Post-Conflict Communications: The Case of Liberia

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Liberia, founded in 1847 by freed African slaves from the U.S. is a relatively small country with approximately 3.3 million inhabitants (see Figure 1). Unrest has been common within Liberia for more than 25 years, with two major civil wars in this time period. These years of conflict have seen nearly one-third of the population displaced and taken the lives of approximately 250,000 people. Recently, a prominent warlord turned Liberian President, Charles Taylor, ruled with violence both at home and regionally. In 2003, as his government struggled under domestic and international pressure, the civil war entered the capital Monrovia. By the end of that year Taylor was forced to resign and sought asylum in Nigeria. Taylor has since been arrested and removed to The Hague where he faces charges of war crimes and crimes against humanity.
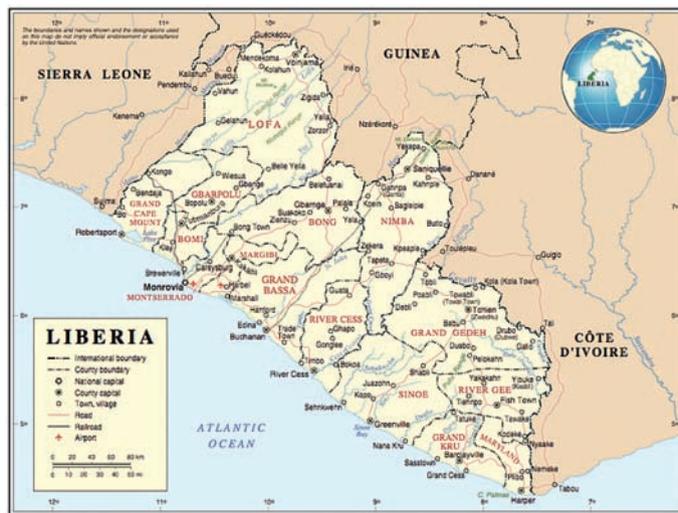
With Taylor's departure, a

Figure 1. Map of Liberia. Used with permission of the United Nations Cartographic Section.

transitional government was established. United Nations forces and the Economic Community of West African States Monitoring Group (Ecomog) were positioned to keep the peace. Democratic elections were held in the fall of 2005, resulting in the selection of Africa's first female head of state, President Ellen Johnson-Sirleaf.

Her job is a formidable one, governing a country with weak or destroyed infrastructure, a mostly poor and undereducated population, and broad unemployment with little economic opportunity. Challenges notwithstanding, her election has generated excitement and attention from the international community and strong domestic expectations for peace, development, and growth.

ICTs and Liberian Development

Information and communication technologies (ICTs) have been identified by the Johnson-Sirleaf government as a critical tool toward the country's rebirth (see the accompanying sidebar). They are being targeted toward

strengthening areas such as government operations and transparency, economic activity and growth, post-conflict reconciliation, and security.

There has been much debate [7, 8] about just how large a role ICTs can and should play in the process of socioeconomic development of low-income countries—

from the optimistic extreme that ICTs are a near panacea [5] to a pessimistic perspective that questions its value in the presence of a range of seemingly more pressing

BUILDING A NEW LIBERIA OUT OF THE ASHES
Her Excellency Ellen Johnson-Sirleaf, President, Republic of Liberia

Excerpts from a speech given at the Georgia Institute of Technology, Sept. 13, 2006.

The juxtaposition of modernity and tradition, of building a new nation on the foundations of the old, is the very magic that makes African development so intriguing…. If any field of endeavor has been so touted with the possibility of doing so much, it is the field of Information and Communications Technologies (ICT). I therefore wish to start a dialogue with you on how the knowledge, products, services, and promise of ICT can advance and accelerate our national reconstruction process. Sometimes we feel that all we have to do is get out of the way so our lives and destiny can be executed for us through the push of a few buttons….

