

SECTION V

Scaling Innovations

Civil society organizations and startups account for a disproportionate number of experiments to improve the lot of the BOP consumers. However, their reach is limited. Their orientation is local and they do not have the resources or the managerial skills for scaling up, much less taking it global.

One of the pressing problems at the BOP is access to clean, good-quality energy. The poor spend a disproportionate amount of their income on expensive and inefficient sources of energy—batteries, oil, and candles. Grid-based electricity does not reach most of them. E+Co is a pioneer in developing alternative energy sources, such as solar and wind, and experimenting with them in remote parts of the world, be it in Latin America, Africa, India, and other such places. They have active projects in countries as varied as Nicaragua to India. They have acted as an “angel and seed fund” group enabling local entrepreneurs to build viable commercial businesses and, at the same time, bring good-quality energy to the isolated populations. The portfolio of projects has all the desirable ingredients: private sector initiatives, commercial viability, success in harnessing renewable sources of energy, and aid for BOP consumers in isolated regions of the world. Given this track record, however, E+Co finds it hard to raise money for scaling up the effort.

A similar but less difficult situation exists for Voxiva, a startup that is a pioneer in the surveillance of emerging public health crises. Voxiva started by developing a system that allows for public health workers in remote regions of Peru to monitor the outbreak of infectious diseases and communicate relevant information to the central public health administrators in the capital of Lima.

The system accommodates a wide variety of devices—regular telephones, wireless, and PCs—to communicate. The system takes the structured information and converts it into a database that can be readily viewed by authorities. This is a real-time, low-cost, effective surveillance system. Voxiva successfully demonstrated it in Peru. Voxiva also had to raise funds to expand.

The company found that the competencies it had developed in converting inputs from a variety of devices, particularly voice messages, into a real-time monitoring system, might have applications in other parts of the world and in other sectors as well. The Voxiva system found applications in the U.S. Department of Defense as it inoculated soldiers for smallpox (a dispersed population with few skills in medical diagnosis). The soldiers could just call in their condition and the central monitoring stations could identify infections. The blood supply in the United States was the next target of opportunity. The situation in Iraq and the threat of SARS in Southeast Asia gave Voxiva a way to leverage its innovations in developed and other developing countries. With this track record, Voxiva was able to raise the modest but adequate capital it needed for expansion.

E+Co and Voxiva illustrate how startups can demonstrate the development of fundamentally new solutions to age-old problems, be it access to energy in isolated rural populations or providing public health access to and warning of latent outbreaks of disease in remote areas. Both bring new skills and technology and elegant, cost-effective solutions. The solutions of Voxiva also have applications in developed markets, such as the United States. These startups need access to funding to scale up. Funding sources, including private equity, are hesitant to back ventures that go against the grain. Non-grid-based electricity or a surveillance system that is not PC-based (but PC-compatible) find it that much harder to attract investments. If access to funding is not solved, ventures such as E+Co and Voxiva will have to seek adoption of these initiatives by multinational corporations that have the scale and resources required.

Section V
Scaling Innovations

The Voxiva Story

Over the last two decades the spread of new diseases such as Acquired Immune Deficiency Syndrome (AIDS) and Severe Acute Respiratory Syndrome (SARS) has generated a renewed awareness of the threats posed by infectious diseases. Indeed, infectious diseases, such as cholera, meningococcal disease, and measles, cause 63 percent of all childhood deaths and 48 percent of premature deaths, and at least 300 million people have acute cases of malaria, 90 percent of them in sub-Saharan Africa.¹

THE INNOVATION...

Controlling the threat of infectious diseases demands early detection of outbreaks and immediate response. Without timely information and effective two-way communication, health authorities cannot hope to manage the spread of diseases such as SARS. In rural areas of the developing world, where many new outbreaks occur, a pay phone is often a community's only link to the outside world. Voxiva's technology turns a village pay phone into a communications device on par with that of a

computer. By calling into Voxiva's system and pushing buttons on the phone, rural health workers can report new cases of disease systematically and in real time. Health authorities can see the information immediately via the Internet, analyze the data, and use the system's communication and messaging tools to respond. By leveraging the world's 2.5 billion phones, as well as the Internet, Voxiva's solutions have a much wider reach than Internet-only solutions. Although Voxiva's technology was developed for the developing world—and pioneered in Peru—its simplicity and practicality have created great demand in the United States and developed world markets. Voxiva's systems are now used by U.S. government agencies—from the Food and Drug Administration (FDA) to the Department of Defense to the San Diego County Health Department—as well as by private health providers. In the developing world, Voxiva has deployed health solutions in Latin America, Africa, Iraq, and India.

