New Wireless Network for Uganda's Healthcare Workers

**A health care worker conducting a survey using a PDA.
(SATELLIFE Photo: Mark Grabowsky)**

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The introduction of cellular telephony has revolutionized Uganda's communication industry, increasing national teledensity by 350% since the first network went live in early 1995. Now the networks that brought remote villages their first voice connectivity are opening new doors for the delivery of health care.

Physicians and health care workers working in locations without fixed-line telephones or regular access to electricity face serious problems in sharing and accessing critical medical and public health information. It can be challenging for them to gain access to updated treatment guidelines for diseases such as HIV/AIDS, or country-specific essential drug lists. It can take months before epidemiological surveys, done on paper in remote areas, can be input into a computer in the capital city of Kampala. This drastically limits the capacity of the health care system to track and respond to disease outbreaks.

However, Uganda's well-established cellular network is now being used to create a new platform that will allow health care workers to access, record, and transmit data. SATELLIFE: The Global Health Information Network, a nonprofit organization focused on improving health in developing countries, an Uganda Chartered HealthNet (UCH) located at the Makerere University Medical School are pilot testing a wireless system that uses handheld computers and battery-powered Linux computers.

The study is being supported by the Connectivity Africa program of the International Development Research Centre (IDRC). [See related sidebar: Innovative Technology for Africa] If the pilot shows that the technology is useful and viable, UCH and SATELLIFE hope to take the project nationwide.

A powerful tool

Personal digital assistants (PDAs) are proving to be a powerful tool for doctors and health care workers in Uganda. Often considered as computer accessories in the North — a handy extension of a desktop computer — PDAs are filling a critical gap for Ugandan health care workers in rural and remote areas. "Just start thinking about the PDA as a computer," says Holly Ladd, executive director of SATELLIFE, "It's got more computing power than the spaceship that went to the moon. It's not a substitute for a full computer, but where you have no electricity or where you can't spend US$2000 a person [on a computer], this is a nice tool. It can be used for storing data, for doing math, for record retrieval, for writing text, and for reading books. It can be used for email and other communication when paired with a telephone line. It can do most of the things that you would need a computer for."

"PDAs are an affordable option for medical professionals in Uganda," says Patrick Okello, Project Manager of the Uganda Health Information Network. "PDAs are within their means — and they are easy-to-learn and user-friendly. PDAs also enhance a doctor's efficiency in terms of keeping track of patients and treatments."

When SATELLIFE tested the use of PDAs in Uganda in 2001, they were found to be a valuable way to bring scarce and much-needed medical information into the field. "Hand-held computers are a simple device to move information all the way out to where care is being delivered. Because you can carry a hand-held computer, you can carry five books in your pocket. It's difficult otherwise," says Ladd.

Moreover, PDAs were found to be an extremely efficient tool for conducting surveys to determine the prevalence of disease such as measles or malaria. The use of PDAs improved accuracy and reduced duplication across surveys, according to Okello. "It's also much faster to collect data using a PDA than paper — and a lot cheaper," he adds.

However, says Ladd, what makes the PDA a particularly useful tool is connectivity. "A hand-held computer alone — it's not quite the sound of one hand clapping. But it's only half of the answer."

The wireless servers

Connectivity for the PDAs is being provided by a wireless server created by WideRay, a wireless technology company. The server, known as a jack, is about the size of a thick textbook and relies on industrial-grade batteries that can last more than a year. As Andrew Blackman, vice-president of sales and business development at WideRay explains: "Essentially, the jack is a cell phone. At the back end of the box itself, there is cell phone connectivity. On the front end, the jack connects to the hand-held computer. So the jack basically acts as a store and forward cache of content."

Jacks are being installed in health care facilities in the Rakai and Mbale health districts. They use the cellular network to interact with a central server located in Kampala. Healthcare workers can use the jacks to download information, such as medication alerts or guidelines, as well as upload information, such as survey results or email consultations with other healthcare workers.

