Technology for good:
Innovative use of technology by charities

Technology for Good at a Glance

Technology for Good identifies ten technologies being used by charitable organizations in innovative ways. The report briefly introduces each technology and provides examples of how those technologies are being used.

Examples are drawn from a broad spectrum of organizations working on widely varied issues around the globe. This makes *Technology for Good* a unique repository of inspiration for the public and private sectors, funders, and other change makers who support the creation and use of technology for social good.

The top ten technologies selected are:

1 **Mobile technology:** Mobile devices that range from low-end talk and text phones to smartphones or tablets.

2 **Tracking technology:** GPS or other monitoring systems that track people and goods.

3 **Mapping technology:** Tools that organize geographic data and feed data sets into a digital map.

4 **Social media and crowdsourcing:** Data collection through open-sources.

5 **Data management technologies:** Tools for processing large amounts of data or improving administrative functions.

6 **Radio/TV:** New uses of these two important mass communication mediums in the developing world.

7 **Translation Tools:** Quick or immediate translations using a combination of technology and crowdsourcing.

8 **Cloud Technology:** Computing that allows access to software and information via the Internet instead of a hard drive or computer network.

9 **Portable Networks:** Moveable devices that can create instant Internet connectivity or telecommunication networks.

10 **Drone Technology:** Unmanned aerial vehicles used to leapfrog infrastructural deficits.

In determining the top ten trends, we chose technology that has the potential for wide reach, deep impact, and ease of use.

What You Can Learn

For nonprofits and other charitable organizations, the report offers many examples of how technology can help organizations achieve their missions, even with modest means.

For funders, the report compiles a variety of successful projects, demonstrating the deep impact of funding technology innovation.

Finally, for everyone interested in creating positive social change, the projects described in *Technology for Good* offer a number of interesting lessons.

Lesson 1: Waiting Is Not an Option

The barriers to positive social change are significant. One billion people currently don't have access to adequate year-round roads,[1] and 1.2 billion do not have a regular supply of electricity.[2] Worldwide Internet penetration rates are under 40 percent, with some regions as low as 15.6 percent.[3]

Creating this infrastructure would take years, if not decades. And even in regions with stable infrastructure, a war or natural disaster can render transportation and communication difficult or impossible.

Because there are urgent needs that must be addressed, charitable organizations have found ingenious ways to continue doing their good work, regardless of infrastructure challenges. For example:

✶ Unmanned aerial crafts, or "drones," have troubling associations with surveillance and war. They also have the potential to deliver aid and supplies to areas that would otherwise be inaccessible due to inadequate roads or dangerous conditions. The Matternet device, a fusion of an unmanned drone with a GPS, could deliver supplies to an aid agency or local clinic within minutes, regardless of the situation on the ground.

1 Ariel Schwartz, "The Matternet: A Flying Autonomous Delivery System for the Developing World," 30 August 2011, <http://www. fastcompany.com/1776951/matternet-flying-autonomous-delivery-system-developing-world>.
2 International Energy Agency, "Global Tracking Framework," <http://www.iea.org/publications/freepublications/publication/ globaltrackingframework.pdf>.
3 Internet World Stats, <http://www.internetworldstats.com/list2.htm>.

Sometimes the barriers to positive change are social rather than infrastructural. The report includes a number of examples of how technology can help disseminate health and other information, despite social barriers, such as:

- In Haiti, a country where 90 percent of the population uses cellphones, the Red Cross offers detailed health information via a free dial-in telephone number. This allows people to learn about sensitive topics like sexual health in a way that is both convenient and private.

Lesson 2: Reuse Great Ideas

Technology for Good is more than a list of interesting technologies. Many of these technology innovations can be applied beyond the region or service sector for which they were initially developed. For example:

- In Afghanistan, some areas are off-limits to non-Afghans. USAID therefore struggled to ensure that its aid projects were being delivered effectively. Local staff (who were permitted to travel throughout the country) were supplied with GPS cameras to document the status of USAID programs. Even in places where staff can travel freely, GPS-enabled cameras could offer new ways to ensure effective program delivery and financial accountability.

- The HelpBridge app was developed in response to Hurricane Sandy in the U.S., but it was consciously designed so that it could be reused to respond to future disasters.

Innovation also isn't always about creating something completely new. *Technology for Good* also demonstrates the power of deploying existing widely adopted technology in new ways, such as:

- The group of young women using radio to fight violence against women in the Democratic Republic of Congo. Because radio technology is already widely adopted, using radio to share their stories helps these women break the silence on formerly taboo topics such as rape and violence against women.

"After Haiti and Japan, we saw a lot of technology pop up right after the event that helped people connect with each other and find ways to donate. But after the disaster, nobody maintained the technologies long-term, so that when the next disaster happened, it would have to be recreated again and right away."

James Rooney, program manager for Microsoft Citizenship's Technology for Good, discussing HelpBridge

Lesson 3: Make Innovation Sustainable

The best tech idea in the world can't have a lasting impact if it isn't sustainable. *Technology for Good* describes a variety of interesting ways that technology projects have been kept running long-term, including:

- Uganda's mTrac data management system replaces cumbersome paper-based tracking with simple SMS-based reporting on disease outbreaks and drug supplies. After the initial investment in building the mTrac software and training users, the program is incredibly low in cost. Because Ugandan healthcare workers use their own mobile phones to send SMS messages, the entire national system costs just US$182 a month.

- Also in Uganda, the Community Knowledge Worker program helps poor farmers boost agricultural productivity and income. Community Knowledge Workers collect data and best practices through a specially designed survey app. That data is then shared with the community. The program is self-sustaining because agricultural ministries, charities, and other organizations are willing to pay for the collected data.

Lesson 4: Collaboration Is a Must

Most of the technology innovations in *Technology for Good* weren't created, implemented, or sustained by just one organization or individual. Many of these technologies required ongoing collaboration between charities, the public sector, and the private sector. For example:

- In Ghana and Nigeria, the West Africa Health Organizations and pharmaceutical company GlaxoSmithKline both supported mobile applications that allow users to check the authenticity of pharmaceuticals. After making a purchase, a user can text a code found on the packaging to the pharmacy and quickly receive verification of its authenticity.

- During Typhoon Pablo in the Philippines, Télécoms Sans Frontières partnered with Vodafone Foundation to set up a portable communications network. The portable communications network allowed aid workers and residents to make calls and send SMS messages after the communications infrastructure was destroyed. The portable network fits in three suitcases and provides coverage across a full 1-kilometer area.

