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Lessons from Haiti's Internet Development

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Abstract

Haiti does not appear to be the most fertile ground for Internet growth. It is a poor nation with a low literacy rate, difficult terrain, and few working telephone lines outside the capital city. Despite these impediments, resourceful entrepreneurs have sought to offer and expand Internet services, and have sometimes explored unconventional technical approaches. Haiti now has four commercial Internet service providers (ISPs), and Internet services are available in five Haitian cities. This paper will provide a brief description of today's Haitian Internet sector. The Haitian experience demonstrates that the shortest path to Internet infrastructure in developing countries may be radically different from the paths taken in wealthier nations. It also shows how policies regarding spectrum management, international telephone service, ISP licensing, and resale can impact Internet growth.

Section 1: Introduction

If one were searching for a nation that could not support a commercial Internet sector, it would be hard to find a candidate much better than Haiti. A weak economy, wide-spread illiteracy, difficult geography, and political turmoil all conspire to inhibit Internet growth. Yet, Haiti has celebrated five years of commercial Internet services. Four firms currently compete for a growing customer base.

Haiti is one of many developing countries that have demonstrated that the benefits of Internet are not limited to the wealthiest nations. While many of those developing countries have pursued a path to Internet development that is similar to that of the wealthiest nations, Haiti's entrepreneurs have taken a radically different path. They have found ways to leverage their strengths, and circumvent their barriers.

This paper provides a brief overview of today's Haitian Internet sector, focusing on the lessons Haiti can provide on Internet development in developing countries. In the process, this paper will show how internet telephony complicates Internet development in many countries, and how spectrum management polices play an important role.

Section 2 provides background on telecommunications in Haiti. The Internet Service Providers are described in Section 3. Section 4 discusses the principal policy issues facing Haiti's Internet development. The paper is concluded in Section 5.

Section 2: Telecommunications Climate

As this section will show, there are good reasons why infrastructure development is challenging in Haiti. Autocratic rule and political turmoil have left a difficult legacy. For almost three decades, Francois and Jean Claude Duvalier (father and son) ruled Haiti, and despite the nation's poverty, these leaders amassed large personal fortunes. The second

Duvalier regime collapsed in 1986 after an open revolt. Years of crisis and instability followed. The current democracy was established in late 1994 when Jean-Bertrand Arastide, the elected and deposed leader, returned from exile.

This history has left Haiti among the least developed countries in the hemisphere - a real challenge for infrastructure development. Its per capita gross domestic product is around 250 US dollars. Although there is great need to build the information infrastructure that can facilitate long-term economic growth and political stability, short-term needs like health care are also pressing. For example, roughly one in nine Haitians do not survive to their first birthday. With an illiteracy rate exceeding 60%, the number of people who could navigate the Internet is somewhat limited. Finally, the geography itself is not conducive to infrastructure development. As an island nation, it is remote from every country except the Dominican Republic, and mountainous terrain makes domestic interconnection expensive. Costs are further increased because 65% of the population is rural.

Haiti does have one trait that is conducive to telecommunications growth: a large expatriate community living in the United States, Canada, and elsewhere. This boosts the demand for international communications services, even among those with relatively low incomes.

Telephone services are provided by Telecommunications d'Haiti (Teleco), a government-owned monopoly. Telephone infrastructure is among the most limited in the world, making a lack of phone lines the preeminent issue in Internet growth. Haiti has 0.9 phone lines for every 100 people - less than half the average for Africa.
Haiti has not pursued an active universal service policy [1] to expand service.
If one excludes the large capital city of Port au Prince, Haiti has 0.2 telephone lines per 100 people. It often takes years to get a phone line; there is a waiting list of roughly 100,000. Despite some ambitious plans, there has been no significant increase in phone lines for years. Moreover, at any given time, roughly one third of the nation's phone lines are out of service. Telephone service costs are roughly ten US dollars per month.

