this barrier, competitors are not likely to enter the rural Internet market.

Fortunately, these barriers are crumbling. For one, the introduction of comparatively low-priced cellular and wireless technologies has significantly decreased the initial requirement of funds for infrastructure. Second, asymmetrical regulation between the incumbents and the entrants can facilitate the setup and entry of new telecoms or ISPs. Finally, external funding (e.g. foreign aid) can directly contribute to the setup of these new players.

Factors that Help with Successful Universal Service

In general, competition and liberalization in telecommunications markets is widely supported by scholars and policy makers. Best and Maclay (2002) submit that the establishment of pervasive and sustainable Internet in the rural world requires the market. Fink, Mattoo, and Rathindran (2003) found that competition and privatization in telecommunications had a positive effect both in labor productivity and in teledensity. According

to them, liberalization together with privatization showed higher performance across 86 developing economies. And in surveying ten EU Accession countries in Central and Eastern Europe, Gruber (2001) found that latecomers were faster in diffusion of mobile technologies and, more importantly, competitive market structure contributed to faster diffusion.

Along with competition and liberalization, meticulous regulation and institutional design that promotes "meaningful competition" seems needed. It is observed that such meaningful competition is hard to come by especially in the broadband market due to the influence of powerful incumbent telecom operators, as reported by ITU (2003). The World Bank's (1998) seminal report *Assessing Aid* emphasizes good policy and the design of aid conditional on the institutional context of the recipient country. It also reports that an effective economic aid policy emphasizes private investment:

> *"…with sound country management, aid works in partnership with private capital. Specifically, 1 percent of GDP in aid crowds in another 1.9 percent of GDP in private investment. … assistance to well-managed countries increases private sector confidence and supports important public services. It hardly needs to be said , but in poorly managed countries aid crowds out private investment" (World Bank, 1998 in pp.14).*

Therefore, a combination of factors including proper regulation and sound government policy along with market liberalization are required to open up the market to competition.

Previous Aid Models to Further Universal Service

Previous aid models to increase rural Internet diffusion have involved the use of telecenters, schools, and community centers (e.g. libraries) to get people online. For example, the Estonian government devised a "Tiger Leap" program to put Internet in its schools in conjunction with a "Village Road" program to connect rural municipalities to the Internet (Rajasalu & Laur, 2003). These programs trained teachers and students on how to use the Internet, instituted IT usage in classrooms and libraries, and made the Internet affordable for rural municipalities. As a direct result, students and teachers (which make up a significant portion of the population) learned to use ICTs more effectively.

Another way to proliferate ICT services in rural populations is through privately run cybercafés or telecenters. States such as Colombia, Chile, and Peru have sponsored the growth of telecenters in rural areas by granting concessions to firms that offer to implement a certain number of telecenters for the least amount of subsidy (Proenza, 2001). This is typically a far better approach to telecenter institutionalization than the more inefficient donor-run way as donors may not understand the local environment and invest money where it is not needed.

Other successful examples of rural Internet diffusion include the World Links project in Uganda and the Schools Program in India. These schools financed Internet access by offering their computer labs (complete with Internet access) to the general public after school hours are over, like an Internet café (Best & Maclay, 2002).

ANALYTIC FRAMEWORK

To evaluate the Macedonia Connects Aid Model, we did not single out one factor as having a decisive impact, but, instead, we start from the assumption that institutional arrangements and environmental and project-level factors all affect the actions of the actors in the project, and therefore the project itself. As such, our analytic framework is basically consistent with Elinor Ostrom's (1996) Institutional Analysis and Development(IAD) framework.

We rearranged Ostrom's IAD framework into environmental factors, controllable factors, project outcomes, and evaluative criteria. The environmental factors identify relatively stable variables that can affect aid projects. We classify these factors into three groups: physical conditions of the problem, socioeconomic attributes of the recipient country, and rules-in-use in the recipient country.

The *physical conditions of the problem* are about the nature and characteristics of the relevant problems upon which the policy intervention will be implemented. As the case of Macedonia, the available repository of technology and the physical infrastructure available both to the recipient country and under the command of the aid project team will be identified. The *socioeconomic attributes of the recipient country* refer to the culture, norms, general level of education, wealth, the degree of equity in resource allocation, and industry structure relevant to the aid project. The *rules-in-use in the recipient country* refer to the laws and regulations relevant to the aid project (both formal and informal). Because we are interested in the setting of the institutions that *actually* affect the actors, we will attempt to identify the rules-in-use as well as the literal laws and regulations. All of these factors are relatively stable and are generally not controllable at the project level.

The controllable factors comprise of action situation and actors. The *action situation* refers to the positions of the participants and stakeholders (actors) and their relationships, including the set of allowable actions and their links to outcomes. Also relevant is what information was available to the actors during the course of the project, as well as the costs and benefits of their actions. *Actors* include the following attributes (variables) of stakeholders: 1) the resources under a specific actor's command; 2) the objectives and valuation that actors put in their actions conditional on the action situation and environmental factors; and 3) information and knowledge capability. The complex interactions of these controllable factors combined with the environmental factors result in outcomes.

We assess these environmental and controllable factors against our criteria of evaluation: efficiency, effectiveness, and sustainability. We use these criteria because they appear to be a powerful evaluatory framework that captures many of the angles of successful aid.

Efficiency

In economics, efficiency captures the amount of loss or friction present in the economic system. If we translate this concept into the context of conducting aid projects, inefficiency can come from a variety of sources. For example, "byzantine bureaucratic structure of aid agencies, the weak economic incentives in aid contracts, and the imprecision of project evaluation" all may create inefficiency in an aid project (Murrell, 2002). Thus, the efficiency lens is related to the relationships, resource allocations, and processes governing the project participants.

In this context, we consider aid efficiency as equivalent to process effectiveness. According to organization theory, process measures are "intended to answer the questions, 'What did you do?' and 'How well did you do it?'" and to "assess effort rather than effect" (Scott, 2003, p. 366). Therefore, the efficiency lens of assessment will address the following aspects of the model: 1) whether or not the project achieved its explicit and implicit goals; 2) how well financial and other resources were managed; and 3) how well participants and stakeholders communicated.

Effectiveness

For an aid project to be categorized as successful, efficiency alone is not a sufficient condition. Along with efficiency, the aid project should bring forth a visible positive impact on the recipient parties. This criterion we dub as effectiveness.

There are several ways to measure aid project effectiveness. Some studies argue that environmental factors - especially the macroeconomic situation and the institutional setting - are the most determinant factors of return to an aid project (World Bank, 1998). Other studies argue that an aid project turns out to be more productive when these environmental factors are worse (Guillaumont & Chauvet, 2001). We gauge effectiveness in terms of the potential of Macedonia Connects to improve the lives of the communities it touches.

Effectiveness may be broken down into outputs and outcomes. Outputs measure the direct results of the project while outcomes measure more of the indirect changes (e.g. change in socioeconomic conditions). By including both outputs and outcomes, we assess "a program's reach to the target audience" and the "quality and significance of outcomes" (Stufflebeam, 2002). Specifically, we look at 1) the effects on the Internet service market in Macedonia; 2) effects in the school community; 3) effects in the general public, especially those residing in rural areas.

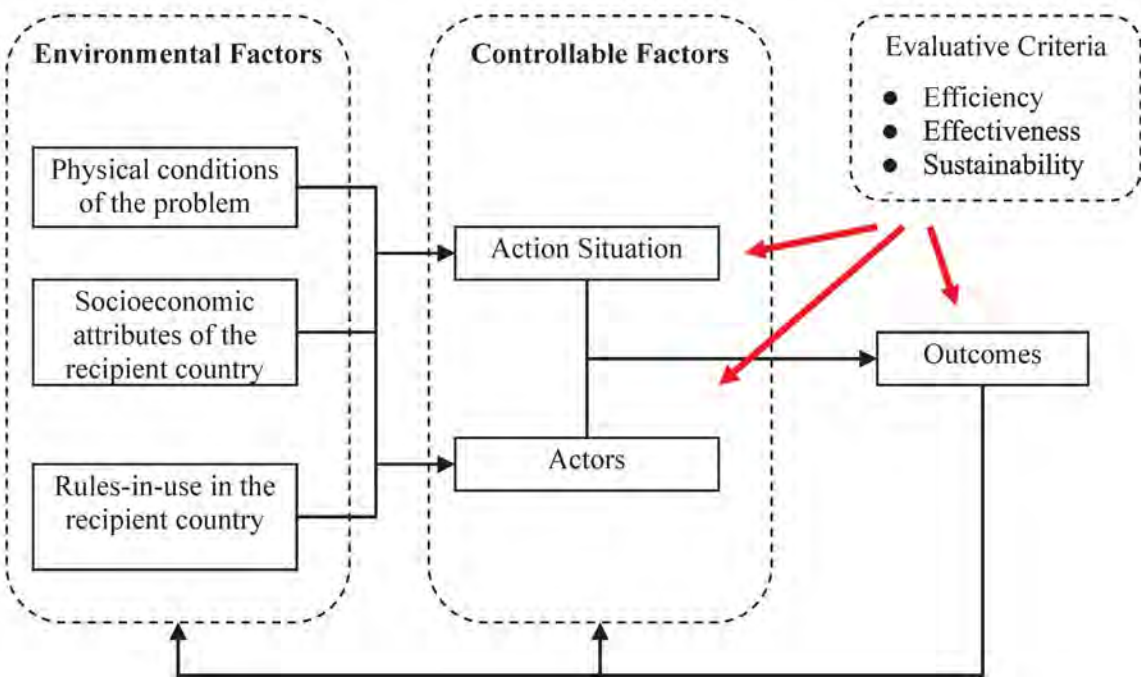
Sustainability

Sustainability criterion partly overlaps with the outcome measures of the effectiveness criterion but focuses more on structural elements that can be maintained with some level of contingency due to the change in environmental conditions after the project has ended. According to some observers of ICT aid projects in developing countries, the volatility of social infrastructure of developing countries makes the sustainability aspect of aid projects an extremely important determinant of success (Heeks, 2002; World Bank, 1998).

We employ Stufflebeam's (2002) definition of sustainability: "the extent to which a program's contributions are successfully institutionalized and continued over time", and include the following evaluative criteria by Ostrom (1996): fiscal equivalence, redistributional equity, conformance to general morality, adaptability. Then, considering the applicability of each criterion, we categorize them into the following areas: 1) school sustainability; 2) market sustainability; 3) socio-economic sustainability; and 4) technological sustainability.

To measure school sustainability, we look at the financial and human resources of the schools, and estimate as to whether they will be able to maintain their computer labs and Internet connections. Maintenance is a key issue here, as is education and training for the teachers. The key indicator for market sustainability is the relative competitiveness of On.net (the #2 ISP) to Maktel (the incumbent ISP). The indicators for socio-economic sustainability include whether there are differences in the depth and width of Internet penetration between males and females and amongst ethnic groups. Technological sustainability measures how well the implemented wireless technology "fits" with its environment. In this case, conformity with the WiMax standard and scalability of the On.net network (both the backbone and the loop) will serve as our key indicators. We claim that every aid project should aspire to be efficient, effective, and sustainable. When an aid project meets the all the criteria set in these three lenses, we call the aid project a success.

The analytic framework is summarized in Figure 1.



(Source: Adapted from Ostrom, 1996)

Figure 1. Institutional Analysis Framework for Aid Projects

METHODS

To evaluate the model, we chose to use a case study approach which includes a stakeholder analysis. Montealegre (1999) explains that case studies of IT projects in developing economies are sorely lacking, and that this deprivation of case study literature is partly responsible for the lack of adequate theories in this field. The case study approach also provides "for a foundation for understanding the dynamic interweaving of the new system's content, multilevel contexts, and changes over time" (Montealegre, 1999, p. 204). This is critical for us, as our goals are to understand the complex interplay of the stakeholders and relate the model within its context to the greater aid community.

Because the project is still ongoing and quantitative data is not yet available, we employed a technique of evaluation which draws heavily on stakeholder interviews. By inspecting project documents available and communicating with project participants we identified the following key stakeholders:

- Donor agency: USAID
- Donor-side contractor: Academy of Education Development (AED) and Macedonia Connects project team
- Recipient agents: On.net
- Recipient principals: The Ministry of Science and Education (MSE)
- Project beneficiaries: Rural schools, rural Internet users in Macedonia, On.net
- Project non-beneficiaries: Maktel, ISPs other than On.net
- Indirect, potential beneficiaries: general Internet users in Macedonia, the Ministry for Transportation and Communication, The Agency of Electronic Communication, the Committee of Information Technology, IT experts in Macedonia including university professors.
- Other stakeholders: The Educational Development Center Inc. EDC's e-Schools project, The World Bank' teacher training project team, The Bureau of Development of Education.

Instead of soliciting opinions from rural citizens, we tried to gauge the perceptions and expectations felt by opinion leaders in the IT field. We did this because the project benefits are not yet fully enjoyed by the general populace apart from schoolchildren.

The interviews were conducted in the following manner: First, to prepare our interviewees for the actual interviews, we sent them our key questions by email. Then, we developed customized interview questionnaires and conducted interviews in person during December 12 to 18, 2005. A typical interview lasted 30 to 90 minutes.

As you have probably noticed, the stakeholder category of "rural citizens" is missing from this list. As well as rural citizens, it would also be nice to get a *comprehensive* idea of what kinds of changes have been taking place in the rural schools and rural businesses since On.net began to provide Internet access. Macedonia Connects is funding a third-party company to conduct surveys to help answer some of these questions.

We also make mention that Maktel along with most of the ISPs (other than On.net) were unresponsive to our interview requests. As such, the flavor of this paper will be inherently biased towards the beneficiaries of this project. If we were to make any analyses into how the model has affected Maktel or the other ISPs, they would be purely speculative.

THE MACEDONIA CONNECTS AID MODEL

This section presents the basic configuration of environmental factors and controllable factors of Macedonia Connects, as referred to in Figure 1. In particular, we present 1) the general socioeconomic attributes of Macedonia, 2) the physical and socioeconomic conditions of ICT in Macedonia, 3) the relevant rules-in-use (laws and regulations), 4) the major actors in the aid model, and 5) how these actors relate to one another.

Socioeconomic Attributes of the Recipient Country

Macedonia is a small, mountainous, landlocked country of approximately two million people. Of these people, most are considered to be ethnically Macedonian Slavic (~64%) while the second largest ethnic group is Albanian (~25%). Macedonia has had a turbulent history. One of the more recent disturbances was back in the early 2000s when the ethnic Albanian population demanded better political representation. But today the situation in and around Macedonia is calm, in part because of the formation of the EU and the desire of Macedonia and its neighbors to obtain membership. About 29% of the population lives in Skopje.

As the country transitions to a more liberalized and open system, the Macedonian economy is currently working itself out. GDP in 2004 reached $5.2 billion, an increase in 2.5% from the previous year. Gross National Income per capita is $2,350. The service sector accounts for about 60% of GDP, the industry sector 28.4%, and the agriculture sector 12% (Source: World Development Indicators, August 2005). Annual trends show that the service sector is increasing, the industry sector is shrinking, and the agriculture sector remains stable. Despite the growing number of people working in the service sector, the bulk of the workforce continues to be concentrated in agriculture, producing tobacco, cotton, and livestock. A serious problem in the Macedonian economy is its high unemployment rate: 37.6% in 2004 (source: Macedonian Ministry of Finance).

Physical and Socioeconomic Conditions of the Problem

Macedonia has one of the best copper wire networks in Eastern Europe; it extends throughout the cities and into most of the rural areas of the country. Unfortunately, it has been heavily underutilized by Maktel. The number of fixed-line subscribers is about 560,000 and decreasing. The number of mobile telecom subscribers is about 900,000 and increasing. Macedonia has two mobile operator: Mobimak, a subsidiary of Maktel, and Cosmofon. Mobimak enjoys 90% of market share.

While there are no reliable statistics about Internet penetration, projections range from 5% to 15%. The major providers of Internet service are MTNet - a subsidiary of Maktel, On.net, Macedonia OnLine (MOL), and UNET. Market shares and capacity are summarized in Table 1.

Table 1. Key Internet Service Providers in Macedonia

Name	Market Share (2004)	Capacity	Link type
MTNet	49%	68Mbps	ADSL, Dial-up
On.net	21%	15Mbps	Wireless
MOL	14%	10Mbps	Satellite
Unet	12%	4Mbps	Satellite

(source: On.net and MTNet)

Telecom-Related Rules-In-Use

New telecommunication laws were recently drafted and are slowly coming into effect. Also, a new independent regulatory agency, the Agency for Electronic Communication, was formed in early 2005 to cope with telecommunication and competition issues. Such changes are consistent with the government's plan to phase out Maktel's dominance, decrease access price, and promote the Information Society in Macedonia.

Actors and Action Situation

In this section we identify the key actors involved in the project and analyze the resources under their command, their capabilities, their

relationships with other actors and outcomes.

Macedonia Connects, a project group managed by the Academy for Educational Development (AED) and funded by the United States Agency for International Development (USAID), is charged with the task of making the Internet commercially available to the rural citizens of Macedonia. They are the main delivery agents of the Macedonia Connects Aid Model. The team itself is composed of ten or so individuals working in an office in Skopje, the capital city of Macedonia. Everyday tasks include everything within the purview of making sure the various actors in the aid process are happy.

Founded in 1961, **The Academy for Educational Development (AED)** is an independent, non-profit organization that focuses on "improving education, health, and economic opportunities for the least advantaged in the United States and developing countries throughout the world" (AED website, 2005). As mentioned, it is the parent organization of Macedonia Connects.

AED has been one of the largest contractors of USAID during the past 15 years (Berríos, 2000; USAID, 2001). AED is also a participating member of the dot-COM (Digital Opportunities Through Communication Partnership) network,which is an exterior knowledge networks built by USAID to promote the use of information and communication technologies (ICTs) in achieving strategic development objectives. AED leads the dot-ORG collaboration, one of three independent cooperative agreements under the umbrella of dot-COM, to help USAID missions and bureaus to achieve their strategic objectives with technology solutions, especially through increasing disadvantaged groups' access to ICT.

The United States Agency for International Development (USAID) is the organization that funded AED to carry out the task of providing Internet access to rural citizens through Macedonia Connects. One of USAID's wings, "USAID Macedonia" (located in Skopje), is responsible for overseeing USAID-funded projects in Macedonia, including Macedonia Connects. USAID is a major player in the aid community in Macedonia - it has invested over $400 million in Macedonia since 1962. This funding, 63% of which has been spent by 2000, has gone towards economic assistance. In 2001, USAID assistance to Macedonia accounted for about 0.4% (or about $69 million) of total value of assistance that USAID maid (USAID Yellowbook, 2001). Over 30 projects worth more than $35 million a year are currently being implemented. These projects are designed to support Macedonia's transition to a free market-based, multi-ethnic democracy.

On.net is the local Internet service provider in Macedonia who was selected by Macedonia Connects as the local implementation partner. It is the second-place ISP with revenue of about 62 million denars in 2004. Since its association with the Macedonia Connects project, it has fulfilled its mandate to provide Internet connectivity to every school in the nation via a (wireless) Motorola Canopy system. Their plan now is to leverage this new network presence by attracting rural as well as urban customers that fall within the domain of their connectivity hotspots.

Through the Macedonia Connects project, it is On.net's hope to gain as much market presence as possible by connecting people that have until recently been unable to afford Internet connectivity, and by offering better services than Maktel.

Macedonian Telecom (Maktel) Maktel's share of the telephone market (both fixed–line and mobile) and is the incumbent telecom service provider. Although it was privatized, Macedonian government officials continue to own 47% of its shares. The majority of shares (51%) are owned by Hungarian Telecommunications MATAV. The economic power of Maktel in Macedonia is huge. The revenue Maktel earned in 2004 stands at about $370 million and accounts for roughly 7.1% of Macedonia's GDP. Most of its income comes from fixed-line and mobile telecom services. Although Maktel started to provide ADSL service from January 2004, the data service revenue is insignificant thus far (at only about 555 million denars or $12.3 million). Internet market is massive (see Table 1). However, most of Macedonia (especially rural Macedonia) continues to be underserved because of Maktel's prohibitively high rates and slow response to such "low-profit" regions.

Two important stakeholders of Macedonia Connects in the Macedonian government are the **Ministry of Education and Science (MES)** and the **Ministry of Communication and Transportation (MCT)**. Other governmental organizations that are relevant to the project include the

Agency for Electronic Communications (AEC) and the **Committee for Information Technology (CIT)**. MES and MCT benefit from the model because it helps them implement some of their policy goals. For example, the incorporation of ICT in education and broadening education opportunity for students in underserved areas falls under the mandate of MES, and for MCT deeper Internet penetration is of interest.

How These Actors Relate to One Another

The project started when in December 2004 Macedonia Connects issued a Request for Proposal (RFP) to the local ISP community in order to find an appropriate agent to deliver the Internet to the rural communities of Macedonia.

The ISP "On.net" was chosen for this task. Their first job was to provide broadband access to every primary and secondary school in the country. Their second job, which is not yet complete, is to use this new infrastructure to offer affordable Internet access to the surrounding community (individual households, businesses, government, and NGOs).

Figure 2 illustrates how the aid model is organized. In the Design box, "Practitioner" refers to the aid practitioners responsible for the project idea. USAID was involved in bringing the design to fruition.

From the Delivery box, we can see that USAID funded AED to carry out the project management, and AED, in turn, funded On.net to build the new Internet network. USAID's local office "USAID Macedonia" monitored the entire aid delivery process.

On.net and the rural communities are directly impacted by the project while Macedonia at large indirectly benefits (e.g. via better economic and social traction).

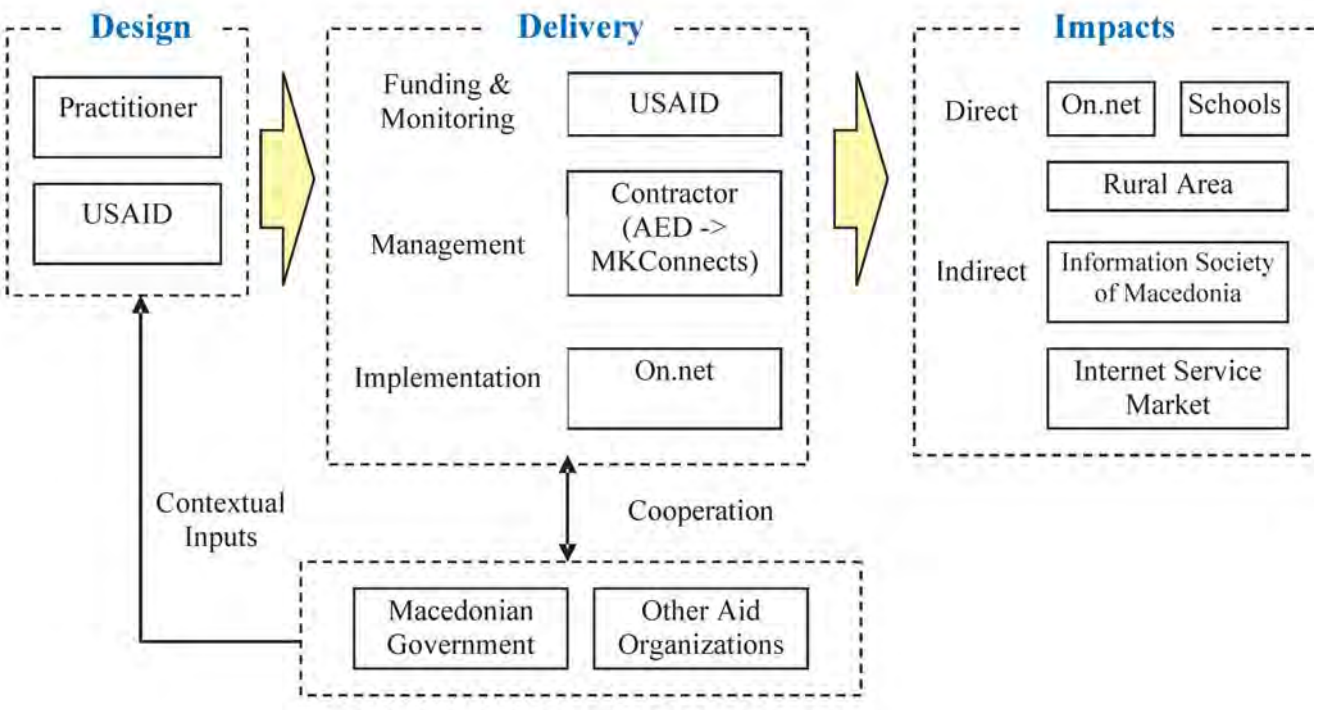


Figure 2. Simplified View of Macedonia Connects Aid Model

EFFICIENCY

To assess the efficiency of the model we ask the following questions: 1) whether or not the project achieved its explicit and implicit goals; 2) how well financial and other resources were managed; and 3) the quality of communication amongst participants and stakeholders.

Goal conformance

Macedonia Connects explicitly states its goals in its RFP, which fall into three categories: connection; community service; and sustainability.

- Connection goal: to connect 434 primary and secondary schools with broadband starting from September 2005 through to September 2007.
- Community service goal: to provide sustainable and commercial Internet points of presence for rural communities where the connected schools are located.
- Sustainability goal: to maintain a level of connectivity that is sustainable and commercially viable for valid competition in the Macedonian ISP market.

The connection goal was actually overachieved. As of December 2005 the connected entities enumerate to 477 including 458 primary and secondary schools. They are all linked with high-speed wireless Internet.

According to On.net, the community service goal is in progress. Although the physical infrastructure for the provision of points of presence has been built, no commercial service in newly connected rural areas is available yet. Considering that this paper is being written and submitted around the midpoint of the project, complete assessment of this goal is impossible at this time.

For the same reason, the sustainability goal is also too early to evaluate.

Resource management

We focus on the efficiency of the management of financial and human resources. Regarding financial resources, we found that aid money worked as seed money to induce private sector investment. Regarding human resources, only six team members managed the whole venture. We argue that utilization of motivated local partner probably contributed significantly to this efficiency gain.

Although the total endowment to On.net from USAID was $2.5 million, the total expense of On.net's side of the project was actually far more than this. The $2.5M acted as a subsidy to pay for the schools' Internet connections for two full years. The expense for the construction of the backbone network is not included in this sum. This is a big efficiency highlight from the perspective of Macedonia Connects. Without the promise of $2.5M, On.net would never have had the means of getting a Macedonian bank to lend them enough capital to begin such a project in the first place, as the General Manager of On.net stated in our interview with him. Several government officials also commented on Macedonia Connects as being critical in this regard.

Some good qualities about On.net are that it is a local company and because its director, Predrag Cemerikik, has been involved in the Macedonian media business and advertising for decades, plus he is familiar with matters of technology, especially wireless. To date, the new wireless infrastructure (which employs tv radio towers) seems to have been implemented successfully.

At one point On.net began to suffer from organizational issues as their business grew and they hired additional employees. They were fortunate enough to find somebody to consult with who was familiar enough with bureaucratic organization and was willing to help them reform their

organization during this time. However, as Cemerikik said, it could have turned into a disaster – there are not so many people who understand organizational issues such as these in Macedonia.

During our interviews, we found that the use of local expertise helped make the Macedonia Connects Aid Model efficient. For example, AED hired a project team that had previous experience with IT development projects in and around Macedonia. Consequently, as we will discuss in the Discussion section, there were very few design-reality gaps. Motivation was another aspect that contributed to project efficiency. Because the team members are all individual contractors, they have an incentive to work hard and get good results so they can get contracted later on. Also, the Macedonia Connects staff knew that USAID funding was largely contingent on their perceived performance – another motivating factor.

The implementation of wireless networks requires a substantial amount of skills and management. This was mostly done in an autonomous capacity by On.net. On.net's objective fit well with the objectives of Macedonia Connects, and payment conditions were smartly designed to be subject to their performance. Thus, smart contracts and the selection of a knowledgeable local partner made it possible to utilize resources efficiently.

Communication and coordination

Before we move on to analyzing efficiency issues related to communication and coordination, we first relate how the aid delivery process was organized. The structure of the aid model was vertically layered with USAID located on top, AED and Macedonia Connects in the middle, and On.net on the bottom. The roles and responsibilities of each organization were distinct and complementary, and during our time in Macedonia we observed that this layered structure facilitated smooth operations. Indeed, the actors in the system communicated and coordinated with remarkably few crises coming to the fore. Later in the Discussion section we will employ some principal-agent theory to analyze why it worked so well.

Heeks (2001) stresses adaptation as one of the most important success factors both from the point of view of the aid project, and from the environment in which it is located. All the stakeholders were very open to change in this regard, because their goals were so well aligned. The following list consists of the major goals of some of the stakeholders:

- Macedonia Connects. Goal: to diffuse Internet service in the rural communities
- On.net. Goal: to gain footing in the rural Internet market
- Schools. Goal: institute IT in the school curriculum
- Government. Goal: to take steps towards making Macedonia IT-compliant for EU accession
- e-Schools project. Goal: to work with Macedonia Connects to ensure maximum effectiveness of computer labs

Because everybody wanted the same result out of the aid model, they were all quite willing to adapt and cooperate to make it work. Maktel (the ex-telecom monopoly) appeared to be one of the few stakeholders whose goals were not aligned with the others.

We recorded several good examples of stakeholder cooperation that continue to occur today. On the government side, the Head of the ICT & Education and Science group in the Ministry of Science and Education meets with other government, USAID, Macedonia Connects, and other stakeholders on a bi-weekly basis to ensure activities are going smoothly. Local government officials meet with school principles, IT teachers from the schools, and other stakeholders in working groups to discuss problems in the schools (e.g. maintenance issues). The Bureau of Education Development planned an IT curriculum for the schools with the new computer labs. Booz Allen Hamilton (BAH), a private consulting firm, helped the newly formed independent regulatory agency form proper laws. BAH also played an integral role in helping the new Agency for Electronic Communications deal with Maktel, who continues to draw out the process of deregulation. Also, the European Agency for Reconstruction will be donating a million dollars to accommodate an expert to help the Agency for Electronic Communications. The e-Schools project trains teachers on how to use the computers and the Internet effectively in class. A World Bank project repairs faulty wiring in the schools. On.net and Macedonia Connects staffs meet on a daily basis to ensure everything is on track. All these efforts occur simultaneously and remarkably with very little duplicity.