Learn More

These are just a few examples of what the *Technology for Good report* offers. In the coming months, TechSoup Global will dive deeper into the technologies presented in the report, sharing best practices and lessons learned in detail. The first piece in this series, covering recent innovations in crisis mapping, was published in the Guardian in October 2013.[4]

Acknowledgements

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4   Ariel Gilbert-Knight, 8 Oct 2013, "Social Media, Crisis Mapping and the New Frontier in Disaster Response, <http://www.theguardian.com/global-development-professionals-network/2013/oct/08/social-media-microtasking-disaster-response>.

1. MOBILE TECHNOLOGY

Overview

"The biggest difference that technologies have made in charity work is the ability to make a phone call," says Matt Berg, ICT Director for the Millennium Villages Project. "There is a saying out there that voice is the killer app." [1]

The rapid spread of mobile technology in the developing world has changed the way charities deliver services. Those living in remote areas of the world can now access their banks, receive information on healthcare, pass an exam or take care of their livestock, all with simple, low-end devices. To date, 85.5 percent of the world subscribes to mobile phone services while only about one-third of the world uses the Internet or owns a computer, making the potential of mobile technology in delivering services even greater. [2]

Mobile technology also enhances the administrative tasks of charities. A survey by the UN Foundation and the Vodafone Group Foundation revealed that 86 percent of charity employees consider mobile technology an essential tool: [3]

1. 95 percent of charities use mobile technology to save time

2. 91 percent use it to mobilize or organize individuals

3. 74 percent use it to reach remote audiences previously difficult or impossible to contact

4. 67 percent use it to transmit data more quickly and accurately

5. 59 percent use it to gather data more quickly and accurately

The following are ways in which charities are using mobile technology to change and save lives.

Agriculture

In 2010, the Grameen Foundation launched the Community Knowledge Worker (CKW) project to help poor farmers in Uganda boost agricultural productivity, efficiency, and income. Among smallholder farmers, crop failures or loss of livestock can ruin a family already struggling to make ends meet, so information on how to address problems is crucial.

Grameen armed farmers, selected as CKWs by their local communities, with smartphones and trained them to collect data through a specially designed survey app. The app provides agricultural best practices such as caring for livestock, producing crops, eradicating pests and disease, and obtaining market prices for produce and livestock. The data can also be used to monitor agricultural trends and potentially curb pest or disease outbreaks before they become epidemic.

The information improves the farmers' productivity and in turn, increases their income. The program is also self-sustainable as agricultural ministries, charities, and other organizations pay for the collected data. The database currently holds more than 35,000 current tips on

1 Interview with Matt Berg, ICT Director, Millennium Village Project.
2 World Bank Data, "Internet Users (per 100)"; "Mobile Cellular Subscriptions (per 100)"; Economist, "It's a PC World," 29 December 2009, <http://www.economist.com/node/15062710>
3 GSMA, Africa Mobile Observatory 2011, p. 29-34, <http://www.gsma.com/publicpolicy/wp-content/uploads/2012/04/africamobileobservatory2011-1.pdf>

how to grow nearly three dozen varieties of crops and care for various kinds of livestock. It also has weather information, market prices of goods, and mobile-money agent locations.[4]

Charles Mukonyi is an example of how the CKW project works on the ground. Charles lives in the remote Gamatui parish of Kapchorwa in Eastern Uganda and for some time, had difficulty with his hens which died shortly after hatching a clutch of eggs. In the winter of 2010, his neighbor Tabitha Salimo, a trained CKW, used her mobile phone app to search the database and help him find a solution. Tabitha believed Charles' hens were spreading disease to each other from sharing the same straw when incubating the eggs. Using that solution, Charles changed the straw for every new incubating hen and three months later had not lost a single hen.[5]

Similarly, Saulo Mwanga worked with CKW Alfred Chepsikor on identifying a strange disease afflicting his one goat. Losing this goat would cost Saulo US$50 when he only makes around US$1.75 a day. Through the phone app, Alfred was able to also identify the type of medicine needed to treat the goat. Saulo was able to find an agricultural store across the border in Kenya that sold the medicine. Normally, without the help of a CKW, Saulo would have had to cure his goat through trial and error, costing him more time and money. He lives 47 kilometers uphill from the closest township where he could receive any sort of agricultural advice. He explained, "I might even have sprayed the plant with a drug left over from spraying the cows just to try [a solution]. If you are lucky, it works. Otherwise, you just lose it."[6]

The GSM Association, which represents hundreds of mobile companies, launched a similar agricultural texting program in Kenya through its development fund, in partnership with NGOs.[7]

Education

Amjad Hassan lives in a remote village in Pakistan where both he and his teachers must go to great lengths to get to school. As a result, neither students nor teachers are able to show up consistently to school. How did he pass his exams and gain admittance to university?

Mobile education has become a cheap and powerful alternative to traditional classroom-based education. Amjad uses the Academic Text Service in Pakistan to ask questions about his coursework via a basic mobile phone, not a smartphone. "The great thing about this service is that you are able to ask questions and get answers so I was able to pass my entrance examination for university," Amjad Hassan told the BBC. Mehsim Samir of the Academic Text Service in Pakistan says that it costs less than one U.S. cent to send and receive these texts. They also offer services like career counseling and effective time management.[8]

4 Grameen Foundation, <http://www.grameenfoundation.applab.org/AppLab-Ag.html>
5 Grameen Foundation, <http://www.ckw.applab.org/ckw/uploads/The%20Difference%20a%20CKW%20makes.pdf>
6 Ibid.
7 GSMA, 29-34.
8 Nosheen Abbas, "Cell Phone Education in Pakistan," BBC, 25 October 2012, <http://www.bbc.co.uk/news/world-asia-20009040>

In February 2011, close to 150 students at Asghar Mall College in Rawalapindi, Pakistan volunteered to take vocabulary quizzes via their mobile phones. The program was piloted by the Provincial Education Department of the Government of the Punjab. The quizzes were individually tailored, addressing each student by name — through a simple mail merge — and kept track of students' answers. It was the first time for many students that they received one-to-one, personalized instruction. Due to the program's success, the Punjab government is exploring other ways to engage not only students, but parents and teachers as well. They might send text message to parents, asking them to engage and ask questions about their child's curriculum, or use mobile phone GPS to track teacher attendance.[9]

Mike Trucano, the World Bank's Senior ICT and Education Policy Specialist writes, "While Pakistan may not see high household penetration rates of desktop computers connected to the Internet for many, many years to come, most every household already has access to a small connected 'computer' of a different sort — the mobile phone — and this project is seeking to capitalize on this reality."[10]

In several of the United Nations millennium villages, the One Million Community Health Workers project uses mobile phones to provide on-the-job-training and patient education. Workers use mobile learning plans to learn about reproductive health and caring for newborns while patients can receive similar information.[11] In these scenarios, mobile learning overcomes some of the social barriers to traditional learning such as gender issues — providing women the ability to learn in the privacy and safety of their homes.