Continuing threats of emergent diseases, such as SARS, threaten state and regional economies. In a report issued by the Asian Development Bank (ADB) in the spring of 2003, it was estimated that the SARS outbreak will, in addition to the loss of life, cost Asia approximately \$7 billion in forecast economic output while the region as a whole could lose up to \$28 billion.² However, disease detection and communication can inhibit the spread of infectious diseases. According to the World Health Organization (WHO), reporting systems are the intelligence network that underpins disease control and prevention. Without this framework in place, it is impossible to track where disease is occurring, measure progress in disease control targets, or provide an early warning system for outbreaks and the emergence of new diseases.³

There are three key ingredients of an effective system for disease surveillance and response:

- Real-time collection of critical information from a distributed network of people, in this case, health workers with new cases of disease to report.
- Rapid analysis of data to drive decision-making and allocation of resources.
- Communication back to the field to coordinate response.

Voxiva's solutions are designed to address all three: real-time data collection for early detection of outbreaks, rapid analysis, and communications for response. Although Voxiva's system was developed initially to support disease response, the fundamental problem that Voxiva solves is universal and

applicable to a range of problems, from monitoring of patients to crime reporting to tracking commercial orders and distribution. Although solutions to these problems might seem obvious in the developed world where people have ready access to the Internet, Voxiva primarily targets rural areas, where 70 percent of the world's poor live with limited access to telecommunications.⁴

So how does Voxiva bridge this communications gap? Why is it targeting consumers who make under \$2 a day? Their value added is socially admirable, but is it profitable? In this case Voxiva challenges a basic assumption held by many: Computers must proliferate in rural communities to connect the poor to real-time information systems. In bypassing this assumption, Voxiva rejects previous notions of cost structure by leveraging existing infrastructure: the billions of phones already in place. By creating an account for rural health workers and letting them access robust information systems from any phone or computer, Voxiva connects marginalized communities to the health system in a systematic and meaningful way.

The Founders of Voxiva

Before co-founding Voxiva in March 2001, Paul Meyer founded IPKO, the first and largest Internet service provider in Kosovo. Started in the weeks after the 1999 war, IPKO was hailed by the United Nations Secretary General as “a model for future humanitarian emergencies,” and is today one of the largest businesses in Kosovo. Before IPKO, Meyer wrote speeches for President Clinton, graduated from Yale Law School, and deployed IT systems to help reunite refugee children separated from their families in West Africa and the Balkans. After returning from Kosovo, Meyer was a Senior Fellow of the Markle Foundation, where he studied efforts to “bridge the digital divide”—projects using information and communications technologies (ICTs) to support development. He summarized his findings in three general points:

1. Most projects were deployed on a pilot basis and were fundamentally not scalable. Making a system work in one village in India is very different from making it work in 600,000 villages in India.
2. Projects were overwhelmingly focused on connectivity and devices—building out networks or putting computers in schools—rather than on applications that addressed critical information flow challenges. There was much greater emphasis on machines and data networks and not enough thinking about people and the human networks.
3. There was too much focus on the Internet and computers as a solution, particularly given the challenges of electricity, hardware and maintenance costs, training, and literacy.

Above all, Meyer observed that people were ignoring the fact there are a lot more telephones in the world—2.5 billion at last count—and deduced that telephones are a much more accessible, practical tool for most people in the world.

Dr. Pamela Johnson, a PhD in medical anthropology, is co-founder and Executive Vice President of Business Development at Voxiva. She provides insight into the marriage among government, technology, and public health that serves to define the company. Previously, she was the coordinator for child survival at the U.S. Agency for International Development (USAID), overseeing public health programs in 50 countries, and subsequently helped lead the U.S. government's eGovernment Initiative at the White House. Johnson said, "To me the real potential of technology in the developing world is to try to make better use of scarce resources."

Dr. Anand Narasimhan, Voxiva's third co-founder, provided the technological vision for the company. Before joining Voxiva, he was the founding Chief Technology Officer of J2 Global Communications, the largest unified messaging company in the world, and spent many years at IBM.

Voxiva: A Social Venture

Voxiva was founded to deliver practical technology solutions to important problems in the developing world. Voxiva sought to extend the reach of software applications to people and communities without access to the Internet and to connect them in a systematic and meaningful way to promote health and development. Although Voxiva's solutions create significant social value, the company balances its social vision with its clear mandate to create strong returns for investors. Meyer contemplated starting Voxiva as a nonprofit organization but concluded that only by creating a powerful economic model that leverages Voxiva's technology and infrastructure across many applications and customers could the company scale and realize the full potential of its founding vision.

Voxiva's initial investment came from socially minded sources: Ben Cohen of Ben & Jerry's Ice Cream (\$250,000) and the Markle Foundation⁵ (\$500,000). The funding for Voxiva's first deployment, the Alerta disease surveillance system in Peru, came from the World Bank's InfoDev⁶ program for innovative uses of technology in economic development. Meyer noted, "We were able to get started because we raised money from people who thought what we were doing was important to the world and also believed in our business model. For the early investors, it was probably more the former than the latter." Voxiva has since raised more than \$8 million from socially minded angel investors and top-tier investment firms like Allen & Company in New York.

