

The Value of Information and Communication Technologies in Humanitarian Relief Efforts

Innovations Case Narrative:
Inveneo

I was in a meeting on January 12, 2010, when I heard about the earthquake in Haiti. The moment is still vivid in my mind because we had been working for months with our partner, the EKTA Foundation, on a plan to make information and communication technologies (ICTs) accessible and sustainable in rural areas of Haiti. I had planned to fly to Port-au-Prince with another Inveneo cofounder on January 15, where we were to stay at the now-collapsed Hotel Montana to research opportunities and connect with the local tech community. Then the earthquake struck. It wasn't until hours later, after trying to reach our Haitian contacts, that we realized the extent of the devastation. Our connections with Haitian colleagues made our commitment immediate and more personal.

Later that day, we met with our partner NetHope¹, a collaboration of 31 of the world's leading international humanitarian organizations that share technology best practices. Our conversation immediately turned to the tragedy in Haiti. We had been working with NetHope on a large-scale ICT project for relief camps across the world, but as they counted the number of their member organizations directly affected by the earthquake (20), our conversation shifted to ways we could address their urgent needs.

For many disaster response veterans, the Haiti earthquake represents a turning point in our collective thinking about the value of ICTs in humanitarian relief efforts. A range of ICT-focused initiatives have demonstrated that technology—from accessing detailed maps of the affected area, to turning simple SMS messages into life-saving systems, to establishing broadband Internet connectivity to humanitarian organizations—improves both the speed and substance of relief efforts. The impact of these voluntary and even spontaneous initiatives was real, measurable, and widely publicized. Their success, even in the absence of any plan-

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Léogâne, post-earthquake. Access to online maps was critical for rescue and relief efforts.

ning or coordination, hints at the true potential of ICTs to revolutionize disaster preparedness and response.

This article provides a play-by-play account of Inveneo's efforts to reestablish connectivity for humanitarian organizations working in Port-au-Prince immediately after the earthquake, as well as the impact of and challenges involved in those efforts. It outlines how relationships formed through the Clinton Global Initiative (CGI) proved critical to the success of these efforts. It also lays out our plans for continued collaborative efforts to bring broadband connectivity to the rest of the country, where it is critically needed. Inveneo's goal, in combining sustainable solutions with capacity-building development programs, is to deploy a digital infrastructure that will:

- Accelerate ongoing disaster preparedness, relief, and rebuilding efforts
- Dramatically improve the quality of education and health-care training and delivery
- Enable and streamline microfinance and other business development programs
- Lay a foundation for locally driven development throughout Haiti, particularly in rural areas
- Improve accountability and transparency for local government, multilateral organizations (UN agencies), and international non-governmental organizations (NGOs)



A typical setting for Inveneo's work: Kiziba Refugee Camp in Rwanda. No power, no connectivity, and not the best environment for dust-sensitive electronics.

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- Give voice to hundreds of thousands of disconnected and disempowered Haitians as they come to grips with their experiences over the past six months and beyond

Our success or failure will depend, in part, on a shared willingness to think innovatively about how ICTs—especially broadband connectivity—can be combined with relevant social programs and novel business models to become an engine for rebuilding a new and better Haiti. It will also depend on the sort of positive collaboration the CGI has enabled to date.

DECISION TIME

Before January 2010, Inveneo didn't think of itself as a disaster response organization. We work in some pretty troubled settings—Sierra Leone, the Democratic Republic of Congo, Northern Uganda, and Mozambique to name a few—but on a different, less emergent timeline. Inveneo typically works in support of NGOs that deliver vital services such as health care, education, relief, and microfinance in rural and low-resource settings. These places are usually hot, humid, and often dusty—not ideal for sensitive electronics. Grid power, if available, is generally unstable and unreliable. What Internet connectivity exists (if any) is slow and extremely expensive. Meanwhile, these settings often have a shortage of the skilled ICT personnel needed to ensure that systems can be repaired when something goes wrong.

To overcome these challenges, Inveneo deploys ultra-low-power computing systems that are affordable and sustainable where typical computer systems are

not. Our expertise in point-to-point wireless links can provide, in the right circumstances, reliable broadband hops spanning distances of 50 to 60 kilometers.