The World Bank recently began to take note of mobile education, particularly since it provides a more immediate solution than 1-to-1 computing initiatives to provide every child with one laptop. In 2011, the World Bank launched the Mobiles for Education Development (m4Ed4Dev) Alliance, gathering international professionals in both private and public sectors to highlight case studies, best practices, and lessons learned.[12]

Healthcare

Mobile technology has had a great impact on healthcare in developing countries where access to hospitals is either difficult or impossible. Telemedicine is the practice of providing remote diagnoses via mobile phones, which can be used to immediately capture symptoms and other data without requiring the patient to make a time-consuming trip to the hospital. Smaller clinics can obtain speedy medical support from larger hospitals for hard-to-diagnose illnesses. Mobile technology also provides a quick and private way to disseminate vital health information, particularly during disease outbreaks. Finally, with the rise of counterfeit drugs in the developing world, a mobile phone can act as a scanner to quickly determine the medicine's validity.

The GSMA development fund has been pioneering the use of mobile technology, and improving the way in which healthcare professionals collect data. In Rwanda, GSMA, along with MTN and Voxiva, has implemented a system that allows healthcare field workers to collect data via mobile technology, tracking the number of patients who have contracted a contagious disease and at what stage those who have been treated. This method of data collection is more efficient and also reduces the errors and delays common with traditional paper-based methods.[13]

Cell-Life NPC, a charity based in South Africa, provides various health services including HIV/AIDS outpatient services via mobile phone. Studies have shown that mobile technology plays a crucial role in controlling the spread of HIV/AIDS by delivering appointment reminders and improving communication between healthcare workers and their patients. The same information also improves the ability for doctors to diagnose and offer treatment. Finally, SMS allows the delivery of quality healthcare at a low cost.

Since the Red Cross began using SMS in 2010, they have sent around 100 million messages, reaching more than 3.5 million people. They use the TERA system, which

9 Michael Trucano, "SMS Education in Pakistan," World Bank, 25 April 2011, <http://blogs.worldbank.org/edutech/sms-education-pakistan>
10 Ibid.
11 GSMA, 30.
12 Michael Trucano, "More on SMS Use in Education in Pakistan," World Bank, 6 July 2011, <http://blogs.worldbank.org/edutech/sms-education-pakistan>
13 GSMA, 31.

allows them to send targeted SMS messages, specifying a particular region where it would like the SMS message to be sent. Traditional SMS requires broadcast messages to be sent to everyone in on its network.[14]

TERA also provides a very simple interface: a Google maps type of view allows you to select the areas you want to target and compose a message for that group of people. Messages include information from how to prevent, identify, and treat cholera to hurricane warnings and preparedness. The TERA program has also been used to support government-led vaccination campaigns as well as sharing first aid, HIV/AIDS prevention, and sexual health information.[15]

Since each SMS message is limited to 140 characters, the information provided by one text message is limited. In May 2012, the Red Cross launched the Telefon Kwa Wouj IVR system where callers can dial 733 to access free, detailed information both anonymously and from the privacy of their home. Since including the 733 number, calls to the Telefon Kwa Wouj system have increased eightfold, averaging 4,000 to 5,000 calls per day, and will soon reach its millionth call. The most popular information is on sexual health, accessed nearly 16,000 times per month on average, followed by cholera and disaster preparedness.[16]

The SMS service also allows the Red Cross to conduct simple surveys to determine what information may be missing on their Telefon Kwa Wouj system. With quizzes on topics like violence prevention and HIV/AIDS, the Red Cross can note what users get right and wrong and determine where there are information gaps.[17]

For the Red Cross, the effectiveness of the TERA system was twofold. First, the mobile phone usage in places they operated was very high. In Haiti, for example, cellphone usage is 90 percent. Second, the Red Cross discovered that simply releasing information and allowing people to use it in their own time worked much more effectively than "ramming it down people's throats," explained Mark South, the Communications Delegate for the Red Cross Haiti Operation. "You are just providing information for access if they want when they want. If it works in Haiti then it works all the around world."[18]

Another major health issue in Africa is the use of counterfeit drugs. In Ghana and Nigeria, the West Africa Health Organizations and GlaxoSmithKline have endorsed mobile applications that allow users to check the authenticity of pharmaceuticals. After making a purchase, a user can text a code on the packaging to the pharmacy and quickly receive verification of its authenticity. If the medicine is counterfeit, a warning and helpline number to call for assistance is provided.[19]

Banking

While mobile banking is still catching on in the developed world, it is now the norm in developing countries where regular access to banks is still not feasible. A recent survey by the Gates Foundation, the World Bank, and Gallup World Poll revealed that African countries are the primary users of mobile banking. Among the 20 countries more than 10 percent of adults said they used mobile money at some point in 2011 — fifteen of whom were African. The rate was particularly high in Kenya, Sudan and Gabon, with 50 percent or more of adults using mobile money.[20]

While the two largest mobile providers in Kenya, Safaricom and Vodacom, are not usually associated with social change, the mobile banking initiative M-PESA is changing lives and banking in Africa.

In 2007, Safaricom developed a money transfer service allowing users to transfer money, keep an electronic wallet, withdraw cash, and make payments, all without a bank account. Since many in Kenya simply do not have a bank account or find it impractical to travel to financial institutions to make such transactions, mobile banking provides a necessary service for Kenyans to keep track of their earnings and store them safely.

14 International Federation of Red Cross and Red Cross Societies, "TERA and Beneficiary Communication," < http://www.ifrc.org/en/what-we-do/beneficiary-communications/tera/>
15 Interview with Mark South, Beneficiary Communications Delegate, The Red Cross Haiti Earthquake Operation
16 Ibid.
17 Ibid.
18 Ibid.
19 GSMA, 31.
20 Economist, "Mobile money in Africa: Press 1 for modernity," 28 April 2012, <http://www.economist.com/node/21553510>

Within the first 30 months of use, 8.5 million Kenyans signed up for M-PESA, making a total of US$3.7 billion transfers worth approximately 10 percent of Kenyan GDP. As of April 2010, there were 18,000 Safaricom's M-PESA agents acting as mobile bank tellers, compared to 491 bank branches.[21] There are currently 19 million out of 43 million using Safaricom in Kenya.[22]

The primary appeal of mobile banking is that it is time - and cost-efficient. In Kenya, for example, a SIM card costs just a few cents but allows users to make a range of transactions like paying farmers for their goods or receiving remittances from family members abroad. Mobile banking has thrived even in Somalia where, essentially, there hasn't been a central government for decades. It make sense, however, that in countries lacking basic infrastructure like roads and public transport, mobile banking plays an even more crucial role, allowing people who cannot access a bank branch or ATM to receive and send money.[23]