Beyond helping it raise the initial capital, Voxiva's social vision and mission have helped the company enormously in winning customers and attracting dedicated employees. Because of Voxiva's track record in the developing world and deep understanding of the public health sector, customers trust Voxiva and are more comfortable working with Voxiva than with a more traditional software company. In addition, Voxiva has been able to attract, retain, and motivate exceptional employees by appealing to their hearts as well as their wallets. According to Meyer, the ideal Voxiva employee is part McKinsey consultant, part Microsoft engineer, and part Peace Corps volunteer.

Voxiva in Peru

Voxiva first deployed its technology in Peru to facilitate real-time disease surveillance from rural health workers. The project was funded with a \$250,000 grant from the World Bank's InfoDev program. Officials from the Gates Foundation and the WHO suggested Peru as a good place to pilot the system because the country had established a strong paper-based disease surveillance system in the aftermath of a devastating cholera outbreak in 1991. Voxiva wanted to work with a pilot customer who would actively manage the information collected by the system and use the system to respond to disease outbreaks in real time, a role filled by Peru's Department of Epidemiology (OGE). As Johnson emphasized, "The head of the OGE not only understood the role of information technology, but could see the power behind it. We like to work with people who are really hungry for information and actually want to do something with it. We don't believe in collecting data to end up in annual reports. We believe in collecting data for action."

Voxiva also wanted a pilot country where the telecommunications infrastructure had sufficient reach into rural areas. By 2002, telephones had reached more than 6,000 communities in Peru, with Internet access reaching 900. Karen Lynch, Director of the Markle Foundation's Global Digital Opportunity Project, said, "Markle's interest was that [the project] be done in a developing country that showed some critical success factors, such as in-country leadership and an enabling environment, and Peru filled that bill—among other reasons because its president was showing a strong interest in information technology and Peru had put considerable work into its health care administration."

Peru's Ministry of Health

Problem Definition

The fundamental challenge faced by Peru's Ministry of Health was to monitor new cases of disease from more than 6,000 health clinics spread across

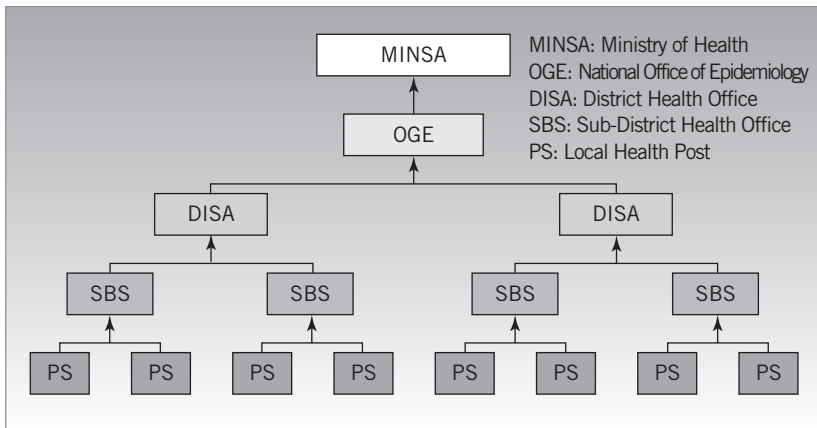


Figure 1 Hierarchical information flow in epidemiologic surveillance from rural clinics to the Ministry of Health of Peru. Data flows up gradually with a paper-based system but no information flows back to health workers in the field.

the country and respond in time to stem new outbreaks. Peru's existing surveillance system collected weekly disease outbreak reports from every health clinic in the country. However, because the reports were collected on paper and recompiled at each level of the Ministry of Health's (MINSA) hierarchy (see Figure 1), weeks or months could pass before Ministry of Health officials in Lima learned of outbreaks and were able to respond.

"Previously you couldn't transmit data and therefore couldn't administer data," said Dr. Luis Botton, IT Director at the District Level within the Health System.

Moreover, information rarely, if ever, flowed back to health workers in the field. More than 90 percent of rural health workers reported receiving health alerts "never," rarely," or "less than once a month."

Voxiva's Alerta disease surveillance application was designed to allow for information to flow directly from health clinics into a national-level system so that information is accessible to those at all levels simultaneously. Moreover, the system allows health authorities at higher levels to view the incoming data on a map, analyze it, and use the system's communication and notification tools to provide feedback to the field and coordinate the response.