[D]uring my first official visit to the U.S., a Liberian reporter asked me about Africa One, an optical fiber project that was supposed to ring around Africa. "If it is beautiful," I told her, "We will wear it!" I have since found out that Africa One did not materialize, which points to another side of the communications industry—the rapid changes of technology, and the threat of obsolescence. Yet African nations themselves, working with global partners, have built their own undersea cable SAT-3, along the coast of West Africa, linking to Europe and Asia. They are detailing a sister undersea cable to run along the East African coast.

We all know that technology is a powerful tool, but just a tool. Its efficacy lies in its ability to accomplish the will of man and society, at a level of efficiency, speed, and economy of scale, so that we can create products and services, and reach more people over great distances, all exponentially, at more affordable costs to those who need them most. Put differently, technology in its rightful place and deployment can stretch the returns on human investment, permitting especially those with much less, to accomplish much more than they otherwise could. The goals, the method, the effect, and the utility of tech-

Liberia's President Ellen Johnson-Sirleaf

nology must aim at the service of a better life today and tomorrow, all based upon human desire and command….

In order to get the most out of the promise of ICT; in order to develop the ICT sector in Liberia, to attract investment and support, and ensure the smoothest operation of all participants with minimum interference amongst competitors and collaborators alike, it is important to establish the modus operandi and the appropriate policy, legal and regulatory framework, and environment for promoting and managing the sector. Accordingly, we are considering the establishment of a National Steering Committee, consisting of expert Liberians from around the country, to draft a National ICT Policy.

They will be given the responsibility of formulating a vision and mission for ICT in the country, of crafting the framework for the strategic development and the most beneficial deployment of ICT to meet Liberia's strategic needs. We will ask the Committee to direct their focus especially on community access and development, government, learning, health, economic development and the growth of the ICT sector, infrastructure and security, legislation and policy.

Our vision is for Liberia to become a globally competitive knowledge and information society where lasting improvement in social, economic, and cultural development is achieved through effective use of ICT. We want to create an enabling environment for the growth of an ICT industry in the country; to provide universal service and access to information and communications facilities in the country; and if realistic, to make Liberia a regional ICT hub so as to make the country's service sector globally competitive.

We hope to build a culture of lifelong learning that maximizes the potential within all citizens and accelerates innovation to develop knowledge-based systems.

needs and appropriate technologies [4]. What is clear is that more robust and thoughtful research on the topic is needed before all these debates will be answered [6, 9].

If we are to consider the role of ICTs in Liberia's post-conflict development, a first step is to assess the current human, policy, economic, and technological capabilities within the country. Our present research is in service to this goal.

THE STUDY

This study employed a series of stakeholder meetings and interviews among the primary sector participants to assess the state of ICTs in Liberia. We conducted interviews with management from the Liberian Telecommunications Corporation, the incumbent fixed-line operator, as well as the four currently active mobile operators. Relevant government officials from The Ministry of Information, Ministry of Planning, the Ministry of Posts & Telecommunications, and the Liberian Telecommunications Authority and members of the Office of the President were consulted. We also met with owners and operators of wireless ISPs, Internet cafés, and IT training centers. Faculty and administration from the University of Liberia were consulted, and we received valuable insights from non-governmental organizations working in the country along with donor and international agencies including the World Bank and USAID.

Our study applied the Mosaic Group's Global Diffusion of the Internet analytic framework. The Mosaic e-Readiness framework has been developed to assess a country's level of Internet penetration and use, basic Internet infrastructure, and its readiness for Internet-enabled business and economic growth [1]. We extended the framework to examine the mobile

We want to make Government services available electronically; increase economic diversification and foreign investment, including ICT-enabled services based in Liberia. We want to promote access to relevant, localized, and understandable information for all citizens. We hope to establish ICT access points in many villages and to provide ICT support for enhanced disease control and health care programs. We expect to build an efficient and cost-effective ICT infrastructure; and establish a clear ICT legal framework. We know the key to the successful development and implementation of Liberia's ICT policy will be the enabling legal and regulatory framework, and its administration by an independent regulatory authority. In this regard, we have already established the Liberia Telecommunications Authority (LTA), the key tasks of which are similar to [the U.S.] Federal Communications Commission. The LTA will not just regulate the sector, issue licenses, and supervise compliance with the terms of the licenses. It will not only manage spectrum allocation and use (to prevent inappropriate or rogue use of this precious national asset), but more importantly, it will have prime responsibility to drive the development and growth of the sector. At the end of the day, we want to build an ICT business sector in Liberia, one in which Liberians and other Africans can acquire and deploy critical ICT capabilities, working in close consort with global partners. That is our ambitious but ultimate goal....