Safaricom, in conjunction with the Commercial Bank of Africa, has also recently launched a savings and loan service called M-Shwari. The bank has no branch facilities but an M-Shwari account can be set up and accessed via mobile phone. It requires a 7.5 percent setup fee but does not require a minimum balance. It also allows a small overdraft, but those who default on their loans may lose their phone number, which would cut them off from a number of vital resources.[24]

Within its first four months, 2.3 million subscribed to M-Shwari. Nearly 40 percent have active accounts, and one-third have requested small loans, averaging around US$12. M-Shwari has garnered a total of US$47 million in deposits to date.[25]

Disaster Relief

When the Red Cross received warnings about Hurricane Sandy in the winter of 2012, it immediately sent out text messages to all potentially affected areas in Haiti, using its SMS-based TERA program to reach out to disaster victims. The Red Cross continued to send a message every day for the next five days with related information. As the forecast became clearer, it could effectively craft specific messages for the areas that were going to be most affected, giving advice on how to get to higher ground, avoid dangerous storm surges, and after the storm had passed, staying away from fallen power lines.

After the storm, Red Cross teams went on the ground to assess the damage and discovered that for many, even within the more urbanized capital of Port-au-Prince, the only warning some had received about Hurricane Sandy was through their SMS. "It's clear it's a very good way to get information out to people who are not physically accessible," explained Mark South.[26]

Mobile phone applications also played an important role in the U.S. during Hurricane Sandy. Microsoft developed a free mobile application called HelpBridge for Windows iOS and Android that enabled users to stay in touch with each other and donate aid money to disaster victims in Haiti and to those affected by Hurricane Sandy in the U.S.

HelpBridge was built to help with disaster preparedness as well as relief efforts, a two-in-one feature that is not found in other disaster-related apps. "After Haiti and Japan, we saw a lot of technology pop up right after the event that helped people connect with each other and find ways to donate," said James Rooney, program manager for Microsoft Citizenship's Technology for Good. "But after the disaster, nobody maintained the technologies long term, so that when the next disaster happened, it would have to be recreated again and right away. Working with some partners, we created a solution that wasn't tied to a specific disaster so that the next time disaster struck, it would already be out there."[27]

21 GSMA, 31.
22 The Economist, "Is it a phone, is it a bank?" 30 March 2013, <http://www.economist.com/news/finance-and-economics/21574520-safaricom-widens-its-banking- services-payments-savings-and-loans-it>
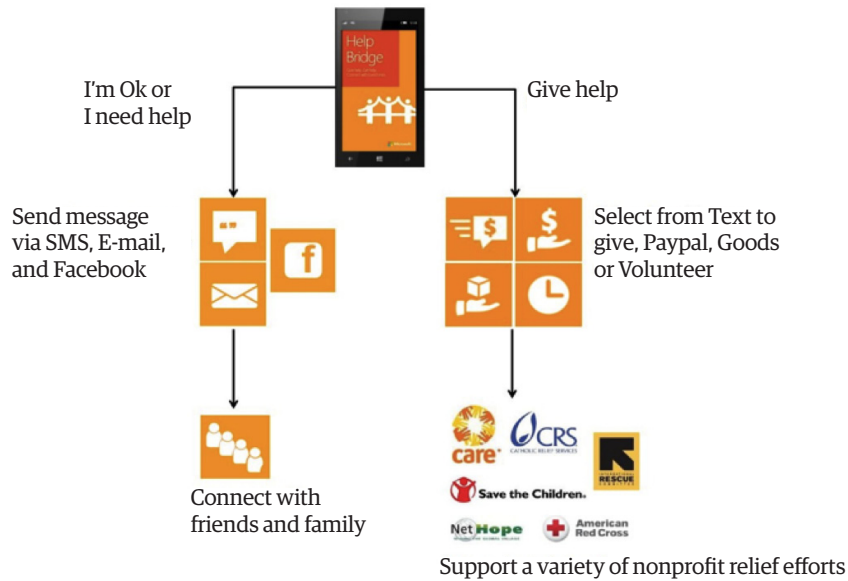23 Ibid
24 Ibid
25 Ibid
26 Interview with Mark South
27 Interview with James Rooney, program manager for Microsoft Citizenship's Technology for Good

Since their launch on January 16, 2013, Microsoft has seen a steady amount of HelpBridge downloads and a spike in usage when the snowstorms recently hit the Northeast. Microsoft is now working to extend the application — at least the communications part — internationally.

I'm Ok or I need help

Give help

Send message via SMS, E-mail, and Facebook

Select from Text to give, Paypal, Goods or Volunteer

Connect with friends and family

Support a variety of nonprofit relief efforts

Source: HelpBridge, http://www.microsoft.com/about/corporatecitizenship/en-us/nonprofits/Helpbridge.aspx

Campaigns and Fundraising

Blackbaud, a company that provides fundraising products for not-for-profits, recently conducted research on fundraising among NGOs and came to the conclusion that mobile fundraising is one of the most efficient and cost-effective tools.[28]

Since approximately 98 percent of text messages are actually opened, charities can reach audiences they otherwise cannot with more traditional media campaigns. One fairly effective campaign run by Amnesty International in the U.K. read: "A man presses send at Paddington and a stoning is stopped in Iran." The advert provided information on how to text to make an SMS donation. These text-based campaigns are effective because they are simple for both the charity and the potential donors.[29]

The success of text-based fundraising was effectively used for the East African drought, which hit in July 2011 and was one of its most severe droughts in six decades. Through SMS, Kenyans donated nearly US$200,000 in aid to drought victims.[30]

Behind successful fundraising campaigns, however, is financial transparency. Reliable data and the technology to deliver it is core to resolving issues of showing how charities operate on the ground. Some of these technological tools are discussed further in the report. Tracking technology can be used to document the progress of a project, allowing donors to see how their money has been used in real time. Data visualization allows donors to easily process and evaluate outcomes. Both are essential in keeping track of data and ensuring a project stays on target.

Energy

When you marry mobile phone technology with solar technology, you get mobile energy that can power homes for as cheaply as US$1 a week. IndieGo is "pay-as-you-go solar" — a bright-yellow box the size of an Internet router that users top up via a scratch card whenever they need more energy.

28 Robert McAllen, "Why charities need to make better use of messaging," 27 February 2013, 160characters.org, <http://160characters.org/comment/guest-article-why-charities-need-to-make-better-use-of-messaging/>
29 GSMA, 31.
30 Ibid.