How It Works

Voxiva designed Alerta to address the needs of Peru's dispersed rural health workers. Alerta allows front-line health workers to submit disease reports in real time from any phone or Internet-connected device. Users receive an account


 Call 1-800-555-5555		
Menu		
Voice Mail	Press 1	
Case Report	Press 2	
Update Profile	Press 3	
Operator	Press 0	
Case Report		
To File Report	Press 2	
Enter Notification Code		
If Negative Report	Press 999	
<ul style="list-style-type: none"> • Is the report from your district? • What is the date of onset? • Enter the age of the patient • Enter patient sex • What is current status of case? • Would you like to add a voice message with additional information? 		
Voxiva, Inc. 1250 24th St. NW, Ste. 350 Washington, DC 20009 202.776.7767 info@voxiva.net www.voxiva.net		
	Acute Diarrhea 001 AFP 803 ARI 002 Bartonellosis 449 Chagas' Disease 57 Cholera 00 Congenital Rubella 06 Congenital Syphilis 500 Cutaneous Leishmaniasis 551 Dengue 90 Diphtheria 369 Disasters 911 Hemorrhagic Dengue 91 Hepatitis 16 HIV/AIDS 240 Human Rabies 820 Malaria Falciparum 50 Malaria Vivax 51 Maternal Death 96 Measles 59 Meningococcal Meningitis 390 Neonatal Tetanus 33 Plague 209 Pneumonia 18 Rubella 06 Snakebite 20 Tetanus 35 Tuberculosis 010 Typhus Fever 750 Whooping Cough 379 Yellow Fever 950	Notification Codes

Figure 2 Alerta user cards. Health workers enter numeric codes corresponding to the diseases they must report.

number, personal identification number (PIN) and a plastic card with simple instructions and codes for all the diseases they need to report (see Figure 2). From a phone, they dial a toll-free number to access the system. From the Web, they go to Voxiva's Web site.

Authorized users log on and follow instructions on a wallet-sized card or a simple voice-prompted menu and enter digital information about cases of disease and disaster incidents. They can attach additional information in voice files. Each user also has a voice mail account, which can be accessed when he or she logs on. Thus, rural health professionals are able to send and receive voice messages, even if they do not own a telephone. Users are also able to receive health alerts, information about diseases, vaccination programs, training opportunities, natural disasters, and so on.

Health authorities can monitor incoming cases through a Web interface. Individual disease reports arrive in real time with full case details. Authorities can also listen to voice files recorded by the remote health workers. Data are available immediately, and health officials can export data to various programs for analysis and presentation. Geographic information systems can also be used to view data using dynamic maps.

Designated users receive automatic notification of selected reports via e-mail, voice mail, or SMS message. Health officials can communicate with remote health professionals using voice mails as if they were e-mails, to individuals or to predetermined groups of users. The system is operational 24 hours a day, seven days a week.

Information is entered into the Voxiva system directly, making it accessible at all levels simultaneously. Because health posts enter data directly, errors in the data are reduced. The system provides feedback to users at all levels via SMS, e-mail, and voice mail. Health workers use voice mail to communicate with each other peer to peer.

Medically remote, but not out of touch

The Houston Chronicle

March 6, 2004

<http://www.chron.com/cs/CDA/ssistory.mpl/business/2436493>

Associated Press

PACARAN, Peru — Beyond the reach of the Internet and paved roads, this quiet town in the Andean foothills is typical of much of rural Peru, where isolation can hinder timely medical reporting and health officials' ability to respond. But when villagers from the hamlet of Picamaran, a five-hour hike away, started showing up in Pacaran with symptoms of sometimes-deadly bartonellosis three years ago, nurse Malena Rivas turned to her new "computer"—a cell phone.

Using a pilot program set up by Voxiva, Rivas dialed a toll-free number and, through a several-step menu system, punched in the data on her patients. Within minutes, the Health Ministry had the data. And only days later, university physicians arrived to contain an epidemic of bartonellosis, also named La Oroya Fever after the Peruvian smelter town where an 1871 outbreak killed more than 7,000. The disease, which is transmitted by sand fly bites, can cause fever, chills, aches, seizures and death.

The Alerta Pilot

The Alerta pilot connected approximately 204,000 individuals in two sparsely populated districts south of Lima to the national health surveillance system: Chilca-Mala with 15 residents per square kilometer and Cañete with 24 inhabitants per square kilometer. The system incorporated 76 health clinics, health centers, and district centers (SBS) that are part of the four levels of the Ministry of Health. In total Peru has more than 6,000 health posts (PS); 53 SBSs; 34 state-level health centers (DISA), which play a vital role in outbreak

management; along with the Department of Epidemiology (OGE) and the Ministry of Health (MINSA) located in the capital, Lima.

The initial pilot ran from March 2002 through early September 2002. After a short orientation, health professionals began to use available telephones and the Internet (whichever was available) to submit real-time, electronic reports of mandated diseases and disasters. Of the participating health posts, 68.4 percent had easy access to a phone. Another 17.1 percent reported via high-frequency radio link to a nearby clinic. Only 14 percent of facilities had no access to technology and reported using the traditional paper methods.

Prior to Alerta's installation, 28 health posts reported on a weekly basis and 22 reported on a monthly basis to the Chilca-Mala SBS. Although MINSA required that health posts and centers report on a weekly basis, due to the cumbersome process of transporting the reports, many reported only monthly. After Alerta's deployment, 12 of the 22 that had previously reported on a monthly basis began reporting on a weekly basis because of access to a telephone in their village. Of the posts with access to a phone or radio, 86.5 percent reported regularly.