I see nothing but hope and immense possibilities for the renewal of our nation. We are determined as a people to rebuild a national and human security system; to renew and capacitate our governance structure; to revitalize our economy and reconstruct our infrastructure thus putting the nation back to work, putting our children back in school, and keeping our people healthy. We are determined as a people to build a new Liberia out of the ashes, pain, and anguish of the old. We are convinced that we can become once again a proud and noble people, mindful of the shortcomings of our past but challenged by the hope and promise of our future. We know that we have the will and the capacity to become America's success story in Africa.

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phone sector, which in Liberia is currently much more robust than the Internet.

The Mosaic measure of global Internet diffusion is divided into the six dimensions [10] discussed here. Each dimension is measured in discrete levels; these map to a range of underlying values and conditions designed to reflect ground realities.

Here, we present an assessment of Liberia's current state of e-Readiness along each of these six dimensions for the Internet and mobile phone sectors. (A more formal version of this evaluation has also been developed [3]).

Internet diffusion. Liberia is comparatively rather isolated from the international Internet cloud with no outgoing fiber connectivity and therefore satellite communication is required for all international networking. This, coupled with a lack of a national network backbone, has created a difficult environment for expanding the availability and use of the Internet. Moreover, there is no major international gateway provider, which forces individual providers to implement their own international gateway facilities. This constraint limits the sector's growth, increases prices, and ultimately reduces the nation's available capacity.

Pervasiveness, connectivity infrastructure, and geographic dispersion. Pervasiveness quantifies the growth of the Internet beyond early adopters and the ease with which the population can access the Internet. Liberia sits between an *experimental* and *established*

Figure 2. Combined cell coverage for the four mobile operators.

level with the Internet available only to a small portion of the Liberian population, mostly via Internet cafés or wireless ISPs (WISPs). Total home and business subscribers among the 10 WISPs in Monrovia are estimated at between 1,000–2,000 with most of the WISPs having less than 100 customers and the largest, Comium, estimated with between 400–700 customers. As of 2004, the ITU estimated that

only one in 1,000 people in Liberia had Internet access—this number would represent approximately 3,300 people with access. Based on the number of Internet cafés, the growth of the fixed-WISPs, and the number of very small aperture terminal (VSAT) installations, it is possible that this number is closer to two people per 1,000 with access to the Internet at the end of 2006.

The network has limited penetration outside of Monrovia with only a few VSATs employed by private entities (such as a major rubber plant owned by Firestone). Furthermore, there is no countrywide fiber backbone network significantly reducing capacity for intra-country traffic. Thus, in practice, the Internet is relegated to the *single location* of the capital.

Each provider is required to address international connectivity on an independent basis, forcing pricing to be acquired on a retail rather than wholesale basis. The lack of backbone network facilities in Monrovia reduces the ability of these ISPs to interconnect, forcing all domestic internetwork traffic through costly and capacity-bound international satellite links. Indeed, total international connectivity, including telephone network bandwidth for mobile operators, is estimated at between 30Mbps–45Mbps.

Sectoral absorption, organiza-

tional infrastructure and sophistication of use. While pervasiveness, infrastructure, and dispersion measure "how much" Internet exists in Liberia, other more qualitative factors are central to understanding the overall network readiness. For example, the absorption of the Internet among a number of critical sectors such as health, industry, academia, and the public sector is critical to true e-Readiness. We found that within all of these

Finally, to understand the full Internet capability of a country it is necessary to examine not only who uses the network where, but also exactly how and why the Internet is used. We find that the sophistication of use in Liberia is challenged by the weak and unreliable connectivity infrastructure, which constrains the scale, scope, and thus sophistication of use. Those who gain access to the Internet use it mostly for email

2000, this number was down to $8 million [2], and today it is near zero with an estimated $150,000 coming from equipment leases to the mobile operators. The decline in fixed-line subscribers follows a similar trend—from over 9,300 in 1990 (0.36% teledensity) to 6,900 in 2002 (0.21% teledensity) to zero today.