Despite the limited domestic service, Teleco has remained profitable in most years. 50% of Teleco's revenues come from international services, which are highly profitable, thanks to high accounting rates. The government receives 25% of Teleco's revenues, so it depends on the company's success. Moreover, there is talk of privatization in 1999 which would bring more money to government coffers, particularly if Teleco is profitable. Thus, as in many countries, one cannot address Internet policies without considering the impact on the monopoly telephone provider.

Other telecommunications services are also limited. Teleco does not provide payphones, nor does it allow others to use phone lines for this purpose. There was an open tender for cellular licenses in 1995, and several companies are developing cellular infrastructure in Haiti, but operation has been repeatedly delayed. The one functioning telecommunications sector that is not controlled by Teleco is Internet.

Section 3: Today's Internet Service Providers

There are currently four commercial Internet Service Providers (ISPs) in Haiti, offering services in five cities to between one and two thousand customers. (For comparison, there are roughly 40 thousand working phone lines). Even with high costs to establish Internet service, the number of customers is growing.

Each of the four commercial Internet Service Providers is unique. They have different histories, objectives, resources, and market niches. Each is responding in a different way to the challenges of the Haitian environment, where the most recurring theme is the weakness of the telephone system. Their varied origins are representative of typical ISPs. Each ISP is described below.

Section 3.1: Hintelfocus - The Multinational Telecom Connection

MCI came to Haiti as a provider of telecommunications services for the US armed forces and the US embassy, without offering commercial services to Haitians. Once a company has established a satellite link for international communications, it is cost-effective to expand the capacity of that link and support other services. Eventually, an ISP called Hintelfocus was born which exploits this resource.

Hintelfocus offers Internet services through its point of presence in Port au Prince, which is collocated with MCI's international gateway. MCI carries the international traffic over a satellite connection. The connection with MCI gives Hintelfocus easy access to international communications capacity. In addition, although they would probably be more prosperous with additional telephone lines, they have considerably more lines than their competitors. Given their relatively good access to telecommunications capacity on both sides, they provide a typical Internet service based largely on dial-up access over the telephone system.

Hintelfocus prices would be competitive in many countries. There is a thirty dollar set-up fee. Customers requiring access for less than 25 hours per month pay only ten dollars per month. Other packages are available for heavier users.

Section 3.2: Alpha Communications Network - The Internet Founder

Alpha Communications Network (ACN) became Haiti's first commercial ISP in 1993, and is still Haiti's largest ISP. ACN's history and orientation is very different from that of Hintelfocus. The original purpose of the system that has become ACN was to support the internal needs of a large Haitian company. They soon realized that could use the same equipment to provide telecommunications services for other businesses. Many ISPs around the world have similar origins. ACN now has its own international satellite link that it uses to carry Internet traffic and offer virtual private network services for many businesses that have offices in Haiti. As the ISP with the greatest international telecommunications capacity, ACN also provides the underlying communications services for other ISPs.

Although ACN has ample international capacity, it has few local telephone lines. Indeed, its access to telephone lines has actually declined. After accusations were made that ACN was allegedly providing international telephone services in violation of Teleco's monopoly, Teleco took back two thirds of ACN's telephone lines. Although ACN denied the allegations, it still lost the majority of its dial-up customers as a result of the controversy.

ACN has responded to the scarcity of phone lines with an unusual strategy; it has deployed its own wireless infrastructure, circumventing the telephone system completely. Transmitters are installed on the premises of major customers, providing dedicated connections to the ISP. The principal technology is Lucent's WaveLan, which operates at 2.4 GHz using spread spectrum to facilitate sharing. Although the WaveLan was developed for very different purposes, it has met the needs of ACN customers. Systems have been modified as needed to address local conditions. ACN has used this approach to

serve customers up to 20 km from their point of presence. (This approach has probably reinforced the motivation to focus on customers within the capital city, but ACN has recently begun offering services in a second city.) Clearly, this approach makes spectrum management an important issue for Internet development.