Inveneo also trains and certifies in-country partners with the expertise to install and troubleshoot ICTs. These partners then provide ongoing local support when problems arise, calling on Inveneo for backup support with Inveneo-certified solutions as needed. Inveneo is fervently committed to building local capacity and developing long-term local partnerships.

In our typical mode of work, projects progress from initial assessment to design to deployment over many weeks or months. In considering our potential response to the earthquake, we were acutely aware of our limitations. We did not have a ready stock of equipment and had limited experience making air travel and freight arrangements into disaster zones. Our involvement in the response to Hurricane Katrina made many on our team hypersensitive to the importance of having both a well-defined mission and appropriate tools to get the job done. If we were to respond effectively, we needed a clear plan of action.

On the other hand, Port-au-Prince, powerless and disconnected, suddenly looked a lot like many of the areas where we work. Thousands of NGO staff and volunteers flooded into a country where public phone systems were completely down and mobile phone systems were overwhelmed. Even a week after the earthquake, just 20 of the country's 50 radio stations were back on the air, and the two leading newspapers were still unable to print. These were not luxuries but crucial gaps in post-earthquake civil society. Even U.S. Secretary of State Hillary Clinton identified communications, along with food, shelter, and medical services, as one of the most critical needs in the Haiti response.

NetHope was deluged with requests for assistance from member organizations in urgent need of communications on the ground so they could help organize and deliver rescue and relief services, make decisions involving several regions and partners, order necessary supplies and equipment, and consolidate regional data and report progress to funding agencies. With member organizations as prominent as Save the Children, Oxfam International, Mercy Corps, the International Rescue Committee, Catholic Relief Services, and Concern asking for help, it was imperative that their needs be addressed immediately. The urgent need for communications, and our ability to serve, was clear. A day after the earthquake, Inveneo began planning its strategy to reconnect the organizations that would play a key role in Haitian relief.

ALL HANDS ON DECK

Inveneo's mission in Haiti was precise: reestablish broadband connectivity for NetHope member organizations as quickly as possible. While we were confident of our technical capabilities, we would need help if we were to succeed. It was collaborative partnerships, many of which were made possible through CGI, that made the difference.

A note of background: Inveneo is a small nonprofit with a staff of 15 people, many of whom are traveling in various places around the world at any given time. We needed to quickly purchase, organize, repackage, and transport what ended up being 1,500 pounds of networking equipment into a country that, at the time, was mostly flying people out and only letting in rescue teams and medical staff. CGI team members leveraged their contacts to get UPS staff personally searching a warehouse to find our packages and ensure a special delivery late on a Saturday night.

Through CGI we met the EKTA Foundation, a family foundation with a compassionate interest in serving Haiti partly because of the family's history running an auto electronics manufacturing facility in Port-au-Prince. In the immediate aftermath of the earthquake, the EKTA Foundation was our first funder for the emergency communications effort and remains a key strategic partner in the subsequent phase of our work. Simply put, without EKTA, our work in Haiti would not have been possible, and CGI is largely to thank for this.

As early as 2006, CGI had also introduced us to the Cisco Foundation, which has since become one of Inveneo's strongest allies and strategic partners. In addition to supporting projects and capacity development across East Africa, Cisco has funded Inveneo's work to integrate robust yet easy-to-deploy network management software. This software played a critical role in the initial wireless network in Port-au-Prince, and will continue to do so as we bring connectivity into rural Haiti.

Inveneo's board of directors also played a pivotal role in the Haiti response. One member connected us to additional critical funding from Aruba Communications, another helped us connect with the Federal Communications Commission and the U.S. State Department to make them aware of our work and, perhaps most importantly, helped us find technical volunteers with the specific skills we needed to support the mission. Volunteers helped finalize our network management software, perform installations in Haiti, raise funds, track requests for help, and manage logistics. These volunteers proved crucial to our success in Haiti. I clearly remember arriving in Port-au-Prince, daunted by the task of finding all of our equipment—40 Pelican cases of it—amidst the field of supplies from dozens of organizations that were strewn across the airport tarmac. We found and retrieved it all promptly, in part because a team of conscientious volunteers had carefully inventoried, labeled, and kitted everything in advance.