Samuel Kimani was the first person in the world to use IndieGo, which was designed by a solar energy company Eight19. He lives at the edge of Nairobi, Kenya where electric networks are scarce and expensive. He supports his wife and three children with only US$1.80 a day by selling the milk from his cow. Before IndieGo, Samuel was using a kerosene lamp that cost him US$3 a week, emitted harmful fumes, and did not even provide sufficient light. Now, by investing US$10 for the IndieGo box, Samuel has two bright lights burning eight hours a night, allowing his children to do their homework in the living room and his wife to use the kitchen. Unlike the one-purpose use of a kerosene lamp, Samuel and his family can also use the solar energy to charge their mobile phones, saving them the time of using public kiosks and money — about US$1.50 a week.[31]

There are now numerous mobile applications available for development professionals to better serve their beneficiaries. As mobile applications are increasingly locally designed and locally driven, mobile technology will become one of the primary ways of delivering social services to the developing world.
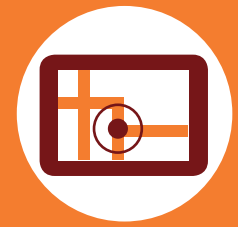

An Eight19 IndiGo unit. (Photo: Eight19 Ltd)

Photos courtesy of Azuri Technologies
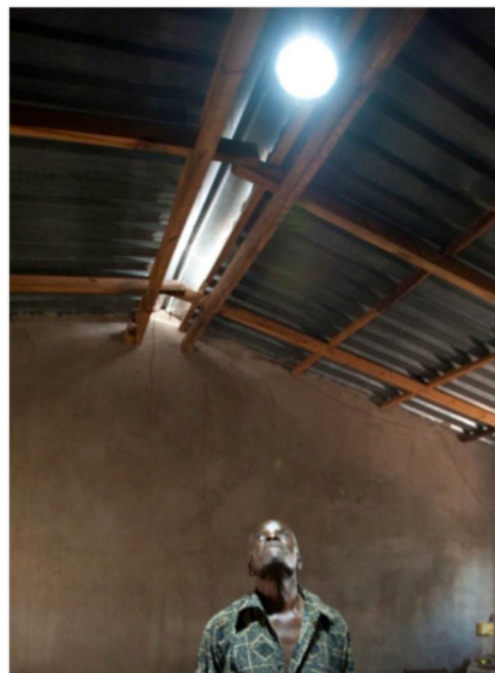
31 Ken Banks, "Pay as You Go Sunshine: How Mobile Phones are Powering the Developing World," National Geographic, 17 April 2012, <http://newswatch.nationalgeographic.com/2012/04/17/pay-as-you-go-sunshine-how-solar-energy-and-mobile-phones-are-powering-the-developing-world/>

2. TRACKING TECHNOLOGY

Overview

When disaster hits, aid agencies need reliable means of determining where at-risk populations are located and how best to deliver services. Many development professionals also require security or surveillance in harsh and dangerous environments, which GPS and tracking, through remote operations, can provide. Finally, GPS and other tracking devices can even be used to monitor the progress of service delivery and aid money. This provides charities with an easy way to be financially accountable to their donors, which in turn increases the likelihood of future support.

Disaster Response and Aid Delivery

Mercy Corps has also extended the use of GPS to relief efforts. In November 2012 when violence erupted in Goma, a city in the Democratic Republic of Congo (DRC), Mercy Corps used the GPS to track population movements, provide humanitarian aid and prevent a cholera outbreak. The GPS was also used to coordinate response with partner agencies during the conflict and avoid overlap.[32]

Mercy Corps has also been piloting a program, using iPods with GPS units to collect monitoring and evaluation data for their Water, Sanitation and Hygiene (WASH) program. While the program is in its initial stages, Mercy Corps has so far managed to send out surveyors with the iPods to collect monitoring information. The pictures and GPS points are uploaded into a database that allows them to monitor, for example, the quality of latrines on the same day as data collection without having to send an entire team into the field. Through this system, it is much easier to identify the concentration of latrines to see where WASH programs are needed as well as to draw conclusions on the quality of the program itself.[33]

Since GPS units are relatively inexpensive at only a few hundred dollars per unit, GPS is a cost-effective tool. The only issue with GPS is that it does require a certain level of technical expertise and access to a computer that can deal with GPS mapping. While the iPod has more up-front costs, such as buying the tools, necessary licenses and training for program staff to design and implement data collection, it significantly reduces back-end costs like data entry and analysis.

Without the use of GPS, Mercy Corps would have needed to spend much more time plotting out locations during a very high-pressure period. It is possible they would have not been able to reach as many internally displaced people. Without the iPod and GPS combination, Mercy Corps could not gather data in real time, improve the speed in delivering services, and adapt to the realities in the field.

Similarly, the American Red Cross is now equipping its vehicles with GPS tracking devices so that it can better manage emergency services, such as communication and resource distribution. Managers can use GPS tracking on American Red Cross vehicles to ensure better response time for emergencies, and the safety of personnel on the road.

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32 Mercy Corps, "Rushing aid to thousands displaced by recent fighting," 30 November 2012, <http://www.mercycorps.org.uk/press-room/releases/rushing-aid-thousands-displaced-recent-fighting>
33 Interview with Mercy Corps staff.

GPS tracking allows Red Cross dispatchers to see the location of each vehicle in real time, allowing them to alert a driver closest to the scene and greatly reducing the time, effort, and resources it normally takes to administer aid. Car theft is another common problem among Red Cross responders. The GPS devices permit users to set a perimeter for their operations; vehicles traveling outside that perimeter will set off an alarm. If a vehicle is lost to theft, it can also be easily recovered with a GPS device.[34]

At the beginning of the Haiti operation, the Red Cross used GPS technology to monitor operations in 125 camps they were supporting with water supplies, among other necessities. Catholic Relief Services and the International Red Cross also used GPS as a follow-up tool to support the Haitian government in waste management and collection in camps.[35]

Financial Accountability

In Afghanistan, USAID partnered with the charity Mercy Corps to ensure that its aid projects were being effectively delivered so that it could pay local wages. But in certain areas that are off-limits to civilian expats, mostly because conflict still rages or access is limited, ensuring accountability is very difficult.

John Stephens, who manages programs in Afghanistan for Mercy Corps, devised a creative solution with a GPS-enabled video camera.