With a business model based on dedicated wireless links, customers can expect good performance, but high initial costs for customer premises equipment, irrespective of monthly service charges. Internet connections to a single computer must cost in the neighborhood of a couple thousand dollars. Customers using their link to connect a bank of computers will pay several times that. Despite these heavy costs, ACN has a waiting list for new customers.

Section 3.3: Companet - The Expanding Computer Vendor

For years, Companet has been a growing vendor for computer equipment in Haiti. They also provide support for their customers. As a result, they already had technical expertise, and established relationships with many potential Internet customers. This is another common and excellent springboard to becoming a commercial ISP.

Like ACN, Companet's access to phone lines for dial-up service is severely limited. They similarly rely heavily on dedicated wireless links using spread spectrum technology, with comparable costs.

Unlike ACN and Hintelfocus, Companet also lacks a license that would give it access to its own international satellite connection. Its application for such a license remains unanswered. Companet survives as an ISP by reselling communications services from ACN. This allows Companet to succeed as an ISP, and allows ACN to expand its market and compete more effectively with Hintelfocus. Resale among competitors is another important and unusual feature of the Haitian Internet sector.

Section 3.4: Globelsud - Serving the Unserved

Like Companet, Globelsud provides Internet services by reselling the international capacity of ACN. It also uses both phone lines and dedicated spread spectrum wireless links. However, Globelsud differs significantly from Companet and the other providers because it targets a different market niche. Created just one year ago, Haiti's newest ISP has emphasized serving those who would otherwise be unserved. For example, Globelsud has vigorously promoted the creation of *telecenters*, where the public can come to use computers that are connected to the Internet. A customer can pay five US dollars to exchange email with a relative living abroad from a telecenter, even if they don't have a computer or a phone line at home. Frequent users of the telecenters pay 35 to 50 dollars per month.

Globelsud has also focused on providing rural Internet access - an important mission in a country where 65% of the population is rural. While their competitors were still offering services only in Port au Prince, Globelsud was operating in five cities. This would be an impressive accomplishment in any developing country, and is more so in Haiti where 75% of the urban population is in Port au Prince. Globelsud has ambitious aspirations to serve many more secondary cities and rural areas in the future. Among their innovative projects is an effort to teach seniors in a Haitian school how to establish telecenters in rural areas.

To provide services cost-effectively, Globelsud has explored different technologies, and different levels of service. In many cases, they use store-and-forward systems that

exchange information over domestic phone lines every hour. This is adequate for email, or for downloading specific information, but is obviously not conducive to interactive web browsing. Globelsud is also exploring a variety of alternative and innovative wireless technologies to make Internet connections to remote areas more cost effective.

Section 3.5: Possible Future Providers

Other Internet providers may be forthcoming. Plans are underway for the launch of a fifth commercial ISP, who would use both phone lines and wireless connections, and who would resell international capacity from either ACN or Hintelfocus. Other providers who do not require telephone lines are likely to begin offering Internet services as well.

The first will probably be the government's National Bank (Banque de la Republique d'Haiti), which plans to deploy a fiberoptic backbone, connecting to an international gateway. They will advance the nation's financial infrastructure by supporting banks, insurance companies, stock brokers, and other critical financial institutions. They also hope to include universities and schools. Customers will pay fees for these services, although this is a not-for-profit venture. What is probably most unusual about this state-owned Internet venture is that it is separate from the state-owned telephone company.

If and when the providers of cellular telephone service begin operating, they will also have the capability to bypass the telephone company to reach local customers. As such, they will have strong motivation to become full ISPs, or to make resale agreements with ACN or Hintelfocus.

Section 4: Issues and Controversies

Section 4.1: Internet Telephony

The government-owned telephone company has a monopoly on the lucrative international telephone services. However, other companies can carry international Internet traffic, and can form virtual private networks by connecting a private local area network (LAN) or private branch exchange (PBX) in Haiti with a LAN or PBX in another country. Of course, the international carrier has no way of knowing when its customers are using this service to support voice communications that might otherwise have taken the form of a long distance phone call. This issue has been so problematic in Haiti that allegations of this practice led to a severe reduction of phone lines available to two of the ISPs (ACN and Companet).