EFFECTIVENESS

In this section we look at environmental and controllable factors to assess what Macedonia Connects has accomplished and what it is likely to accomplish in the future. The main target groups impacted by Macedonia Connects are the school community and the general public, especially those in rural areas. As this study cannot capture the full impact on the rural community (due to the early stage of evaluation), we indirectly measure progress by observing impacts on the Internet service market of Macedonia. Therefore, we delineate the effects of the project into two domains: the Internet Service market and school community.

Effects on the Internet Market

It would be useful to look several kinds of effects on the Internet market to evaluate the aid model with, including change in the nature of the ISP market, downward pressure on Internet access price, increased public recognition of the On.net as an ISP, and enhanced competition in the market environment. Gathering these measures, however, is a problem due to the financial expense of conducting a proper nation-wide survey, and assessing the impact where impact probably hasn't been felt a great deal yet (On.net only started offering service to rural areas in January 2006). We also learned that it would be difficult to determine how Internet access price has changed over the course of the project since all Macedonian ISPs apart from Maktel to this day do not regularly publish their prices. So because it is hard to know the exact price charged by each ISP[1] and because half the market is dominated by Maktel, we use Maktel's price as barometer for access price.

Right before the aid model went public in December 2004, Maktel charged 3,000 Denars (~$60US) per month for basic ADSL service along with a 4,000 Denars (~$80US) installation fee. When December rolled around and the model went public, Maktel immediately began to charge only 2,100 Denars (~$42US) which is still restrictive, but significantly less than in November. By December 2005, Maktel's price dropped to 1,200 Denars (~$24US). We cannot say that the threat from Macedonia Connects should be the sole reason that Maktel reduced its price, but it must have been a significant factor that was considered by decision makers in Maktel for the following reasons: 1) On.net shares the market with Maktel – it has a 21% market share; 2) On.net is a fast-growing, dedicated ISP; and 3) On.net has a competitive, independent backbone network which can now cover the three fourths of the entire Macedonian population.

Also, with the public announcement of the aid model in February 2005, Maktel attempted to try to scare Macedonia Connects off by offering free ASDL to schools, as well as to local government office and non-profit organizations if they committed to Maktel for a certain length of time. Interviewees from Maktel claim that, in 2005, this donation amounted to 500,000 EURO in over 350 educational institutions including primary and secondary schools, universities and faculties, and some scientific institutes (email communication with Maktel). Maktel's donation can be looked upon as a competitive reaction – a positive outcome of the project.

So although nothing is set in stone because the market is still figuring itself out, what we do know is that 1) the price of Internet access began to drop dramatically from the time the aid model went public, and 2) there are signs that Maktel is employing competitive tactics to stay aloft.

The most obvious major potential outcome of the project would have to be the opening of the telecom market to competition in the form of On.net. The Director of On.net speculated that soon after other ISPs see On.net's success, they too will want to employ similar wireless solutions to become more profitable. On.net started to offer high-speed wireless Internet service for only 590 denars a month (about $12) from 2006. Considering this significant drop-down of Internet price, it is fair to assume that Internet subscribership will grow rapidly. And if other ISPs attempt the same business model as On.net predicts, Macedonians should soon be able to purchase affordable Internet anywhere in the country.

Effects on School Communities

During the course of our interviews, we discovered that the aid model initiated several positive changes, including: 1) enhanced quality of

[1] *Fisnik Marku from the Ministry of Education and Science explained that the reason that no ISPs (apart from Maktel) are publishing their prices is because the ISP market is in a state of total confusion.*

education due to Internet use in schools; 2) increased efficiency in the school administration due to Internet and computer availability; and 3) a more open telecom market including a better regulatory and policy environment.

Beti Lozanovska of the Bureau of Development and Education and the principal at the rural school we visited agreed that the computer and Internet exposure the children were receiving was crucial to their skill formation for the world to come. Indeed, the computer labs allowed many schools to begin offering a class in IT.

Not only have children benefited, but many teachers received training so that they could teach the children how to use the computers. This training had the side benefit of helping teachers to deal with administrative tasks in a more efficient manner. The new computers and Internet acted as IT injections for the entire school community.

Exhibit 1. NAIM FRASHERI primary school

Naim Frasheri is a rural primary school located in the Struga municipality about a thirty minute drive from the city of Skopje. The total student body enumerates to 1,200 from the first grade to the eighth grade. Most students are ethnic Albanian. All of the senior students (7th and 8th grade) must take an IT class twice a week for a period of forty minutes. One class accommodates thirty students with sixteen computers. School-wide, twelve IT classes are taught per week, reaching approximately 360 students in total. The school began teaching IT in 2002. There is one teacher dedicated to teaching all IT classes. All sixteen computers in the lab were provided by the Chinese government through the e-Schools project and connected to the Internet via On.net's wireless network. Three computers from the e-Schools project are used for administrative purposes. In total the school has forty computers (nineteen from the e-Schools project).

Computer usage

The students in the IT class we observed were very enthusiastic. Most of them unanimously answered that they liked to surf the Internet. What they enjoyed most about the Internet was making friends via instant messenger, and email. They also enjoyed getting information on popular movie stars. Out of thirty students, only five had computers at home. At the time of our visit (Dec. 13 2005), the computers were not yet being used in subjects other than IT. The computer lab is opened to high school and university students in the local community under permission from the school.

Issues

The pupil per computer ratio is 75 to 1 (or 23 to 1 only for the senior students). Although this number is far from meeting European standards, it is not too bad for this school, according to the principal. The more serious problem is unstable supply of electricity. The principal said that they were experiencing four to five hours of power outages per day. Also, the school has no plans for financing the operating costs of the computer labs after e-Schools and Macedonia Connects funding dries out, but the principal was optimistic that the school would find a solution.

SUSTAINABILITY

Sustainability criterion partly overlaps with the outcome measures of the effectiveness criterion but focuses more on structural elements that can be maintained with some level of contingency due to the change in environmental conditions after the project ends. According to some observers of ICT aid projects in developing countries, the volatility of social infrastructure of developing countries makes sustainability a challenge of aid projects (Heeks, 2002; World Bank, 1998). Because we do not have actual indicators to assess whether or not the project is sustainable (the project is not yet mature enough to yield anything foretelling), we rather focus on the structural aspects of the project in the following areas: school sustainability; market sustainability; socio-economic sustainability; and technological sustainability. Although sound structure does not guarantee the sustainability of a project, it is one of the few things we can evaluate at this early stage of the game.

School sustainability

School sustainability can be estimated by how well the connected schools will likely be able to sustain the project benefits. What are essential to look at here are financial and human resources. For the project to be financially sustainable, we observe how the schools are planning to finance their running operation costs, including maintenance and upgrades of hardware and software. Considering the low income of rural Macedonia, the issue of financial sustainability seems to be critical. But besides this, for the project to be fully effective, teachers must be equipped with proper computer skills and with well-designed curriculums that integrate computer skills into learning.

Financial sustainability

Unfortunately, the exact numbers needed to determine the long-term upgrade costs of hardware & software and maintenance cannot be estimated right now. However, it seems clear that the participants of the project including the central government of Macedonia and the rural schools themselves seem to be aware of the importance of this problem and have some plans. As for the software provision issue, the Macedonian government has received school productivity software from Microsoft free of charge (we don't know whether Microsoft plans to make similar donations in the future). With regard to educational software, the Bureau of Development of Education (BDE), a subsidiary organization of the Ministry of Science and Education, is responsible for developing IT into the school curriculum. Beti Lozanovska, the BDE program director, assessed that the preparation of infrastructure (hardware, software, Internet) and teacher training has already been effectively integrated. According to her, the only foreseeable problems are those related to maintenance (due to a lack of funding and skilled technicians in rural areas). Although On.net covers maintenance related to problems with the Internet, non-Internet software and hardware maintenance has no long-term financial backing. This may be addressed in the future by the schooling communities. Proposed solutions include strengthening teacher training so that they can do basic maintenance themselves, outsourcing maintenance to private companies, or operating rapid dispatch units for hardware/software maintenance at the regional level. There is no fixed plan to address this issue in the long term. For now, the Ministry of Science and Education will pay school maintenance costs for the next financial year, and is seeking ways to solve the issue, including the creation of regional disaster recovery centers.

Another serious issue that can affect maintenance costs in rural schools in Macedonia is unstable electricity. In the rural school we visited, Naim Frasheri primary school, IT teachers were concerned about the unstable supply of electricity. The school suffers from sporadic blackouts. Because they do not have an uninterruptible power supply system, the sudden cut-off of the electric power may harm the computer and network equipment.

The most serious problem concerning financial sustainability is finding a way to pay for basic operating costs beyond 2007 when Macedonia Connects' subsidization ends. After that, the schools must find funding amounting to approximately 5,000 denars every month. This is a burden for poor rural schools. This issue (amongst others) is being discussed, along with maintenance, by the forementioned community working groups. Fisnik Marku revealed to us that the Ministry of Education was hoping regional governments would find a way to fund local schools' connectivity, although some of the cost will be subsidized by the central government for now. At the school level, the principal of Naim Frasheri primary school told us that his school will seek donations from the parents and through fund drives.

Curriculum Development and Training

As the BDE program director said and as we observed in the primary school, the teacher training program targets "at least one IT teacher per school" and seems to have accomplished this goal. Reflecting upon the rapid diffusion of computer knowledge within the Macedonian populace along with the training programs planned by the government, the World Bank, and other NGOs, providing IT teachers who are capable of teaching basic computer knowledge to primary school students doesn't seem to be a big problem. The BDE even wants to expand IT education to fourth graders (IT education currently starts at the seventh grade). The more challenging task is to develop proper educational content into the curriculum. As of right now there is no customized software developed for educating primary school students in Macedonia. Currently, the BDE only provides a basic textbook to be used in computer class for seventh and eighth graders. Exposure to IT is so crucial at the primary level because many students do not make it to high school.

Market sustainability

The key indicator for market sustainability is relative competitiveness of On.net's rates to Maktel's rates. Despite all the optimism, it is difficult to predict On.net's future market sustainability. Indeed, there is a variety of uncertainties that can affect the market environment as well as the competitiveness of On.net.

Barney (1986; 1991) provides a way to give us some insight into the matter. He claims that the competitive advantage of firms is determined by the resources that a firm preserves, and sustained competitive advantage is subject to several unique characteristics of these resources, including: value, rareness, inimitability, and substitutability.

The wireless network backbone and points of presence that On.net has spread across the country are definitely rare resources in Macedonia and are not easily imitable. Prior to this network, the only country-wide network backbone was owned by MTNet (Maktel's ISP). Although MTNet is mandated by law to share its network with other ISPs, the process is slow, cumbersome, and unprofitable for other ISPs (as testified by managers from On.net and NeoTel as well as by the director of the regulatory agency, AEC). Therefore, an entirely new, proprietary network helps facilitate On.net's future competitiveness. Furthermore, wireless is more flexible and easier to maintain than copper wire, especially considering the mountainous geography of Macedonia.

Also, On.net cooperated closely with Motorola which helped them absorb practical knowledge regarding wireless networks. This intangible asset is definitely hard to imitate and is not substitutable.

Socioeconomic sustainability

The indicators for socioeconomic sustainability include difference in depth and width of Internet penetration between males and females and amongst ethnic groups.

Several of our stakeholder interviewees commented that gender is not an issue. Most of the teachers that were being taught to use the Internet were women, and, apparently, classrooms do not discriminate against males or females. Indeed, during our visit to the rural primary school we did not find any immediate evidence of gender bias.

We also did not find any evidence of ethnic discrimination either in provision of the Internet or in the provision of computer and Internet training. The connected schools are dispersed all over the country covering all the primary and secondary schools regardless of ethnic concentration.

Technological sustainability

Technological sustainability refers to 1) scalability, and 2) conformity to technology that will be likely to proliferate.

WiMax conformity is naturally immersed in the selection of the Motorola Canopy Advantage System (see Motorola Canopy Advantage system homepage: *http://motorola.canopywireless.com/products/advantage/)*. Although we do not assess the technological aspects of this system in this paper, it is in the forefront of technology and guarantees near-future sustainability. Also, it scales quite well.

DISCUSSION

In this section we draw some lessons from studying the Macedonia Connects Aid Model. First, we summarize them into critical success factors. Then, we attempt to relate what we have learned from to some theoretical discussions in the aid literature.

Critical Success Factors

We asked interviewees what they thought the critical success factors of the project were. Many respondents pointed out 1) smooth cooperation amongst the stakeholders; and 2) the strong leadership role of USAID in Macedonia as important. In total, we identified the following four critical success factors:

1) *Utilization of local expertise*
   - USAID and AED utilized aid workers in touch with the aid environment
2) *The project objectives fit with the recipient's needs*
   - The objective of rural Internet diffusion was what Macedonia wanted. Local ISPs were willing to provide this need if they had the capital.
3) *Partnerships and cooperation among the stakeholders*
   - Stakeholders operated more in a complementary capacity than in a competitive one.
4) *Aid project design utilized market leverage*
   - By contracting a capable but incipient local ISP, a new network was implemented efficiently, injecting competition.

From an analytical standpoint, the problem with a successful project is that it can be hard to pinpoint what specific factor(s) were most substantial in their contribution to project success. To overcome this difficulty, first, we identify what might have been some potentially significant obstacles to the success of the project and then contemplate what aspects of the aid model successfully dealt with these problems.

Design-reality gaps and the utilization of local staff

By studying ICT aid project failures in African countries, Heeks (2002) concludes that seven different types of design-reality gaps (information, technology, process, objectives and values, staffing and skills, management systems, and structures and other resources) were most responsible for these failures. In the Macedonia Connects Aid Model, we found that such gaps were virtually non-existent. We argue that, amongst other factors, utilization of local expertise, and local delegation from the initial design stage of the aid project played a significant role in closing these gaps.

The initial idea of the project was borne by practitioners who were very familiar with the project environment, especially those who participated in e-Schools project. Because most of the design was done in close cooperation with local practitioners, there was little room for information and process design-reality gaps to manifest themselves. Also, due to frequent exposure of international aid, Macedonia had plenty of public officials who were capable of dealing with aid delivery-related issues.

As for design-reality gaps in technology: when implementing the new wireless infrastructure, On.net and Macedonia Connects' local expertise managed to close most of the gaps that might have occurred as a result of misled perceptions about the Macedonian environment.

In sum, the utilization of skilled local staff solved many of design-reality gaps in the aid model. The implication for other aid projects is that it is worth investing in local aid workers knowledgeable both in the local context and in aid processes in substantive areas. These workers can not only help with future aid projects but also work as agents of change in the recipient country.

Principal-agent problems in aid delivery and smart contracts

As we came to understand the Macedonia Connects Aid Model we wondered how USAID had successfully managed the services of its intermediary organization, AED. To explain this we employ principal-agent theory.

In layered management structures, there exists the possibility of excessive management costs resulting from conflicts of interest between contracting parties in cases where there is information asymmetry. When the donor agency (principal) delegates responsibility of an aid project to a contractor (agent) who is better informed than the principal, the contractor may have an incentive to exploit the principal's ignorance. There are three such ways a contractor might do this: 1) the adverse selection problem: an agent may exaggerate its capability to cause the principal excessive costs; 2) the moral hazard problem: an agent may utilize resources for self-serving purposes; and, finally, 3) the hold-up problem: when the sunk-costs are larger than the costs of appointing a new agent, the incumbent agents may intentionally hold up the project and renegotiate to raise the payments they will receive.

The major focus here is placed on "two-fold" principal-agent relationships: first, between USAID as a principal and AED and Macedonia Connects as an agent; and, second, between AED and Macedonia Connects as a principal and On.net as an agent[2].

USAID-AED/Macedonia Connects relationship

In this first relationship, we identified the following aspects of the aid model that helped resolve principal-agent problems:

1) *USAID Macedonia – the USAID regional office – actively monitored the project*
   By operating in a regional capacity and dedicating locally hired staff to supervise and monitor the project, USAID could reduce the information gaps between themselves and the local agents.
2) *Long-term partnership and competition*
   AED had a long-term partnership with USAID. In fact, USAID is the biggest customer of AED, and AED has been one of the most favored contractors of USAID for the last few decades (Berríos, 2000; USAID, 2001). However, maintaining a good relationship is not always an easy task, especially given harsh competition among non-profit development organizations. What this means is that AED has an incentive to maintain a good reputation with USAID, and therefore a disincentive to shirking.
3) *Project-based approach*
   The Macedonia Connects staff is all temporary, individual contractors. Also, some of the key personnel are career aid workers whose customers are aid agencies. To all of them, the success of one aid project is important in getting their next job.

AED/Macedonia Connects-On.net relationship

In the second relationship, the following aspects of the model reduce the principal-agent problem:

[2] *Principal-agent issues can also happen at a higher level, like the relationship between donor and recipient. However, according to Martens (2005), there is "no need for mediation when donor and recipient interests are fully convergent" (Martens, 2005, p. 644). In the case of the Macedonia Connects Aid Model, the bottom-up approach of aid design places little room for conflict of interest between the donor and recipient.*

1) *The selection of a motivated contractor and congruence of objectives*
The Macedonia Connects project was regarded as a huge business opportunity by On.net; they were thirsty for this kind of an opportunity. Also, the design of the project made the contractor competitive in the local market. Therefore, the objectives of the principal and agent converged to avoid any principal-agent problems.
2) *Fixed-price plus incentive fee structure with distributed payment*
The design of the contract also contributed to resolving potential principal-agent problems. First, the contract amount does not reimburse the cost of network implementation but merely subsidizes user service fees. Therefore, On.net had to invest its own money into building the network infrastructure to get the aid money. Second, there was a contract award connection bonus for every three rural schools connected. This seemed to work as an incentive that induced On.net to connect rural regions which might have been avoided otherwise due to the higher cost for building the network. Third, Macedonia Connects distributes payments through the two year period conditional on successful Internet maintenance. This mechanism makes On.net mindful of sustainable service.

CONCLUSION

The Macedonia Connects project has brought Internet connectivity to all primary and secondary schools in Macedonia, and will try to provide a good chunk of the entire rural population with affordable connectivity. To determine how well this project has worked to date, we analyzed its components (e.g. actors, socioeconomic attributes) through the lenses of efficiency, effectiveness, and the sustainability. We find that it has met these criteria thus far.

The efficiency highlights include the meeting of all project goals to date, excellent resource management, and the use of efficient communication channels. The effectiveness highlights include the lowering of Internet access price levels, enhanced exposure to ICTs in Macedonian schools, and pro-competitive shifts in the Internet market. The sustainability highlights include the optimistic outlook for market, socioeconomic, and technological sustainability.

It would not be right to credit Macedonia Connects alone for all these successes. Antecedent development initiatives such as e-Schools and computer donations from China, in conjunction with regulatory and government reform and a strong desire on the part of the entire nation to meet EU-eligibility criteria were also critical factors of success.

Several other success-factors were apparent. For one, the project had the benefit of a highly motivated local project team. Not only was this team aid-savvy, but they were also knowledgeable of the local environment and communicated with stakeholders on a frequent basis to ensure project success. The organization of the aid delivery itself (largely facilitated by USAID-Macedonia) proved to be beneficial in that it contributed to motivating and aligning the various USAID aid recipients that had a hand in the model.

One of the few hanging points of the project was the maintenance and continued funding issue. It is apparent that the schools will struggle to maintain their Internet connections without economic support. The issue is, however, stimulating community-based working groups that are focused on solving these and related issues. This may be of opportunity for citizens to take responsibility for their own transition towards the information society.

The goal of the project is to make an impact on the rural community by providing them with the same ICT opportunities as the urban population. Our preliminary findings suggest that the Macedonia Connects Aid Model is on its way to achieving this goal.

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APPENDIX C. LIST OF INTERVIEWEES

Name	Organization	Job Title	Date/time
Predrag Cemerikik	On Net	Director	Dec. 12. 10:00
Darko Arsov	Education Development Center / e-School project	Technology Integration Manager	Dec. 12. 14:30
Glen Strachan	Macedonia Connects/ Academy of Education Development	Chief of Party	Dec. 12. 10:00
Alex Biblilov	Macedonia Connects/AED		Dec. 12. 10:00
Ljupcho Tagasovski	Macedonia Connects/AED	Assistant Director	Dec. 14. 14:00
	Naim Frasheri Primary school	Principal	Dec 13
	Naim Frasheri Primary school	IT teacher	Dec 13
web-café owners	Random web-café in Skopje	Owner	Dec. 15
Fisnik Marku	Ministry of Education and Science	Head of IT Dept	Dec. 14. 15:20
Elizabeta Stamenov	Neotel	General Manager	Dec. 14. 11:00
Daniela Stojcevska	Makedonski Telekomunikacii (Maktel)		email
Hal Yaeger	EDC/e-Biz	Chief of Party	Dec. 14. 09:00
Dimitar Bukivalov	Ministry of Transport and Communications	Head of Communications Dept	Dec. 15. 11:00
Ljuben Talev	Media Market Skopje	Executive Director/Consulting Services	Dec. 15. 11:00
Jani Makraduli	Committee for Information Technology	President	Dec. 15. 11:00
Beti Lozanovska	Bureau for Development Education/MoES	Head of Department, curriculum and test	Dec. 15. 09:00
	USAID Macedonia		Dec. 16. 09:00
Bardul Jashari	Metamorphosis		Dec. 16. 11:00
Kosta Trpkovski	Agency for Electronic Communications	Director	Dec. 16. 13:00
Artan Saliu	World Bank	IT consultant	Dec. 18. 09:00
Marjan Gushev	University of St. Cyril and Methodius	Faculty of Natural Science and Math	Dec. 18. 12:15
Sasho Josimovski	University of St. Cyril and Methodius	Faculty of Economy	Dec. 18. 14:00

USAID IMPLEMENTING NETWORKS: A MACEDONIAN E-CASE STUDY

DAVID RAJEEV SIBAL

USAID IMPLEMENTING NETWORKS: A MACEDONIAN E-CASE STUDY

THIS CASE STUDY ANALYZES HOW STAKEHOLDERS OF THREE DEVELOPMENT PROJECTS IN MACEDONIA INTERACT. THE PROJECTS include Macedonia Connects (MKCon), e-Schools, and e-Biz – all of which are United States Agency for International Development (USAID) efforts. They follow a traditional USAID model where contracts are dispersed in Washington, D.C. to a non-profit organization that does most of the ground work. In implementation, these organizations oftentimes require the assistance of other stakeholders (i.e. local government, civil society, private enterprises, etc.). By studying the relational hierarchies along with communication and information transfer, each effort is portrayed within an institutional context to create clearer understanding of interaction between actors and their implications. We found that USAID in Macedonia capitalized on their unique position as primary funder and diplomatic liaison to ensure that its contracted projects were executed on their terms, under their guidance, while maintaining a cooperative atmosphere. While not all aspects of the interaction were positive, the formula followed by USAID in Macedonia was, on the whole, successful and worth inspection.

ACRONYMS

AED	Academy for Educational Development
CRS	Congressional Research Service
EDC	Education Development Center
EMP	Education Modernization Project
GAO	Government Accountability Organization
GDA	Global Development Alliance
ICT	Information and Communication Technology
IQC	Indefinite Quantity Contract
LMI	Last Mile Initiative
MKCon	Macedonia Connects
NGOs	Non-Governmental Organizations
SME	Small and Medium Sized Enterprises
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USAID-DC	United States Agency for International Development – Washington, D.C. Offices
USAID-MK	United States Agency for International Development – Macedonian Offices

U.S FOREIGN AID BACKGROUND

Non-governmental organizations (NGOs) have increasingly been utilized by USAID. The end of the cold war (Smillie, 1999) and new management initiatives, including efforts to privatize some government operations (Kilby, 2004), were driving forces behind a USAID operational shift. NGOs provide expertise, maneuverability, sensitivity, and can sometimes bring additional funding, characteristics that have led them to become the primary implementers of most USAID initiatives (Chege, 1999; GAO/NSAID-95-37, 1995). For example, a 2002 Government Accountability Office (GAO) report found that NGOs, through contracts and grants, received nearly 60% of all money dispersed by USAID in the 2000 fiscal year, or $4 billion out of a $7.2 billion dollar budget (GAO-02-471, 2002). This is in contrast to contracting levels of $1.07 billion in 1982 and $1.51 billion in 1992 (GAO/NSAID-96-34, 1995). Recent figures show that this trend has continued.[1] USAID has undeniably shifted from an implementer to a manager.

By shifting towards management and oversight, USAID's role on the ground has been reduced. Generally, contracts are developed in USAID's Washington, D.C. bureaus, and funding is secured from one of the various departments within the organization, such as the Global Development Alliance (GDA). Figure 1 depicts the traditional path that a contract takes once it is created. A limited number of subcontractors will compete for the funds and then the winner takes on implementation responsibilities.[2] One type of agreement that is directly relevant to the case study at hand is the Indefinite Quantity Contract (IQC).[3] An IQC provides for a pre-set contract to be drafted between USAID and the implementing NGO, where the NGO is given relative autonomy of project management, with USAID acting as a support structure, and, occasionally, overseer (Berrios, 2000). This study touches on the general contracting process, but focuses mainly on contract performance and evaluation of in-progress & completed work (refer to Figure 1).

Figure 1. Phases of Contracting

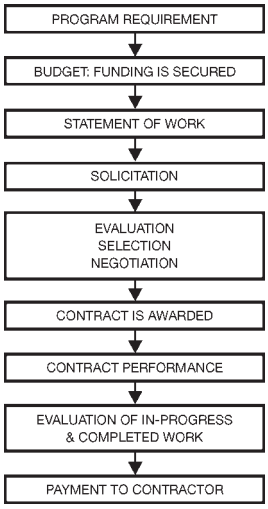

Figure 1. This flowchart is an overview of the contracting process (Berrios, 2000).

[1] *In 2004 $4.52 billion out of $8.77 billion was requested of Congress for programs managed by USAID (USAID, 2004). And in 2005 that figure was $3.2 billion out of $8.823 billion (USAID, 2005).*

[2] *Aid distributed to private organizations takes three primary forms: grants, contracts, and cooperative agreements. USAID is involved in all three types, with the latter two requiring a stronger presence for oversight. The awarding process is supposed to imitate a free market where the lowest bidder and/or best qualified organization would win the contract. This, however, has not always been the case. One of the defining characteristics of late has been a monopoly of contracts by larger, more influential non-profits that have been able to build networks (Berrios 2000). Cooley & Ron have done significant research demonstrating, from an economic perspective, that a skewed market may be having adverse effects on the execution of contracts (2002).*

[3] *It is normally hard to determine what kinds of contractual agreements are made with NGOs, since much of that decision making process is left to USAID missions in country (GAO 02-471 2002). In the context of this case study, it is known that IQC's were used.*

On the ground, depending on the scope of an initiative, the stakeholders responsible for implementing a project can be numerous. For example, an education program may require the involvement of the contracted NGO, any of their partners, USAID, local government, foreign national government, and the private sector. All these players become inter-dependent. This means that there are greater opportunities to maximize delegation, thus capitalizing on specialization. For example, NGOs can focus on ensuring that the aid delivered is effective, manageable, and sustainable, while USAID offers strategic/diplomatic support, and the private sector provides inputs that would not be possible or affordable otherwise (i.e. technology, equipment, etc.). Meanwhile local government can act as a valuable resource for understanding the context within which the aid is being implemented. Each stakeholder adds value to the process in their own way.

Research has found that the current aid market structure hinders full efficiency because of competitive behavior. Inter-dependent aid groups compete for resources, especially financial and symbolic capital[4] (Ebrahim, 2003); although positive in a free market, in an imperfect market this behavior leads to distortions. Imagine a scenario where project staffs on the ground from competing non-profits are given instructions not to communicate with each other, even though gains can be made from cooperation. Similarly, given the recent explosion of non-profit revenues, aid is becoming a growth market, which contradicts its purpose. Ideally, if aid is well utilized, progress would be sufficient to reduce the need for assistance and additional funding.

NGO growth has paralleled USAID funding increases (Paul, 2000). To sustain their contracts, NGOs have incentive to downplay failures, exaggerate successes, and rent-seek (Sibal, 2005). Cooley and Ron point to "contractual relationships, information asymmetries, and agency problems [that] often produce 'imperfect' or perverse outcomes" (2000). Evidence indicates that these trends will continue because of weak evaluating mechanisms and imperfect bidding markets (Cooley & Ron, 2002). Much of this results from a relational and communication disconnect between NGOs and USAID (Sibal, 2005). These processes then become part of the institutional environment and negatively influence the NGOs organizational behavior.

Analyzing Aid Delivery

Aid networks can be quite complex, and for that reason strong management and clear responsibility structures (both of which can be studied from institutional perspectives) are essential for aid systems. On the ground, USAID functions much like a corporation with subsidiaries.[5] As undefined power structures and boundaries of action can inhibit this model (Kanter, 1991), clearer responsibility structures facilitate communication and information transfer, allowing each stakeholder to best contribute their resources. Within that context, they must also consider the organizational behavior and interests of their partners. Given the 1) inherently fragmented environment; 2) competition for resources amongst contractors on the ground, and 3) differing organizational behaviors, achieving such cooperation is challenging. To overcome these factors, partnerships must include some degree of equality, well-established project governance, and the necessary investments (not just financial) from the parties involved.

The relationship between USAID and NGOs is supposed to be cooperative, where NGO autonomy is checked by USAID's ability to define the project guidelines and regularly evaluate progress. Figure 2 offers a visual representation of an appropriate interaction between NGO and USAID. As in any system, throughput and efficiency are key factors; but USAID must accomplish even more, as they have to worry about public diplomacy[6] on top of effectiveness. One of their biggest jobs is to transfer and catalyze information and resources into output. Within the aid network, this is all facilitated by positive relationships, effective communication, and consideration for the working environment. An institutional framework offers assistance in studying the driving forces, relationships, of aid systems.