Activity in the mobile sector began as early as 1998, but up

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important spheres, use of the Internet was *rare* in Liberia and there was a low level of capacity. We estimate that less than 10% of organizations with each of these sectors are connected.

Rapid absorption among these sectors relies on a strong organizational infrastructure. These institutional structures include supportive public policies and regulations. Current legislation relating to the Internet and telecommunications is broadly based on laws passed during the interim government and their application remains questionable. New legislation is in the works and should come before the legislature this year. In addition, a draft of the national ICT policy was released last April. Overall, the organizational infrastructure in Liberia is *controlled*.

and general communication. Very few people make use of advanced applications of the Internet to provide efficiencies or improve business processes. Ultimately, Liberia's use of the Internet is *minimal*.

The mobile phone sector. The mobile phone sector in Liberia is much stronger than the Internet arena. Mobile phones are currently the only voice service provided in the country, the entire fixed-line network was destroyed during the civil conflicts and the copper infrastructure was looted. But prior to the recent wars there was a fixed-line operator offering some, albeit limited, phone service. The Liberia Telecommunications Corporation (LTC) was established by congress in 1973. In 1985, LTC had estimated revenue of $36 million (U.S.). By

until 2003 mobile density remained at 0.06%, due to the ongoing conflict and an unorganized licensing regime. Spectrum management and allocation had been the province of the Ministry of Posts & Telecommunication (MP&T) until recently when the responsibility was passed to the newly established independent regulatory authority, the Liberia Telecommunications Authority (LTA). Spectrum management by the ministry has had a very poor record. At one point, there were 14 mobile operator licenses issued with very little oversight of the spectrum allocation—several had overlapping frequencies and large gaps between spectrum allotments. In 2003, the spectrum plan was sanitized, redistributing the frequencies to the four current mobile providers.

Today, the market is very active with the four operators collectively enjoying a customer base exceeding 400,000, giving a telephone penetration at 12%–13%. It is estimated that 60%–70% of the population centers receive signals from at least one of the mobile providers' services (see Figure 2). And operators are actively extending both their networks and services; for example, Libercell recently launched a 2.5G GPRS/EDGE service in Monrovia.

All providers have stated they plan to continue network expansion into rural Liberia. For example, the operator Lonestar (owned by the major South African GSM company, MTN) stated it will provide service to 80%–90% of populated areas by the end of 2007. Libercell currently has coverage in 90% of the counties and has plans to add 50 additional towers to its existing 35. Finally, Comium plans to cover all of Liberia, but offered no time line or detail to this statement.

Competition has dramatically improved pricing and all providers now offer per-second rounding, low entry fees (SIM cards for under $5), and a growing array of services. All providers are interconnected, although one provider (Cellcom) inexplicably provides interconnection via an international route. They all provide international connectivity,

and most offer international roaming capabilities. Post-paid accounts are available, often with substantial discounts, and busi-
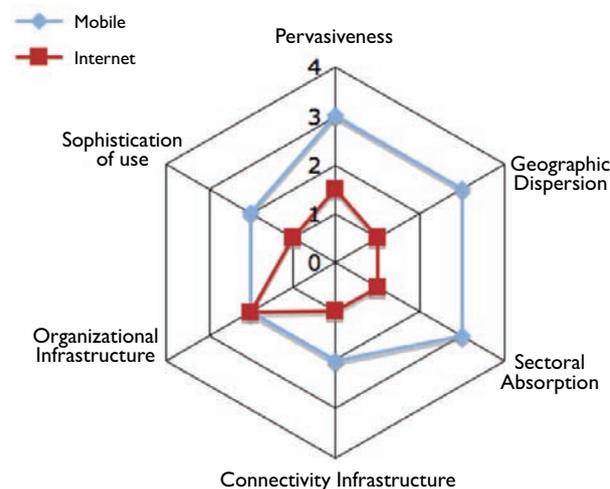

Figure 3. Liberian diffusion of the Internet and mobile telephony.

ness accounts are becoming more feature rich, for example by providing group billing and fax services. With the introduction of 2.5G network capabilities, additional services should be on the horizon, but likely only within Monrovia for the near future.