Once on the ground, our partner NetHope proved essential to our success. It's hard to overestimate the value of local knowledge amidst the chaos of post-quake Port-au-Prince, and it was NetHope's promise of support that was the deciding factor in Inveneo's decision to respond. In addition to providing critical bridge funding, NetHope coordinated and streamlined communications with all 20-plus of its Haiti-based member organizations, helped us identify in-country transportation and security, and find accommodations for our staff. In the first weeks we slept in tents on the lawn of CHF International along with other NGO staffers.

No one wanted to be inside a building due to the frequent aftershocks, and when we did find ourselves indoors during aftershocks, we ran. Fast.

Our NetHope contacts informed us that they had received an offer of donated bandwidth from ITC Global, a leading provider of satellite-based network connectivity. Serendipitously, CHF had an unused dish on the premises, and so the plan came together almost on its own. Located in Petionville in the hills above Port-au-Prince, CHF's office provided an excellent staging ground and vantage point for the line-of-sight links that WiFi requires. We decided to go with WiFi frequencies because the rules on spectrum allocation were unclear, and WiFi frequencies are generally acceptable to the FCC and Conatel, the local Haitian regulator.

Our initial strategy was to first stabilize and expand CHF's VSAT link, and then build outward to as many other NGOs as possible. Priority would go first to NetHope member sites, and then to other nonprofits and relief groups as they approached us.

In those first critical weeks, we worked 18-hour days, performing WiFi installations and coordinating the next day's installs late into the night to the hum of the generator. We were all very much on task, painfully aware that the speed of our efforts could help save (or lose) lives. Meanwhile, our CHF hosts mentioned that one of their staff members was stuck inside a collapsed three-story shopping mall and was communicating with colleagues via SMS messages, assuring them that he was okay and uninjured. Sadly, they weren't able to get him out in time and eventually the text messages simply stopped. We worked even harder. Through it all, the streets had an eerie feeling, somehow both deserted and teeming with dispossessed. Pleas for help were painted on surfaces everywhere.

I am not a veteran of many emergency situations, but I imagine they're all similar in the overwhelming feeling of urgency. We knew how little time we had, how many people remained in precarious situations, but we also knew that in order to do things right, we needed to work as thoughtfully and methodically as possible. This paradox continues to guide our work in Haiti.

KEY CHALLENGES

We faced numerous challenges implementing this project. In the U.S., managing logistical details for deployment, engaging funders and partners, and backstopping the technical crew in Haiti all added to the complexity of the work. In Haiti, the challenges ranged from often frustratingly simple logistics and communications problems to more complex and political issues. In particular, we needed to make certain that our relief efforts and the new systems we deployed did not, in the end, undercut the viability of the local ISPs and IT service firms.

As a small organization, Inveneo runs a lean operation. While we had the know-how to deploy the right technologies in this environment, we didn't actually have extra equipment on hand. One of the first phone calls I made was to Ubiquiti Networks, a manufacturer of wireless broadband networking equipment. We at Inveneo had long been a fan of Ubiquiti's antennae, radios, and base sta-

tions, and had used them to connect communities in even the most rugged conditions throughout sub-Saharan Africa. We appealed to the president of Ubiquiti, who was thrilled to help us out. But, unfortunately, it would take a few weeks for them to process the donation. In the meantime, we purchased some stock ourselves—a significant expense that later was the basis of the EKTA Foundation’s initial donation. Three weeks later, in time for the second wave of Inveneo engineers to travel to Haiti, the Ubiquiti equipment donation had arrived.

We have had our share of glitches shipping equipment to Africa and Asia, so we knew it was important to have staff travel with the gear. Our staff and volunteers investigated every travel option, but all ports of entry into Haiti were in a holding pattern. Commercial airlines would not (or could not) publicize the date they could recommence flying into Haiti, and freight operators had been told that only essential government gear could go through, so they were reluctant to agree to the transport. At one point, my colleague Andris Bjornson and I were booked on six different flights, most of which would take us through Santo Domingo in the Dominican Republic, from where we would make the overland journey into Haiti.