[4] *Symbolic capital can be closely associated with power.*

[5] *Credit is due to Teresa Albor, who aptly made this analogy in the interview.*

[6] *Public diplomacy is a major component of soft power.*

Figure 2. NGO, Funder relational process

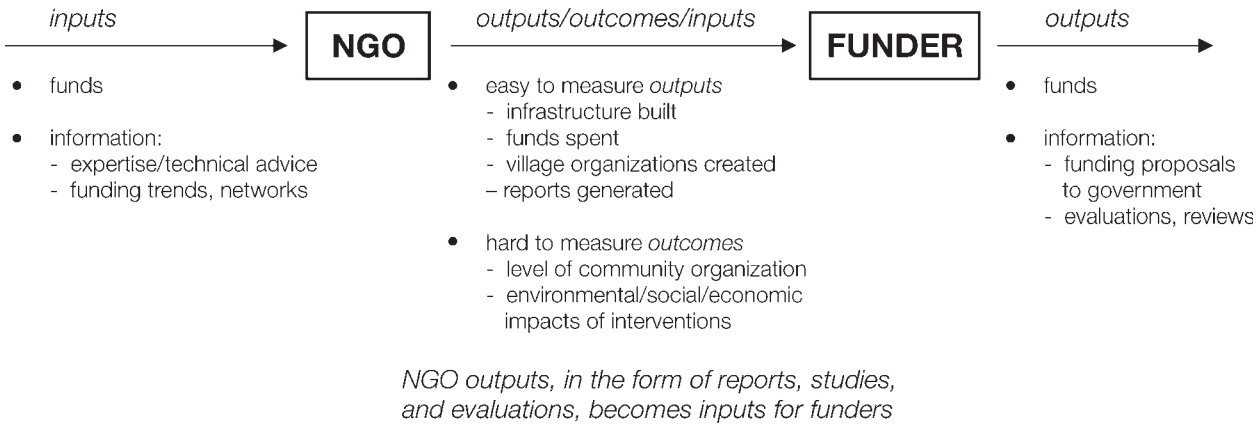

Figure 2. Organizational inputs, outputs, and outcomes (Ebrahim, 2003).

Institutionalism provides an apt framework for analysis because it accounts for the non-tangible factors that influence groups working together within an organization or network (Scott & Christenson, 1995). So, in terms of this case study, it shows the interaction of various stakeholders working together to implement a project. Each stakeholder has its own organizational behavior and institutional processes. Using institutionalism we can study how these differences are overcome (DiMaggio 1998). Implementers face many relational barriers, but four that are especially problematic, in the aid environment, include challenges of symbolic capital, fragmentation, external forces, and isomorphism (refer to Table 1 for definitions of each). Given the complexity of the implementer's network, competing interests of each member, and their differing working styles, the aforementioned factors allow us to classify and depict challenges of cooperation.

Table 1. Definitions of Key Institutional Factors

Institutional Factor	Definition
Symbolic Capital	How credibility is built up through characteristics like prestige, status, authority, reputation, etc. (Ebrahim 2003).
Isomorphism	Pressure for one organization working under another focal organization to change as a result of exposure (Borum & Westenholz, 1995).
Fragmentation	Situations where there are numerous participants surrounding a focal organization and administrative operations are complex (Meyer, Scott, & Strang, 1995).
External Factors	The many internal and external social and environmental forces that influence organizational culture; this includes, but is not limited to, communication networks, communication frequency, politics, economics, organizational behavior, values and beliefs, and project perceptions (Scott & Christenson, 1995).

USAID in the Macedonian Context

Macedonia is a small, landlocked country situated in the extremes of southeastern Europe. It is in the process of liberalization and modernization, much like many of its neighboring transitional nations. The country is made-up primarily of Slavic Macedonians, while ethnic Albanians comprise

25% of the population (smaller ethnic groups like the Turks and Roma people are about 5% of the population). Much like its neighboring states, Macedonia enjoys a relatively well educated populace (literacy rates in the high 90%'s) and high levels of life expectancy (CIA, 2006). Economic development has been slowed by bouts of ethnic strife.[7] But since 2002, Macedonia has been conflict free and is looking forward, but they still suffer, like many developing countries, from high levels of unemployment[8], insufficient economic growth[9], poor wealth creation, overly bureaucratic government, inefficient markets[10], and lower standards of living[11] (Micevska, Eftimoski, & Mircevska, 2002).

This case study focuses on three USAID initiatives in Macedonia that are currently in progress: e-Schools, Macedonia Connects, and e-Biz. The common goals of these initiatives are to further integrate information and communication technologies (ICTs) into society. e-Schools aims to place computers in all the schools, so as to provide students with better educational opportunities and preparation for the modern marketplace. Macedonia Connects was established to bring internet to the schools and, commercially, to the entire country. Finally, e-Biz integrates ICTs into Macedonian businesses so that they can be more productive and grow. Each initiative, in its own way, addresses domestic deficiencies to provide better opportunities for the people of Macedonia. More importantly these projects mimic the traditional on-the-ground stakeholder network where NGOs, USAID, private enterprises, government, and civil society work together to make the projects a reality (CRS, 2004). The projects analyzed here are a microcosm of the greater aid world and can provide many valuable lessons.

One other area, relevant to greater aid literature, to which this case contributes, is the delicate balance between differential diagnoses, as termed by Sachs, and aid learning processes, arguably one of the key reasons for stringent evaluation and oversight. Aid systems must follow prescribed agendas that have proven successful in the past, but only to the extent that enough maneuverability is available for domestic concerns to be addressed (Sachs, 2005). Because of the success of these three initiatives, it is likely that USAID will seek to replicate their models elsewhere. In Macedonia, regulated procedures were used for contracting and project initialization, but then freedom was given to the aid implementers and USAID staff on the ground so that they could adapt the project to function within Macedonia's unique business and governmental cultures.

Methodology to Study Interaction of Stakeholders

Fifteen interviews were conducted over the span of ten days (six work days) with various individuals who have played key roles in implementing the three initiatives. A uniform, open-ended question set was executed for all interviews. The interview mechanism addressed issues related to organizational behavior, institutional roles, effectiveness, project efficiency, feedback and evaluation, and credit-sharing. Also, I spent nearly two days in the Macedonia Connects office, which gave me a more tangible understanding of day to day operations. For the e-Schools and Macedonia Connects project, we visited a school's computer facility. These experiences contributed to a fuller understanding of how the aid network was implemented on the ground.

To help verify the findings and to give this study some quantitative flavor, anonymous surveys were administered to gauge organization communication and information transfer. Included in the survey were questions that measured how often (weekly, monthly, quarterly, annually) organizations utilized email, meetings, reports, etc. to help facilitate coordination. Both the interviews and surveys were framed within an institutional context.

[7] *The country had strong economic growth in the late 1990's, but that pattern was interrupted in 2001 by an ethnic Albanian insurgency (CIA, 2006).*
[8] *Nearly 40% (CIA, 2006)*
[9] *-4.5% (2001); 0.9% (2002); 3.4% (2003); 2.9% (2004); 4% (2005) (CIA, 2006)*
[10] *20%+ of economic activity in a grey market (CIA, 2006)*
[11] *30.2% of population living in poverty (CIA, 2006)*

THE CASE STUDY

Initial Observations

Origins of the three projects were quite similar, with ideation coming primarily from the ground.[12] In being receptive to new ideas and project spin-offs, USAID-MK has accommodated for differential diagnosis – adapting aid projects to best fit local environments, needs, and circumstances (Sachs, 2005). Proposals were then taken to the Global Development Alliance (GDA), which in this case is a division of the Europe/Eurasia Bureau of USAID. After approval, funds were allocated via both GDA and the Last Mile Initiative (LMI). Dot-COM acted as the mechanism through which the funds were contracted out. The Academy for Educational Development (AED) and Education Development Center (EDC) – non-profit aid groups who are the primary partners of dot-ORG and dot-EDU – both competed for the funds. Figure 3 offers a visual interpretation of the avenues taken from proposal to funding to implementation.

There is an opportunity for improvement within the allocation process. When the proposal is brought to Washington USAID should compare it to similar initiatives in other countries. Strategic project improvements can be integrated. This process appears to be weak due to a lack of institutional learning and inter-project coordination.

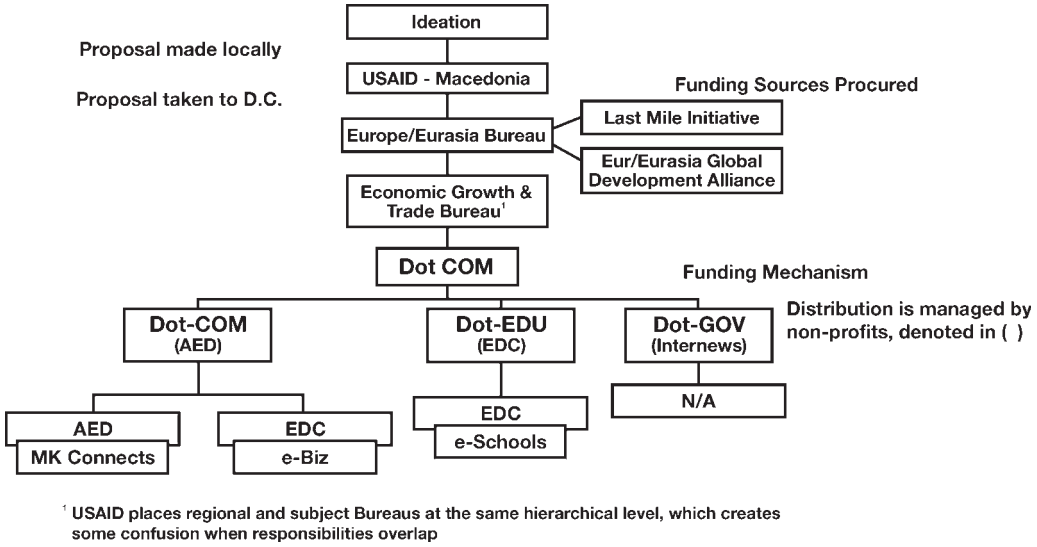

Figure 3. Hierarchy of Project Creation

Figure 3: A visual representation of how ideas were created, and through what institutional bodies the idea was passed before funding reached the ground in Macedonia.

Earlier in the paper it was noted how the aid market structure hinders implementation. A major component of this relates to winning contracts, and how the contracts for these three Macedonian projects were assigned demonstrates some of the complication. MKCon was a homegrown idea that found its way, operationally, to the Europe/Eurasia Bureau's GDA (interview with Peter Lampesis, December 16, 2005).[13] Taking the process one step further, all financial resources were channeled through Dot-COM, which is an alliance of USAID and contractors to fund ICT projects.[14]

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[12] *Expanded upon in Figure 3 and Macedonia Connects project origins*

[13] *In the interview it was noted that the Europe/Eurasia GDA should not be confused with the general UDAID GDA. As an outsider, this is quite confusing, as most people are familiar with the general, USAID GDA. It sounds like this is a Europe/Eurasia "funding source".*

[14] *Research makes it appear as if Dot-COM was an actual bureau inside USAID, but in fact it is only a distribution mechanism used by USAID to connect NGOs with projects and group e-initiatives.*

Dot-COM is managed and dominated by three non-profits. Procurement within the DOT group includes fierce competition amongst mainly three organizations, thus demonstrating how important established networks are to winning contracts. So, in the case at hand, the ideation for MKCon came from within Macedonia, more specifically from e-Schools (EDC). USAID-MK then supported and sharpened the proposal; it was eventually approved for funding in Washington. Initial speculation was that EDC would win the new contract, but it was assigned to dot-ORG instead of dot-EDU, bringing its allocation under the purview of AED (it is shown in Figure 3 that AED manages dot-ORG, while EDC and Inter-News managed dot-EDU and dot-GOV, respectively). An exact explanation of this unexpected shift was not found, but some suggest it was because EDC had a monopoly over e-initiatives in country. Regardless, this demonstrates the bureaucratic and oligopolistic challenges faced in the contracting process.

Understanding politics in Washington is an important part of understanding aid systems. NGOs must win contracts to survive, and that depends on who you know and how integrated your organization is in the USAID network. And it is typically the same organizations that become increasingly entrenched in the USAID network. To survive, rivalries between NGOs are often carried to the ground. For example, by tracing through Figure 3, especially towards the bottom, you can see very specifically how interests and projects can overlap. It was discovered that ground staff are normally not allowed to communicate with each other (by order of their headquarters in the U.S.) (Interview with Natasha Murdzeva, December 12, 2005).[15]

Many projects could benefit from collaboration with other in-country aid actors. Even in this case study, EDC/AED rivalries prevented e-Biz from contributing valuable expertise to MKCon.[16] Competition and self-interest can stall cooperation, which reduces the impact of aid. This lack of cooperation is especially troubling because USAID is making a concerted effort to fund cross-cutting initiatives (interview with Peter Lampesis, December 16, 2005).

e-Schools

The vision with e-Schools was to have computers installed in all schools in Macedonia. As a result, all schools now have access to a computer classroom where students can take computer classes as an elective. Much of the project stimulus for this originated from the late President of Macedonia, Boris Trajkovski. He was able to ascertain a donation 5,300 computers from the Chinese government and then enlist the help of USAID to fund the installation. A contract was handed down by GDA (with a percentage coming from LMI) through dot-EDU to EDC. EDC is the primary contractor on this IQC, while USAID-MK offers necessary diplomatic and strategic support (interview with A. Biblibov, December 12, 2005). Both organizations work closely with the Ministry of Education and Science.

The network is depicted below in Figure 4 in a more comprehensive visual format. Starting from the right and moving to the left, the first component of the graph is the USAID bureaucratic structure. This is the primary source of funding for the initiative, and is a condensed interpretation of Figure 3, adapted to fit the e-Schools project. Connecting the right hand side (funding sources) to the left hand side (implementing groups) are EDC and USAID-MK, which are connected to dot-EDU and the Europe/Eurasia Bureau, respectively. Ideally this is where feedback and evaluation would occur. Once you reach the ground, you come to e-Schools, which is the arm of EDC that executes the installation of computers. Diplomatic support and some project guidance are provided by USAID-MK. The Macedonian government is naturally involved in the project as they provide the link to the schools. China and Microsoft are tangentially connected to the initiative because of their donations (computers and software). Worldlinks, United Nations Development Program (UNDP), and World Bank are all auxiliary organizations that became involved in the initiative once the e-Schools staff shifted their work towards ensuring sustainability through educational integration efforts after the computers were successfully installed. It should be noted that the only relational connect back to USAID-DC is through USAID-MK, but that did not appear to be a very active line of communication.

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[15] *A special exception was made for the e-Schools and Macedonia Connects programs because of their overlapping goals; given their inexorably tied mandates, no communication would have been detrimental.*

[16] *Part of the MKCon project included helping a local Internet Service Provider (ISP) become a marketable company to compete against the state run telecom monopoly. In an interview with this ISP's CEO, it was noted that perhaps the one shortcoming of the aid model was a lack of business support as his company experienced growing pains (Interview with Predrag Cemerikik, December 12, 2005). E-Biz could have easily helped out in this domain as their expertise is essentially business consulting for firms trying to integrate new technologies into their operations. E-Biz would have been better able to provide advice on business growth and company restructuring.*

Figure 4. e-Schools Network

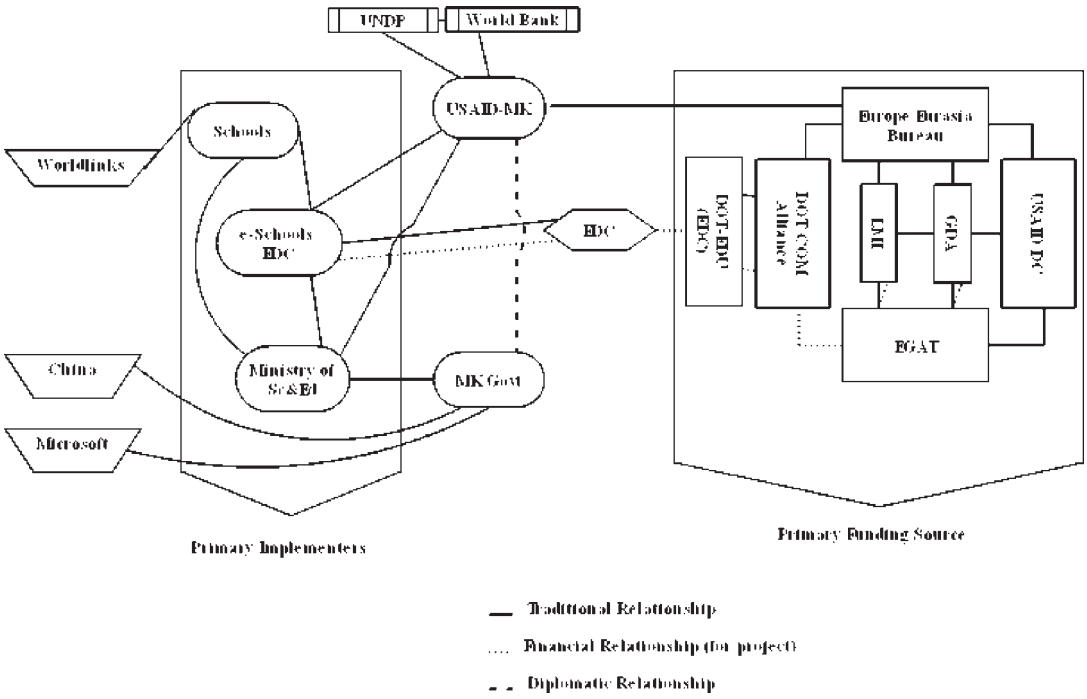

Figure 4. This is a visual interpretation of the stakeholders involved in making the e-Schools initiative a reality. Included are funding, support, and implementing groups/institutions.

Analyzing the e-Schools initiative in the context of our institutional factors, the following conclusions can be made:

- Symbolic Capital: USAID-MK held the necessary symbolic capital to ensure that the project was executed as they wanted and credit was given to the American people (interview with Fisnick Marku, December 14, 2005).[17]
- Isomorphism: The scope of e-Schools was the narrowest of the three projects. It required little institutional change, and the integration of computer science into curricula was the most capricious aspect of the project (but even that met little resistance).
- Fragmentation: It was noted by an EDC employee that one of the biggest challenges was finding a systematic approach to coordinate meetings where all stakeholders were present (interview with Darko Arsov, December 12, 2005). But these challenges were sufficiently overcome and specialization was not disrupted, making fragmentation a positive characteristic of the network.
- External Forces: Some friction came from logistical challenges associated with handling the bureaucratic Ministry of Education and Science (interview with Darko Arsov, December 12, 2005; interview with Fisnick Marku, December 14, 2005). Another challenge that is being overcome is integrating new technologies into the educational curriculum.

A minor problem appeared once the initial computer installations were completed. Because of the nature of the contract, EDC has a strong incentive to spend all the funds allocated to it. As a result, the staff began to move towards sustainability, working on issues such as teacher training and educational support (interview with Darko Arsov, December 12, 2005). Although some progress is being made, it does overlap slightly with other initiatives in country sponsored by the UNDP and Education Modernization Project (EMP) of the World Bank. This is a scenario where USAID-MK oversight is essential, as they have the unique capability to coordinate with other donor bodies and ensure that "extra efforts" are not wasteful.

[17] *Although this was not made especially clear in interviews with the e-Schools representative, an interview from the Ministry of Education and Science revealed that USAID was much more recognized as the focus rather than EDC.*

Overall, though, cooperation and amiable relations were a common theme in interviews. It was specifically noted that there was very little conflict between USAID-MK and e-Schools. Ground execution, for the most part, followed expectations.

It is worthwhile to note the importance of well-trained, experienced employees in implementing projects, and, in this case, a testament to the expertise of NGOs. Macedonia Connects was an idea born out of the shortcomings found in e-Schools by local staff. It was discovered that without internet, the computers would not live up to the needs of the students. As a result, proposals were made first to USAID-MK and then to USAID-DC. In a rather streamlined process, an IQC was extended through dot-ORG to AED (much to the chagrin of EDC) with funding from GDA and LMI. The project was then able to take on a life of its own. The vision was not only connectivity for schools, but for the entirety of Macedonia (interview with Alex Bilbilov, December 12, 2005). Funds would be allocated, as capital investment, to a company through a bidding process.[18] This subsidy (2 years of paid subscription for providing all schools in the country with internet) was given to a local Internet Service Provider called On.net. It gave them an opportunity to create a wireless, broadband infrastructure that would serve not only the schools but also the entire population, commercially, at an affordable cost.[19] Repeatedly, throughout each of these projects, similar situations and initiatives were driven by local change agents.

Macedonia Connects

Making MKCon a reality was quite a challenge and required intense efforts from USAID and AED as well as cooperation from the Macedonian government and other stakeholders. Figure 5 offers a visual understanding of the MKCon network. Once again, tracing the network from right to left, one can see how the project developed from funding to implementation. The right hand side is the non-linear representation of the contracting process that was described earlier and depicted in Figure 3. In this figure it should be noted that the only non-monetary relational connection from USAID-DC to the ground is through USAID-MK. This is bad because the feedback process tends to be business like (as observed on the ground); it involves checkpoints rather than evaluations that could be used for institutional learning. In country, MKCon handled the vast majority of implementation tasks, while USAID-MK and the Macedonian government helped pave the paths to make this ambitious project feasible (interview with Jani Makraduli, December 15, 2005). First, there had to be a lobby to deregulate the internet market so that the state-dominated telecom monopoly could not usurp the network. Liberalization would allow for the market to take shape through competition. Promoting such changes under the guise of education helped remove political obstacles. Simultaneously, capital was supplied to On.net in the form of service prepayments for the school's internet.[20,21] Thus far, the project has successfully connected all the schools through a wireless network (making Macedonia the first all wireless, broadband country in the world), although the commercial stages are still being developed. Only time will tell if the secondary, but more important, goal of the project is successful; the signs thus far are positive.

[18] *MKCon offered a request for proposal, which is where the bidding process originated.*

[19] *This technology allowed them to circumvent the use of land lines that continue to be controlled by the former state-run telecom monopoly.*

[20] *A 2-year supply was provided by aid, with the hope that the schools would be able to absorb the costs thereafter.*

[21] *Motorola is included in figure 5 because of their cooperation and contributions to On.net, which made the internet backbone installation possible.*

Figure 5. Macedonia Connects Network

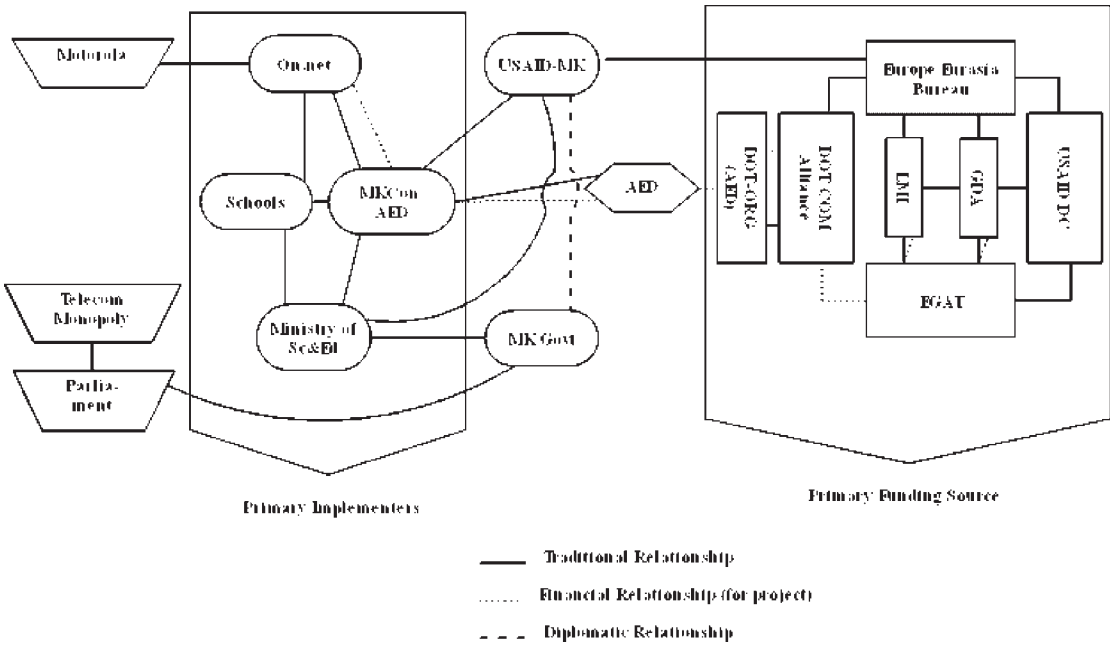

Figure 5. This is a visual interpretation of the stakeholders involved MKCon initiative. Included are funding, support, and implementing groups/institutions.

The scope of MKCon is the most far-reaching of the three projects. It required a deeper level of involvement from a larger number of organizations than the other two projects, which complicated the interactive dimension of implementation. Once again analysis will begin within the context of key institutional factors.

- Symbolic Capital: More so than in the other cases, USAID-MK was able to assert its symbolic capital (interview with Predrag Cemerikik, December 12, 2005; interview with Fisnik Marku, December 12, 2005). This allowed significant trust to be placed in USAID.
- Isomorphism: USAID was able to work with the Macedonian government to institute reform legislation that deregulated the telecom industry and paved the way for On.net (interview with Jani Makraduli, December 15, 2005; interview with Alex Bilbilov, December 12, 2005). Macedonia Telecom provided some resistance and still is somewhat hindering the commercial success of On.net, but their ability to control the market is rapidly diminishing. Another instance of isomorphism was MKCon's ability to offer some guidance to On.net on how to operate a business in a fully free market (interview with Predrag Cemerikik, December 12, 2005). American influences in politics and business were visible in changing local institutional cultures and perspectives.
- Fragmentation: For the most part, each stakeholder was able to contribute in its' own unique capacity.[22] Contributions were facilitated through efficient information transfer and convergence of organizational cultures.

  On a side note, some irony became apparent when it was learned that the one request made of MKCon by On.net was support on management and business consulting types of issues (previously discussed on pp. 14/footnote 16 in the discussion on the role e-Biz could have had); this problem could have been addressed through greater cooperation amongst NGOs/stakeholders on the ground.
- External Forces: Again institutional friction was a challenge; as noted in the isomorphism section, this was overcome. Beyond USAID-MK, though, some credit for this must be given to the incentives laid out for Macedonia by the promise of EU candidacy status.

  On the whole, the relationships amongst the MKCon staff and USAID-MK as well as On.net were very strong. Daily communication combined with amiable relations increased the level of trust amongst stakeholders, which increased cooperation and facilitated progress.

[22] *It should be noted that EU candidacy hopes also helped USAID assert the importance of free markets and liberalization.*

e-Biz

The final initiative studied in Macedonia was e-Biz, an initiative geared to integrate private sector development into public sector aid. It is set up much like a consultancy; EDC-hired personnel work with local companies to use ICT in their businesses to increase productivity and expand their markets. The goal is sustained economic development that can help instill a vibrant business culture in the country. Figure 6 provides an overview of the e-Biz network. Similar to the other two network depictions, the funding source is a non-linear graph of the USAID network (depicted in Figure 3). Connections on the ground are e-Biz and USAID-MK, which are provided through EDC (US offices) and USAID-DC, respectively. This initiative did not require involvement from the government. The main stakeholders are the e-Biz staff and Macedonian small and medium sized enterprises (SMEs) receiving assistance.

Figure 6. e-Biz network

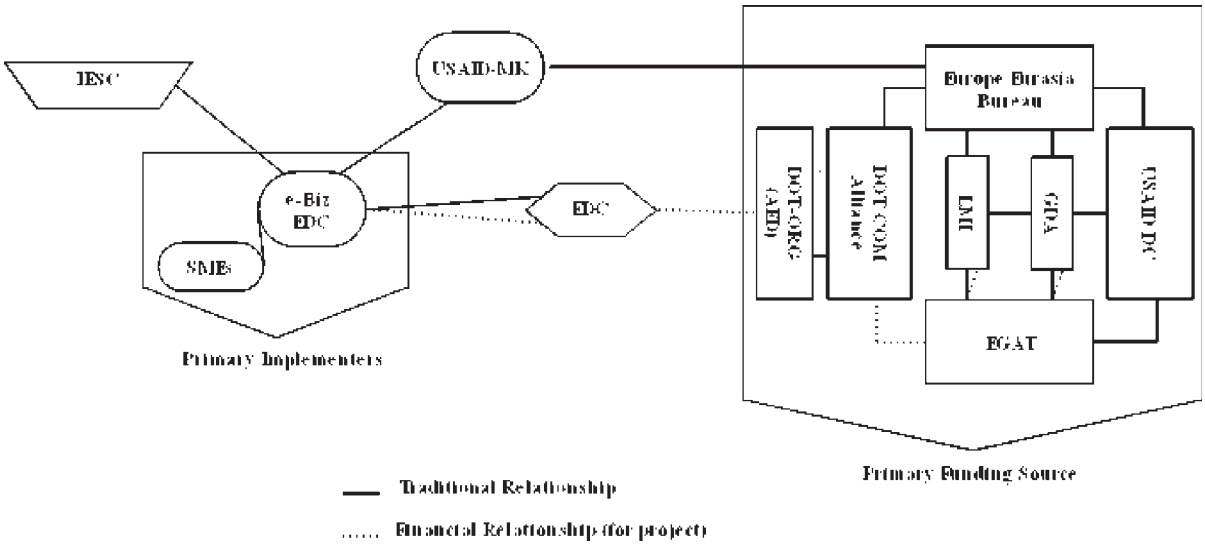

Figure 6. This is a visual interpretation of the stakeholders involved in making the e-Biz initiative a reality. Included are funding, support, and implementing groups/institutions.

Although the structure of e-Biz is not very complicated, some interesting results were found that contrasted with the other initiatives, especially within the institutional framework.