CONCLUSION
The results of our study are depicted on a Kiviat diagram in Figure 3; as the lines approach the graph's edge conditions along that dimension are improved. The diffusion of the mobile telephone has clearly outpaced the rate at which the Internet has been adopted in Liberia. While

the mobile phone sector is quite healthy, many issues remain (national backbone, rural penetration, reliability, advanced services, electricity, number portability, interconnection regime, licensing regime, and independent regulation) and sadly over 85% of the people in the country still do not enjoy ready access to communication technology.

We have used the Mosaic analytic framework to assess the state of the Internet and mobile telephony in post-conflict Liberia. Overall, we find Internet penetration and use to be minimal and the mobile sector to be comparatively vibrant. These studies, along with related research assessments we have made, lead us to a broader set of concluding recommendations:

• A strong independent regulator is critical to growth of the overall ICT sector. The LTA is transitional and has not been given a permanent mandate, sufficient capacity to license operators, raise independent funds, enforce regulations, nor resolve disputes. The LTA should be strengthened.
• The lack of a fiber network in metropolitan Monrovia along with a national fiber backbone limits significantly domestic Internet capacity. Private opera-

tors, or a revitalized Liberian Telecommunications Corporation with foreign investment, can serve naturally as a network service provider.

• Liberia's reliance on satellite connectivity for all international traffic reduces capacity while increasing costs. A connection to the submarine cable that travels from Portugal along the west coast of Africa (SAT3/WASC) can be realized most efficiently with a link via neighboring Côte d'Ivoire.

• Human capacity development is the central component to Liberia's successful post-conflict development. A focus within the educational systems on the effective use of ICTs, especially in the universities, can transport Liberia into the global knowledge economy

• Finally, ICTs should be viewed as a component in the national strategy for development in all sectors including: agriculture, international trade, finance, energy, health, conflict resolution, and law and order. The creation of a unified Liberian ICT Agency that centralizes expertise and assists in overall policy development across this broad mandate should be contemplated. This agency could facilitate overall adoption and management of ICTs across the government ministries and divisions. And while a nodal agency is useful, it does not reduce the requirement for strong executive leadership setting a broad vision. **C**

REFERENCES
1. bridges.org. *E-readiness Assessment Tools Comparison.* Cape Town, South Africa, 2005.
2. Guermazi, B. *Liberia Telecommunications Sector, Overview of Issues and Roadmap for Reform.* Global Information and Communications Technologies Department, Policy Division, The World Bank Group, 2005.
3. Jones, K., Best, M.L., Kondo, I., Thakur, D., Wornyo, E., and Yu, C. *Internet and Mobile Telephone Diffusion in Post-Conflict Liberia,* 2007.
4. Kenny, C. *Overselling the Web? Development and the Internet.* Lynne Rienner, Boulder, CO, 2006.
5. Negroponte, N. The third shall be first. *Wired 6,* 1 (1998).
6. Raiti, Gerard Charles. 2007. The lost sheep of ICT4D literature. *IT and International Development 3,* 4.
7. Unwin, T. Ed. *ICT4D.* Cambridge University Press, Cambridge, MA. Forthcoming.
8. Wilson, E.J., III. *The Information Revolution and Developing Countries.* MIT Press, Cambridge, MA, 2004.
9. Wilson, E.J., III, Best, M.L., and Kleine, D. Moving beyond "the real digital divide." *Information Technologies and International Development 2,* 3 (2005).
10. Wolcott, P., Press, L., McHenry, W., Goodman, S., and Foster, W. A framework for assessing the global diffusion of the Internet. *J. Assoc. for Information Systems* 2 (2001).

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