When an area is off-limits to expats, Mercy Corps sends in local Afghan staff with GPS cameras to check that USAID supported projects are actually being implemented. The information from the cameras is then incorporated into an electronic map that can track the progress of USAID funded projects. Even for areas that are not off-limits, GPS cameras enable program managers to better do their jobs and provide simple, accurate documentation that the work is getting done.[36]

Remote operations

In many places where the U.N. operates, like Somalia, high-intensity violence limits the ability of U.N. and international charity workers to move around the country safely with tools like Skype and GPS. Under the U.N. mandate, foreign workers must use an armed military convoy every time they leave specifically designated areas, known as International Zones. The military convoy prevents many humanitarian workers from effectively doing their work. To counteract this problem, the U.N. employs locals to act as intermediaries, entering zones that are off-limits to expats. These intermediaries receive training on how to execute a mission and how to collect valuable data.[37]

34 Greg Bartlett, "American Red Cross Uses GPS Tracking," Rocky Mountain Tracking, 28 November 2009, <http://www.rmtracking.com/blog/2009/11/28/american-red-cross-uses-gps-tracking/>
35 Interview with Achala Navaratne, Red Cross Haiti Earthquake Operation.
36 Nathan Hodge, "Using GPS to Track Afghanistan Cash," Wired, 25 February 2010, <http://www.wired.com/dangerroom/2010/02/using-laptops-cameras-and-gps-to-track-afghanistan-cash/>
37 Bridget Guarasci, "PS Humanitarianism," Slate, 28 September 2011, <http://www.slate.com/articles/technology/future_tense/2011/09/gps_humanitarianism.single.html>

3. MAPPING TECHNOLOGY

Overview

A geographic information system (GIS) organizes geographic data, allowing humanitarian and development workers to feed data sets and other information into a digital map to create layers of data that can then be manipulated and viewed in multiple ways. If, for example, healthcare workers in Gulu, Uganda, needed a way to identify where at-risk mothers lived, they could use GIS to input roads, storm drains, gas lines, electricity networks, and hospitals. Then, they could feed public data from the World Bank or their government on education levels, maternity health, and mobile phone usage for Gulu. Finally, they could look at how maternity health corresponds with hospital density or mobile phone usage. In areas with low hospital density, low mobile phone usage, and high maternal mortality rates, healthcare workers could establish small clinics and train mothers how to use mobile phones to track their health.

While crisis mapping uses GIS, it is also uses other tools and human-based crowdsourcing to create real-time maps of disaster, conflict or development zones. It often involves a hefty team of volunteers around the world who can manually cull and process data, photos, and satellite images from social media platforms like Twitter and Facebook. While crisis mapping may occur over one to two weeks during a disaster period, over the long term, it creates an image of a crisis — how it begins and builds — and aids in finding a resolution.[38]

Disaster Relief

Patrick Meier is one of the key innovators in the field of crisis mapping and was recently named a National Geographic emerging explorer. He was the director of crisis mapping at Ushahidi, an African startup that provides a free crisis-mapping platform. Meier says that the Haiti earthquake was the milestone event that first demonstrated the power and capabilities of crisis mapping. "That's when we went from talking about crisis mapping to doing live, operational crisis mapping in the middle of the major disaster," he explained.[39]

Before 2010, crisis mapping was a tedious, static process that played out on paper posters. While it worked to an extent, the new crisis mapping allows for humanitarian workers to gain a situational awareness in real time.

When Meier heard the news of the earthquake, he recalls sitting in his dorm room at Tufts University where he was working on a Ph.D. "To be perfectly honest," he recalls, "I had an emotional reaction. I had friends in Port-au-Prince. I could not wait another minute to find out whether they were dead or alive."

Meier noticed that there were numerous Haitians tweeting live about the earthquake, such as where they were, naming landmarks like a specific church in Port-au-Prince. With a quick Google search, Meier would be able to find the location of the church and then plot it out on a map using Ushahidi. It was a tedious and gigantic task, however, and Meier discovered he just couldn't keep up with the output of data.

By the end of the week, Meier had recruited and trained 100 volunteers to monitor social media and gather mappable information. From there, it just expanded. In conjunction

38 Sarah Farmer, "Crowdsourcing and Crisis Mapping," Change Assembly, 16 November 2012, <http://www.changeassembly.com/crisismapping/>
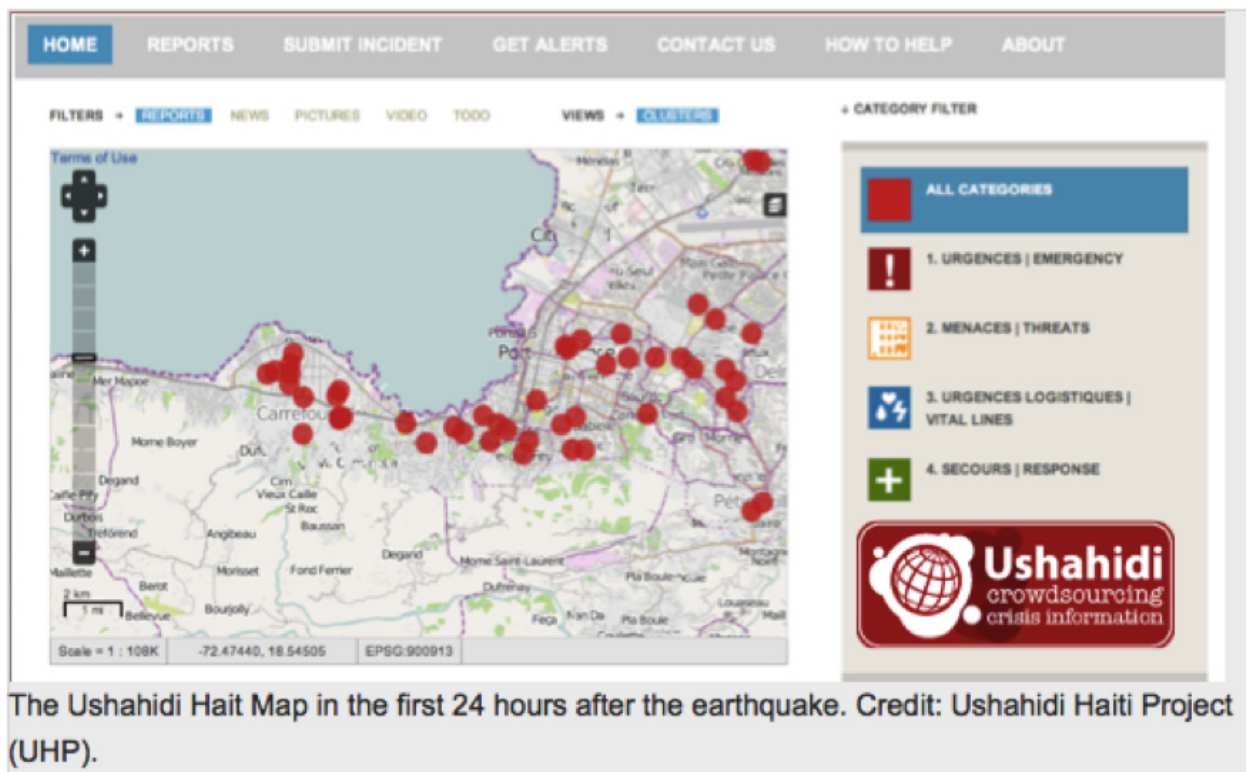39 Interview with Patrick Meier.

with Digicel, Haiti's largest telecommunications company, Thomson-Reuters Foundation, InSTEDD, and the U.S. State Department, Meier set up an international SMS number that allowed anyone to send in a text with their location and needs.