- Symbolic Capital: The power structure of e-Biz was not as clear cut as the previous two initiatives. An interview with the e-Biz Chief of Party revealed that he had much autonomy and that communication with EDC superiors was just as frequent as with USAID-MK superiors (interview with Hal Yaeger, December 14, 2005). Basically USAID-MK did not have an opportunity to build symbolic capital because of the nature of the project, and, as a result, it appeared to be more of an EDC implementation rather than a cooperative effort.
- Isomorphism: Similar to Macedonia Connects, isomorphic tendencies were visible as e-Biz staff imparted knowledge on business operations in a competitive free market.
- Fragmentation: More generally e-Biz had a very simple organizational structure, reducing and simplifying institutional elements.
- External Forces: The main challenge here was e-Biz, as a partially public sector institution keeping pace with the private sector.

Public Diplomacy [23]

A final aspect of USAID-MK is its public diplomacy efforts. Aside from ensuring effective and efficient execution, one of the reasons USAID has an interest in the execution of its projects is because of the positive American image that is created through aid. In the past USAID has not been recognized for their efforts; in 2001 former USAID director Andrew Natsios was quoted as saying, "the NGOs do some very good work in communities, and the people think that the NGOs raise the money, do the work, and have no relationship to the US government" (Timmreck, 2001). Even in Macedonia it was found that only 25% of respondents knew of USAID, and few of them knew exactly how much the US is donating to their country (USAID-MK Communications Strategy: September 2005 – September 2006).

In this case study, it was found that subcontractors clearly understood that their work was for the glory of USAID, and other affiliated groups acknowledged that USAID deserved credit for success because of their strong involvement and financial generosity (interview with Darko Arsov, December 12, 2005; interview with Alex Bilbilov, December 12, 2005; interview with Margarita Grazhdani, December 14, 2005; interview with Teresa Albor, December 16, 2005). This symbolic capital gave them credibility and allowed USAID to implement an aggressive publicity campaign to ensure that the Macedonian people were aware of American efforts to improve their lives (interview with Teresa Albor, December 16, 2005; USAID-MK Communications Strategy: September 2005 – September 2006).[24]

General Results/Analysis

All three projects have been successful to date, so understanding how they overcame institutional challenges provides lessons for USAID aid systems. Several conclusions can be made from a holistic perspective:

- Symbolic Capital: USAID-MK has established a high degree of symbolic capital through their strong presence on the ground and direct involvement in implementation, as is shown in Table 2. This allowed them to maximize their pay-off (i.e. being effective and receiving credit).
- Isomorphism: Initially it can be hard to distinguish isomorphic tendencies since the parties involved shared similar goals, but changes did occur gradually. For implementers, an enthusiastic and visionary mission director was very important to maintain momentum and morale (interview with Peter Lampesis and Natasha Murdzeva, December 16, 2005). More broadly, the Macedonian government and the economy both improved due to the external pressure from the aid projects. Finally, on a broad and more indirect level, are the positive Western influences left on the locally hired staff.[25]
- Fragmentation[26]: Basic economic theory favors specialization. Aid process specialization has high utility because different stakeholders offer different efficiencies. Strong communication and information transfer along with positive relationships help coordinate tasks. USAID-MK maintained a balance between itself and its implementing NGOs that allowed for sufficient freedom of action and an appropriate amount of oversight.

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[23] *Soft power in IR theory.*

[24] *The publicity campaign is part of a USAID branding campaign. Included in this effort are improved relations with local media and greater advertising. It also centralizes the projects under one brand (USAID) rather than numerous project-specific brands (interview with Teresa Albor, December 16, 2005).*

[25] *This point relates more directly to general government and economic ideas, but the impression of USAID bureaucracy is also important, as this may be the closest thing to a well-functioning, non-corrupt government administration that these locals will be exposed to.*

[26] *Tangential to specialization is the notion of empowerment. It is a delicate task finding opportunities for local constituents, such as the Macedonian government, to positively contribute to the effort, as they tend to be inefficient and engrained in their less than stellar organizational cultures. These Macedonian initiatives did well to involve local constituents as much as possible, giving them a voice, but maintaining enough control to ensure implementation was on MKCon (or e-School's) terms.*

- External Forces: The politics of Washington were "left at the border". Battles for contracts in Washington can sometimes shift attention in the wrong direction on the ground, at the expense of results (Cooley & Ron 2002). Fortunately, this was not the case in Macedonia because USAID-MK was able to gain sufficient symbolic capital. Also, the removal of communication barriers by AED and EDC contributed to the success of the e-Schools/MKCon projects. Focus was placed on the real issues. However, that is not to say that the contracting process of these initiatives did not face challenges.[27]

Table 2. USAID-MK Communication frequency

	MKCon	e-School	e-Biz	Min. of E & S	Mk Govt.
USAID-MK	0.799	0.813	1	1	0.813

Table 2: It shows how frequently USAID staff in Macedonia communicated with key stakeholders on the ground. The values are normalized to a range of [0,1].[28] A value close to 1 indicates frequent communication (daily or weekly), whereas a value close to 0 indicates infrequent communication (annually).

Also contributing to the efficient management and implementation of the project were creative and focused staff on the ground. Bornstein compares good aid workers to entrepreneurs, claiming they are "change agents who recognize problems; who understand the political and cultural environment; who have a special talent for spotting opportunities, creating solutions, and building organizations" (2004). Each country has its own set of circumstances that impact the way aid is implemented, especially from an institutional perspective when one considers cultural, business, economic, and political environments. Domestic staff can help USAID overcome these challenges on the ground.

Feedback processes are a final area that merit attention. There may have been too much of an administrative disconnect between Washington and the ground. This is especially true when one refers back to Figure 3 and notices the confusion of bureau responsibility and the dividing out of a funding mechanism; Table 3 shows some of the disconnect between the ground and both USAID-DC and dot-COM, the funding mechanism. Although the focus of this work is on the implementation side, my survey results did allow me some insight on the feedback processes. Communication lines remained open between the ground and USAID-MK and between USAID-MK and USAID-DC, although, there appeared to be an information gap between project specifics and information transfer to USAID-DC. This is because reporting mechanisms dealt more with checkpoints and monetary oversight than with institutional learning processes. Also, there was practically no communication from USAID-DC to the project teams themselves (refer to Table 3). This indicates that Washington did not take advantage of opportunities to learn about the successes and failures of aid initiatives and their methods of implementation. Fortunately, there are signs this may be changing. USAID is beginning to address this concern through programs like EvalWeb, an initiative that seeks to communicate lessons learned in projects to the greater AID community to improve aid effectiveness (USAID, 2006).

Table 3. Communication Frequencies between the implementers and USAID-DC

	MKCon	e-School	e-Biz	Min. of E & S	Mk Govt.
USAID-DC	.016	0	.38	0	0
dot-ORG	.005	n/a	.021	No value	No value
dot-EDU	n/a	.016	n/a	0	No value

[27] *Previously discussed in contracting section.*

[28] *The original survey asked how frequently the parties communicated (i.e. once per year, once per month, once per week, etc.), so values were assigned to these frequencies as follows: 0.2 for once a week (i.e. 1/5); 0.05 for once a month; 0.017 for once a quarter; and .0042 for once a year. These values were then normalized and samples were averaged to give the numbers you see.*

Table 3: It shows how frequently USAID-DC and dot-COM structures communicated with key stakeholders implementing the projects on the ground. All values are normalized to a range of [0,1].[29,30] A value close to 1 indicates frequent communication (daily or weekly), whereas a value close to 0 indicates infrequent communication (annually).

CONCLUSION

This research analyzed the ways in which ground operations are executed in an institutional context. As was demonstrated through the network depictions, assistance is often convoluted and complicated. Macedonia provided a unique case study because, contrary to much of the expectations one would have after reading aid literature, stakeholders on the ground were able to create synergy and execute profound projects (especially Macedonia Connects and e-Schools) that had a substantive impact on the people of Macedonia and a high payoff for USAID.[31] Open channels of communication, high levels of information transfer, strong cooperation, well organized stakeholders, and USAID-MK support were critical success factors.

The case of Macedonia shows us that many positive benefits can result from utilizing NGOs to implement aid initiatives, but that does not remove the need for USAID to have a strong presence on the ground. In working as a partner to the contracted NGOs, USAID was able to maximize their funds for both the Macedonian and American people. Macedonia benefited from the improved status of their education system and market structure, while America won the admiration and gratitude of a Balkan country that may soon find itself as a voting member of the European Union. On a weaker note, though, one visible weakness was a lack of institutional learning occurring between the ground and USAID-DC. It is very important for USAID-DC to learn about what is and is not successful, so that they can ensure greater probabilities of success in future projects. Lessons learned in these three Macedonian initiatives could greatly help projects around the world, or, at minimum, those in Eastern Europe.

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[28] *Please refer to Footnote 28 to see how the values were normalized.*

[29] *No value indicates no value was recorded; n/a indicates not applicable.*

[30] *Not only was a capitalistic culture introduced, but the publicity associated with e-Schools and Macedonia Connects has been very significant.*

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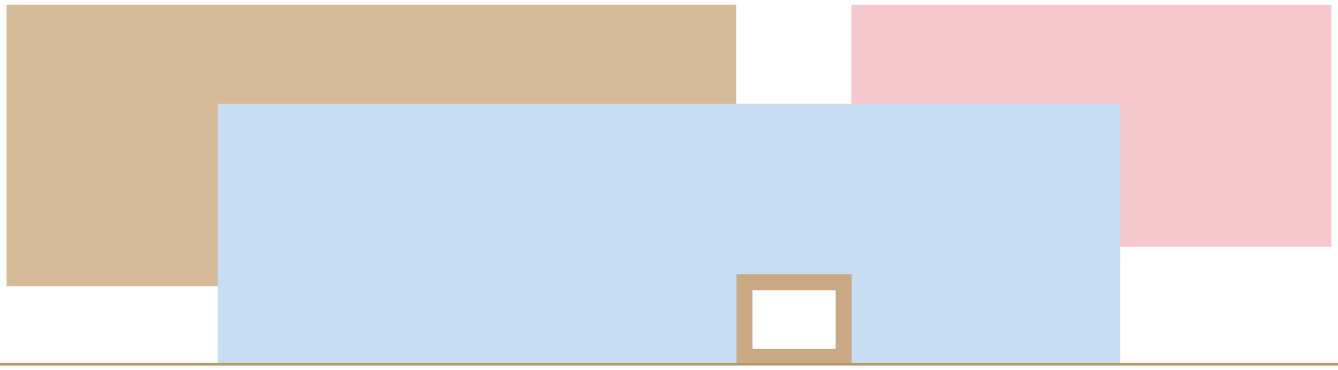
CONNECTING THE RWANDAN COFFEE COOPERATIVES: ECONOMIC ANALYSIS OF NETWORK DEPLOYMENTS FOR RURAL RWANDA

MICHAEL H. SUN



ABSTRACT

UNDER THE USAID LEAD PEARL PROJECT, A NUMBER OF RWANDAN COFFEE COOPERATIVES NOW SELL HIGH PROFIT, SPECIALTY coffee to the international market. Essential to the project's success has been the "richness" in relationships developed between cooperatives and international buyers. As the project nears completion, management and operation responsibilities will be transferred from USAID directly to the local cooperatives. It is critical for the cooperatives to maintain and cultivate these vital business relationships. Currently however, none of the cooperatives have Internet connectivity and few have phone service. USAID wishes to deploy a low-cost, economically sustainable network to the cooperatives that will provide at minimum, e-mail capabilities.

Ten cooperatives are to be connected with varying levels of Internet service. Some cooperatives seek high bandwidth solutions that will support cooperative-run cyber-cafés, bandwidth re-selling, and voice-over-IP, while others desire only connectivity adequate for e-mail. This work proposes several wireless network technologies and topologies capable of connecting the cooperatives. Economic models for WiFi (802.11), pre-WiMAX (proprietary OFDM), VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO based deployments utilizing point-to-point, point-to-multipoint, and cellular-based topologies are constructed and analyzed. Resulting from the analysis are insights on proper technology choices—fixed-link versus cellular-based wireless deployments—key cost factors, and the impacts that NGOs and other external funding agencies have on local telecom tariffs.

INTRODUCTION

Devastated by the genocide of 1994 and by a collapse of international coffee prices throughout the 1990s, the Rwandan coffee industry partnered with the United States Agency for International Development (USAID) to foster the production and sale of high end, specialty coffee, capable of commanding high prices. Through managerial and technical support, the USAID Partnership for Enhancing Agriculture in Rwanda through Linkages (PEARL) project has successfully helped local coffee cooperatives grow, process, and distribute their high quality coffee beans to buyers worldwide. As a result, cooperatives under the program have seen their revenues quadruple and exports increase tenfold.

The high end, specialty coffee industry brands itself as "relationship" coffee. Purveyors of such coffee seek its uniqueness both in taste and in its origins. Marketed as more than just coffee, consumers are attracted by its regional uniqueness and its positive economic impacts on the lives of its growers. USAID/PEARL has done an extraordinary job in developing and nurturing these "rich" relationships cooperatives and international buyers from communicating logistical information such as production figures and quality ratings to providing valuable "soft" resources such as the personal stories of coffee farmers that had been afflicted by the genocide.

As the USAID/PEARL project comes to a close however, all managerial and business operations must be taken over by the cooperatives. Currently, none of the cooperatives have Internet access, and telephone service is sparse. The USAID Last-Mile Initiative (LMI) aims to provide at

minimum, e-mail capabilities to the cooperatives. Higher bandwidth solutions will enable voice-over-IP (VoIP), rich web content, and higher fidelity media such as streaming video. Survey work by Caine and Hargrove (2006) have revealed the strong desire of cooperatives for high bandwidth Internet services such as the World Wide Web and voice-over-IP (Caine and Hargrove 2006). Likewise, international buyers have indicated their interest in live video streams from coffee farms as a means of enhancing the "relational" experience in their coffee shops.

Even with the support of USAID/LMI, connecting all of the cooperatives and providing high bandwidth remains an economically challenging endeavor. This work aims to study in detail a range of potential wireless network solutions incorporating WiFi (802.11), pre-WiMAX (proprietary OFDM), VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO technologies in various point-to-point, point-to-multipoint, and cellular-based arrangements. Economic models incorporating deployment costs and estimated revenue streams are then constructed for the proposed network solutions. Analysis of the resulting models reveals two major insights:

1. Cellular-based Wireless Wide-area network (WWAN) deployments such as GPRS, CDMA2000 1x, and CDMA2000 EVDO are the preferred solutions if enough aggregate demand exists within the coverage area; otherwise fixed-link WWAN deployments utilizing WiFi and WiMAX are more viable when specific locales must be reached and regional demand is uncertain.
2. Operating expenses such as human resources and bandwidth dominate the overall costs of these networks. Bandwidth tariffs generally rise exponentially as bandwidth requirements are increased, but can display great variability across technologies. This is a result of the complex set of revenue and external funding streams telecoms receive that subsidize certain technologies deployments in differing ways.

RELATED WORK

The corpus of work relating to network deployment for rural regions generally falls into three categories: high-level qualitative commentaries on factors critical to sustainable Internet access; case study reports on real-world deployment experiences; and economic analyses of deployment strategies and technologies.

Best and Maclay (Best and Maclay 2002) argue that disinterest of businesses and political entities in undertaking the provisioning of Internet access in rural is chiefly due to the misconception that markets do not exist for such endeavors, requiring economic subsidy and financial loss. They believe Internet access is sustainable given low capital and recurrent costs, diverse fees and services, proper use of network effects, appropriate policy, and sufficient local capacity. Several other works support the claims of Best and Maclay. Hudson cites the explosive growth of mobile phone services in rural areas and argues that demand does exist for Internet access (Hudson). Galperin (Galperin 2005) highlights the potential benefits of using WLAN technologies by theorizing about the potential low cost deployments involving WiMAX, and cites examples of successful WiFi deployments in Peru.

In contrast to high-level analyses, a number of projects have deployed experimental wireless networks in rural areas around the globe. The N-Logue project employed a Wireless Local Loop (WLL) network technology developed by the Indian Institute of Technology-Madras called CorDECT, in providing low cost Internet access to rural regions in India (Narayanan, Jain et al. 2005). The Digital Gangetic Plains project developed and deployed a mesh network in the rural plains of India utilizing low cost WiFi links and equipment (Bhagwat, Sanghi et al. 2004). Improvements to the 802.11 protocol for long-distance use were made as a result of the project.

Most similar to our work is the economic analysis performed by Mishra, Hwang et al. (Mishra, Hwang et al. 2005) on the sustainability of various WLAN and WWAN technologies. Their model examines a deployment in Akshaya, India, and concludes that a network utilizing WiFi for the back-haul links and CDMA450 for the access network provides the lowest cost solution.

PROJECT SETTING

Rwanda is a small, landlocked country in East Central Africa comprised mostly of grassy uplands and hills with a total land area of roughly 26,000 square kilometers. With a population of over eight million inhabitants, it is the most densely populated country in Africa averaging 230 people per square kilometer ("ECA's Rwanda-Background", n.d.). Despite the high population density, the level of urbanization remains low at 6.4%. The majority of the population engaged in subsistence agriculture. As a result, Rwanda remains an extremely poor country with a GDP per capita of US$210 (Nsengiyumva and Stork 2005).

Three telecoms/ISPs currently operate in Rwanda. MTN-Rwandacell is the dominant mobile telecommunications operator with a GSM/GPRS network covering an estimated 70% of Rwanda. Artel has been addressing rural telephony through their satellite-based VSAT deployments, but performance and penetration remain low. Terracom, a new telecom and ISP is aggressively implementing a fiber-backed network and deploying CDMA2000 coverage. Their acquisition of the incumbent government telecommunications provider, Rwandatel, means they operate much of the existing wired telecommunications infrastructure (Nsengiyumva and Stork 2005). Major urban areas such as Kigali are connected through leased lines, frame relay, ISDN, with newer technologies such as fiber and CDMA2000 EVDO now entering the market. The rural areas however still lag far behind in connectivity. Overall, Internet penetration remains extremely low at 0.3% (Stats).

Deploying networks to the cooperatives in rural Rwanda presents unique challenges and constraints. Such rural areas are characterized by low disposable income, high cost per line, weak economies of density, and poor infrastructure to support the operation and maintenance of networks (Gasmi and Virto 2005). These areas are coverage-limited, where demand is elastic relative to geographic area covered, and not capacity. The power infrastructure in the rural areas of the cooperatives remains primitive with many areas without access to any power. Transportation around many cooperative sites is limited, with access restricted by hilly terrain and poor roads.

Figure 1 - Coffee cooperatives and cell base stations

Figure 1 shows the geographic distribution of the cooperatives and existing cellular base stations around the country. Many cooperatives are within reach of existing base stations[1]. The liberal regulatory environment of Rwanda also allows several technologies to be used for connecting the cooperatives—voice-over-IP (VoIP) is permitted and the 2.4 GHz frequency spectrum is unlicensed. These factors bring optimism that innovative, cost-effective solutions can be found to network the cooperatives.

TECHNOLOGIES

In the rural areas of the cooperatives, low population densities and high costs of building wired infrastructure necessitate the need for wireless network technologies. Wireless technologies ar used for both wide area networks (WANs) and local area networks (LANs).

Network Topology

Wireless WANs (WWANs) are generally constructed in two tiers: a backbone network comprised of Points of Presence (POPs) interconnected by backhaul links and access networks that connect POPs to endpoints such as telecenters or cybercafés. WWAN access networks can be implemented with a range of topologies, generally falling under two categories. Fixed-link networks provide point-to-point, point-to-multipoint, or multipoint-to-multipoint (mesh) connectivity between stationary endpoints. Cellular networks provide access for entire coverage areas to both stationary and mobile clients. Ranges for both fixed-link and cellular-based networks can reach 30 km. Sites with access to the WWAN access network can further share their network connectivity with local entities through the use of a wireless LAN (WLAN). Figure 2 illustrates WWAN and WLAN network topologies.

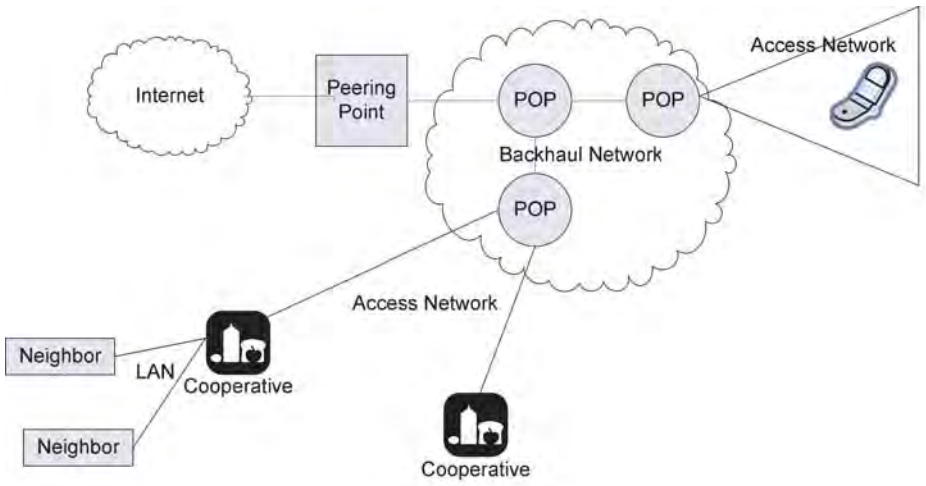


Figure 2. WWAN and WLAN topologies

Network Technologies

Since a backhaul network exists in most parts of the country, we focus our attention on access networks.

WiFi (802.11g): Originally designed for short-range LAN use, the use of higher power transmitters and high-gain direction antennas enables long range point-to-point links of up to 30 km to be achieved. 802.11g operates in the unlicensed 2.4 GHz frequency spectrum, providing both high capacity and long range. The standard's immense popularity has allowed significant commoditization of equipment resulting in very low costs. For our work, we have chosen the Cisco 1300 series of 802.11g access points and bridges.

[1] *Cellular base stations have a coverage radius of roughly 30 km. Obstacles such as hills, dense vegetation, and other factors can greatly affect actual ranges.*

Pre-WiMAX OFDM: WiMAX technology promises much greater capacity and range than WiFi through the use of a technique called orthogonal frequency-division multiplexing (OFDM). WiMAX has only recently been ratified, and equipment has yet to appear in marketplace. We have chosen to evaluate other OFDM-based technologies, so called pre-WiMAX equipment, as representative of WiMAX's capabilities and costs. Motorola's line of Canopy solutions provides OFDM equipment capable of operating in the 2.4 GHz (unlicensed) frequency spectrum. Specifically, we evaluate the Motorola Canopy 2.4 GHz, 10 Mbps line of backhaul equipment[2]. This equipment provides point-to-point links reaching up to 30 km.

VSAT: VSAT satellite technology provides network connectivity to sites without the need for a backhaul network. Artel is the primary operator of VSAT services in Rwanda, and we have performed our evaluation based on the performance and costs figures they offer.

GSM/GPRS: A second generation (2G) cellular technology, GSM is the voice communication component, while GPRS provides data services of up to 48 Kbps. Depending on how GSM/GPRS base stations are configured, coverage can extend up to 30 km. Modeling their costs and revenues can be extremely difficult however; such information is often kept under wraps by telecoms and equipment vendors. For that reason, when modeling the GSM/GPRS, we rely on the pricing of services offered by MTN-RwandaceII.

CDMA2000 1x/EVDO: A third generation (3G) cellular technology, CDMA2000 provides both voice and high bandwidth data services. CDMA2000 1x allows up to 144 Kbps of data bandwidth while the newer revision, CDMA2000 EVDO, can deliver up to 3.1 Mbps on the downlink and 1.8 Mbps on the uplink. Both technologies share similar ranges of up to 30 km. Similar to GSM/GPRS, data equipment costs and revenue are difficult to obtain; we therefore base our models on subscription prices offered by Terracom.

METHODOLOGY

Our analytical approach evaluates the costs and potential revenues associated with deployments at various cooperatives for each technology, utilizing the net present value instrument to determine economic viability over a ten year period. Our approach:

1. Models the costs of various fixed-link WWAN access technologies.
2. Models the costs associated with various WLAN technologies.
3. Determines the network needs and estimates potential revenue streams for the various types of cooperatives.
4. Determines the net present values (NPVs) of deployments for four types of cooperatives utilizing various WWAN and WLAN technologies.

Cost Modeling Fixed-Link WWAN Access Technologies

We model the capital expenditure (CAPEX) and operating expenditure (OPEX) costs associated with WiFi and Motorola Canopy 2.4 GHz for a point-to-point WWAN access network over a ten year period. CAPEX items include base station equipment and customer premises equipment as well as installation charges. OPEX items include maintenance and power costs. The technology with the lowest aggregate cost is chosen as the most viable fixed-link WWAN technology.

Cost Modeling WLAN Technologies

The costs associated with WLANs based on WiFi, Motorola Canopy 2.4 GHz, and Motorola Canopy 900 MHz technologies are modeled. Aggregate costs over a ten year period for the various WLANs are calculated. The lowest cost technology is then chosen to be the baseline WLAN technology choice for the remainder of the analysis.

[2] *Though it is marketed for use in a backhaul network, we are evaluating its use for a long-range point-to-point access network.*

Determining the Needs and Capabilities of the Cooperatives

There are ten cooperatives requiring varying forms of Internet connectivity. We have categorized them into four types according to their needs and characteristics.

- The *Sub-POP cooperative type* resides in a locale with a substantial business district. There is enough demand to support a cooperative-owned cybercafé and the reselling of capacity to local schools, health centers, and government offices. They require fairly high bandwidth (at least 384 Kbps) and a WLAN network to share Internet connectivity with neighboring entities.
- The *Telecenter cooperative type* operates a cybercafé, but does not resell bandwidth to local entities. 256 Kbps of bandwidth through the WWAN is sufficient.
- The *Rich cooperative type* desires high quality connectivity (at least 128 Kbps), but does not run a cybercafé or resell to local entities.
- The *Minimalist cooperative type* resides in an isolated locale and requires minimal connectivity for e-mail use (48 Kbps).

Assessing the Overall Economic Viability of Deployments

Using a discount rate of 15% over a ten year period, we model the NPVs of deployments utilizing the most lowest cost fixed-link WWAN technology (determined in Section 5.1), VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO for all four cooperative types. When a WLAN is needed to resell capacity to local entities, the lowest cost WLAN determined in Section 5.2 is used.

CAPEX items:

- Base station equipment (access points, antennas, routers, power supplies, wiring)
- Customer premises equipment (computers/laptops, network cards, routers, wiring, power supplies)
- Mounting equipment and installation costs

OPEX items:

- Maintenance and power costs
- Personnel expenses (cybercafé manager)
- Bandwidth/Internet subscriptions

Each cooperative is assumed to be capable of affording US$220 annually for Internet access by itself. A cybercafé run by the cooperative is estimated to earn US$3198 annually. For *Sub-POP type cooperatives*, it is assumed that bandwidth is resold to three neighboring entities, generating combined revenues of $US660 annually.

ECONOMIC ANALYSIS

We report in this section the results of our economic models, highlighting key cost factors and preferable technology choices.

Costs of WLANs

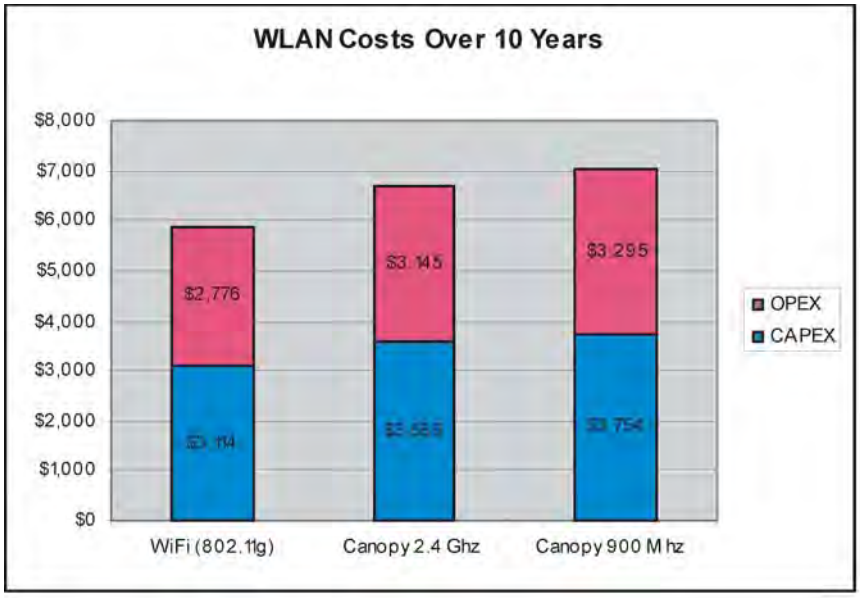


Figure 3. Aggregate costs of various WLAN technologies over a 10 year period

Figure 3 illustrates the costs associated with deploying a WLAN at a cooperative site, allowing three other local entities can share network connectivity. For all three technologies, the ratio of CAPEX to OPEX costs is nearly the same, roughly 1.1. Though all are relatively comparable in cost, a WLAN based on WiFi provides the lowest aggregate cost. A WiFi WLAN is used as the baseline for our other models.