Thankfully, Airline Ambassadors came through for us, saying we should fly ourselves and our equipment to Chicago and then hop on United’s first goodwill flight to Port-au-Prince. We jumped at the chance. Surely this was a positive sign. While we once might have had to queue up behind other relief organizations, the disaster response community was beginning to value the role ICT was playing in this emergency.

Anyone who’s ever been to Haiti can attest that even before the earthquake, travel by car through Port-au-Prince was neither easy nor predictable. In post-earthquake Haiti, getting from point A to point B was an ongoing battle. Key roads were impassable, there were no street signs or building numbers. Concrete, rebar, and crushed vehicles were scattered over the landscape. Makeshift shelters quickly spread into the streets, obstructing traffic even more. Most of the individuals we were working with were new to Haiti and could not easily direct us to their location. Critical hours could be wasted simply by making a wrong turn, so we planned our routes carefully. Without a working mobile phone network, making calls was impossible and even text messages took a long time to come through. Every morning, we had to hope anew that our days would unfold as intended.

Unfortunately, we didn’t have reliable location data for the NGOs we sought to help. Few NGOs had GPS coordinates for their offices in Port-au-Prince. We relied heavily on a team of volunteers in the U.S., some of whom fielded the initial requests for connectivity, and others who helped schedule our next day’s installations and pinpoint precise locations. Since many street signs and other directional markers had been obliterated, we needed to be creative in identifying locations. We depended heavily on OpenStreetMaps and Google Earth, which had released massive amounts of up-to-date, detailed satellite imagery of Haiti almost immediately following the earthquake. Our U.S. volunteers contacted NGO staff in Port-au-Prince and honed in on their locations by asking the proximity to landmarks made

visible on Google Earth: “Are you at the building with the large red cross painted on the roof, next to the tent camp with blue tarps?” Sometimes we even needed to find a Haitian in the diaspora, based in the U.S. or Canada, and put him or her on the phone with NGOs to answer questions like, “You know that gas station near Delmas 23? Well, just beyond that there’s a little alley with no name; can you identify that intersection?” Clearly, this process often entailed a good deal of back-and-forth. But once volunteers identified the GPS coordinates, we loaded them into our Garmin GPS and uploaded them to OpenStreetMaps.org. With NGOs all over Haiti also using OpenStreetMaps, we collectively assembled a detailed map of Port-au-Prince with virtually zero centralized coordination.

Another supporting player in our effort was GeoChat, an open source disaster response application developed by INSTEDD. We used GeoChat to help with group communications between our team in Haiti and our team in the U.S. The application proved particularly useful when the field team required critical state-side support for a networking firmware upgrade. GeoChat’s combination of email and SMS messaging functionality smoothed communications. The team felt that if we had trained adequately on its use prior to deployment, GeoChat could well have been even more valuable.

Once we began adding NGOs, connecting them as nodes on the WiFi network, we found it increasingly difficult to manage the network itself or to perform “traffic shaping,” which allocates bandwidth and usage among the users. My Inveneo colleague Andris went online to seek answers to issues with OpenNMS, a network management application platform, and came across a community of OpenNMS engineers. Initially they helped Andris and me with our questions on their own time, but news of this pro bono work and how it was benefiting those in the Haiti earthquake reached the founder of OpenNMS, who then gave us a year of free enterprise-level support. The open source community yet again came through to help out one another.

Over the next five weeks, Inveneo engineers cycled in and out of Port-au-Prince, making sure that the 18-hour days didn’t take too much of a toll on our ability to function and manage the workload. Andris and I returned to the U.S., and Brian, another staff engineer, and Oliver, a full-time volunteer, took our places in the CHF camp and on the roofs of humanitarian organizations across the city.

We responded to all of the requests from NetHope NGO members, seeing to each of their unique technical needs and connecting them to the main network. With the ability to access reliable, high-speed Internet, these organizations could return to their operations at a pace comparable to before the earthquake, and in some cases, faster and more efficiently. For Catholic Relief Services, the earthquake brought an additional throng of volunteers to help them with emergency relief work. With that, their need for broadband grew to accommodate a 100-user network.