A total of 26,264 cases was reported during the pilot with more than 4,167 calls. Altogether, 204 users, including front-line health workers and management, utilized the program during the pilot. A survey conducted in August 2002 revealed that 90 percent of the respondents who used the system believed the faster responses from supervisors were a primary benefit of the system, and 70 percent of the users cited the increased communication with their colleagues and supervisors as another key benefit of the system.

Cost–Benefit

An evaluation of the pilot by San Marcos University in Peru found that, as compared with the traditional system, Alerta required a substantially lower allocation of resources, lower operating costs, and resulted in a threefold increase in reporting coverage. Overall, the Alerta system required 40 percent lower costs of operations than the traditional paper system. The study also concluded that the use of voice mail for communications was 7.8 times less expensive than written communication.

Alerta's benefits, based on the pilot, can be summarized as follows (see Table 1).

1. It is intuitive to use and accessible, even from very remote regions of Peru.
2. It allows for quicker, better informed decision-making by health authorities and better allocation of scarce resources.
3. It fosters better data quality because data is entered directly by users in the field and validated at the source.
4. It allows for rapid feedback of information to the field and can be used to reinforce the skills and knowledge of health workers in the field.

Table 1 Alerta Pilot Scorecard

Goals	Grade	Comments
Technically Appropriate and Feasible	B+	Voxiva reaches the lowest common denominator of technology: the village phone. Its system has even incorporated reports from clinics that report via high-frequency radio. Because most users interact with the system via the phone and respond to voice prompts, they do not have to be literate to use the system. On the other hand, many end users who work at health posts are not familiar with the use of IVR and voice mail, so ongoing training is required.
Cost-Effective	A+	It had a clear and rapid benefit demonstration because deployment was fast. Compared to other IT applications, startup costs were low due to piggybacking on the existing telecom infrastructure. Also, the fact that it is an open system makes integration with the existing IT health system used by the Ministry of Health possible and relatively simple. Voxiva provides an "appropriate" IT solution in an environment with not only limited (but growing) telecom infrastructure, but it's also appropriate in a resource-strapped country like Peru.
Can Be Maintained with Local Skills and Resources	A-	Because Voxiva relies on existing infrastructure, the phone and data networks are maintained by telecommunications companies like Telefonica in Peru. As an application service provider, Voxiva's in-country team worries about keeping the application up and running, allowing the customer to focus on managing the information. Since it is so intuitive for end users, the system requires very little training for most users. Higher level users who manage the information require better skills and more extensive training.
Accepted by Clients and Providers	A-	High score from all end users. More important, it had multilateral and private-sector participation and alignment with national planning to strengthen the disease prevention system. There is avid dedication in both quality and intensity of use. For example, the Navy had 100 percent reporting from participating naval bases. The only vulnerability is due to the frequent turnover in the Ministry of Health. In three years working in Peru, Voxiva has interacted with six Ministers of Health.

Table 1 Continued

Goals	Grade	Comments
Result in Favorable Effects on Health	N/A	At this point health impact has not been assessed. The goals of the project were not measured in health objectives, but rather by efficiency within the process and overall medical administration.

Source: Rodrigues, R. J. (2000). *Telemedicine and the transformation of healthcare practice in the information age*. In Speakers' Book of the International Telecommunication Union (ITU) Telecom Americas 2000; Telecom Development Symposium, Session TDS.2; Rio de Janeiro, April 10–15, 2000, p. 9.

5. It reduces the paperwork burden on health workers in the field.
6. It promotes transparency and accountability by making information available at multiple levels simultaneously.
7. It is cost-effective relative to the current system and other IT rollouts because it leverages the existing telecommunications infrastructure and has an open structure to seamlessly link to legacy systems.

In the words of Dr. Jaime Levano, an Alerta user in Cañete, Peru, “We can see the information instantaneously . . . now everyone is informed about a case and the disease and the appropriate measures can be taken according to the case . . . it is truly an important benefit . . . it could help eradicate diseases.”

Alerta Deployed for the Peruvian Navy

In October 2002, Alerta was expanded to support the disease surveillance efforts of the Peruvian Navy (DISAMAR), with support from the U.S. Navy's Global Emerging Infections System (GEIS).

After 15 months of operations, the results of the deployment were presented to the American Society of Tropical Medicine and Hygiene. “The introduction of Alerta has led to early outbreak identification/response, timely case management, and increased review of clinical procedures within reporting units.” Compliance with the system reached a sustained 100 percent within six months of its launch. The study concluded that:

Alerta represents a fully functional alternative for cost-effective real-time disease surveillance in countries at all stages of technological development. The investment required is small compared to alternative approaches to building disease surveillance capabilities, particularly in terms of infrastructure and maintenance expenses. The combination of scalable technology, accurate and close monitoring of performance, controlled growth, and effective mechanisms for information sharing, feedback and data-driven decision making has turned this pilot project into a highly innovative, cost-effective and replicable surveillance model.