Costs of Point-to-Point WWAN Access Technologies

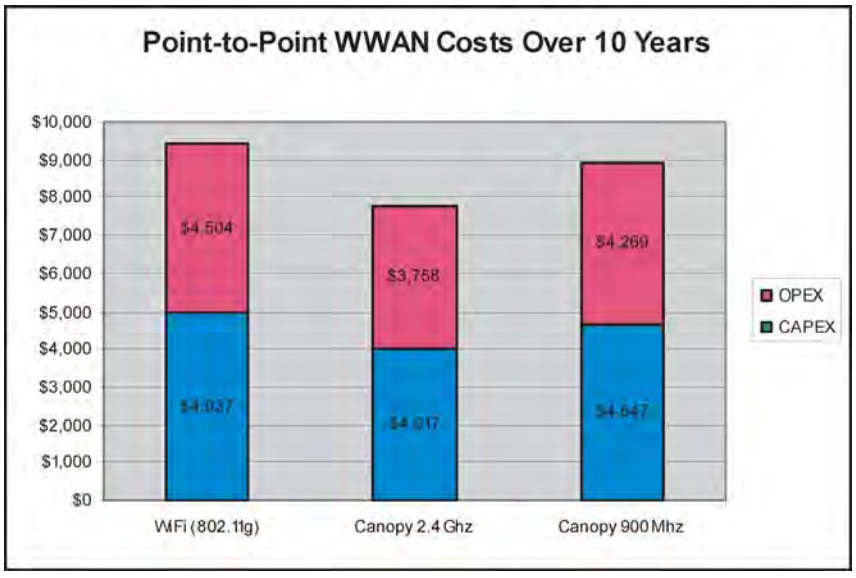


Figure 4. Aggregate costs of various WWAN access technologies over a 10 year period

We see in Figure 4 that CAPEX and OPEX for point-to-point WWANs have roughly the same ratio as in the WLAN case. However, the Canopy 2.4 GHz solution becomes the lowest cost solution when long range is required.

In examining the CAPEX structure for the three technologies, we see that equipment costs are distributed differently. Figure 5 illustrates that for WiFi, the costs are fairly evenly distributed between the POP and the cooperative site. In the case of Canopy 2.4 GHz, a significantly larger proportion of the cost is borne at the cooperative site. For Canopy 900 MHz, the situation reverses as the majority of cost is located at the POP.

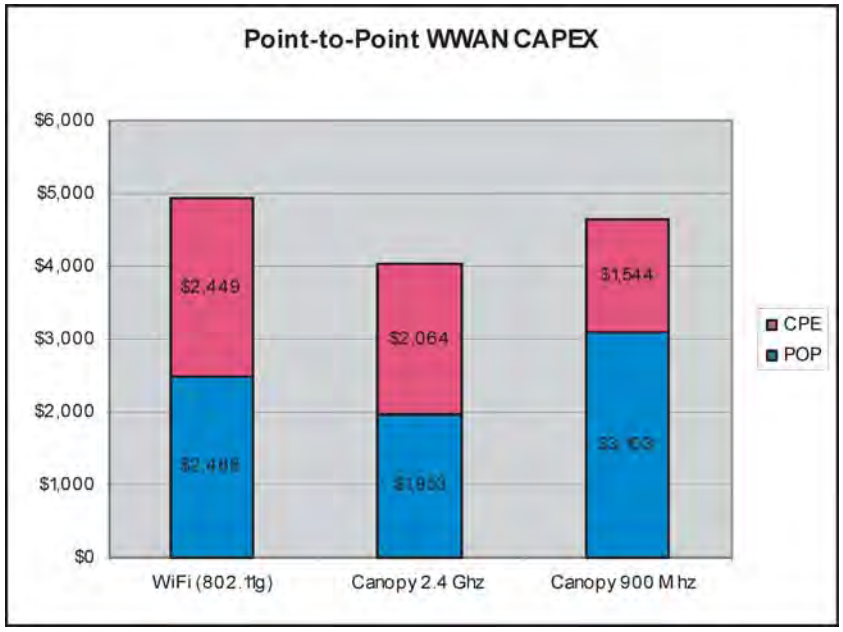


Figure 5. Point-to-point WWAN CAPEX

Overall Viability of Technology Deployments

After determining that WiFi is the lowest cost solution for WLANs and Canopy 2.4 GHz for fixed-link WWAN access networks, we proceed to determine the overall economic sustainability of deployments utilizing these technologies in addition to VSAT, GSM/GPRS, CDMA2000 1x, and CDMA2000 EVDO. We derive NPVs over a 10 year period for each technology solution and cooperative type in Table 1.

Table 1. NPVs of various technology solutions

Technology	Net Present Value			
	Minimal Coop	Rich Coop	Telecenter Coop	Sub-POP Coop
Canopy 2.4 GHz	-$8,072	-$12,105	-$15,814	-$39,377
VSAT	-	-$29,400	-	-
GSM/GPRS	-$2,352		-	-
CDMA2000 EVDO	-$8,309	-$10,999	-$16,729	-$30,024
CDMA2000 1x	-$4,814	-$8,847	-$17,804	-$28,952

None of the proposed solutions produce a positive NPV for any cooperative. For the *Minimal cooperative type*, existing GSM/GPRS from MTN-Rwandatel is the most cost effective. For a *Rich cooperative type*, the existing CDMA2000 1x service provided by Terracom proves most cost effective. As bandwidth requirements increase, the Canopy 2.4 GHz fixed-link solution becomes the most viable solution. Surprisingly however, as bandwidth requirements increase to 384 Kbps for the *Sub-POP cooperative type*, the cellular-based CDMA2000 EVDO technology becomes the most cost effective solution.

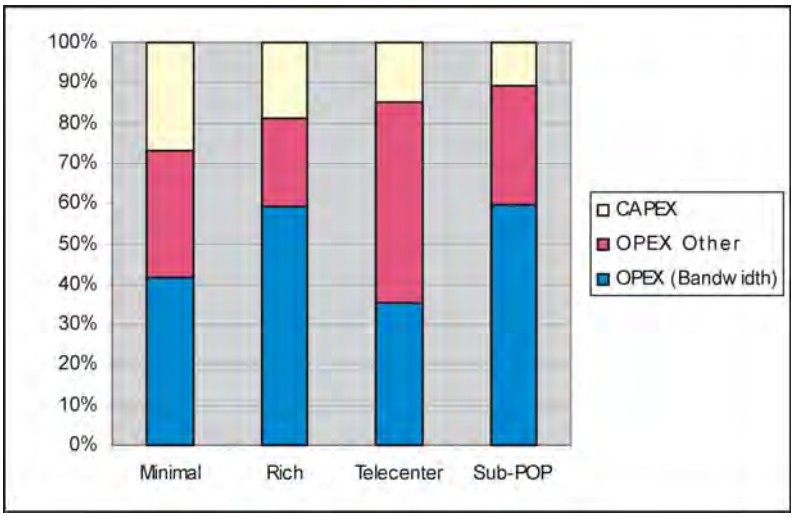


Figure 6. Bandwidth as a fraction of costs for Canopy 2.4 GHz

We investigate further how varying bandwidth requirements affect technology choices. In Figure 7, we see that bandwidth costs make a significant portion of the total cost of a 2.4 GHz solution, roughly 25%. Figure 7 illustrates that at lower bandwidths (64 Kbps, 128 Kbps), CDMA2000 1x has the lowest cost of bandwidth. When 256 Kbps of bandwidth is needed, the cost of bandwidth rapidly increases for CDMA2000 1x, while the cost of bandwidth for a Canopy 2.4 GHz deployment grows at a much lower rate. But when 384 Kbps of bandwidth is needed, the cost of bandwidth skyrockets for the Canopy 2.4 GHz deployment, resulting in the CDMA2000 EVDO deployment having the lowest bandwidth costs. This leads to the conclusion that the price of bandwidth for each technology deployment is the dominant factor in determining overall viability, and not equipment costs.

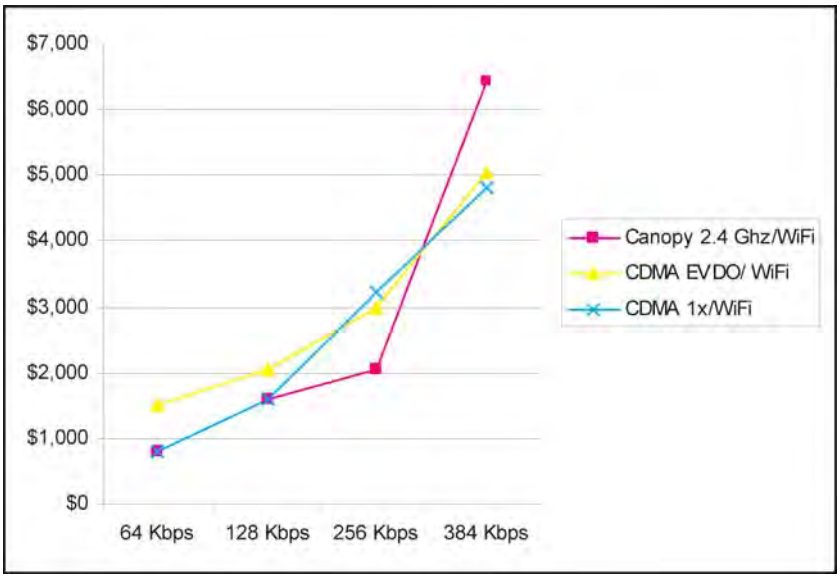


Figure 7 - Internet bandwidth/subscription costs

DISCUSSION

Bandwidth as the Key Cost Factor

The analysis has shown the sensitivity of cost effective deployments to bandwidth prices. More important than equipment costs and the transport capabilities of access technologies is the technology's ability to determine the price at which it can obtain bandwidth. As was seen, the pricing for bandwidth can vary greatly across technologies and capacity. Such disparate and non-linear pricing of bandwidth may be surprising since all technologies solutions eventually utilize the same backhaul network. One reason is that fixed-link solutions do not allow much overbooking of leased bandwidth, while cellular-based technologies can take significant advantage of such a scheme. But more significant reason is due to the complex pricing structures developed by the bandwidth providers. Raw backhaul bandwidth costs—the actual costs to the backhaul providers—grows exponentially as bandwidth capacity is increased. It is often the case however, that funding from various donor organizations and government entities will be earmarked for particular technologies or deployments. For example, CDMA2000 deployments may have a large portion of their costs subsidized and this subsidy is then reflected in the reduced tariffs for CDMA200 bandwidth. As a result, what determines cost-effectiveness for network deployments in Rwanda is not necessarily the lowest cost technology solution, but the technology solution that has received greatest subsidy or support within a telecom.

Fixed-link versus Cellular Deployments

The analysis has shown that both fixed-link and cellular-based deployments can provide the most economically viable solution depending on bandwidth needs. All of these models have so far assumed that cooperatives are within range of an existing cellular tower. For point-to-point WWAN technologies, this means that costs for a POP include only the WWAN equipment, and not the expense of physical tower construction. Cellular solutions such as GSM/GPRS and CDMA2000 1x/EVDO were modeled under the assumption that such services were already available or would be made available to the cooperatives at the current market prices offered by the telecoms. A corollary to this assumption is that existing cellular deployments often have enough aggregate demand in their coverage areas. If a cooperative is not within range of an existing tower however, the costs and viability of cellular deployments changes dramatically.

For cellular operators, the rough cost of deploying a new base station (tower and equipment) exceeds US$100K. In order for the operator to offer their advertised subscription prices, enough latent demand would have to exist in that locale to offset the large capital cost. These rural regions are marked by uncertainty of demand and provisioning of new base stations can be a risky endeavor.

When specific sites in areas in which cellular towers do not already exist must be connected, it is a less risky proposition to deploy fixed-link access networks. Even with the cost of new towers factored in, the total CAPEX of such deployments remains below US$40K—well below the cost of new cellular base stations.

CONCLUSION

We have evaluated the costs for several technology deployments capable of connecting the ten coffee cooperatives around rural Rwanda. Depending on the needs of individual cooperatives, various technologies offer the lowest cost solution. These choices are dictated less by actual technical capabilities and costs, but rather by bandwidth tariff structures offered by backhaul providers. When a cooperative is not within range of an existing base station tower and latent demand in the area is uncertain, fixed-link WWAN technologies offer the most cost effective, risk averse solution.

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3G IN CHINA: A RESOURCE-BASED EXAMINATION OF TELECOM FIRMS IN CHINA

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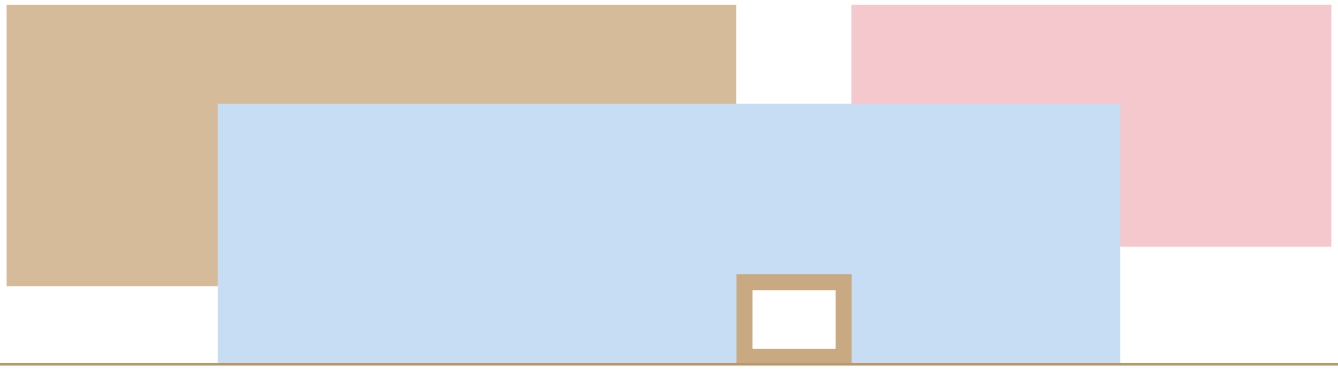

ABSTRACT

INTERNATIONAL AND DOMESTIC TELECOMMUNICATIONS FIRMS IN CHINA ARE WORKING ACTIVELY ON THE R&D OF 3G, OR THE THIRD generation mobile communications before China licenses any standard for commercial use. This paper uses the resource-based perspective of a firm's sustained competitive advantage to examine and compare the long-term competitive advantage of multinational telecom firms and Chinese telecom firms in terms of 3G strategies. It concludes by going beyond the resource-based perspective and discussing what the current 3G R&D situation means to China.

INTRODUCTION: 3G

3G is the third generation mobile communications that allows mobile subscribers to use data service as well as voice. Compared with the second generation (2G), 3G does better in high-speed data services, such as providing videocommunication, videoconferencing, and news, music, and data downloading services for mobile subscribers. Three international 3G standards have been approved by International Telecommunication Union (ITU): W-CDMA, which is widely accepted and used in Europe; CDMA2000, primarily used in the United States; and TD-SCDMA, China's homegrown standard submitted by China's local telecom company Datang in 1998 and approved by ITU in May 2000.

Unlike the European or the American markets where 3G operations have been in commercial use for years, the Chinese market has not officially started. On Jan. 20, 2006, China approved TD-SCDMA as the national 3G standard, but has not issued licenses of any 3G standard to operators for commercial use. Some people think that TD-SCDMA will take its day, while more and more people are convinced that all of the three standards will find their space in China sooner or later (Zhao, 2005). The fact that TD-SCDMA has been announced as the national standard is believed to give it priority to be chosen as the standard that will be licensed soon. However, it is still possible that China will offer 3G licenses to operate using WCDMA or CDMA-2000 alongside TD-SCDMA (Clarke, 2006). Also, telecom firms can manufacture products based on different standards as long as they are compatible with the standard that is to be licensed and adopted (Sohu IT, 2006). The questions of how many licenses will be issued, which operator will get the license(s), and which standard(s) will be licensed have been in debate for years. Since before official licensing of 3G standard(s) it is important to consider questions, such as whether it is necessary to construct overlapping 3G networks by multiple operators on the same standard(s), it is reasonable that it takes time for the Chinese government to think it over on issues related to 3G licensing (Wu, 2006).

While it is not clear which standard will be finally licensed, telecom firms have been working on 3G for years. Multinational telecom firms arrived and are expanding their 3G R&D work in China not only because they believe that 3G will be the key technology soon in China. China is also recognized as too important a market for 3G to be ignored by anyone (Liu, 2004). By the end of 2004, there had been about 335 million mobile phone subscribers. By Jan. 2006, there had been more than 398.8 million users (MII, 2004 & 2005). Officials of China's Ministry of Information Industry (MII) estimated that mobile phone subscription will keep growing in the next several years, with an average increase of 15 percent, and it is estimated that 3G users will have been about 200 million in China by 2008 (TD-SCDMA Forum, 2004). Since the late 1990s, both multinational and domestic telecom firms in China started the R&D work of 3G.

Looking back to the 2G time, we find that international telecom firms played a predominant role. After China adopted GSM as the 2G standard in 1994, international telecom firms came and occupied the huge Chinese market. Due to the barriers to entry, Chinese firms were not able to compete until the late 1990s. While the multinational corporations enjoyed their first-mover advantages, Chinese firms, such as Huawei and Zhongxing, finally stepped into the market by going to the remote areas such as those in the mid-western region and also the eastern region where international telecom firms did not consider. The high-power and low-cost base stations produced by Chinese telecom firms met the opreators' needs to expand the peripheral networks at a low cost. Chinese firms thus successfully seized a portion of the 2G market gradually, and dropped the price of the network technologies and equipment (Sun, 2005). However, in 2004, the investment to GSM (2G) waned (CCID Consulting, 2004). When the GSM market goes into saturation, there is hardly space for them to grow (Qiu, 2005).

Unlike 2G, 3G offered a better opportunity for domestic players to compete with their international competitors in the game in China. Currently, the Chinese government has not licensed the standards yet, and all their work is primarily on R&D. Multinational telecom firms have gained experiences of 3G operation from European and/or other markets. Comparatively, some Chinese firms are working on China's own standard TD-SCDMA, while the others are also working on CDMA2000 and/or WCDMA, and are opening up successfully the 3G markets in Europe and other parts of the world.

The purpose of this paper is to compare the sustained competitive advantage of international telecom companies and local telecom companies in R&D of 3G, and discuss the domestic telecom firms' position in the 3G time.

THEORETICAL FRAMEWORK: RESOURCE-BASED PERSPECTIVE

The resource-based view of sustained competitive advantage examines a firm's physical, human, and organizational resources to measure a firm's long-term competitiveness. The physical capital resources include the physical technologies a firm uses, its plant and equipment, its geographic location, and its access to raw materials. The human capital resources include the training, experience, judgment, intelligence, relationships, and insight of individual managers and workers in a firm. The organizational capital resources include a firm's organizational capital resources include formal reporting structure, its formal and informal planning, controlling, and coordinating systems, and informal relations among groups within a firm and between a firm and those in its environment (Barney, 1991, p. 101).

Based on the assumptions that firm resources are characterized by some degree of heterogeneity and immobility, this perspective argues that a firm's sustained competitive advantage should be examined in terms of the value, rareness, imitability, and substitutability of its resources. When a firm implements a strategy that satisfies all the four aspects, the strategy the firm is implementing can result in its long-term competitive advantage (Barney, 1991).

METHODS

In this paper, I examine two groups of firms, international or multinational telecommunication firms and China's local telecommunication companies. The international telecom firms include Siemens, Nokia, Ericsson, and Motorola; the domestic telecom firms include Huawei, Zhongxing (or ZTE, Zhongxing Technologies and Equipment), and Datang. Both groups have been active players in the 2G era, and are currently actively involved in the R&D of 3G standards.

I conducted three telephone interviews (with Yijiang Cheng of Siemens, Yingfei Huang of Nokia, and Peng Dai of Ericsson), and had an email correspondence with Sharon Chen of Huawei. I also used online newspaper reports and articles as well as these firm's websites to collect information about them.

Firms or telecom firms in this paper refer to telecommunication firms working on R&D in 3G standards in China. They are the equipment and network technologies provider rather than operators.

The limitation of this paper is that some information is not available either from the phone interview or from the web. Based on the information I collected, I examine physical capital resources and human capital resources, which are directly related to R&D activities.

In the next sections, I will discuss these firms' physical capital resources and human capital resources, and then discuss the four closely related standards Barney (1991) uses to measure firms' sustained competitive advantages: value, rareness, imitability, and substitutability of the international telecom firms and domestic firms in China. It will conclude by going beyond individual firms' resources and examining the advantages and disadvantages of Chinese telecom firms in general in the 3G game.

PHYSICAL CAPITAL RESOURCES

In Barney's (1991) framework, physical capital resources include the physical technologies a firm uses, its plant and equipment, its geographic location, and its access to raw materials (p. 101). In the case of 3G R&D in China, we have reasons to believe that, having R&D capabilities, all of these telecom firms have and employ state-of-the-art technologies, including hardware and software necessary for research. For the purpose of this paper, the focus is on geographic location.

The geological location is important to R&D because the right environment in terms of both public policies and customer's needs can help with R&D work in general and the development of marketable features in specific. Telecom firms have established research centers in many cities in China to conduct R&D activities related to 3G. Siemens, for instance, have founded research centers in Nanjing, Beijing, Shanghai, and Hangzhou to work on the software part (please refer to figure 1). These big cities are traditionally well developed, and many multinational corporations as well as big domestic enterprises have established headquarters or offices there. In addition to these cities, in Sep. 2005, Siemens went into the Western Region by setting up a new R&D center focusing on the R&D and testing of mobile business application platform in Chengdu, Sichuan (Luo & Chen, 2005).

The Chinese government is developing the Western Region, with favorable policies in terms of stock proportion multinational firms can hold, tax, credit, and government-sponsored infrastructure construction. Chengdu, as a big and core city in the region and the capital city of Sichuan Province, has attracted a huge amount of foreign investment. On Apr. 1, 2004, Chengdu issued and announced policies of encouraging the development of the software industry. According to Chengdu's deputy mayor Kangli Hao, the foci of the development are on security safety software, digital entertainment software, integrated circuit, and software outsourcing. Many big multinational and Chinese software and communications corporations have invested and established research centers or branches in Chengdu, such as Motorola, IBM, Microsoft, Intel, SUN, Oracle, China's Neusoft, Shenzhou Digital, etc. Hao also said that new academic programs related to digital entertainment will be established in more than 10 universities in Sichuan to train human resources for the development of the industry (Wang, 2004).

Figure 1. Map of China

Source: http://www.travelchinaguide.com/map/index.htm

In line with the local government's policies on developing digital entertainment and other features, telecom firms chose Chengdu as the location for their new R&D centers. The focus on entertainment provides an incentive environment for the R&D of the application of 3G technologies, such as IMS (IP Multimedia System), according to Yingfei Huang (2005) of Nokia. Nokia opened its 6th R&D organization and 2nd R&D center for 3G in Chengdu in 2005. This center works on the R&D of IMS on 3G and on IP. The first 3G R&D center in Hangzhou founded in 2002 is geared towards wireless network technologies, while the one in Chengdu focuses on services and applications. The two centers complement and facilitate each other, and make Nokia better prepared for the Chinese market (Ji1, 2005).

Before Siemens and Nokia went there, Ericsson established its China Western Region District in 2004 in Chengdu, which works on base station products suitable for GSM, CDMA, and WCDMA for Chinese and global markets, as well as working on R&D of 3G standards for the Chinese market. By May 2005, Ericsson has finished its strategic planning of 3G in China by setting up its 7th R&D center in Guangzhou in South China. Ericsson has research functions in Beijing, Shanghai, Qingdao, etc. The one in Guangzhou in South China will improve their overall strategic layout in China (Huang, 2005). Ericsson aims at facilitating the sales and export of the Chinese market through the localization of R&D and production in China (Ji2, 2005).

Motorola established a 3G R&D center in Beijing in 2005. Its work includes the global R&D of 3G network solutions, with specific attention to 3G and super-3G technologies including UMTS and HSDPA (Li, 2005). Till the end of 2005, Motorola China Institute has 19 R&D centers in China, with more than 1,600 R&D engineers.

According to the CEO of Motorola China, Ruibin Gao, Motorola will move its global center of R&D function to China, from where Motorola will support the global market. To them, it is not just to outsource the production, but to introduce advanced technology to China, and promote the R&D as well as the localization of technologies and human capital in China. The localization of R&D, production, and purchase will promote the development of China's whole industry chain, according to Gao (Yu1, 2005).

Chengdu is also known for its educational and research resources. It was one of the three electronic industry bases in China, and it has information-oriented universities, colleges, and research institutes, which gives it advantages in human resources in ICT (Notice, 2003). Furthermore, the employee turnover in Chengdu is lower than those traditionally developed cities for R&D, such as Beijing or Shanghai, according to Qingyuan He, the president of Nokia (China) Investment Co Ltd. (Nan, 2005).

It is obvious that all of these multinational telecom firms have realized the good opportunities 3G is bringing and expanded their research activities in new regions in China. The China strategy is clearly recognized and embraced. It is also worth noting that, while localization of services is being emphasized, China is not the battlefield for winning just the Chinese market. The relatively low cost of human resources in R&D and other resources in China, as well as its huge market, have been widely recognized. Multinational telecom firms are taking advantage of them as a part of their global strategies. In this sense, setting up an innovation center in Chengdu or Beijing is a step of entering not only the Chinese market, but also the Asia-Pacific, and the global market.

It is also believed that these firms, in addition to expanding their research efforts for a better opportunity to win out once 3G standard is licensed, there also involves the positive relationship with the local government. It is argued that R&D is the testing step for entering a new market. The purpose is, in addition to research, the positive influence of the firms involved on the local government, through which the firms can influence local operators. It is also a good thing for local governments, since the current investment imply more investment in the future. So this situation can be regarded as win-win situation (Yang, 2005).

China's telecom companies also joined the multinational telecom firms in expanding R&D efforts and heading west. Huawei set up its 3G R&D center in Chengdu in 2005. Huawei has research centers in many cities in China, such as Beijing, Shanghai, Nanjing, as well as other countries such as the U.S., Sweden, India, Russia, etc.

Compared with the multinational telecom firms, Huawei has a much shorter history, but it has already stepped into the global market successfully. Founded in 1988 in Shenzhen, Guangdong, Huawei started as a small company. In 1994, with C&C08A, the first generation of digital switcher developed by Huawei independently, Huawei entered into and gained the rural market (Sun, 2005). In the 2G battles, Huawei was a late comer, but it also successfully seized a portion of the market by successfully expanding China's peripheral network at a low cost. In the 3G time, Huawei seized the opportunities, and won contracts from overseas markets, such as Thailand, the Netherland, and Britain. Till Jun. 30, 2005, Huawei had won 11 commercial contracts in WCDMA in the world (Liu2, 2005). Huawei has been serving 22 of the top 50 operators in the world, and its products have been exported to over 90 countries and regions. Till Jun. 2005, Huawei had established 10 joint labs with Texas Instruments, Motorola, IBM, etc. In addition to R&D centers, Huawei also has offices or branches in Asia-Pacific regions, North America, South America, Europe, and Africa.

Another China's telecom firm, Zhongxing, or ZTE, was founded in 1985 in Shenzhen, Guangdong. Similar to Huawei, Zhongxing started by entering into rural markets in the early 1990s. In 1997, Zhongxing went public. In China Unicom's (an operator) first CDMA bid in 2001, Zhongxing won about 10% of China's new CDMA market share, and thus ended China's history of no domestic telecom firm winning in the first bid (Sun, 2005).

ZTE has a research center working on 3G in Shanghai. In addition, ZTE has set up research centers in Chengdu, Shenzhen, Nanjing, Shanghai, Beijing, etc. It will also establish a R&D center in France.

As a member of international and national organizations, such as ITU-T, ITU-R, ITU-D, 3GPP, and 3GPP2, ZTE is actively involved in issues related to international 3G standards. As a member of China Communication Standards Association, Zhongxing has led and participated in activities on softswitch, CDMA, CDMA 2000, etc. As a member of the TD-SCDMA alliance, ZTE is actively making efforts in the R&D of this standard as well.

China's another telecom firm, Datang, was founded in 1998 by China Academy of Telecommunication Technology (CATT) of Ministry of Information Industry with a higher starting point than Huawei and ZTE. CATT was founded in 1957, and is the largest professional research institution of telecommunications technology with the strongest R&D capability and widest R&D fields. In 2002, Datang Mobile was founded in Beijing, and is centered on the R&D of TD-SCDMA products and services. It has offices in Xi'an and Shanghai.

Compared with Huawei and Zhongxing, Datang is smaller in size, has fewer research organizations or centers, works solely on TD-SCDMA, and does not work so closely with customers. In comparison, Huawei works on all of the three standards, and Zhongxing works on CDMA 2000 and TD-SCDMA.

All these firms conduct R&D activities in more than one city in China. In addition to expanding their research efforts, it is clear that they are taking advantage of various locations. For instance, Chengdu is and will be a suitable place for 3G services or digital entertainment, etc. The bottleneck of 3G is the development of its application, and Chengdu's policies as well as IT-oriented universities, colleges, and research institutes provide an encouraging atmosphere for the application. The capital Beijing is known for its good investment environment, its state-of-the-art universities and graduates, as well as other factors, which had attracted more than 2,000 R&D organizations by the end of 2004, with more than 200 from multinational corporations. Among them, about 100 are in electrical and information fields. Beijing has been the first choice for multinational ICT corporations to start their R&D activities in China. Beijing will further encourage multinational ICT corporations to set up R&D organizations and cooperate with Chinese firms through favorable policies and other related activities. (Zheng, 2004). Other traditional well developed cities in the East Coast, the Changjiang River Delta Area (e.g. Shanghai, Nanjing, Hangzhou), and Zhujiang River Delta Area (e.g. Guangzhou) have also witnessed the arrival of telecom firms as a part of their R&D efforts in general and R&D in 3G in specific.

While foreign telecom firms come to China and set up R&D centers in China, China's telecom firms go abroad and set up research centers there. Localization and gaining experiences, among other factors, may explain this situation. Multinational telecom firms from Europe and America come with experiences in 3G in those continents, make efforts to meet the specific demands of the Chinese market, and in the meantime to take advantage of China's relatively low cost in human resources and raw materials to meet global demands. The Chinese telecom firms expand their R&D efforts by setting up R&D centers within China. By setting up research centers abroad, they can get closer to and better meet the needs of overseas markets. Also, by doing so, they can gain successful experiences from going into the European and other markets, which will be useful references for the incoming 3G practices in China.

HUMAN CAPITAL RESOURCES

Barney (1991) reports that a firm's human capital resources include the training, experience, judgment, intelligence, relationships, and insight of individual managers and workers in a firm (p. 101). Based on the available information, I compare primarily these firms' human capital resources in terms of training and experience.