This issue is common to many developing countries, although it is particularly severe in Haiti. Reasons include the heavy dependence on revenue from the telephone monopoly, the potential impending privatization, and the extremely high prices for international telephone calls. Regardless of the Internet, Haiti will eventually have to decrease the price of international calls, and probably increase domestic rates to balance revenues. Such a move will probably be driven by call-back services, which allow calls out of Haiti to be charged as if they were calls into Haiti. International regulatory pressure is also mounting.

Ironically, Haiti's attempt to protect the telephone company has probably harmed it in the long term. In many countries, Internet growth increases revenues for the telephone company. Calls to ISPs can be extremely long, leading to significant revenues in countries where there is a per-minute charge for local calls. This is especially true in countries like Haiti where long downloads of information from abroad are common. In addition,

frequent Internet users often request additional phone lines. If Teleco were allowed to charge more for installing extra phone lines, it could raise significant revenues to expand and improve its infrastructure. However, the existing policy of rationing phone lines to Internet users has further encouraged the best customers for long calls and additional phone lines to bypass the phone company. This could be extremely costly when the inevitable rate changes do occur.

Section 4.2: Spectrum Management

Due to lack of telephone lines, three of the four commercial ISPs rely primarily on wireless technology to reach their customers. Consequently, wireless communications are essential for Internet growth in Haiti. So how should access to the spectrum be regulated? At the moment, *no license* is required for access, and wireless devices can be placed anywhere, but ISPs are required to pay significant fees back to the regulator. The rights and obligations of these unlicensed users are not entirely clear. The policy has already led to controversy, with allegations that some unlicensed wireless connections interfere with a licensed microwave link. There have been demands that these Internet connections cease operations. Whether the allegations are true or not, this controversy demonstrates the value of clear spectrum management policies to promote Internet growth.

There are many options available to manage such a band [2]. The traditional approach is to require licenses for all transmitters. Applicants for a license specify enough information about intended use that a regulator can prevent excessive interference with any current license-holder. Haiti's current *unlicensed* approach has the advantage that the regulator does not add unnecessary delay to the process of Internet expansion. It also makes it possible for ISPs to offer dedicated links to mobile devices, as there is no need for permission from the regulator when a transmitter is moved from one site to another. There are also disadvantages to unlicensed. One is that there is nothing to prevent many businesses from deploying these transmitters in the same location, so there is always risk of congestion. Luckily, in a country like Haiti where spectrum utilization is low, this is considerably less likely than it would be in an American city. (Haitian ISPs have made good use of this advantage.) Another problem is that, since spectrum is shared, devices have little incentive to conserve spectrum. This may lead to devices transmitting at excessive powers, or transmitting constantly. Some may even set up transmitters whose sole purpose is to interfere with the transmissions of their competitors. If an unlicensed approach is selected, explicit rules of coexistence can reduce many of these problems [3,4].

Section 4.3: International Gateways

Two of the current ISPs can operate international gateways, and the other two cannot, despite applications to the regulator. In many developing countries, there is only one international gateway. The advantages of having more is apparent in Haiti. One ISP voluntarily chooses to provide communications services for some of its ISP competitors. If it refused to do so, customers might be lost to the other facilities-based ISP. The fact that the ISPs have different market niches makes the arrangement more attractive to potential facilities-based competitors. The additional competitors are also good for Haiti, particularly when one of those competitors has targeted customers that might otherwise have been missed.

Although this can benefit the facilities-based provider, it is often to the provider's advantage to take customers from the resellers when it can. This will inevitably lead to some tension. Disputes may address prices, quality of service, access to equipment, access to IP addresses, or other limited resources. Issues have already arisen, and some believe

that the regulator should intervene. These are difficult matters to regulate effectively. This tension will probably continue until more companies gain the right to operate an international gateway (even if they choose not to exercise that right).