Beyond Health Care in Peru

Although Voxiva's efforts have been directed primarily at delivering health care solutions, because of the flexibility of the technology platform, the company has begun to deploy solutions in additional vertical markets. In the summer of 2003, Voxiva deployed its second application—Citizen's Alert in Lima, Peru—to allow citizens to report crime to municipal authorities in real time and for authorities to track the location of police and dispatch them accordingly. The system was first deployed for the Miraflores municipality in Lima and has since been expanded to four additional municipalities. Like all its applications, Voxiva hosts the solution and charges on a per-citizen, per-month basis.

Application in Developed Countries: From Peru to the Developed World

Although Voxiva's systems were originally developed to serve developing world markets, the simplicity and practicality of the solutions have created demand for the systems in the United States. In the spring of 2002, in the wake of the anthrax letters and broader fears over bioterrorism, Voxiva's board directed the company to explore opportunities in the United States.

Voxiva's first customer in the United States was the FDA. The FDA had developed a Web-based system for monitoring blood shortages but soon discovered that 40 percent of the nation's blood centers did not have ready access to the Internet. In fact, according to a study conducted by the Pew Foundation in April 2003, 42 percent of Americans have not used the Internet, nor do they plan to do so.⁷ Because Voxiva's systems are accessible from the phone as well as the Web, the FDA was able to deploy a much more accessible system to track blood shortages (see Figure 3).

Voxiva's other U.S. deployments include disease surveillance systems for Washington, DC, and San Diego County and a smallpox vaccination monitoring system for the U.S. Department of Defense.



Smallpox Vaccination Program: U.S. Department of Defense

CHALLENGE: Concern about weaponized smallpox led the Department of Defense to vaccinate military personnel against the disease. Because data on the effects of the smallpox vaccine were more than 30 years old and because of changing demography and health status of the U.S. population, the Department of Defense wanted to monitor the early recipients of the vaccine closely.

SOLUTION: Voxiva deployed SAFEVAX, an electronic diary, for the Department's Smallpox Vaccination Program. Vaccinees, using secure IDs and passwords, report on their symptoms on a daily basis using toll-free telephone access or the Internet. If vaccinees miss a report, they receive a reminder call from a call center operator who can help them submit their data. Vaccinees can access their own diary after logging into the Web site. SAFEVAX facilitates rapid identification of reactions; analysis of reaction patterns and trends; and automatic alert and notification. The Department of Defense can specify criteria based on symptoms (i.e., fever of over 103 degrees) that result in an automatic telephone or e-mail notification to the appropriate person.

Even as Voxiva continues to win business related to bioterrorism preparedness and homeland defense, it has discovered even greater opportunity for its technology in providing patient monitoring systems for leading disease management companies and home health agencies in the U.S. and U.K. markets. Voxiva has also found a market for its crime reporting system in the United States. In spring 2004, it signed its first contracts to deploy the service for several university campuses.

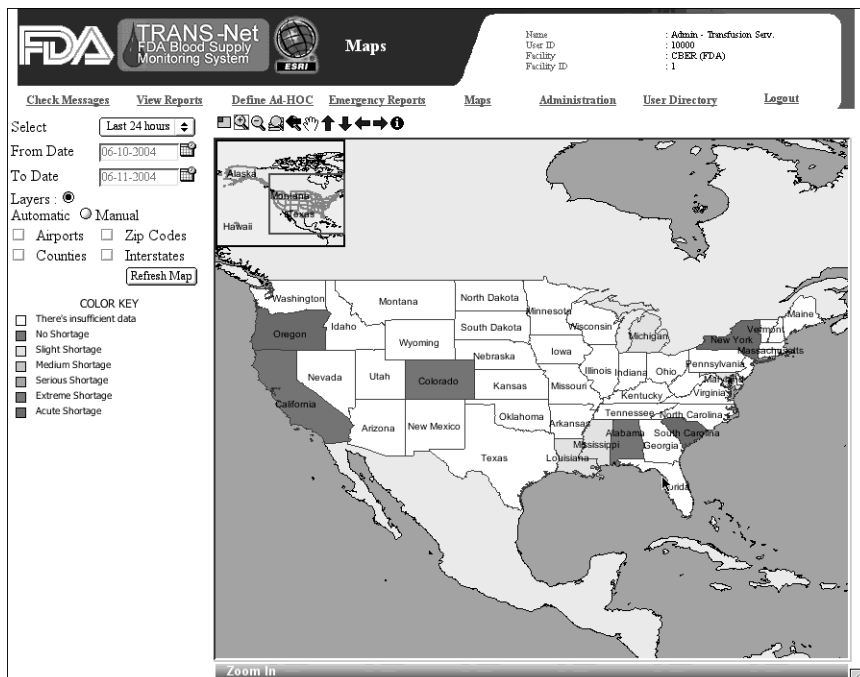


Figure 3 The FDA can monitor blood shortages in real time using Voxiva's system.