Before and after 3G is put into commercial use in China, one of the keys to success and profit is 3G human resources. However, since 3G is still a new technology, there are not enough people with required skills. One of the solutions is to train people. Not only before they get recruited, but also after they are placed in R&D function. This makes training more important than ever.

According to Yijiang Cheng (2005), Siemens' Technical Director to China Unicom, training is the advantage of international firms, such as Siemens. Siemens' 3G and other R&D personnel get systematic training in Germany and/or Austria. They have good understanding of technologies and the Chinese market, which can help them with R&D work. Also, their training also enables them to understand the whole process from R&D to marketing and then to the supply chain.

Siemens' R&D personnel are made up of experienced workers and fresh graduates. This is true with most telecom firms that are working on 3G. 3G is still new in China, and to expand R&D activities, telecom firms should recruit more R&D personnel than ever (Dong, 2005). Thus, training plays a very important role.

Nokia also has numerous training programs for its staff. Abroad and domestic training and seminars provide opportunities not only to gain new knowledge, but also to share innovative ideas. Nokia has four Nokia Institutes in China, the U.S., Europe, and the Asia Pacific Region, providing online training, cross-field guidance, personal development counseling, etc. (Alibaba.com.cn, 2005).

Nokia is also known for its localization of human capital – till Aug. 2004, more than 95% of its staff was Chinese, and many mid-level and senior managers were locally employed. Nokia regards China as its human resource base, which can provide human capital support to the world (Alibaba.com.cn, 2005). Localization of human resources has advantages, such as having a better understanding of local needs and meeting the needs. Many of the application features that are suitable for Chinese users in the 2G period were initially the ideas of Chinese R&D personnel. Averagely, every year every R&D worker has one patent application, which is higher than Nokia's global average This tradition will also benefit the 3G R&D, especially in the application of 3G. (Yu2, 2005).

Ericsson does not lag behind in this regard. R&D staff have opportunities to go to Finland, domestic universities, and other organizations for 3G training, according to Peng Dai (2005) of Ericsson's R&D. Ericsson founded the Ericsson China Institute in 1997, providing management and technological training courses for clients and its staff. They are trying to teach and promote state-of-the-art technologies and knowledge, and provide first-class management ideas and practice and capability management solutions.

Motorola's Engineering Institute provides systematic training courses to clients and its staff. It provides courses on mobile communication products and engineering management. Since Motorola plans to move their R&D function to China, we can believe that they will pay more attention to training. When recruiting, Motorola requires the R&D personnel to have 5 years of research experience, which can enhance their research capabilities.

On the other side of the comparison, the Chinese telecom firms also have training function. Huawei has its Huawei University, which provides training for both clients and Huawei personnel. Their R&D staff get training from the University and from their own departments, according to Huawei's Sharon Chen (2005), the manager of Media Relations.

Most of Huawei's R&D staff are fresh graduates from college, and more than 60% of them hold a masters degree or higher (Chen, 2005). Huawei has about 4,000 people working on 3G. However, this number may still be far from enough (Dong, 2005).

Zhongxing has its Zhongxing Communication Institute, which provides 3G training to its staff and clients. There are about 2,000 R&D personnel in Zhongxing.

Datang Mobile has about 2,000 R&D personnel. 3G R&D personnel are from Datang's Central Research Institute, Shanghai Datang, and researchers from other 3G functions of the Datang Group. All of them are experienced researchers and engineers with more than 15 years of R&D experiences.

Datang provides its staff three levels of courses on TD-SCDMA. Upon the completion of these courses, R&D staff will have a solid understanding of the technology and join the further R&D work. Datang also offers customized management training to mid-level and above managers.

Most of these firms' R&D staff are not experienced in 3G. All these firms have capabilities of training their R&D staff. International telecom firms started 3G R&D earlier than China's telecom firms, and they can learn from the operations in overseas markets. Their experience can also provide solid technological background to train R&D personnel from China and in China, and can serve as technical reference to China's R&D activities. Some of China's telecom firms have stepped into overseas markets, and their technologies are recognized by the overseas markets. In terms of experience at an institutional level, foreign firms have advantages, which in turn can bring advantages to their R&D personnel in terms of training and experience. These experiences may or may not be available to Chinese telecom firms.

VALUE, RARENESS, IMITABILITY, AND SUBSTITUTABILITY

The examination of these firms' advantages reflects the sustained competitive advantages not only of individual firms, but also of the bigger group of foreign telecom firms on the one hand, and domestic telecom firms on the other hand.

The resource-based view of sustained competitive advantages argues that whether a firm has sustained competitive advantage depends on whether it is implementing a value creating strategy that is not being implemented by any current or potential competitor and when these competitors are unable to duplicate the benefits of this strategy (Barney, 1991, p. 102). The advantages may not last forever and can be changed. Firms may lose sustained competitive advantages when their resources lose their value or rareness, imitated by other firms, or there is a substitute of it in other firms.

Based on this framework, we can find that both groups of firms are implementing a value creating strategy. Their R&D work is definitely valuable, even when the government has not licensed any standard. All of them except Datang are working on more than one standard, and Datang has reasons to believe that the government will give priority to TD-SCDMA as the standard to be licensed for commercial use, so both groups will benefit from their current R&D work.

However, the strategies they are implementing are not so unique that no other firm is employing or that there is no substitute. In terms of location, both foreign and Chinese telecom firms have been expanding their R&D activities in various cities, and taking advantage of local capital resources, policies of the cities where they set up 3G R&D centers.

In terms of their experience of 3G operations and 3G training, Chinese firms have been making progresses, however, foreign telecom firms have more experiences in European and American markets, though most of the 3G markets have not started to make profits yet. Their experience and earlier start in 3G R&D in other markets enable the international firms to have a systematic knowledge base, which can be used to train R&D staff in China. Chinese telecom firms also have capabilities to train their staff, and the experience they gain from overseas market may further enhance these abilities.

Most of the R&D staff in most telecom firms are not experienced. This will still be true when they expand recruitment in the near future (see Table 1).

Table 1. Comparison of multinational telecom firms and Chinese telecom firms working on 3G in China

Groups	Location	Experience of 3G operations and 3G training	R&D Personnel
Multinational Telecom Firms	Traditionally well developed major cities (East Coast, Changjiang River Delta, Zhujiang River Delta); the Western Region (Chengdu)	Experienced in overseas market; training in overseas centers	Both experienced R&D workers and new graduates, but most are not experienced. This will still be true when they expand recruitment in the near future.
Chinese Telecom Firms	Ditto	Some experience in the overseas market; training primarily in China	Ditto

Thus the above descriptions show that international telecom firms do not enjoy absolute long-term competitive advantage. However, it does not mean that international telecom firms do not have advantages. R&D personnel in international firms can go to Europe and other places where the firms' headquarters and major R&D centers are located, and gain 3G technologies at first hand. This experience may or may not be obtained by staff of Chinese telecom firms. Also, it does not mean that Chinese firms cannot catch up. Those working on WCDMA and CDMA 2000 are gaining experiences from European and other markets. Both groups are gaining more experience in the Chinese market by setting up trial networks. The experience from these markets will give the Chinese firms more credibility of training their own staff and clients as well as their overall credibility as 3G equipment and network technologies providers.

What should also be considered when comparing the sustained competitive advantage of international and domestic telecom firms are the size and number of competing firms in each group. In the international group, we can find not only the four firms examined in this paper, but also Shanghai Alcatel, Nortel, NEC, Lucent, etc. All of them are big corporations with long history, and have R&D capacities of core network technologies. Chinese firms that are working on 3G technologies and terminal devices include the three firms examined in this paper and other firms in the TD-SCDMA Alliance, including China Putian, Hisense, etc. However, they are not as big-scale as the international competitors, not all of them have R&D capacities of network technologies, and if they do, they have shorter history of telecommunications R&D and less experience in any telecom market.

Another factor that can be considered is the market share of the 2G market. Nokia, for instance, represents about one third of the 2G market share (Huang, 2005), and the multinational telecom firms in total represent most of the market. If the operators decide to upgrade their 2G networks to 3G networks, multinational telecom firms will benefit much more than domestic telecom firms.

So even they do not enjoy sustained or long-term competitive advantage based on the framework of resource-based view, international telecom firms still have advantages.

However, Chinese firms will not lose the battle so easily. China is believed and suggested to give priority to China's homegrown standard, TD-SCDMA (or TD in short). Most of the multinational telecom firms are working on all the three standards. Their advantages are in W-CDMA and/or CDMA 2000, but they have started to give more weight to TD-SCDMA in their R&D work. Chinese firms are divided into two groups. One group, including Huawei and Zhongxing, is working on more than one standard; the other group, including Datang, is working on TD-SCDMA solely.

Scholars find it hard to ignore TD-SCDMA years ago (Chakraborty, 2001). It is a matter of national pride and exemption from patent fees (Nelson, 2004). It is believed that very likely all the three standards will be licensed, and it is also argued that considering national interest, TD should be given at least one third of the market; the telecom firms and operators should make TD network independent from other standards, so that it will not be excluded in the name of mix networking; the government should encourage operators to use TD by giving financial incentives; and the government can license TD earlier than the other standards, so that it grow in the market. Only in this way can China let the world know about TD-SCDMA, and assure international telecom firms to cooperate with Chinese firms, attract investment on TD-SCDMA, accelerate its industrialization, and eventually improve China's innovative capabilities (Liu1, 2005). The fact that TD was chosen as the national standard have given the hint to the world that China's homegrown standard will be given priority. Firms seem to have realized this, and they have been cooperating on the R&D of TD-SCDMA: Ericsson is cooperating with Zhongxing; Siemens is working with Huawei; Alcatel from France is working with Datang (Yang, 2005). Motorola also started to work on TD; Nokia paid primary attention to WCDMA, but it also started to work on TD-SCDMA.

3G AND ICT R&D: WHAT DOES IT MEAN TO CHINA?

China has attracted more and more 3G and other R&D centers or organizations. It is believed that the coming of multinational R&D centers and their localization of human resources can help China with training Chinese human capital, and enhancing China's overall level of the communications market (Ji3, 2005). However, being home to multinational telecom firms and R&D centers is not equal to having all the core technologies. Reports from China's Ministry of Commerce show that most R&D centers of multinational corporations in China tend to be wholly owned rather than jointly invested with Chinese firms. In terms of R&D investment, 46% of these firms tend to establish independent R&D centers. For instance, the Motorola China Institute which had an investment of 155 million U.S. dollars and the Lucent-Bell Lab that invested 100 million dollars in five years are both wholly owned. These foreign firms, due to their technological advantages, are majority stock holders in research organizations or joint venture companies in order to get the absolute advantages in the value chain. Another report shows that wholly owning will still be the primary approach of foreign investment (Sina Finance, 2005). So it is hard for the Chinese part to get core technologies. China has to increase her own innovative capacities to compete with the multinational firms (Zhang, 2002; Meng, 2005).

The situation in 3G R&D does not show significant change in this regard, however, there is a sign of improvement, and more changes can be expected. Chinese firms have obtained a considerable number of patents, though they still are far less than those owned by multinational telecom firms. Huawei, for instance, established its Intellectual Property Department in 1995. Till Jun. 2005, Huawei had obtained 46 WCDMA basic invention patents, which represents 5% of all WCDMA basic patents, and became one of the top 5 companies that have WCDMA basic patents in the world. The basic patents are those that meet criteria and have to be used in production, sales, or use. So the basic patent is an important criterion to measure a firm's research capability. To Huawei, 5% is just a starting point, according to Huawei's Director of WCDMA Product Line. World-class R&D ability enables a firm to meet customers' needs better and faster; it can also enable the firm and a nation to provide solutions regarding standards and testing standards (China Telecom World, 2005). Datang owns 7.3% of TD-SCDMA basic patents, but the disadvantage of Datang is that it is not working closely with operators. Rather, it works closely with the government. To better serve the market and win market share, Datang needs to get closer to operators.

Multinational telecom firms do not enjoy sustained competitive advantage in terms of physical capital resources and human capital resources. But the disadvantages of Chinese telecom firms are easily recognized. Those working on 3G are fewer in number and smaller in scale in general than multinational telecom firms. They also have fewer patents than their international competitors. The multinational telecom firms have embraced not only the standards they started to work on earlier, but also the Chinese homegrown standard. However, Chinese firms have made the first step, and they are believed to make further steady steps in the near future.

After China licenses the 3G standard(s), the competition will be very fierce. All firms will do their best in investing more on R&D, marketing, and production, and whoever has been better prepared and works hard on further investment should be able to win. Chinese telecom firms, as we may expect, will need to make even more efforts to get a share of the market.

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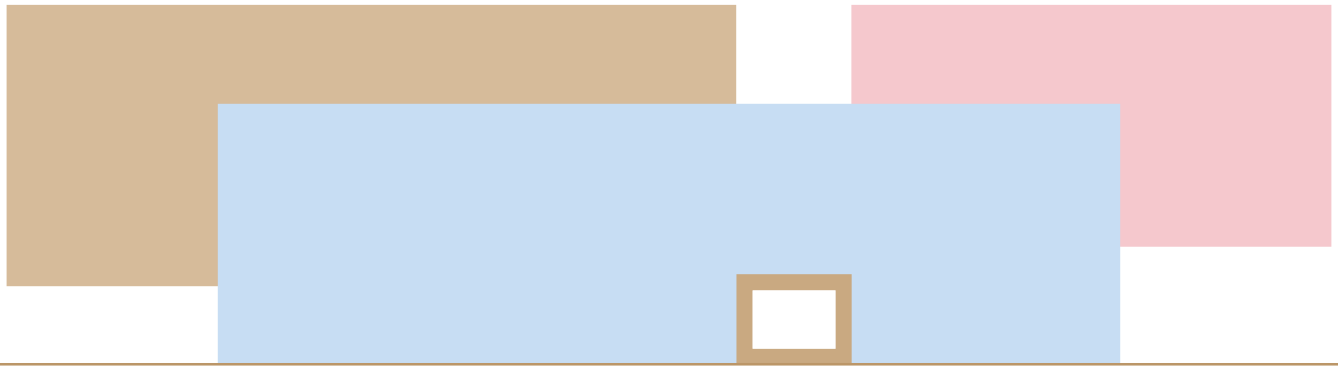
RELATING REGULATORY INDEPENDENCE TO TELECOMMUNICATIONS SECTOR PERFORMANCE: A STUDY OF THE ECOWAS REGION

NSIKAN UDOYEN



ABSTRACT

A SURVEY OF NATIONAL TELECOMMUNICATIONS REGULATORY AGENCIES IN WEST AFRICA WAS CONDUCTED TO BETTER UNDERSTAND regulatory environments within the region and determine whether the independence of regulatory regimes could be used to explain variations in teledensity and telecommunications sector performance. The survey characterized the regulatory agencies' independence by studying their relationships with the government, the industry, and the general public. In studying responses from six respondents, no significant variation was found in terms of the regulators' relationships with the industry and the general public. Differences in the regulators' relationships with the government could not be used to explain variations in teledensity, but were found to reflect the total number of fixed lines and mobile subscribers in the country.

INTRODUCTION

The Economic Community of West African States (ECOWAS) is an important telecommunications market. The telecommunications sector in ECOWAS states has continued to develop rapidly in recent years, prompting calls for a more integrated sector and more harmonized policies across the region. The West African Telecommunications Regulators Assembly (WATRA) is the regional regulatory body for the region and lists harmonization of telecommunications policies across the region as one of its objectives. Through the illustrations in this study, we hope to promote discussion on harmonization of telecommunications policies in the ECOWAS region that incorporates a better understanding of current capabilities of regulators and the environments they operate in. The long-term benefit of such discussions is the identification of best practices for approaching recurrent common problems.

Surveys were sent out to national telecommunications regulatory agencies in the ECOWAS region with several aims in mind. The first objective was to gather data on the functioning, roles and capabilities of the regulators. The gathered data enables benchmarking by WATRA in several important ways. First of all, by discussing the capabilities of regulators, opportunities for collaboration between regulatory agencies can be identified. The feasibility of proposed plans can be better assessed if the regulatory environments and capabilities of regulators are understood. Secondly, an understanding of the roles of individual regulators enables further, more formal discussion on various approaches employed to resolve problems commonly encountered in fulfilling these roles.

The second objective was to characterize regulators in the ECOWAS region using a framework developed by Irene Wu of the Federal Communications Commission (FCC) to assess their independence and the openness of their rule-making procedures (Wu, 2004). The framework is designed to help identify traits of independent regulators based on several indicators that describe their relationships with other government agencies, the general public, and the telecommunications industry. This study provides the basis for discussion of the applicability and adequacy of this framework for the ECOWAS region, primarily to determine which specific ways it can be augmented to more accurately identify common traits of independent regulators in order to examine the correlation between such traits and telecommunications sector performance.

RELATED WORK

Similar surveys of telecommunications regulators and regulatory policies have been conducted, primarily to better understand the impact of telecommunications sector liberalization on the sector's performance. In a study of telecommunications sectors in 16 Middle Eastern and North African (MENA) countries (Varoudakis & Rossotto, 2004), the relationship between telecommunications sector liberalization and higher efficiency is confirmed. The authors list pro-competition regulation as one component of an indicator they use to assess benefits of liberalization on sector performance. They rate the quality of the regulatory regime based on

- adequacy of the interconnection regime
- equal access to spectrum frequencies
- well-defined universal access obligations

The authors associate existence of regulations and legal provisions for these areas with reductions in regulatory risk *in the sector. Securing the independence of the regulator is thus presented as a means of reducing perceived regulatory risk, which has positive implications for the sector's ability to attract investments.*

An assessment of the impact of policy reform in basic telecommunications on sector performance, (Fink, Mattoo, & Rathindran, 2003) concludes that the interaction between regulation, privatization and fixed-line competition leads to an increase in labor productivity and the number of main lines. The authors' conclusion is based on a survey of 86 developing countries using data from 1985 to 1999. They also conclude that the introduction of competition reinforces privatization of the incumbent operator, with the order in which these events occur being especially important for allocative efficiency*. One reason the effect of these telecommunications sector liberalization stages on allocative efficiency is believed to vary with the order in which they occur is the changes in regulatory environments implied by the particular sequence.*

An econometric analysis of the effects of competition, privatization and regulation on telecommunications sector performance in Africa and Latin America concludes that a positive correlation exists between teledensity and the combination of privatization and an independent regulator (Wallsten, 2001) . The study uses data from 30 African countries over a 14-year period. The author incorporates regulatory independence into his model through a dummy variable that indicates whether or not a country has a regulatory agency that is directly under the control of a government ministry. While the selected indicator is important, it does not describe in detail the regulatory agency's capacity to function independently.

The impact of telecommunications regulation on the deployment of basic infrastructure has also been explored (Baudrier, 2001). The author concludes from a study of data from 30 African and Latin American regulators over a ten-year period that independent regulation has a "relative positive impact" on the growth rate of telecommunications penetration. Specifically, the author hypothesizes that

> *"countries in which industry and political pressures on independence of the regulator are relatively low should show relatively better growth rate of basic telecommunications infrastructure deployment"*

Unlike Irene Wu's study, the regulator's relationship with the general public is not studied. This is interesting, because while the regulator's relationship with government, industry and the general public may impact the sector's performance, the impact of these relationships may be uneven, with certain relationships being more useful in studying the relationship between independence and variations in performance across a region like ECOWAS. An understanding of which indicators are important may help refine or extend the set of indicators to create a framework more applicable to the region.

Forces that drive deregulation and other aspects of telecommunications sector liberalization have also been studied through surveys. The need to simplify regulations, and the need to eliminate laws that hamper investments, have been identified as factors that drive governments towards converged Information and Communications Technology (ICT) regulators, based on a study of converged ICT regulators in India[1], Malaysia, the UK

[1] *Proposed converged ICT regulator (García-Murillo, 2005)*

and South Africa (García-Murillo, 2005). The author notes that though the effectiveness of converged regulators is not clear, the need for convergence is implied because liberalization and technological advances have enabled companies to deliver data, content, and telecommunications services. The elimination of inefficiencies in their business that arise when these companies operate in regulatory environments where they must conform to different, and possibly conflicting regulations in each sector is cited as a major benefit of a converged regulatory agency.

In anticipation of the advent of a single telecommunications market in the European Union (EU), Worthy & Kariyawasam (1998) evaluate the needs of the European telecommunications sector, and discuss legal and practical approaches to the creation of a regional telecommunications regulator for the EU. The authors state that a common regulatory framework for the EU should harmonize policies and refine the roles of national regulatory agencies (NRAs), other pan-European bodies, as well as the role of the European commission in enforcement. Based on discussions with stakeholders in the European telecommunications sector, they identify areas that would benefit from policy harmonization through a regional regulator. The areas listed include:

- interconnection
- numbering
- licensing
- dispute resolution
- implementation and enforcement of EU directives

The authors also propose several alternative approaches to define the role and structure of the regional regulator (Worthy & Kariyawasam, 1998). They include:

- incorporating regional bodies with overlapping functions into a regional regulatory body
- establishing formal links between the regional regulatory agency and existing regional bodies to enable them provide specialized advice to the regional regulatory agency
- structuring the regional regulatory agency as an agency that advises the European Commission

The authors conclude by discussing political and practical barriers to the creation of a regional regulator for the EU, and assert the need for a regulatory vision in tune with current needs of the sector.

The study by Worthy & Kariyawasam (1998) has several important aspects relevant to the question of a regional regulatory body in ECOWAS. Firstly, the concerns voiced by stakeholders echo opinions about the need for regional regulatory policy harmonization in ECOWAS, based on responses to surveys sent out during the course of this study. Secondly, the scope of diversity in ECOWAS, in terms of culture and the relative development of regulatory capacity in various markets in the region, leads to similar problems concerning the practicality of a regional regulatory agency. The role of the regional regulatory agency thus needs to be clearly articulated in response to needs of the sector, while definition of its mission must take into account the current capabilities and roles of regulators. Several pertinent questions, such as how bodies with overlapping functions must be refined, the ideal relationship between the NRAs and the regional regulator, and how these bodies must refine their roles, must be addressed as part of the process of defining WATRA's role, if it is to deliver on its rather broad mandate. An understanding of the roles and capacities of these bodies is thus important, and several researchers have sought to shed light on the regulatory environment in West Africa, either through surveys that focus on ECOWAS, or on Africa as a whole.

In surveying license-exempt wireless policies across Africa, (Neto, Gillett, & Best, 2004), the authors argue that significant diversity in regulations across the continent may discourage large entrants into the sector, while the lack of clarity and enforcement, aspects of what Varoudakis refers to as "regulatory risk", discourage innovation and small entrepreneurs. Their study incorporates responses from regulators and other respondents in 47 of Africa's 54 countries. The authors advocate harmonization of policies across the continent and encouragement of license-exempt transmission over the standard 2.4GHz and 5 GHz bands as part of the solution.

A survey of spectrum management policies in West Africa (Schaar & Doyle, 2005) concludes that most countries in the region have primary legislation in place, but few have effective management. The study cites the lack of human resources as a key factor contributing to this trend and notes that spectrum scarcity is generally not an issue in the region. Successful spectrum management strategies from the United States, New Zealand, Nigeria and Malaysia are reviewed and the authors propose several guidelines to spectrum management.

The reviewed work illustrates the benefits of policy harmonization, a stated goal of WATRA, but also highlights policy reform challenges only amplified by regulatory risk, whether real or perceived. From the authors' conclusions, it can be inferred that independent and pro-competition regulators promote efficiency in the telecommunications sector. Independence of the regulator is difficult to characterize qualitatively, let alone quantify for objective study in relation to other indicators of sector performance. An understanding of the regulatory environments in the developing world is more easily communicated through a study of the telecommunications regulators' roles and relationships with stakeholders in the sector. Such a study is thus an important part of the process of assessing regulatory risk in specific nations, which in turn supports the process of formulating an effective strategy for regional telecommunications policy harmonization and articulating the roles and priorities of regional regulatory agencies in implementing such a strategy.

METHODOLOGY

A recent study by Irene Wu of the FCC (Wu, 2004) attempted to identify common traits of independent telecommunications and broadcast regulators by assessing the regulators' relationships with consumers, industry, and other government institutions. The indicators used to characterize the relationships between the regulator and other state institutions were:

- Inability to dismiss the head of the regulatory agency for political reasons
- A guaranteed term of office for the head of the regulatory agency
- Scope of authority clearly distinct from the policymaking body
- Funding sources independent of political review

For the purposes of this study, the existence of a legal act establishing the regulatory agency was included as another indicator.

The indicators used in the Irene Wu's study to characterize the relationship between the regulatory agency and the industry were

- Private ownership of the incumbent telecommunications operator
- Frequent exchange of staff between the regulator and regulated firms

The indicators used to characterize the relationship between the regulatory agency and consumers aim to describe the regulator's ability to include consumers' concerns in the rulemaking process. They include

- Existence of a dedicated office of consumers' affairs
- Existence of a dedicated office for universal service

In assessing universal service, the survey was also used to understand the nature of the regulatory agency's involvement in a universal service plan, if one existed. Their goals and the partnerships that facilitated the implementation of the plan were of interest for benchmarking purposes.

Regulatory agencies were queried on their decision-making processes. Several questions were included to determine whether or not public consultations were held prior to regulatory decisions. The questions also sought to determine whether or not regulatory decisions and their justifications were made publicly available, as a means of determining the level of stakeholders' involvement in the decision making process. Additional questions also sought to clarify whether the regulator's decisions could be appealed, and how. The survey used can be found in Appendix 1. In all, six countries (Cote d'Ivoire, The Gambia, Ghana, Guinea, Mali and Nigeria) responded to the survey. Their responses are presented in the following sections.

THE REGULATORS' RELATIONSHIP WITH GOVERNMENTAL INSTITUTIONS

Leadership

Table 1.Leadership of Regulatory Agencies

Country	How is leader selected	Leader has a fixed term of office	Duration of tenure	Formal process for removal of head
Cote d'Ivoire	Selected by administrative council [2]	Yes	Duration is determined by administrative council	Yes
Gambia	Appointed by president	No	Not limited	No
Guinea	Appointed by decree	No	Not limited	No
Ghana	Selected by president	No	Not limited	Yes
Mali	Governmental decree	Yes	6 years, renewable	No
Nigeria	Appointed by president, ratified by Senate	Yes	5 years, renewable once	Yes

The first indicator of the relationship between the regulatory agency and the government was the nature of the relationship between the leader and other governmental institutions. It has been suggested that the protection of the leader's position by custom or by custom or law for a fixed period of time, regardless of the agencies decisions, is an indication of the agency's insulation from political pressure (Wu, 2004). The existence of a legal act establishing the agency and formal procedures and conditions for removal of the head of the organization can also be indicators of the independence of the agency's leadership. The existence of formal procedures for the removal of the head of the regulatory agency implies that the head of the agency cannot be removed for political reasons. The results are summarized in Table 1. Some respondents indicated that formal procedures existed for the removal of the head of the agency. None of these respondents indicated that these processes had ever been bypassed in the process of removing the head of the agency. All respondents noted the existence of a legal act establishing their agencies.

Scope of Authority

Table 2. Telecommunications Wireline & Wireless Licensing

Country	License issued by regulator only	License issued by Ministry only	Ministry and regulator have roles in licensing
Cote d'Ivoire	Yes	No	No
Gambia	No	No	Yes
Ghana	No	No	Yes
Guinea	No	Yes	No
Mali	Yes	No	No
Nigeria	Yes	No	No

[2] *The respondent from Cote d'Ivoire noted that the regulatory agency was run by an administrative council, whose members were selected based on their experience in the area of telecommunications. The administrative council had the power to select and remove the head of the regulatory agency.*

A clearly defined scope of authority is another indicator of a regulatory agency's relationship with other government institutions. The exclusive authority to issue wireline licenses has been used as an indicator of a regulator's independence (Wu, 2004). In this study, exclusive authority to issue wireless licenses was also surveyed.

Table 3. Scope of Authority

Country	Regulates Sectors other than Telecommunications	Additional sectors regulated by agency
Cote d'Ivoire	No	
Gambia	Yes	Electricity, Water
Ghana	Yes	Broadcasting
Guinea	Yes	Postal Services
Mali	No	
Nigeria	No	

Depending on the size of the regulatory body, the capacity to effectively regulate telecommunications may be hampered by additional responsibilities. While regulatory convergence for digital media may result in simpler rules more conducive to multimedia firms, the effect of convergence of telecommunications regulators with other regulators from other sectors has not been studied. As such, regulators were also asked whether they are responsible for regulating sectors other than telecommunications.

Funding

A third indicator of the regulatory agency's relationship with the government is the source of its funding. The agencies surveyed were either self-funded and/or dependent on a budgetary allocation from the government. The self-funded category was defined to include all sources of income other than the government. These sources were found to commonly include licensing fees and levies on operators.

Table 4. Regulators' sources of income

Country	Self-funded	Budgetary Allocation
Cote d'Ivoire	Yes	Yes
Gambia	Yes	Yes
Ghana	Yes	No
Guinea	No	Yes
Mali	Yes	No
Nigeria	Yes	No

THE REGULATOR'S RELATIONSHIP WITH INDUSTRY

Table 5. Regulator's relationship with the industry

Country	Privatized Incumbent [3]	Little movement of staff b/w industry and regulator
Cote d'Ivoire	Partially	Yes
Gambia	No	No
Ghana	Partially	Yes
Guinea	Partially	No
Mali	No	No
Nigeria	No	No

The indicators of the relationship between a regulator and the telecommunications sector include:

- privatization of an incumbent operator
  The regulator is believed to be more independent if the state has less interest in the profitability of the incumbent as a state-owned operator.
- frequent exchange of staff between the regulatory agency and the industry
  The use of this indicator to describe the relationship between the regulator and the industry is debatable, and both sides of the argument are summarized in (Wu, 2004). It has been argued that greater independence is possible if staff serve their entire careers in the regulatory agency, as they are less likely to be influenced by other interests. However, an opposing view posits that regulators benefit from technical knowledge of staff from the industry.