Section 4.4: The Government as Provider

The National Bank's decision to provide Internet services exemplifies another dilemma that is common in developing countries. The Bank recognizes the need for such a network to strengthen the financial sector, and no commercial ISP has access to the necessary capital. A government can even tap international donor organizations. However, the move may threaten the commercial ISPs by siphoning customers, perhaps with the help of implicit subsidies. Making the enterprise effective and efficient under government control will also be a challenge, as is demonstrated by the experience with the government-owned telephone company. Perhaps this Internet infrastructure will also be privatized some day. It is too early to draw conclusions from Haitian experience in this area.

Section 5: Conclusions

The Haitian experience clearly demonstrates that the Internet can grow even in the least developed countries, when regulators grant commercial ISPs permission to operate and access to critical resources. Four commercial ISPs have emerged, each capitalizing on its own unique experience, resources, and objectives.

More importantly, Haiti has shown that there are many paths to Internet development, and that every country must find the path that best matches its resources and objectives. The Internet began in the Untied States, at a time when telephone lines were in roughly 95% of all homes, the lines were dependable and relatively free of noise, and prices were low with respect to income. Thus, commercial ISPs in the US relied primarily on dial-up service, and ISPs in many developing countries have emulated this approach. Haiti did not, and with good reason. Haiti has no such telephone system. Resourceful Haitian ISPs have instead adopted wireless technologies as a critical part of Internet infrastructure, even though these wireless devices were clearly designed for other purposes. The ISPs are consuming a resource that is more plentiful in Haiti than in counties like the US: unused spectrum. They have also demonstrated that low-speed store-and-forward communications and telecenters have particular value in the Haitian context.

The importance of wireless technology to Internet growth makes spectrum management particularly important. Like all developing countries, Haitians have the opportunity to develop spectrum policies that are appropriate to their unique situation, like a greater availability of spectrum. Their current use of unlicensed spectrum demonstrates its vast potential, as well as challenges to overcome if clear and effective coexistence rules are not established.

As in many developing countries, artificially high prices for international telephone service create particular difficulties for Internet growth, as Internet telephony threatens this revenue stream. The growth of wireless alternatives complicates this issue. The artificial prices encourage heavy users to bypass the telephone system; when international telephone rates are reduced, as they inevitably will be, telephone carriers cannot share to the same degree in the increased revenues from Internet expansion. Thus, the presence of wireless Internet access provides additional incentive for regulators to rebalance these rates.

Many developing countries allow only a single entity to operate an international gateway carrying commercial Internet traffic. Some point to economies of scale to justify this arrangement. Haiti has demonstrated the value of having two such gateways, and allowing resale. As a result, four ISPs have emerged which collectively cover a broader range of customers. Still, the resale arrangements are not entirely without tension, because some ISPs offer both wholesale services to resellers and retail services to Internet customers, which always complicates matters. It is likely that easing licensing restrictions on international gateways further will reduce or eliminate these tensions.

References

[1] J. M. Peha, "Tradable Universal Service Obligations," accepted to appear in *Telecommunications Policy*.

[2] J. M. Peha, "Spectrum Management Policy Options," *IEEE Communications Surveys*, Vol. 1, No. 1, Fourth Quarter 1998.

[3] D. P. Satapathy and J. M. Peha, "Spectrum Sharing Without Licensing: Opportunities and Dangers," *Interconnection and the Internet: Selected Papers From the 1996 Telecommunications Policy Research Conference*, Mahwah, NJ: Lawrence Erlbaum Associates, pp. 49-75.

[4] D. P. Satapathy and J. M. Peha, "Etiquette Modifications For Unlicensed Spectrum: Approach and Impact," *Proc. IEEE Vehicular Technology Conference*, May 1998, pp. 272-6.

All referenced papers available at http://www.ece.cmu.edu/~peha/papers.html

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