Mapping became increasingly difficult as the team discovered that Google had not finished mapping Port-au-Prince and that half the city simply lay blank. Meier came up with another brilliant solution. He crowdsourced the mapping project to OpenStreetMap, and within weeks, over 1.4 million edits were made, creating the most comprehensive map of Port-au-Prince at the time.[40]

Despite the success of the Haiti project, there were also lessons to be learned. With thousands of tweets coming in a day, it was difficult to get the human capital needed in such a short amount of time.

To counteract this problem, Meier created the Standby Task Force consisting of thousands of volunteers from 80 different countries that gathered real-time data and incorporated them into a crisis map. "I no longer wanted to do [crisis mapping] reactively but proactively," Meier said. The task force has since been activated 30 times by humanitarian organizations like the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), United Nations Development Programme (UNDP), Amnesty International and even Al Jazeera.

Photos courtesy of iRevolution

The Ushahidi Hait Map in the first 24 hours after the earthquake. Credit: Ushahidi Haiti Project (UHP).

Source: http://newswatch.nationalgeographic.com/2012/07/02/crisis-mapping-haiti/
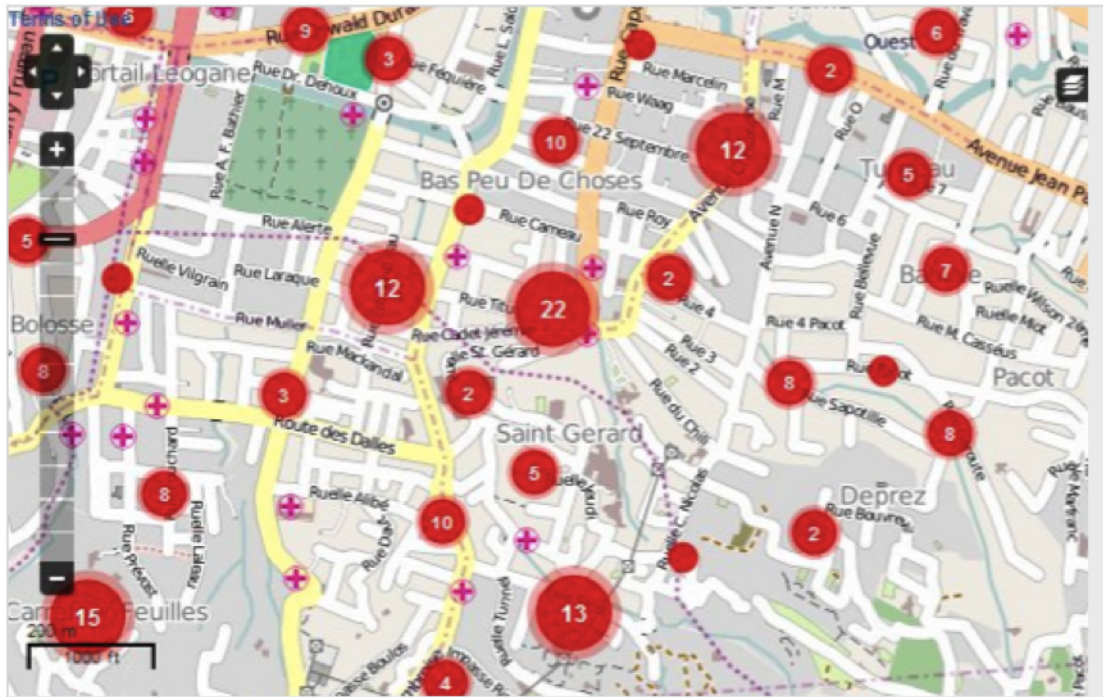
Close up of the Haiti Map. Each number represents the individual number of reports within the area. Users could zoom in further to see the individual reports. Credit: Ushahidi Haiti Project (UHP).

Source: http://newswatch.nationalgeographic.com/2012/07/02/crisis-mapping-haiti/

Source: http://newswatch.nationalgeographic.com/2012/07/02/crisis-mapping-haiti/

Meier pointed to Libya as another key moment for crisis mapping. "Haiti showed the potential [of crisis mapping]. Libya actualized that potential," he said.

When Meier and his team launched the crisis map in Haiti, they did so without connecting right away with humanitarian organizations. This was a significant disconnect they did not want to repeat for future missions. After Haiti, the U.N. approached Meier and asked him to collaborate. The opportunity to test their new partnership and put crisis mapping to work came only a few months later when revolt and violence broke out in Libya.

The Libya Crisis Map became the first project where OCHA used social media to build a picture of the crisis as it played out in real time. The mapping provided OCHA with information related to aid relief, such as food, health, sanitation, refugee camps, displacement, and security. The map was also used by the World Food Programme (WFP), the U.N. High Commissioner for Refugees (UNHCR), and USAID, among others.[41]

Even with the Standby Task Force, Meier acknowledged that the project was still tedious, manual and therefore not scalable. "The rise of big data is something already having huge implications and consequences," said Meier. "But throwing more and more volunteers at this data problem is not the solution. There is burnout that has happened before." He noted a few statistics to put it in perspective: there were 20 million tweets in one week during Hurricane Sandy and 2,000 tweets per second during the Japan earthquake.

In what Meier calls "next generation humanitarian technologies," artificial intelligence (AI) and algorithm-based technologies can be used to find mappable tweets and other open source data, reducing the burden of human computing. He says it's not as sci-fi as it sounds: "The technology has been around for a decade but is very new to the humanitarian community."