None of the respondents had a fully privatized incumbent operator. Two respondents reported little or no movement of staff between the regulator and the industry.

THE REGULATOR'S RELATIONSHIP WITH CONSUMERS

Table 6. Regulator's relationship with consumers

Country	Specialized office for consumer concerns	Specialized universal service office
Cote d'Ivoire	No	No
Gambia	No	No
Ghana	No	No
Guinea	No	No
Mali	No	No
Nigeria	Consumer Protection Agency [4]	No

Indicators of the regulator's relationship with consumers include the existence of an office dedicated to consumer concerns, and the existence of a specialized office for universal service. The Telecommunications Regulation Handbook (Tétrault & Intven, 2000) lists features of a good universal access fund as

[3] *Source: (World Bank, 2006)*

[4] *Reported as NCC's Consumer Affairs Bureau in (Wu, 2003)*

- independent administration
- transparent financing
- market-neutral
- funding targeted to specific beneficiaries
- small subsidies
- competitive bidding process for implementation of universality projects

Of the qualities listed, it was most feasible to establish the independence of the administration of the universal access fund. As such, the existence of an agency dedicated to universal access was seen as a definite indicator of independent administration of a universal access fund, in cases where a universal access plan existed. All respondents reported having a universal service plan. Most were funded by contributions from operators, and administered jointly by the regulator and a government agency.

Table 7. Universal service funds

Country	Universal service plan	Agencies involved in universal service plan	Funding sources
Cote d'Ivoire	Yes	ATCI, Ministry of Economic Infrastructure, the incumbent operator	Incumbent operator [5]
Gambia	Yes	PURA, Department of State for Communications, Information and Technology	Contributions from operators
Ghana	Yes	NCA, Ministry of Telecommunications	1% levy on operators
Guinea	Yes	MPT-DNPT, Ministry of Postal Services and Telecommunications	Not yet finalized
Mali	Yes	CRT, Department of the Economy and Trade	Government funds, operators' contributions
Nigeria	Yes	NCC, Ministry of Communication	Contributions from operators, government, grants from foreign agencies

OPENNESS OF THE REGULATOR'S DECISION-MAKING PROCESS

Several indicators were used to describe the openness of the regulators' decision-making processes. They were selected to determine the extent to which the regulator made provisions to involve stakeholders in its decision-making processes and include:

- whether the regulator publishes drafts of pending regulatory decisions
- whether the regulator holds public consultations on regulatory decisions
- whether the regulator publishes its decisions and their justifications

[5] *The incumbent operator financed a previous plan, but future plans will be financed by a fund supported by operators.*

Table 8. Decision making procedures

Country	Publishes drafts of pendingdecisions	Holds public consultations on regulatory decisions	Publishes decisions and their justifications	Mode of publication
Cote d'Ivoire	Yes	Yes [6]	Yes	
Gambia	No	No	No	
Ghana	Yes	Yes [7]	Yes	Annual report
Guinea	No	Yes	No	
Mali	No	No	Yes	
Nigeria	Yes	Yes [8]	Yes	Website, newspapers

DISPUTE RESOLUTION

The role played by the regulatory agency in resolving disputes, specifically disputes over interconnection and interference, was also of interest in this survey. The availability of alternative dispute resolution mechanisms was deemed to be of interest for benchmarking purposes. These mechanisms were however not discussed in detail. Respondents were also asked about the appeal processes for the regulators' decisions to further describe the role of the regulator in dispute resolution. In all cases, the body tasked with handling appeals against the regulator had the power to reverse the regulator's decisions.

Table 9. Regulator's involvement in dispute resolution

Country	Resolves interconnection disputes	Resolves interference disputes	Alternative dispute resolution	Who handles appeals against the regulator's decisions
Cote d'Ivoire	Yes	Yes	CTCI [9]	ATCI, CTCI
Gambia	Yes	Yes	Yes [10]	Courts
Ghana	Yes	Yes	No	The Minister and the Courts
Guinea	Yes	Yes	No	The Ministry and the Courts
Mali	Yes	Yes	No	Administrative tribunal
Nigeria	Yes	Yes	Yes [11]	Federal High Court

[6] *Depending on the decision; open to operators.*
[7] *Open to Ministry, consumers, stakeholders and the telecommunications industry.*
[8] *Open to all stakeholders.*
[9] *Conseil des Télé communications de Cote d'Ivoire.*
[10] *Independent arbitrators appointed by each party.*
[11] *Arbitration centers manned by independent arbitrators subject to NCC guidelines.*

DISCUSSION

Results

The results of the survey are summarized in Table 11, based on the approach used by Irene Wu to summarize her results. They indicate that according to this framework, none of the six respondents adopted the most independent option for the traits used. The existence of formal procedures for the removal of the leader of the regulatory agency was used as an indicator of the independence of the agency's leadership. The lack of such procedures was the key indicator that a leader could be removed for political reasons. Self-funded regulatory agencies were deemed to have independent funding if they operated completely independently of a budgetary allocation from the state.

Table 10. Summary of indicators

Country	Independent Leader	License issued by regulator only	Independent Funding	Private Incumbent	Little mov't of staff b/w regulator and industry	Consumer office	Universal service office
Cote d'Ivoire	Yes	Yes	No	No	Yes	No	No
Gambia	No	No	No	No	No	No	No
Ghana	Yes	No	Yes	No	Yes	No	No
Guinea	No	No	No	No	No	No	No
Mali	No	Yes	Yes	No	No	No	No
Nigeria	Yes	Yes	Yes	No	No	Yes	No

The results showed little variation in the characteristics of the regulators' relationships with the general public. Despite low teledensity in the surveyed countries, only one respondent reported an agency dedicated to consumers' interests. It should be noted that despite the size of the sample set, the range of respondents reflects the variations in teledensity that exist within the region. These results indicate that current variations in sector performance within the region should not be explained by studying the relationship between the regulator and the general public. While these results may not explain variations in the performance of the telecommunications sectors across the six countries, overall trends may be an indication of the current roles and capacities of individual regulators in the region. The regulatory agencies within ECOWAS are relatively new, and may not yet have the capacity to build institutions that independently manage consumer concerns such as universal access or customer service.

The results also showed little variation in the characteristics of the regulators' relationships with industry. None of the respondents reported a private incumbent operator, a key indicator of the relationship between the regulator and the industry. Some of the incumbent operators in surveyed countries surveyed are partially privatized and currently at various stages of the privatization process. Two respondents reported little exchange of staff between industry and the regulator. However, in the absence of other supporting information, this trend could not be adjudged to be a factor more likely to influence the interests of the regulator than the lack of a private incumbent operator. The small variation in the nature of the relationships between the regulators and the industry does not therefore explain the variations in sector performance across the region.

Indicators of the regulators' relationships with the government returned the most varied results, justifying deeper analysis to better understand how these indicators relate to indicators of sector performance. For starters, the more financially independent regulatory bodies were found to have more open decision making processes and independent heads. Overall, the variation in results for these indicators supports the idea that in seeking to relate the independence of regulators to variations in sector performance within the ECOWAS region, we should focus on indicators that describe the regulators' relationships with the governments and their independence from political pressure. This idea seems to support the choice of indicator by Wallsten

(2001) to account for regulatory independence. While the consistently low teledensity throughout ECOWAS may be related to simple indicators like these, how do we explain variations within the region? Teledensity data from the respondents' countries is presented in Table 11.

Table 11. Teledensity data (World Bank, 2006)

Country	Population (millions)	Lines / 1000 people	Mobile subscribers / 1000 people
Cote d'Ivoire	17	13	98
Gambia	1	21	131
Ghana	21	15	71
Guinea	8	3	14
Mali	12	5	21
Nigeria	140	8	66

No significant correlation was found to exist between teledensity and the indicators that described the relationship between the government and the regulatory agencies. The selected indicators, columns 1-3 in Table 10, were then compared to the estimated total numbers of fixed lines and mobile subscribers. The estimates were extrapolated from the data in Table 11. The total figure was used as an indicator of deployed infrastructure. The aim of this analysis was to determine whether a relationship exists between the indicators of the regulator's relationship with government and the number of subscribers. The calculated estimates are presented in Table 12.

Table 12. Estimated total number of lines and mobile subscribers, based on figures from (World Bank, 2006)

Country	Lines	Mobile Subscriptions	Total
Cote d'Ivoire	221000	1666000	1887000
Gambia	21000	131000	152000
Ghana	315000	1491000	1806000
Guinea	24000	112000	136000
Mali	60000	252000	312000
Nigeria	1120000	9240000	10360000

The estimates are compared to the regulators' responses in Figure 1. The number of subscribers in each country is compared to the number of positive responses in the first three columns of Table 10. Regulators in countries with the smallest numbers of subscribers had the least independence from political pressure. By responding negatively to all three indicators, Guinea and the Gambia pursued the least independent option, based on the indicators, but for different reasons. Guinea's telecommunications regulator (DPT) is affiliated with the Ministry of Postal Services and Telecommunications, while the telecommunications regulator in the Gambia (PURA) is part of a multi-sector regulator. Despite a sizeable difference in population, both countries had roughly the same number of fixed lines and mobile subscribers.

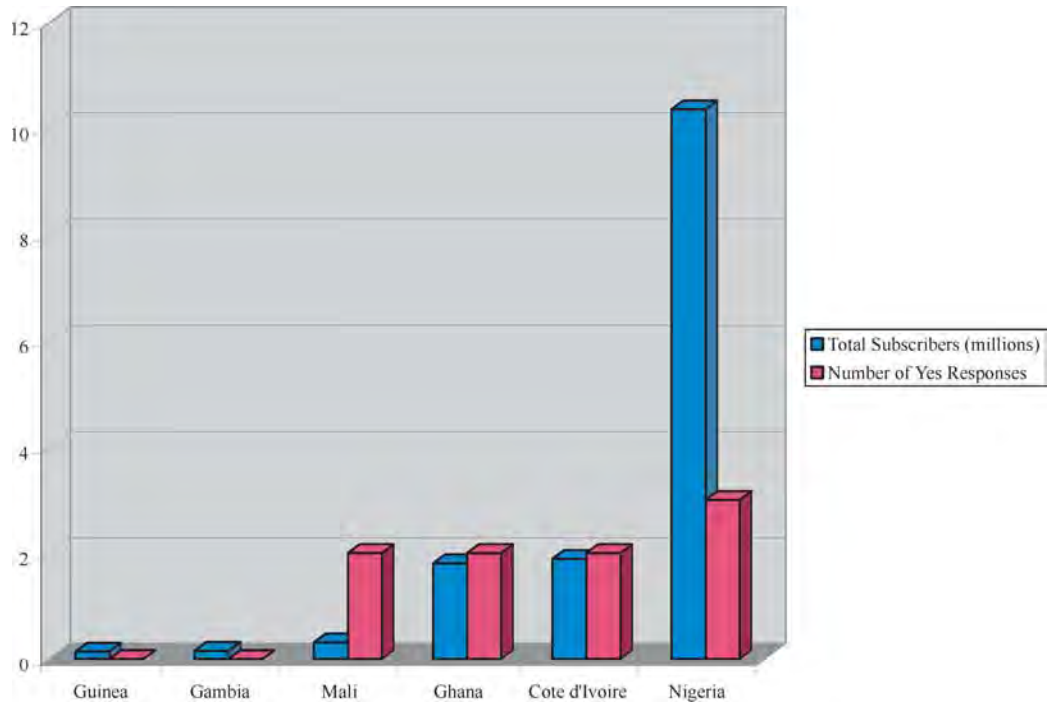


Figure 1. Total subscribers and regulatory independence from government

Cote d'Ivoire, Ghana and Mali responded positively to two out of the three indicators of the regulator's relationship with the government. Interestingly, within this group, the countries that indicated that they had independent leaders had significantly higher numbers of users (almost six times as many) and teledensity (at least three times as much), when teledensity was calculated as the sum of fixed lines per 1000 people and mobile subscribers per 1000 people. Such results justify further investigation into the relative importance of indicators in explaining variations in telecommunications sector performance within ECOWAS.

The regulator in the country with the most subscribers, Nigeria, had the most independence from government, based on the indicators. Overall, the results may indicate that the relationship between the government and the regulator evolves in response to regulatory needs that vary with the size of the subscriber base. This is a possibility, given that most regulatory agencies in ECOWAS are relatively new. It is too early to use the independence of the regulatory agency to explain variations in telecommunications sector performance across ECOWAS. The indicators of sector performance are based on consumer concerns such as access (teledensity, etc.), quality (faults per 100 lines per year, etc.), or affordability, which are consistently low throughout the region, despite variations in regulatory independence.

Articulating WATRA's Priorities

In light of the results of the survey, WATRA's current role as an advisory forum for harmonization of regional telecommunications policy must be re-examined vis-à-vis the region's anticipated needs. Several initial steps are proposed:

1. Focus on capacity building

The dispute resolution responsibilities of the NRAs have implications for the roles envisioned for WATRA. The need for human resources to effectively carry out these duties in light of the rapid expansion in mobile phone subscriptions in ECOWAS countries implies the need for capacity building. Interestingly, Worthy & Kariyawasam (1998) note the possibility that a regional regulatory agency may only be needed for a "transitional

period". Could the current rapid expansion in the telecommunications sector in ECOWAS be one such period? If so, a regional regulatory body with an expanded mandate that emphasizes capacity building and supports members in this area would be more useful to NRAs trying to effectively manage such a transition than an advisory forum for "harmonization of regional telecommunications policy".

2. Achieve financial independence, guide development of regional telecommunications regulatory framework

The financial sustainability of the regional telecommunications regulatory body is critical, if it is to be relied upon to provide consistent guidelines for enforcement of regulations in the region. Arguments have been made that NRAs are too easily influenced by incumbent telecommunications operators (Worthy & Kariyawasam, 1998). Noting that the ECOWAS region does not have any fully privatized incumbent telecommunications operators (World Bank, 2006), it can thus be argued that the regional regulatory agency's lack of a strong relationship with any incumbent telecommunications operators, coupled with financial independence would insulate its regulatory decisions from political pressure. This would position the regional regulatory body to take on a more central role in developing a regulatory framework for the region in rather than focus on policy harmonization, which is a more transitional role. The key to the shift is the more active involvement at the regional level in developing regulatory guidelines and building enforcement capacity. Such a role would however demand the creation of the legal and political foundations required to make the regional regulatory agency successful.

CONCLUSION

Telecommunications regulators in six ECOWAS countries were studied based on their responses to a survey designed to characterize their independence by examining their relationships with the government, the industry, and the general public. The responses showed that the relationships between the regulators and the general public and the industry varied little across the six countries. It was therefore proposed that if regulatory independence has any impact on the performance of the telecommunications sector, only the relationship between the regulator and the government should be used to describe that effect. The indicators used to describe the telecommunications regulators' independence from government did not explain variations in teledensity within ECOWAS. It was concluded that it is too early to relate variations in teledensity across ECOWAS to regulatory independence. There may also be a need for indicators that describe the relationship between the regulator and the government in greater detail if the correlation between that aspect regulatory independence and teledensity in ECOWAS is to be studied.

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APPENDIX 1

Study of National Telecommunications Regulatory Authorities in West Africa

The West Africa Telecommunications Regulators Assembly (WATRA), in conjunction with several research fellows from Georgia Institute of Technology, is conducting a study of institutions responsible for regulating telecommunications in the ECOWAS region. The results of the study will be compiled, analyzed and used to help WATRA better address the needs of individual regulators and provide valuable information to regulatory bodies across the ECOWAS region about the structure and functioning of their peer organizations. We would therefore appreciate learning some details about your organization and how it works. Some aspects of the following survey are drawn from a similar survey that has been successfully used by the Federal Communications Commission (FCC) International Bureau's analysis office to gather data to support their studies of national telecommunications regulators. The FCC is the telecommunications and broadcast regulator of the United States of America.

Section 1: Organizational Issues

Corporate

1. Is there a legal Act establishing your organization?
2. How is your organization funded?
3. How is the head of your organization selected?
   a. How long may the head serve in the office, and are there other conditions to the office?
   b. Is there a formal process for removal of the head of your organization?
   c. Have there been instances in which this process has been ignored in the process of removing the head of your organization?
4. With which other organizations in the government do you work closely, and what is your relationship to them?
5. Does your organization regulate sectors other than telecommunications?

Decision Making

1. Does your organization publish drafts of pending regulatory decisions?
2. Does your organization hold public consultations on regulatory decisions? Who participates in these consultations (i.e., operators, consumers)?
3. Does your organization publish its decisions and their justifications? Where is this information published (i.e., annual report, other publication)?

Staffing

1. How many officers are in your organization?
2. Can you provide an organizational chart, indicating how many officers are in each unit?
3. What percentages of the staff come from each profession - i.e., engineers, economists, attorneys, accountants, etc.?
4. In the course of an individual's career, is it common for someone to serve as an official in your organization, and then move to work in industry, or vice versa?
5. In the course of an individual's career, is it common for someone to move from one government organization to another?
6. Are there procedures for recruitment of personnel, or examinations to admit officials into your organization?

Section 2: Telecommunications Regulatory Functions

Licensing

1. Which agencies are involved when issuing a new wireline license? Could you briefly explain the roles of the agencies involved in the process of issuing a wireline license?
2. Which agencies are involved when issuing a new wireless license? Could you briefly explain the roles of the agencies involved in the process of issuing a wireless license?

Dispute Resolution

1. Which agencies are involved in resolving disputes between operators over interconnection?
2. Which agencies are involved if a wireless operator has a complaint about interference? What are their roles?
3. Are there alternate dispute resolution mechanisms, other than the regulator and the courts? If yes, please describe them briefly.
4. Can a regulator's decision be appealed?
   a. Who handles such appeals?
   b. Do they have the power to reverse the regulator's decision?
5. Which agencies address complaints of cross-border interference?

Tariffs

1. Which agencies are consulted if the consumer's prices for local or long distance are going to change?
2. Are prices for local and long distance regulated? If yes, who enforces these regulations?

Consumers' Rights

1. Which agencies are involved in handling consumers' complaints about operators?
2. What roles do these agencies play in the process?
3. Is there an agency dedicated to addressing telecommunications consumers' complaints in your country? If yes, how is it related to your agency?

Universal Access

1. Which agencies are involved in organizing and implementing a universal access plan, if such a plan exists?
2. How is the universal access plan funded?
3. Is there an agency responsible for organizing and implementing a universal access plan?

Enforcement

1. Which agencies are involved in enforcing rules, issuing fines, and other judgments?
2. Does the act establishing your organization empower you to enforce telecommunications regulations?
3. What is the role of the courts in enforcement of telecommunications regulations?

Spectrum Management

1. Which agencies are involved in spectrum management?
2. Please describe the relationship between your organization and the agencies involved.

Section 3: Internet

1. Which agencies are involved when issuing a license to an internet service provider, if a license is required? What are the roles of the agencies involved? Could you briefly describe the process?
2. Which agencies are involved when a consumer has a complaint about an Internet service provider?
3. Which agencies are involved if there are disputes between Internet service providers?

We would like to be able to contact you if clarifications are needed for any of your responses. Could you please include your contact information? Thank you in advance for your cooperation.

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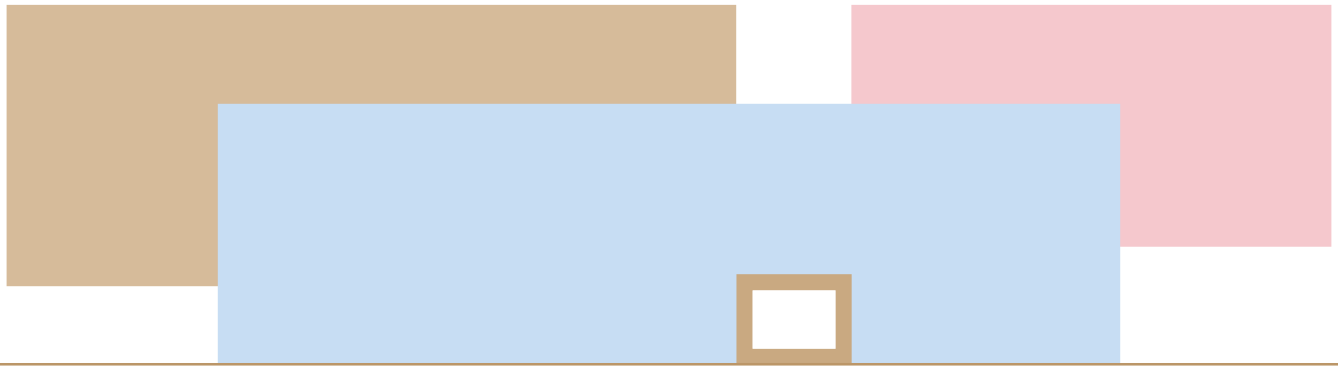
PORTAL, PEDAGOGUE, WORKSITE: CYBERCAFÉS AS SECOND AND THIRD PLACES

ARVIND VENKATARAMANI



ABSTRACT

TELECENTRES (SHARED ACCESS MODELS FOR ICT SERVICE PROVISION) ARE FAST BECOMING A WIDESPREAD METHOD FOR providing public access to information and communications technologies to underserved communities. One particular avatar - the cybercafe - is particularly interesting because it is sufficiently mutable and adaptable to a variety of contexts. Unfortunately, however, cybercafés' status as independent stand-alone business ventures which aren't usually funded by development agencies means that studies of such institutions tend to focus either on their status as enablers of specific communication needs, or as sites for measurement of ICT use. But cybercafés are as much an urban social phenomenon moulded by the peculiarities of their context as a deliberate means of providing access to ICTs. Are there other aspects of access that need to be considered?

This paper attempts to present a more holistic picture of access through a case study of cybercafés in Abuja, Nigeria. We discuss the frames that Nigerians use for cybercafés - portal to the outside world, a pedagogue for computer skills, and an informal worksite - in light of the kinds of relationships between operator and user, the physical location, and the infrastructural, technological and financial hurdles overcome as part of normal operation of these cafes. We then demonstrate how these interconnections explain the practices surrounding ICT usage and access patterns at the cafes, and implications for supporting public access to the Internet.

It is 4.00 pm on a Tuesday afternoon: I'm standing in a crowded commercial plot, comprising two two-storey buildings at right-angles to each other, both facing an open-air courtyard/parking lot. There are shops everywhere – tailors and printers, pharmaceuticals and lawyers' offices, refrigerators electronics in the buildings and on the street and in the grounds I see stalls with spotless white shirts, locally manufactured mobile phone accessories, belts and other leather goods, fake Nike shoes and the occasional food stall selling smoked yam. Billboards proclaim auctions for Nokia phones, and I can see no less than 10 signboards for Internet cafés, cheap international calls and document services. Amidst the cars in the parking lot is a basketball court that has given up territory to the stalls and the billboards and the crowd, and a game is in progress. Just outside the court are tables for pool and ping pong, and people are beginning to gather around them, watching all three games. There is a constant stream of taxicabs and 'okadas' (motorcycle transport) bringing people to and from the complex and to the two banks, a couple of federal government offices, and the city's largest post office nearby. A man offers to sell me a belt: "You'll look much better wearing this belt, my friend, [much] more respectable. Are you from Netherlands? Welcome to Nigeria!"

INTRODUCTION

Much of the discourse on ICT for development in the African continent centres on Africa's technological backwardness relative to the rest of the world – the "digital divide" – and consequently, many technological interventions focus on bridging the divide. However, the regions being bridged – the global North and Africa – comprise very different, and very diverse social, political and technical environments, and any development initiatives ought to take note of that fact. There is no reason to assume that the kind of always-on, technologically mediated communications environment gaining prevalence in the West must also be replicated in other cultures.

There is a long tradition of work treating technology as a complex artifact constructed through social practices (Bijker, Hughes, & Pinch, 1987; Kling, 1991; Lessig, 1999; Suchman, Blomberg, Orr, & Trigg, 1999). Recent work on emerging technology markets has begun to focus on the fact that the digital divide is not a uniform, monolithic phenomenon, but one with multiple manifestations and implications across different social, cultural, infrastructural contexts. Of particular interest in this regard are studies of technology adoption and cultural specificity (Bell, 2005; Ito, Okabe, & Matsuda, 2005), among others. While these deal either with technology usage in general, or usage with respect to a particular technology (computers, mobile phones etc), there has been much more work around problems of access, and on telecenters as mechanisms for providing access.

A 'telecenter' is an institution that provides shared access to technology and technological services to some set of people. However, this definition masks critical differences between the various kinds of institutions that have actually been set up under this moniker. It is instructive to consider Colle's typology of telecenters (Colle, 2000) in order to appreciate the purview of that term(see Table 1).

Recently, however, another typology of shared access mechanisms seems to be emerging: *telecenters, cybercafés,* and *information access points*. *Telecenters*, in this new definition, may be best understood as attempting to benefit a community in addition to providing access – they are usually focused, non-profit initiatives subsidized or funded by external agencies, and are often used to seed development and encourage technology usage in the region/community it serves (Rose, 1999); see (Latchem & Walker, 2001) for an overview of various telecenter initiatives, notable among which are the case studies of the Western Australia telecenter network (Short, 2001), and the Jamaica Sustainable Development Network Program (JSDNP, 2001) since they represent a range of community oriented initiatives with clear local specificities. Given their status as development ventures, it is no wonder then that an important consideration here is success and sustainability, and there has been considerable attention from the academic community in this regard (Best & Maclay, 2002; Harris, 2001; Jensen & Esterhuysen, 2001; McConnell, 2001).

Key Variables Associated with Telecentres

Narrow focus (Provides access to technology only)	**Multipurpose** (Provides services, e.g. training, development information)
Community-based (Represents a broad constituency)	**Establishment** (Top-down government or business organisation based)
Stand alone (Not associated with another institution)	**Attached** (Operates as part of another institution, e.g. school, government units)
Thematic (Specific to theme, e.g. education, health.)	**Universal** (Whole community needs)
Independent (Operates alone)	**Networked** (Works with other telecentres)
Public sector (Operated by a public body)	**Private sector** (Operated by a private body)
Profit oriented (Operates as a business)	**Service oriented** (Operates as a service)
Public funded (Funded by public funds)	**Privately funded** (Obtains funds privately)
Commercial (Charges clients for its services)	**Free** (Provides services for free)
Urban	**Rural**

Table 1. Key Variables associated with Telecentres

Information access points, like the SARI project (Kumar & Jhunjhunwala, 2002; Srinivasan, 2004), and the Canadian Community Access Program (Pfiester, Roman, & Colle, 2000) are usually internet-centric community service ventures that serve specific information needs, and these may or may not be commercial ventures.

While cybercafés are conventionally defined as being urban telecenters not oriented towards development, we would like to give them special status because they are adaptive, commercial, entrepreneurial structures, in contrast to the other two categories. This means that they are molded by the local conditions in which they are situated right from their inception. This does not imply, however, that cybercafés are more successful or sustainable – indeed,

as we discovered in our fieldwork, sustainability is an overriding concern for Nigerian cybercafés. As (Sherry, Salvador, & Ilahiane, 2003) discuss, there are at least 4 kinds of networks and support structures – procurement, access, values, places/locations – that must conjoin in order for a commercial telecenter establishment to succeed. We discovered in our fieldwork that those cybercafés for whom not all of these networks coincided did struggle to survive.

This local specificity and adaptivity of cybercafés bears further examination. Cybercafés in different parts of the world perform different functions; while they may be an affordable means of access in developing countries, they may also be support structures for people on the move in developed nations – the American Starbucks equipped with a wi-fi hotspot is certainly as much a cybercafé as the Peruvian *cabina publica*. This adaptivity of form and services offered is constrained, however, by the fact that the cybercafé must exist as a profit making establishment, which usually means that these cafés usually exist in urban areas where the power and communications infrastructures, available technical expertise and demand (or the *procurement and location* networks), come together to make a cybercafé business sustainable.

Which brings us to values – studies of cybercafé (and internet) usage tend to focus on demographics and problems faced (Adomi, Okiy, & Ruteyan, 2003; Chachage, 2001; Mwesige, 2004; Nnafie, 2002). While this information is valuable, it lacks explanatory power for the patterns it reveals, in that it is difficult to predict future trajectories and posit solutions; in addition, it doesn't tell us anything about the interaction between the other factors that might govern access, such as location, availability of content, network effects, etc. Studies like these assume *value* (to the "user") and measure *demand*, and thus fit in neatly with free market competition theories in which the consumer attempts to minimize price for a good with a particular value. For instance, a common finding is that the financial *cost of access* is an important inhibitor of access. However, it is not at all clear that this is necessarily the case, especially given that the value of technological systems is usually dependent on extrinsic factors such as the networks of people they service, the information they provide, and the processes they reify & enable. In terms of anthropological theory, to assume the value of Internet access is to assume an *etic* perspective – the outsider's – while the cybercafés themselves are constructed using an *emic* perspective - the insider's (Salvador, Sherry, & Urrutia, 2005). While this is not necessarily a bad thing, the outsider's perspective does tend to obscure differences that are important to the insider – in this case, assuming the value of internet access, generalizing that value assessment over all users, and neglecting non-economic factors – making it hard to determine strategies for success.

Several questions then arise: what *is* a cybercafé? Is it something that merely provides access to technology, or is it other things as well? What are the frames used when engaging with a café? What is the nature of these frames? How do they vary regionally & socially? Naturally, none of these questions can be answered without answering questions about access, the factors mediating access and the strategies invoked by the users to manage their access. We attempt to do this for cybercafés in a specific regional context – the city of Abuja in Nigeria – by examining a) technological infrastructure, b) services offered, and c) practices surrounding usage.

ABUJA, NIGERIA

Nigeria is the most populous country in Africa, and one of the ten largest in the world. Originally a set of British protectorates, Nigeria comprises over 400 different ethnic groups speaking as many languages agglomerated by colonialisation into a single political entity. Unsurprisingly then, its political history has been marked with conflict, and ethnic tensions continue to persist to this day. These tensions have been maintained for a variety of reasons, not the least of which have been Nigeria's long history of military rule, and power struggles orchestrated through ethnic differences.