Voxiva's Lessons Learned

Having deployed health solutions on five continents, Voxiva summarized its lessons learned as follows:

1. Foster two-way information flows. Information systems should not just collect data, but also provide feedback and support to health workers in the field. Too often systems are put in place for monitoring and evaluation with information flowing upward to managers but providing no value to the health workers in the field. A well-designed information system supports and contributes to the performance of all the users.
2. Leverage existing infrastructure. It is not necessary to have PCs everywhere to have a robust information system. By leveraging phones, mobile phones, handheld devices, and faxes, as well as PCs and the Internet, it is possible to deploy a health information system much more quickly and cost-effectively than systems that require the up-front purchase, installation, and maintenance of a widespread network of expensive hardware or devices.
3. Avoid stovepipes. Information systems should be integrated across programs. With paper reporting systems currently in place, health workers are overburdened with different forms for each program they interact with. In some countries, health workers spend as much as 40 percent of their time filling out forms, compiling data, and copying data. The danger is that those paper stovepipes get replicated with technology and health workers have to use a different system (and perhaps even a different device) for each program they report to (e.g., tuberculosis, malaria, HIV/AIDS, etc.).
4. Software is not a system. Deploying PCs and clinic-level software does not produce an integrated national system. What is needed is a robust, scalable, integrated information system that connects health professionals from the local to the national level and provides them with the information and support they each need. What is needed is more analogous to a sophisticated phone and Web banking system than to Microsoft Excel. This requires a different technology architecture and different approach.
5. Technology alone will fail. Change management and capacity building are key. Most public health agencies in the developing world are not accustomed to real-time information. Helping decision-makers incorporate better information and use it for strategic decision-making and response is critical to the success. This requires considerable change management, training, and capacity-building efforts that dovetail with the deployment of an information system.

Voxiva's Global Rollout

Although Voxiva's detour through the U.S. market delayed its international expansion, the credibility Voxiva earned from serving customers such as the FDA and Department of Defense has served it well in its subsequent expansion in the Middle East, Africa, and Asia. Customers in new countries seem much more comfortable with technology that is "good enough" for the U.S. market.

Iraq

In Spring 2003, the company won a \$1.3-million contract to deploy the national disease surveillance system for postwar Iraq. The contract was part of a larger \$43-million contract awarded by USAID to Abt Associates to strengthen the Iraqi health care system. Voxiva's first task order from this contract was to design a platform and database architecture for a facilities-based, real-time Iraqi health information system to strengthen health service delivery and support project monitoring and evaluation, with rapid prototype deployment of a disease surveillance module in Basra. Voxiva deployed the Alerta system—renamed "SMART" by Iraqi Ministry of Health officials—in January 2004. The company had to expand its standard training to include a new module, "How to use a cell phone," because cell phones had been outlawed under Saddam Hussein and few health officials had even seen one.

HIV/AIDS in Africa

In Fall 2003, Voxiva turned its attentions to the challenges of combating HIV/AIDS in Africa. In his 2003 State of the Union address, President Bush committed \$15 billion over five years to fight AIDS in Africa under the President's Emergency Plan for AIDS Relief (PEPFAR). Voxiva believed its solutions were perfectly suited to supporting the huge challenges involved in scaling up and managing the delivery of care and antiretroviral treatment (ART) to millions of people in some of the poorest countries in the world. These were countries where many health clinics lack even electricity, health personnel are limited in number and skills, and information systems are rudimentary.

In December 2003, Voxiva CEO Paul Meyer was invited to accompany U.S. Secretary of Health and Human Services Tommy Thompson, WHO Director J.W. Lee, PEPFAR Director Randall Tobias, the directors of the Centers for Disease Control, National Institutes of Health, Global Fund for AIDS, and the CEOs of Pfizer, Merck, and Bristol-Myers on a weeklong delegation visit to four countries in Africa to plan the PEPFAR implementation. The fact that Voxiva was the only software company on the trip was testament to its rising profile in the arena of global public health.

Based on that visit and on lessons learned from Voxiva's previous experiences, the company proposed a system that would assist clinicians, managers, and decision-makers to:

- Monitor key indicators of a national HIV/AIDS program with accurate, current data for national and global reporting requirements.
- Carefully manage ART to reduce the spread of viral resistance.
- Coordinate services and programs across multiple facilities and levels.
- Provide for the information needs of PEPFAR in a way that is sustainable and strengthens underlying health information and infrastructure.

The system was also designed to improve management of programs by allowing countries to:

- Clinically manage chronic illnesses (HIV/AIDS and opportunistic infections), including complex treatment regimes.
- Train, support, and supervise health personnel.
- Assure reliable distribution and tracking of pharmaceuticals.
- Promote transparency and accountability at all levels.

The company's efforts have been rewarded. In February, Voxiva won an initial contract under PEPFAR to deploy the national HIV/AIDS information system for Rwanda. In addition, Voxiva was part of a consortium led by Catholic Relief Services that was awarded a five-year, \$335-million contract to deliver HIV/AIDS care in ten countries and another consortium led by Columbia University that was awarded a five-year, \$125-million contract for eight countries. At printing, the company was also bidding on contracts in South Africa, Nigeria, Madagascar, and Uganda.