The increase in users on the network meant we had to be smart about positioning. That is, NGOs with offices at higher elevations would be prioritized over those in lower-lying places so they could serve as relay hubs, hosting the antennae

that would transmit radio signals to other locations. The “line of sight” concept, which we’d always understood as integral to the success of strong WiFi signals, took on new meaning as we climbed rickety ladders and stood on the roofs of NGO offices that shifted with every aftershock. From there we surveyed the massive destruction in the city below, but also the relative distance to another access point, which could mean connectivity, improved communications, and enhanced social services. We pointed transmission antennas in the direction of receiving antennas, hoisting them on speaker stands, and securing them with sandbags. Inelegant? Perhaps. Effective and prompt? Definitely.

When it came to power options, we were forced to be a bit forgiving and forego the solar-powered setups we prefer. Instead, we found most of the NGOs equipped with generators, which can be costly to maintain, but in post-earthquake Haiti they were highly prized. We made do. To take full advantage of them and establish an environment that was as stable as possible, we added battery backups for each link on the network. This way the battery, charged initially by the generator, could support the node if the generator were to fail. This also ensured the health of the entire network, since the web-like nature meant that the failure of one link could potentially adversely affect the others. Again, inelegant. We do intend to employ solar power when connecting Haiti’s rural areas, as it is a more environmentally sustainable solution.

As the ISPs began to get back on their feet, they were concerned that they had lost many of their best customers who were now receiving free or reduced-cost connectivity from Inveneo and its partner organizations. U.S. government officials and businesspeople alike expressed concern that Inveneo had inadvertently usurped the market for Internet service provision. This issue is a genuine problem with aid work around the world, namely, how to implement an effective disaster response without undercutting local institutions in the process. Fortunately, we were well aware of the potential for conflict and had begun a dialogue with the local ISPs even during the initial days of the response. By the time these firms were back in action, we had told them that we had no intention of becoming a local ISP, and that we were even committed to helping them extend and improve their services. Our vision saw this expansion within Port-au-Prince and, more importantly, to entirely underserved areas outside of the capital region. We formed collaborative relationships with two of Haiti’s largest ISPs, MultiLink and Access Haiti. Within one month after the earthquake, Andris climbed the Bouthillier communications tower 40 meters (over 130 feet) above Port-au-Prince and installed a Ubiquiti dish and antenna. This gear provided a long-distance WiFi link, connecting our network to MultiLink’s, with a similar installation connecting to Access Haiti’s WiMax network. Both of these terrestrial networks provide important redundant Internet backhaul for the original VSAT satellite-based network in Port-au-Prince.

In addition to our relationship with Haitian ISPs, we knew how important it was that we invest in human as well as physical infrastructure. For our technology deployments around the world, we generally prefer to pass client work to local IT

businesses so that funds, opportunities, and knowledge remain in-country. In Haiti, however, a serious shortage of ICT skills had existed pre-earthquake and now was even worse. Technical academies, business incubators, and trade associations just weren't there. Even the potential partners we'd made relationships with before the earthquake were now focused on their own survival or, even worse, were unreachable. We ultimately engaged a group of Haitian technologists, Haiti Technology Group (HTG), who continue to manage the Port-au-Prince wireless network. Nevertheless, we have found ourselves constrained by a fairly limited technical staff pool. Working with NetHope, our goal is to identify, train, and engage more technologists.

RESULTS

Eight days after the earthquake, Inveneo had established connectivity to eight NGOs; 22 days after the earthquake, the number was 18. Access to broadband made an enormous impact on each of their relief operations, often improving their network's speed and reliability over pre-earthquake conditions. Some had no connectivity before the earthquake, while others had only a shaky 160-kbit connection—the equivalent of three dial-up connections. When linked to the long-distance WiFi network, this became comparable to a cable or DSL line.

NetHope member CARE, a leading poverty alleviation organization, employed an unstable and unreliable connection pre-earthquake in its Port-au-Prince office. After the earthquake, staff said connectivity was so stable that they were able to expedite all their purchases and strategic decisions with partners in the Dominican Republic, the U.S., and London. They were also able to accommodate the influx of visiting staff and deliver high-priority, urgent information worldwide. Their pre-earthquake connection could not have tolerated the increase in capacity needs.