Despite this, however, Nigeria has the most liberal telecommunications regime in West Africa, and the regulator, the Nigerian Communications Commission is a well respected independent organization. Unfortunately, this has not translated into good infrastructure – Nigeria has very poor wireline infrastructure which has grown very slowly over the years. Consequently, this means that Internet penetration has also suffered –

Nigeria in a snapshot

Population: 128.7M
Adult literacy: *68%*
Teledensity (/100 people)
Fixed: 0.6 Mobile: 1.3 [2003]
Fixed: 0.85 Mobile: 10.3 [2005]
Internet tariff as % of GNI: 353.7%
Internet users/100: 0.3 [2003], 1.3% [2004]
Broadband: 0.0
(but currently available as DSL, WiFi, VSAT)
Ranked 153rd according to ITU 2003
Sources: ITU [2002-3], NCC [2004-5], CIA Factbook [2005]

less than one in a hundred Nigerians possess a telephone connection, which makes dial-up both infeasible and expensive as a means of Internet access.

This gap between demand and supply for communications technologies means that Nigeria is currently "leapfrogging" in its technological development. Ever since wireless phone operators were allowed into the marked around 1999, the mobile telephony market (serviced by 4 operators) has grown to be about 10 times the fixed-line market (served by 22 operators). As we shall see, this has important implications for Internet access and usage. *[Links to ICT statistics? Mention of mobile telephony market as a street market?].*

The liberal licensing regime has had another result: Nigeria has over 300 licensed ISPs, of which only 36 are actually in operation. Of these, only nine are large enough to serve multiple states and cities – the rest are highly localized. Some of these ISPs are not even purely Nigerian corporations – it is not uncommon for an ISP to be merely a relay point for connecting two satellite communications channels, one terminating in Nigeria, and the other terminating somewhere in Europe or North America, resulting in very high connectivity and bandwidth costs.

Abuja is the capital city of Nigeria, and has been so since 1991, when the government and several important administrative bodies moved there from Lagos, the previous capital on the southwestern coast of Nigeria. For political reasons, Abuja is strategically located in an undeveloped region near the geographical centre of the country – that part of Nigeria has not been exclusively occupied by any ethnic group, and thus forms a middle ground, or no-man's land for political purposes. Like all planned cities, Abuja is quite artificial, with clearly demarcated regions for living, working, and leisure. Abuja is very heavily zoned, and land development occurs according to a strict licensing regime. The metropolitan area in particular contains very few residential areas, and is mostly designed to house commercial establishments and government offices. This has resulted in the city containing a considerable daytime population which at night returns to several suburbs surrounding the city.

Abuja is thus a power centre, both politically and economically. It contains the head offices of important national bodies such as the Nigerian National Petroleum Corporation, the NCC, the Federal Secratariat, the High Court and the National Assembly. It is also the location of the head offices of various Nigerian banks, and other commercial entities. That it is a hub of activity is evidenced both by the furious land development one can see in most parts of the city, and in places like the lobbies of 5 star hotels, where a lot of the business transactions take place. This, too, has its impact on the role cybercafés play in Abuja, and on the nature of public access to the Internet.

METHODS

Given the nature of the research question, it was decided to eschew statistical measures of access, and instead focus on descriptions of usage practices. To this end, we used a combination of participant observation and semi-structured interviews with both operators of cybercafés and users/customers at these cafés. Cafés were selected using a combination of snowball sampling, theoretical sampling along dimensions of location and size. Over a space of 10 days, 15 cafés were visited, and 12 operators and 17 users were interviewed. The interview script used can be found in Appendix 1.

INFRASTRUCTURE AND SETUP

To properly understand the infrastructure and setup of Abuja's cybercafés it is essential to first understand the *plaza* phenomenon. A "plaza" is a multi-storey commercial complex that houses various forms of commercial establishments, from bank offices to hair salons. Plazas vary in size, complexity and in the types of shops they contain. Almost all of them are privately owned plots of land. However, a plaza is more than a location for shops – it is also the typical neighbourhood hotspot and meeting ground, and the kinds of people who come to these places determine, in part, their prestige. That indirectly controls the kinds of clientele that a café receives, and the kinds of services a café needs to provide at a particular location in order to succeed.

This collocation practiced by cybercafés reflects in both where a particular cybercafé is placed as well as where it is *not* placed. Location forms part of a differentiation strategy whereby cybercafés distinguish themselves from the others. This differentiation occurs along many dimensions (Table 2). We identified three distinct forms of cybercafés, each offering different combinations of services, which we call the *cool café,* the *business centre,* and the *neighbourhood café.*

Table 2. Structural dimensions

Location	Services	Technological Infrastructure	Price /hr (in Naira)
Residential, standalone	Document services (printing, typing, scanning, photocopying)	High speed internet (C-band VSAT)	<N100
Residential, plaza	Assistance (checking email, search, form filling etc)	"Normal" speed internet (KU-band VSAT/radio)	N100
Commercial, standalone	Communications (VoIP international calls)	Luxury (drinks, snack food, furniture, spacing & privacy)	>N100
Commercial, plaza	Clientele management (validity of purchased time, loyalty benefits)	High Technology (modern hardware, extra installed software, accessories)	

TYPES OF CAFÉS

Table 3. Business Centre

Location	Services	Technological Infrastructure	Price /hr (in Naira)
Residential, standalone	Document services (printing, typing, scanning, photocopying)	High speed internet (C-band VSAT)	<N100
Residential, plaza	Assistance (checking email, search, form filling etc)	"Normal" speed internet (KU-band VSAT/radio)	N100
Commercial, standalone	Communications (VoIP international calls)	Luxury (drinks, snack food, furniture, spacing & privacy)	>N100
Commercial, plaza	Clientele management (validity of purchased time, loyalty benefits)	High Technology (modern hardware, extra installed software, accessories)	

The *business centre* is the most common form of cybercafé in Abuja. This form of cybercafé is distinguished by its closeness to commercial establishments, minimalism of construction, simplicity of technological infrastructure and an emphasis on document services. While most cybercafés offer document services in some form or another – all cafes visited had printers – the degree to which the document services offered form the main revenue stream differs. This is an important distinction, and one that we will revisit shortly when examining sustainability.

What is especially interesting about this particular form of cybercafé is they seem to have been the precursors to cybercafés proper. Most cafés in this class had not more 10 or 12 computers for browsing, and some had as few as 4. All, however, had at least one and often two computers which dedicated trained personnel would use to type, edit, and print documents for customers; these personnel are also frequently experts at drafting these documents, knowing what style of expression, content organization and so on for specific types of documents. We observed, at various places, the business centre staff creating letters, resumés, project reports and other text documents. These same services are also offered at document services centres proper, which are often called "printing shops" because that is what people go there to do. Despite a well established model of customers bringing in their own data in to print

(one of the authors was surprised when, having announced after entering one such establishment that he needed to get something printed, he was asked if he had a USB flash disk, something he later found was a very common question), the staff at these printing shops do the same sorts of typing and drafting work. The only clearly identifiable difference between a business centre and a printing shop/document services centre then is the availability and number of computers set aside for Internet browsing. This close resemblance suggests that document services centres – where one goes to make formal printed matter – are the older type of establishment, and that business centres – where one goes to both find information and put it in printed documents – are an evolutionary development. This hypothesis is further supported by the fact that, for the business centre class of cafés, the primary revenue source is the income generated by the document services and not the Internet-related services (the *cyber* in cybercafé) themselves.

Table 4. Neighbourhood café

Location	Services	Technological Infrastructure	Price /hr (in Naira)
Residential, standalone	Document services (printing, typing, scanning, photocopying)	High speed internet (C-band VSAT)	<N100
Residential, plaza	Assistance (checking email, search, form filling etc)	"Normal" speed internet (KU-band VSAT/radio)	N100
Commercial, standalone	Communications (VoIP international calls)	Luxury (drinks, snack food, furniture, spacing & privacy)	>N100
Commercial, plaza	Clientele management (validity of purchased time, loyalty benefits)	High Technology (modern hardware, extra installed software, accessories)	

A second class is the *neighbourhood café*: these also usually have 10-12 computers, and are present in a wider variety of locations than the rest, but usually near a residential locality. They may have newer hardware, devote some attention to comfort and privacy, and depending on location, slightly reduced Internet access prices. While they also generally have printers and other hardware related to the provision of document services, they do not have staff dedicated to that purpose. Many of the cafés in this class were very new – most were less than 6-8 months in operation at the time this research was carried out.

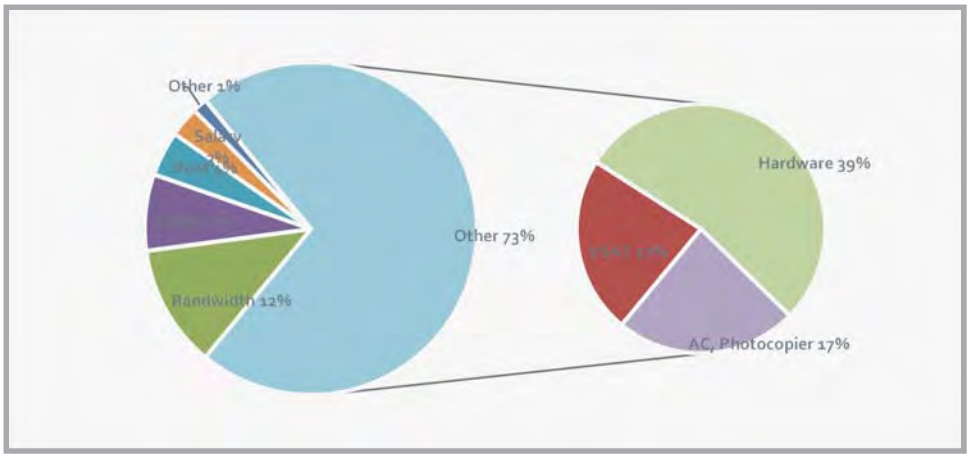
Table 5. The Cool Café

Location	Services	Technological Infrastructure	Price /hr (in Naira)
Residential, standalone	Document services (printing, typing, scanning, photocopying)	High speed internet (C-band VSAT)	<N100
Residential, plaza	Assistance (checking email, search, form filling etc)	"Normal" speed internet (KU-band VSAT/radio)	N100
Commercial, standalone	Communications (VoIP international calls)	Luxury (drinks, snack food, furniture, spacing & privacy)	>N100
Commercial, plaza	Clientele management (validity of purchased time, loyalty benefits)	High Technology (modern hardware, extra installed software, accessories)	

The *cool café* is an establishment that explicitly differentiates itself by framing itself as a place for entertainment and relaxation. These are appropriate located away from the rest, are higher priced, and generally more luxurious. The staff spends less time assisting users because these are generally habitual surfers who are comfortable using computers and the Internet. One café visited had even started a DVD and video game (XBox) lending library, because the operator thought "there should be a place where young people can relax, and have fun". These establishments, though equipped with printers and scanners, will not emphasise these services or devote dedicated manpower to supporting them. This reflects their ability to sustain themselves using computer & Internet usage as the primary source of revenue. This is by far the rarest kind of café. It is, however, not identifiable with a single type of user – though there are people who solely frequent a *cool café*, many choose these cafés when they want to relax, and go to other less expensive and luxurious cafés for work.

SUSTAINABILITY

Figure 1. Overall Costs



Cybercafés in Abuja face two challenges to sustainability: high running costs because of bandwidth prices and unreliable power, and a competitive environment that has stabilized at a price-point not high enough to enable recovery of investments via Internet access provision alone.

Figure 2. Running Costs

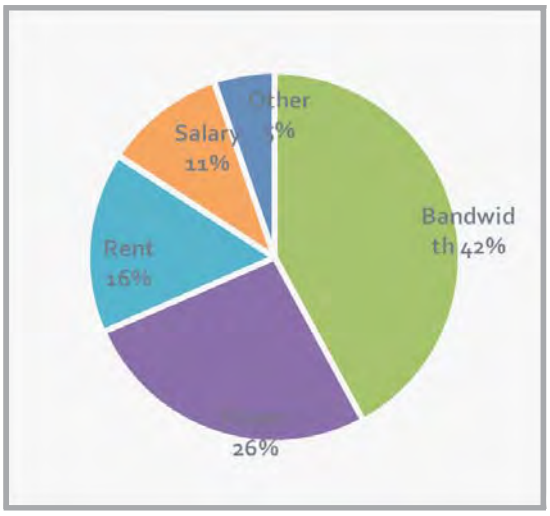


Figure 1 is a chart describing the relative proportions of the costs involved with operating a cybercafé for one particular newly established *neighbourhood café*. While the exact numbers are not accurate - these are based on estimates reported verbally and may not be reliable – the proportion of costs reported has a considerable skew towards the investments in operating infrastructure. The running costs themselves are similarly skewed towards bandwidth (see Figure 2). The operator estimated that at the rate he was charging for internet access (N100/hour) it would take him at least two years to break even and recover his investment – assuming his café's computers were occupied all the time. Every café operator running *neighbourhood cafés* and *business centres* reported similar conditions. In the light of this, the fact that *business centres* get their revenue from document services suggests that financial sustainability for these cybercafés is difficult to achieve. This hypothesis is supported by the fact that most of the cafés visited were not more than a year old; in addition, we discovered in the course of fieldwork that

out of 38 cybercafés identified from a yellow pages listing (or the equivalent in Abuja), no less than 12 had ceased to exist, and two more were in the process of shutting down. Most of the 12 were in or around residential areas, thus suffering from decreased revenues due to low traffic.

Cafés in plazas also have to pay high monthly rents, especially if they are in a central area. At certain plazas, the café owners have to pay two years rent in advance, which acts to increase the initial investment even more. Operators thus have to balance the cost of location with the probability of getting traffic – which is more for more popular & populated areas – while having to keep prices below or at the same levels as other (possibly successfully established) cybercafés in the vicinity.

Cybercafé operators are further constrained by a market dynamics that locks prices at N100/hour for Internet access for most cafés. The origin of this state is unclear, but it seems to be partly caused by competition – as one operator said that if she could, she would set the internet access price at N200/hr, but the price for that plaza was set by a large neighbouring café (" we cannot compete with the big man!"). A solution for this may lie in the clustering of these cafés around plazas: with newer wireless technologies such as mesh networks and WiMax, these cafés can share a single satellite uplink but distribute bandwidth easily amongst themselves.

PORTAL, PEDAGOGUE, WORKSITE

It is important to note that, because of the costs involved, access to the Internet outside of cybercafés is only feasible institutionally. This does not mean, however, that institutions will have Internet access – amongst our interviewees were government officials who would come to a cybercafé after work in order to send emails and do the day's online work. In the rare case where the home/office owner has a telephone line connection, they may be able to use dial-up to connect to a few ISPs. Given the state of the wireline infrastructure, however, only a few ISPs maintain a dialup infrastructure. Thus, for most people, the cybercafé with its fixed times of operation and shared usage model is the *only* means of Internet access.

Given these conditions of access – shared usage, predominantly fixed prices, clustered locations and unreliable speeds – cybercafé users in Abuja frame cafés in three distinct ways: as a portal to the outside world, a place to acquire skills, and as a worksite. These (socially constructed) frames are dependent upon relationships between users and operators, and partly derive from historical reasons. These frames are not invariant across the West African region – Griswold (Griswold, McDonnell, & Metz, 2005) reports contrasting constructions in Ghana, and even within Nigeria (in the city of Lagos). While these frames are distinct in that they emphasise different aspects of the cybercafé, they also interact because most users combine more than one frame in their approach to cybercafé usage.

It is important to note that these frames do not exhaustively describe the valuation of the Internet, or of going online: Griswold et al also report on the glamour of going online, and of cybercafés as sites of socialization (esp. in Lagos). It may also be more insightful to treat these frames as expressions of larger processes of technological adoption – for a similar, albeit much more detailed, description of Internet usage in Trinidad see (Miller & Slater, 2000).

PORTAL TO OUTSIDE WORLD

Zachariah is a 21 year old student at a local polytechnic. When asked about what he liked doing online, he said he liked watching football matches online, or getting the results. He does have a TV at home, but can't always get to see the broadcasts live, in which cases he is able to go to a cybercafé and find out how the game he's interested in turned out. Zachariah also wanted to be able to talk to sportspeople outside Nigeria, and giving them feedback about their play, and telling them what mistakes they had made so they could avoid making them in the next game. But he had not been very successful in finding email addresses of the sports stars, and so hadn't been able to try any of this.

Ernest, 34, runs his own printing business, and is also a consultant to a federal technology organization. Ernest thinks that the Internet is very essential to his work – he is "crazy for information", and "hungry for knowledge, because nobody can be robbed of knowledge", because for him, "knowledge is survival". Ernest USES THE *internet* BECAUSE IT IS CHEAP AND SAVES MONEY & TIME: *"One can get exposure to other things and people. I* LIKE *being able to see how other people know about the field, and being able to appreciate other people."*

Karim, 33, is engineer with a B.E. in mechanical engineering; Karim finds the "internet is addictive, like coffee". Karim frequents cybercafés primarily for email and chatting with friends, and making friends. He has made a lot of close friends this way, and even has phone numbers for some of them, so he often SMSs and calls them. He likes the fact that when he gets online he can be "both in the physical world and the virtual". Karim uses the Internet primarily for entertainment and information, and is comfortable with social networking sites and Yahoo messenger. Karim also found the internet very useful for finding information: for instance, he recently used the internet to find information about mining and mining industries: how they operate, how to work with them.

These articulations form the *portal* frame: a cybercafé is a place where one can 1) connect with people outside Nigeria, and establish relationships with them, 2) find valuable information about the outside world, and information from the outside world about things relevant to oneself, consequently making the café a 3) place where one can escape the confines of one's immediate social and information context.

Internet access comes to Nigerians in an environment that has lacked communications technologies for a long time. Waiting times for fixed line telephone connections may be anywhere from 6 months to a couple of years, and only half the infrastructure is thought to be operational at any given time. The mobile telephony network fills in this gap, and enables Nigerians to communicate with each other quickly and efficiently, though still somewhat expensively and unreliably. Given that personal, private Internet access is still not affordable, the mobile phone forms both a complementary, and in cases, more useful alternative to email and instant messaging. Thus, personal communications within Nigeria are more likely to use mobile phones than the Internet.

From within to without, however, is a different matter. Nigeria has a large diaspora spread all over the world, and the Internet serves to connect these geographically distributed families. Additionally, the Internet is seen as something that connects Nigerians to the outside world, and brings with it potential relationships – many people interviewed stated that as their primary motivation for accessing the Internet. This is especially true with the younger users – as is the case in so many other parts of the world – but we observed older users in their middle ages as well who talked to us about the friendships and intimacies they had formed online. As might be expected, the younger users knew of and relied upon social networking sites like Hi5 and Friendster, whereas the older ones preferred chat rooms. This earnest seeking of friendships in the outside world is, however, fraught with disappointment: Nigeria has long been known for email fraud scams ('419s' , so called because of the article of the Nigerian constitution that prohibits such activities), and many interviewees reported that they faced rejection when approaching new contacts once it was discovered that they were from Nigeria.

It is not just the potential for relationships that the Internet opens up, however – it is also a fount of opportunities. The unemployed youth writing to a businessman in Fiji to fund his hockey team, the high school football fan wanting to write to his favourite footballer with suggestions on improving his (the footballer's) play, the computer enthusiast wanting to get in touch with Microsoft to express his thanks – all of them wish to be part of something that will bring them fame or fortune, or at least recognition.

Emotive aspects aside, the Internet is also seen as a powerful source of information about things not Nigerian, or not found in Nigeria. Many users at the cafés we went to were business people who used the Internet extensively to do their business communications, both within and without Nigeria, but also to find information related to their work. The accounts we received focused on the users' ability to find information speedily ("at the click of a mouse"), and about a wide variety of topics easily and efficiently. This ability was usually articulated as a new-found alternative that released users from having to put up with Nigeria's slow and unreliable information environment.

PEDAGOGUE FOR COMPUTER SKILLS

Zachariah started coming to the café a month ago; he always knew about the Internet and computers, but never acted on it. Now that he'd almost graduated from college, he decided to force himself to learn how to use both of them, and was going through the café's training program, spending an hour twice a week for 3 months learning basic computer usage, using office applications, and how to surf and find information on the internet.

Karim started using the internet/going online out of curiosity when he didn't know how to use computers – he would whisper to attendant whenever he needed help, because he was ashamed of not knowing. He finally learnt how to use computers himself, at his aunt's place (that was 2-3 years ago), after which he started to go to a cyber café everyday because it was close to home. Karim would like to be involved in online universities (but not in a technical program - business administration, management, IT or philosophy). This is why he would like to spend more time online – having more time online means that he can download material, applications, and read on the computer.

Abdul's cousin brother used to run a cybercafé – it was the first in Abuja when Internet access finally became possible in 1999. That was his first exposure to computers, and he started helping out with the café, and learnt how to browse the internet, and use the computer; soon he was able to help other people get online and teach them how to use computers. Later, when the café shut down, he continued to go online at cybercafés, ad eventually took a certification course in computing. For Abdul, that initial exposure to computers at a café allowed him to be a front-runner and teacher, and he plans to further his training to become a systems administrator.

These articulations embody the *pedagogue* frame: a cybercafé as a place where one learns how to use computers and browse the internet, acquiring valuable technical skills for career advancement.

While computers themselves are not new to Nigeria, only a small fraction of our users admitted to having used a computer before they started to access the Internet. Most users did not distinguish between using a computer and going online, a pattern repeated across other parts of West Africa (Griswold, McDonnell, & Metz, 2005). Thus, exposure to and use of cybercafés contributes to one's knowledge of computers – this is the second frame we identified, of cybercafés as a pedagogue where one becomes "computer literate". Cybercafé users we interviewed described their ability to use a computer as a skill that had value, and its implied economic advantages over those who did not. For those who were learning, coming to a cybercafé and accessing the Internet was preparing them for the oncoming IT revolution, and this acquisition of skills was measured by their increasing self-sufficiency in using a computer. This view was not restricted to students, who may naturally be oriented towards educating themselves, but was also espoused by working professionals, many of whom did not use a computer in their daily work. This emphasis on becoming computer literate may partially be caused by the nature of enterprise and commerce in Abuja, which, being the newest power centre, is a place where those wanting social and financial advancement hope to make their mark.

This framing is supported by the operators and the staff who frequently play the role of a teacher who introduces first time users to computer & Internet usage. The staff also help setup and check email accounts, and use search engines to find information online. This is seen as part of providing access, and operators often claim to distinguish themselves from other cafés on the basis of being more assistive and supportive. Some cafés even have training centres and programs attached – one of the more established cafés we encountered had separate facilities set aside purely for training, was affiliated with a nationally recognized certification program, and was a member of several regional and national professional computing organizations.

WORKSITE & EXTENSION OF OFFICE

Daniel is 39 year old marketing & public relations professional, with a degree in Business Administration, and a member of the Nigerian Institute of Public Relations. Daniel comes to cybercafés daily, and spends at least 2 hours there, based on the amount of free time he has, and usually goes to this particular cybercafé because it is near his office. Daniel selects cybercafés based on two criteria: high speed connectivity, and personal relationship with staff. At this café, the staff is friendly, and helps in doing his job (referring to the operator who was composing and sending emails for him. He mentioned that the operator would also help with his other computer work.

Amadi is one of the managers of a cybercafé in a busy plaza; one of the ways in which they differentiate themselves from the other cafés is in the services they provide their business customers without an office. Apart from the usual support provided in document services, Amadi's staff also performs secretarial tasks for long term customers. "For instance, a customer might call up from another city and tell them that she's expecting an important email – our staff will then check their email, and fax the information if necessary. They trust us – we have their email passwords – because we have a relationship with them, and they will always be welcome here".

Daniel and Amadi are describing the third frame: of cybercafés as worksites and extensions of office spaces. In this framing, a cybercafé provides 1) access to information and communications facilities not available elsewhere, or not personally affordable and 2) secretarial assistance with computer related jobs that help meet business needs.

That the internet is a rapid communication medium as well as an information source makes it a natural resource for businesses. In Abuja, this utility is further reinforced by the collocation of business establishments with internet cafés in plazas, leading to third framing observed: that of a cybercafé as a worksite, and an extension of the office. As is to be expected, the primary usage of cybercafés and internet access for most businesspeople is email, and sometimes international telephony. However, those users who frequently create documents often enlist the support of the operators in creating, printing, and managing these documents. This is enabled by relationships of trust between the operator and the users – which can sometimes be strong enough that the operator is given access to the users' email accounts, and takes on quasi-secretarial roles such as checking and sending email, getting documents printed and sent, and so forth. This results in the café being treated as an extension of the office, and for some users who do not have their own offices, as an office itself; in these cases the trust is also complemented with loyalty: the trusted operator also becomes the primary provider of computing and internet access for those users.

SECOND AND THIRD PLACES

Third places are a term first used by Ray Oldenberg in his work (Oldenburg, 1999) on communal spaces to describe neighbourhood spaces such as a tea shops or bars where people come to relax. These are distinguished from first places (the home) and second places (the office) by being a) easily and equally accessible b) neutral spaces which level (social) status, in which to c) conduct casual, unplanned and undirected activities involving both d) regulars and casual visitors.

When considered thusly, cybercafés in Abuja appear to possess aspects of second and third places simultaneously: they are a) equally accessible to a variety of people, whether they are university students or bank servants, b) neutral spaces where social background does not contribute to one's ability to use a computer, c) a place to relax in and get online in a casual manner, with d) both infrequent and regular users. These activities are conducted in the same space as (but not necessarily the same time as) 'serious' users coming in for work. Critical to this is the role of the operator as host and as provider of assistance, and as trusted provider of computing services. Location also plays an important role: those cafés that wished to emphasise their third-placeness deliberately distanced themselves from plazas and localities that were explicitly commercial, instead preferring to serve more privileged or residential communities.

IMPLICATIONS FOR ACCESS

Studies of technology access (especially of the digital divide) reveal a variety of factors – see (Chaudhuri, Flamma, & Horrigan, 2005; Cullen, 2001; Dijk & Hacker, 2003; Eastin & LaRose, 2000; Oyelaran-Oyeyinka & Lal, 2005; Reddick, Boucher, & Groseilliers, 2000) for instances of such studies. Nor is this variation in factors specific to Internet access – (Light, 2001) draws links between the digital divide in USA and the cable television access debate there a few decades earlier. This leads us to the not so profound observation that different factors govern access in different regions – it is therefore no surprise to discover that Internet access in Abuja is a complex phenomenon.

What do these practices mean for our understanding of access? First, that access is not simply constituted by physical availability of technology, appropriate location, affordability or shared usage, but that sites of technology access must be *made* accessible. In the case of Abuja, these factors are brought together by the supportive nature of customer-operator relationships, and it is this that makes the cybercafés accessible. Secondly, it is evident that access is not solely defined by the usage of technology, but also by the ways in which technology usage is framed, learnt and communicated – it seems unlikely that mechanisms for providing access can be separated from those for providing technology education, and educational programs may be very useful in supporting and furthering access; see (Moe, 2004) for similar results from the USA. These practices also point towards the relationship between the valorization of technology and its usage – in the case of Abuja, of cybercafés and the Internet as portal and pedagogue not only encourage use, but also provide support structures that help sustain it.

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APPENDIX 1 : INTERVIEW INSTRUMENT

The following were the interview scripts used. Befitting the nature of semi-structured interviews, they do not represent all the questions that were asked, but they do define the limits of the interview.

User

- Demographics (age, gender, role)
- What are the things you use the internet for? For each such thing…
  - What makes it interesting? How is it useful?
  - Do you do other similar things?
- What would you like to be able to do on the internet, but can't right now? What would make that possible?
- Where do you access the internet?
  - Why do you come here to access the internet? What advantages does this place have over other places?
  - Are there other places you use to access the internet? What things do you do there?
  - Do you come here alone, or with others?
- When do you access the internet?
  - At what times do you come here? On what days? Weekends or weekdays, or both?
  - Do you do different things at each of those times? Is what you do on weekends different from what you do on weekdays?
  - When do you spend more time on the internet? Less time?
- Would you like to spend more time on the internet? What would you do then?
- Since how long have you been going online?
- Did you know how to use computers before then?
- How has having access to the internet affected your life?

Operator

- Infrastructure
  - How many computers do you have? Why?
  - How do you connect to the internet (type of network, network service provider)? Why do it this way?
  - What issues did you face when setting up this establishment?

- Services
  - What services do you provide? Why do you provide these ones?
  - How do you provide these services?
    - human capacity - who's employed, in what capacity, etc
  - What kinds of people use what kinds of services? (i.e., what's the market for the various services)

APPENDIX 2: CYBERCAFÉ LOCATIONS & CLUSTERS

Last Mile Initiative
Innovations:

Research Reports from the Georgia Institute of Technology

In the fall term of 2005 thirteen students from the Georgia Institute of Technology came together as USAID Last Mile Initiative (LMI) *Innovation Fellows*. Their job was to provide fresh and dynamic new perspectives into LMI programs in Africa, S.E. Europe, and Latin America. These student research fellows came from every major discipline represented at Tech including International Affairs, Computer Science, Industrial Engineering, Engineering Psychology, Mechanical Engineering, and Industrial Design. The results of these activities, contained in this volume, are a wide range of insightful, passionate, and often provocative research outputs, including:

- A new typology of cyber café's in Abuja, Nigeria.
- An assessment of the soft-power relationships within aid funding of LMI programs in Macedonia.
- An assessment of existing work flow networks, and the possibilities of new digital networks, for coffee co-operatives in Rwanda.
- An evaluation of ICT needs amongst rural health providers in Peru.
- An evaluation of the needs, and the independence, of telecommunications regulators within the West African region.
- A study of the prospects, and the impediments, to liberalization of the Internet market in Ethiopia.

The program's Principal Investigator was Michael Best of Georgia Tech. Michael Tettleman of the Academy for Educational Development was the project manager. The program was funded by USAID's Last Mile Initiative under the direction of Juan Belt and Bernie Mazer.

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