India

Voxiva launched its operation in India on February 1, 2004, and won its first contract—to deploy a surveillance system for Japanese encephalitis—within a month. To launch Voxiva India, Voxiva recruited Madhu Krishna from her post directing the Bill & Melinda Gates Child Vaccine Program in India. Krishna says she joined the company “because Voxiva has the potential to transform public health.” Meyer is bullish on the company's prospects in India: “I think that India is the market where Voxiva will reach its fullest potential. All the conditions are there: the fixed-phone network reaches into the most rural areas. Mobile networks are building like crazy. The cost of calls has dropped fifty-fold

in the last three years. Most importantly, there are a billion people, very few of whom are connected to the health system in a meaningful and systematic way. We intend to change that.”

Voxiva's Challenges

- Voxiva seems to have hit on a solution to a universal problem: allowing organizations to collect data from and communicate with dispersed populations in a timely and systematic way by leveraging existing infrastructure. Although the opportunities in front of the company are vast, Voxiva faces a range of challenges as it grows; namely, to continue to build the Voxiva brand and reinforce its social capital. Voxiva has benefited enormously from its brand recognition as a provider of practical technology solutions and a socially minded venture. That brand positioning has yielded great advantage for the company in terms of its ability to raise capital; hire, motivate, and retain employees; and attract customers who feel more comfortable working with a company that understands their problems and shares their values.
- Ensure that its capacity to win new business does not outpace its ability to deliver quality services. With operations on five continents, the company will be challenged to maintain the quality of its services. The company cannot afford to let its delivery slip.
- Focus on key opportunities and avoiding distraction. Clearly there is a market for Voxiva's solutions across a range of geographies and sectors. Focus and prioritization are keys. “Saying no to opportunities is a huge challenge,” admits Meyer. He constantly finds himself weighing the business opportunities versus the social benefits; short-term results over long-term impact; and fighting the inclination to grow all at once into different sectors.
- Deal with the challenges and long sales cycles of selling services to governments and international development agencies. Voxiva seems to have solved this problem by partnering with officially approved contractors, from Northrop Grumman to Abt Associates to CARE, who subcontract the provision of data collection and communications systems to Voxiva.
- Develop recurring revenue business models that generate revenue from local economies. Voxiva has benefited greatly from its ability to win large, externally funded contracts to enter countries. Without the grant from the

World Bank to launch Alerta, for example, it would never have had the resources to enter Peru. However, to build a lasting scalable business, it must develop more solutions like Citizen's Alert in Peru and its patient-monitoring applications in the United States that generate stable recurring revenues.

- Manage a diverse team and foster continuing innovation. One of Voxiva's strengths has been to bring together a team with a diverse background. Voxiva employs medical doctors, software engineers, social scientists, development experts, telecom specialists, change management consultants, and financial analysts. Meyer strongly believes that innovation comes from bringing together people with diverse perspectives and "forcing their brains to work together. It isn't always easy, but it's where the magical insights come from."

Conclusion

Three years after Voxiva's founding, Voxiva is operating on five continents. Meyer still relentlessly challenges his employees to create innovative applications that deliver on two bottom lines: social and financial.

Endnotes

1. WHO Report on Global Surveillance of Epidemic-Prone Infectious Diseases. WHO/CDS/CSR/ISR/2000.1, <http://www.who.int/emc-documents/surveillance/docs/whocdscsr2001.pdf/Introduction.pdf>, May 2002. Note: Cancers, cardiovascular, and respiratory and digestive deaths also can be caused by infections and raise the percentage of deaths due to infectious diseases even higher.
2. Economic Impact of SARS—From Asian Development Bank, May 9, 2003, <http://www.abd.org/Documents/News/2003/nr2003065.pdf>.
3. WHO Report on Global Surveillance of Epidemic-Prone Infectious Diseases. WHO/CDS/CSR/ISR/2000.1. <http://www.who.int/emc-documents/surveillance/docs/whocdscsr2001.pdf/Introduction.pdf>, May 2002.
4. The World Bank's Agriculture and Development Home Page: <http://lnweb18.worldbank.org/ESSD/ardext.nsf/11ByDocName/AgricultureRuralDevelopment>, October 2, 2003.
5. The Markle Foundation focuses its work in the program areas of policy for network society and information technologies for better health. The overarching goal of the Markle health program is to accelerate the rate at which information

technology enables consumers and the health system that supports them to improve health and *health care*. <http://www.markle.org/>, February 2004.

6. InfoDev was founded in September 1995, and is a global grant program managed by the World Bank to promote innovative projects in the use of information and communication technologies (ICTs) for economic and social development, with a special emphasis on the needs of the poor in developing countries. <http://www.infodev.org/>, February 2004.
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This report was written by Cynthia Casas and William C. Lajoie under the supervision of Professor C. K. Prahalad. This report is intended to be a catalyst for discussion and is not intended to illustrate effective or ineffective strategies.