PROFAMIL, an affiliate of the International Planned Parenthood Federation, used its connection to communicate with partners in the Dominican Republic and New York City. With its new bandwidth, staff and physicians exchanged files, discussed particular cases, and counseled prenatal and post-partum patients with greater ease and reliability. We've found that we don't even hear from some of the most satisfied client NGOs, since they're able to refocus their attention on work rather than on troubleshooting technical issues.

NetHope member Save the Children used its network connection to monitor CNN and the BBC via live streaming, which helped inform the work of their communications team. What previously may have been considered a luxury turned out to be essential to the organization's emergency relief work. Save the Children staff told Inveneo that by bringing Internet connectivity to them as quickly as we did, we were literally saving children's lives. If the connection between information and communications with relief operations wasn't apparent before the earthquake, it is now.

Today, the Port-au-Prince network is still in operation, supporting some 18 organizations in 35 locations with reliable and redundant Internet connectivity. It

The Value of ICTs in Humanitarian Relief Efforts

Sector	Potential Benefits from Broadband Access
NGOs	More efficient and effective humanitarian services, better collaboration and communication among and within agencies, timely and accurate reporting to funders
Hospitals & Health Clinics	Access to medical expertise in other locations within and outside of Haiti, e-medicine, remote diagnostics, medical training, improved record-keeping and sharing, inventory management
Schools & Universities	Teacher training, 21 st -century skills development, health, hygiene, and entrepreneurial skills training
Government	Improve relations among government and businesses, NGOs, multilateral institutions, and its own staff; improve communication to its citizens and the world; make government programs and information more accessible
Micro-finance Institutions	Enable management information systems to be transparent, scalable, and sustainable
Businesses	Speed commerce, provide small business opportunities such as Internet cafes and trading
Tourism	Build a platform for future tourism services and marketing
Radio Stations	Better access to syndicated content
Community Centers	Encourage entrepreneurship, public education and distance learning, e-government services

Figure 1. Potential Benefits from Broadband

is likely to be up until at least the end of 2010, as the organizations enjoying the access have repeatedly pushed to keep it up and running. In addition to stable access with multiple backups, the network has demonstrated another point of value: that the NGOs deserve and demand a lower price and reliable service. Collectively, these organizations have become more intelligent about technology and have established their buying capacity. Now they represent one of Haiti's largest customers for the local ISPs, bringing more than \$25,000 per month into the local economy. Local ICT company Haiti Technology Group now manages and maintains the network with Inveneo, providing technical support on an as-needed basis. HTG has hired additional staff to help manage the workload and, we anticipate, will ultimately be a leader in a new Haitian ICT revolution.

PHASE TWO

Inveneo's emergency work in Port-au-Prince has largely concluded, but our commitment to Haiti continues. Fortunately, our success in responding to the needs in Port-au-Prince accelerated and galvanized our relationships with a wide range of NGOs, as well as with local Haitian ICT service firms and ISPs. Both types of organization will be critical to the success of the next phase of our efforts in Haiti.

We are working to extend technology access and connectivity to the rural and remote parts of the country, where a digital infrastructure has never existed and where a flood of citizens from Port-au-Prince sought refuge after the earthquake, in part due to the government's urging. Inveneo surveyed the country with the assistance of some of the NGOs we had first encountered through the Port-au-Prince wireless network. Together we prioritized six regions that host significant NGO relief and recovery activities or have experienced significant population growth due to internally displaced persons within the past few months. These areas, often quite rural, include the epicenter of the earthquake:

- Léogâne, Petit-Goâves, Grand-Goâves
- East of Jacmel
- Mirebalais, Saut-d'Eau area
- Gonaïves, Saint-Marc area
- West of Cap-Haïtien
- Jérémie area

Both the need and the challenges are immense, but so are the potential payoffs. Hundreds of thousands of Haitians remain stuck in tent camps, unable to reoccupy their destroyed homes or, in many cases, even to rebuild due to the chaos surrounding land titles. A large number of these people are likely to be homeless for years. Hundreds of NGOs and government organizations—hospitals, schools, microfinance institutions, displaced persons camps, orphanages, and more—are currently struggling to provide basic needs for these people and their communities.