From a technical standpoint, says Blackman, the jacks have tested well in Uganda. "We work with wireless operators all over the world. Working in Uganda is not that different technically from working in the US or Europe or other parts of the world. The real advantage that wireless communications is bringing to places like Uganda is that they can literally leapfrog past decades

of [fixed-line telephone infrastructure] development and get to a point where they are on par with the rest of the world pretty quickly. Even the most remote villages we went to, we had cell phones that were in coverage, and we had connectivity."

"Connectivity will go a long way in linking hitherto disadvantaged healthcare providers who live and work in remote areas, far removed from the better infrastructure of the city," says Okello.

The impact for policymakers

The use of the jack servers will mean that policymakers in the national government will have access to the critical data they need to allocate resources in a fraction of the time it has taken in the past. "If it takes two months for reports to move from a sub-district level to the Ministry of Health, where the information then waits until someone is able to enter that information into a computer, what you are looking at is historical information," says Ladd. "It's a very different experience to get an email — a flash — when you turn on your computer in the morning saying that there is a critical shortage of supplies or a disease outbreak happening right now."

She adds that sending information, such as medical guidelines, from Kampala to outlying areas is equally as critical. "If you have a country that is considering using antiretroviral drugs for HIV, for example, there is a tremendous body of knowledge constantly being developed that needs to be translated into guidelines for care. If people don't have access to information about how to use antiretrovirals, how are they going to use them appropriately?"

A new market?

However, she cautions that PDAs and jack servers represent only one tool, not a panacea. "There are lots of issues around the rest of the healthcare system's ability to actually mobilize a response. This doesn't change the lack of resources, the lack of staff, the lack of medication. It doesn't change any of that. It's not a cure for the health system. It is a way to help people get a handle on finding a cure for the health system."

It is also a way to increase the information available to individual health care professionals so they can more effectively do their jobs. The response of physicians to the device during the training was quite positive, according to Blackman, who conducted training sessions. "People picked up on the technology pretty quickly. They immediately started thinking of applications, saying things like: 'this would be great for looking up information on drug interactions on the spot when I was with a patient'."

Ladd says she hopes that the project will help to illustrate that PDAs will prove to be as ubiquitous as cell-phones have become in Africa. "When you look at the growth of the cellular telephone industry and the number of individual subscribers, you can learn from that. People in Africa will spend money on technology."

"We don't want to be in the business of selling PDAs — that's not our job. Our job is getting healthcare information to the field. So one of our goals with this project is to convince the manufacturers of hand-held computers that there is a market in Africa for this technology."

"It's grandiose to think that the introduction of an information system is going to improve healthcare for the people of a country," says Ladd. "I happen to believe it will. But if we can make physicians and healthcare workers more able to care for their patients because they have more information, then we've gone a step towards that goal."

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Sidebar

Innovative Technology for Africa

Wireless technology for PDAs is one example of the kind of project being supported by Connectivity Africa, a program supported by IDRC that was announced during the G8 Summit held in Kananaskis, Alberta in 2002. Connectivity Africa will build on Canada's experience in connectivity projects in Africa and adapt Canadian expertise and models to the needs of African countries, particularly in education, health, and economic development.

"Connectivity Africa is looking at how to leverage new and improving technologies that have potential for Africa," says Connectivity Africa manager Steve Song. "PDAs are a good example of this."

"There are a lot of inexpensive technologies that are emerging on the market — technologies that were once complex," he adds. "For example, wireless LAN [local area network] connections used to be very complex. Now you find them in the business lounge in the airport. Technologies are becoming cheap; they are becoming commodities. And once a technology becomes a commodity, it has the potential to spread very quickly. I see our job as making sure that Africa has the capacity to capitalize on these technologies to improve the impact of development activities."

In addition to supporting innovation in the use of information and communication technologies (ICTs), Connectivity Africa is also focusing on finding ways to facilitate regional integration in Africa; on building capacity for research and development related to ICTs, particularly in African universities; and on increasing opportunities for partnership and convergence.