While water, food, and shelter are clearly at the top of the list of priorities, information and communication tools are a crucial means to achieve these essential ends. Reliable broadband connectivity can help streamline delivery of essential services while also laying the foundation for locally driven rebuilding and development efforts. Broadband penetration has been shown to have a positive impact on growth and productivity, by some measures even higher than mobile phones, with a mere 10 percent increase in penetrations yielding as much as 1.5 percent increase in overall labor productivity in the five years since its inception.² Since this figure is for the economy at large, it is likely that the productivity impact among NGOs, whose staff are already familiar with computers and the Internet, would be many times higher. Moreover, it is these very NGOs that will spearhead needed efforts to bring Haitians online en masse, with all the potential benefits for their education, health, and livelihoods.

To succeed, however, this effort must first address the question of why a digital infrastructure has not yet been deployed outside Port-au-Prince. We see two main reasons: first, Haitian ISPs have not had clear and sufficient demand from prospective clients in these areas, whereas demand in Port-au-Prince is relatively robust and easy to satisfy with limited incremental investment. Second, the infrastructure these ISPs typically deploy, although appropriate for high traffic and densely populated regions, is not cost effective in more rural areas.

Our planned solution is to lower overall project risks and costs by aggregating demand among NGOs, as we did successfully in Port-au-Prince. This invites greater investment from local partners by leveraging low-cost WiFi technologies and training local services firms to provide ongoing network support. Additionally, by seeking external funds to offset most of the infrastructure and capacity-building costs, we believe we can catalyze a broadly sustainable market for broadband connectivity, even in some of the poorest communities on earth. To ensure the widest and deepest possible impact, the network infrastructure should be owned by an independent entity—a cooperative of NGO clients, for example—with a specific mandate to make certain that access to the network is kept open to both users and ISP suppliers.

Inveneo is already moving forward in the first region of network expansion, at the epicenter of the quake, even as we continue to seek funding for this full initiative. In late July, we established the first critical link, from Port-au-Prince to Léogâne. This wireless backbone link spans 35 kilometers and provides stable connectivity of more than 50 mbps. Since then, we have connected four major NGO offices in Léogâne, including the Canadian Red Cross, Hands On Disaster Response, Save the Children, and IFEWA, with additional organizations in the queue.

CONCLUSION

As long as the original WiFi network remains up and running, the first phase of Inveneo's work in Haiti remains open. We have been able to draw from a number of lessons learned and apply them to the second phase, and to our work elsewhere in the world. This second stage of work is a great potential model to be replicated in other countries; recognizing rural areas as new market opportunities, with broadband provision and local IT experts maintaining it, creates a new delivery system that benefits all parties. Yet this model of building local IT capacity differs from Inveneo's standard model. Without the initial application of broadband to emergency relief work, the NGO and aid communities may not have seen its benefit and relevance in rural Haiti.

The innovations employed with the long-distance wireless network are not new per se, but their application in emergency situations and in rural or underserved areas can be considered novel. As Secretary of State Clinton noted in early 2010, "Innovation is not only the invention of new technologies; it's any breakthrough idea that transforms lives and reshapes our thinking."³ The WiFi network that we deployed in Port-au-Prince and the links we're now establishing in underserved areas outside of the capital demonstrate the importance of a digital infrastructure that is accessible across all sectors of society. This broadband access has not only accelerated relief and rebuilding efforts; as internally displaced populations seek to rebuild their lives in more rural areas, it will lay the foundation for economic development and opportunity.

At Inveneo, we've learned that it could prove valuable to have extra equipment and disaster kits on hand for emergencies. But more important than keeping additional supplies close by, the work in Haiti has taught us the importance of preserving relationships with a variety of stakeholders. Inveneo's tiny size belies our ability to effect change and have an impact, and it has helped tremendously when we can turn to partners, funders, volunteers, and our colleagues at CGI to lend a hand—and lend credence to our work. Collaboration has turned out to be much more innovative than any technology we could have developed.

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1. See <http://www.nethope.org>.
 2. From ITU secretary general Dr. Hamadoun I. Touré's Ambassador's Information Meeting speech on March 15, 2010, in New York. Available at www.itu.int/en/osg/speeches/pages/2010-03-15.aspx.
 3. From "Development in the 21st Century," U.S. of Secretary of State Hillary Rodham Clinton's speech delivered to the Center for Global Development in Washington, D.C., January 6, 2010.