Meier is now the Director of Social Innovation at Qatar Computing Research Institute (QCRI) where they are developing an AI disaster response platform, which combined with human computing, would be what Meier calls "the holy grail." He writes, "On the advanced computing side, it should be perfectly feasible to develop an automated way to crawl Twitter and identify links to images and videos."[42]

41 United Nations Office of Humanitarian Affairs, "Libya: Online Volunteers Help UN Response to Humanitarian Crisis," <http://www.unocha.org/ocha2012-13/stories/libya>
42 Patrick Meier, "How the UN Used Social Media to Respond to Typhoon Pablo," iRevolution, 8 December 2012, <http://irevolution.net/2012/12/08/digital-response-typhoon-pablo/>

Meier pointed to disaster response in the Philippines as an example of why this "holy grail" is so sorely needed. About 24 hours after Typhoon Pablo made landfall in December 2012, a task force was activated by OCHA to conduct a rapid damage assessment. They wanted the first 20,000 tweets manually processed by volunteers within 12 hours. It succeeded in being the first official crisis map adopted by OCHA using data gathered from social media. It was a sign, at least, that an important paradigm had shifted at the U.N. "It was the first time there was political will at the highest levels for leveraging advanced computing and technology," said Meier.

Photo courtesy of iRevolution:
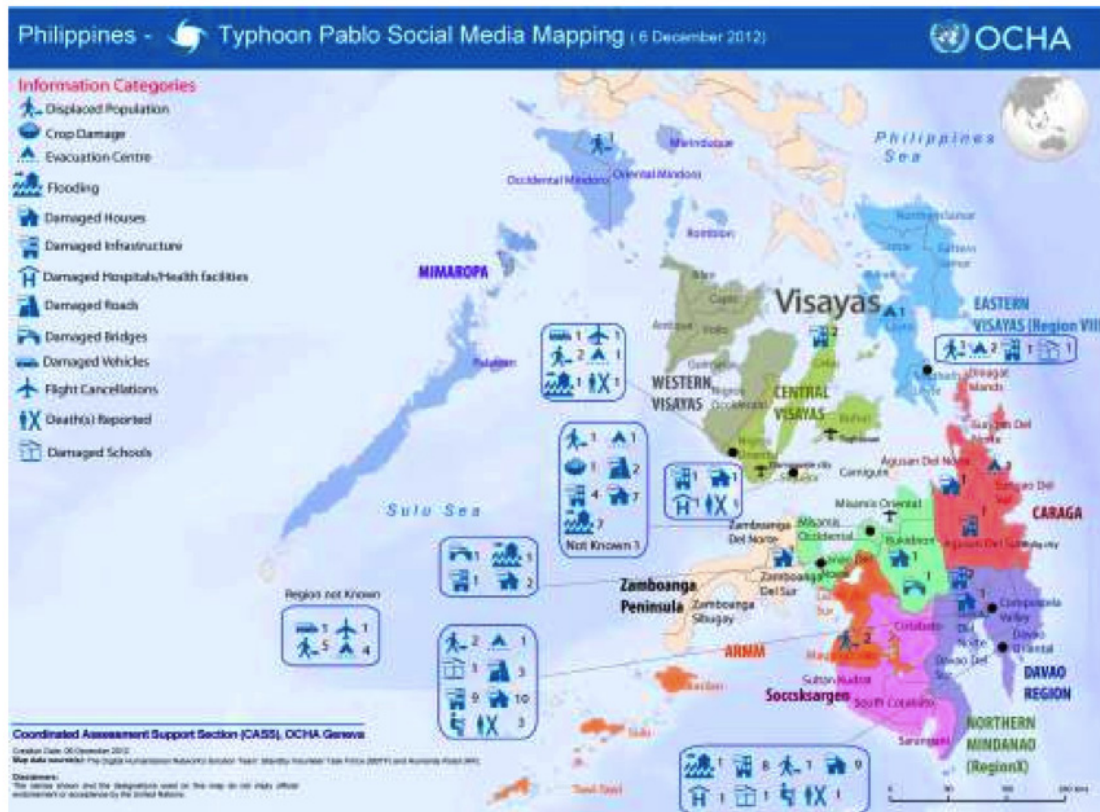
Source: http://irevolution.net/2013/02/26/crowdflower-for-disaster-response/

Urban Planning and Reconstruction

After nearly three decades of civil war that ended in 2002, the Angolan government turned to reconstructing its war-torn infrastructure — 70 percent of which had been destroyed. The government partnered with USAID in 2005 and with the Angola Electricity Support Program (AED). The project received financial support from Banco de Fomento Angola (BFA), who pumped US$400,000 over three years into Kilamba Kiaxi and Viana, two municipalities in the capital of Luanda. In order to plan and manage municipal infrastructure, AESP needed up-to-date maps. At the time, its latest cadastral maps were from 1989.[43]

AED selected ArcView software in order to obtain accurate information on residences and businesses in Kilamba Kiaxi and Viana. Information was collected through surveys and site visits and then added to geographic data and maps to create up-to-date geographic information systems for the two municipalities. The new maps showed the current land plots, existing electrical networks, and stored vital information like street addresses and meter numbers. This information was then shared with Empresa Distribuidor de Electriciade (EDEESTE), Angola's national electricity provider, who used it to extend the network, generate more accurate electricity bills, and provide better customer service.

43 USAID, "Working Together to Expand Energy Access," <http://transition.usaid.gov/our_work/economic_growth_and_trade/energy/
publications/stories/angola_access.pdf>

Through detailed, layered data sets, EDEESTE was also able to determine who was connected legally or illegally and which households had been left out. AED also trained local staff how to use ArcGIS software to ensure the upkeep of GIS was sustainable.[44]

A 2011 study revealed that Angola had made significant strides in rebuilding the electricity grid for its citizens, particularly in Luanda. About 85 percent of the capital's municipalities are now connected. Rural electrification, however, is much lower, indicating that efforts for power connectivity have not been widespread. Without the GIS mapping, such data would not have been possible. Also, the study notes that delays in connectivity fell dramatically from 2007 to 2010. Within three years, firms working in Luanda reported that delays in connectivity dropped from six months to only seven days.[45]

Environment

Long-established institutions like the Conservation Trust of Puerto Rico, have recently turned to GIS to more efficiently manage their projects. Created as a charity in 1970 through a joint effort by the government of Puerto Rico and the U.S. Department of the Interior, the trust aims to protect and acquire ecologically important lands, and promote awareness of protected areas through educational and research activities. The trust currently owns about 19,000 acres of protected land, home to many endangered plants and wildlife.

In July 2003, the trust established a GIS unit to update its conservation mapping system. It was able to map out over 40 land parcels making up its 19 protected areas including details like trails, cave entrances, and locations of certain species. Furthermore, the trust was able to use GIS to evaluate land parcels offered to the trust by private landowners, looking at factors like biodiversity, vegetation, and important habitats.[46]

44 ESRI, "Restoring Angola's Electricity Network," ARCNews Online, Winter 2009/2010, <http://www.esri.com/news/arcnews/winter0910articles/restoring-angolas.html>

45 Nataliya Pushak and Vivien Foster, "Angola's Infrastructure: A Continental Perspective," World Bank Africa Infrastructure Country Diagnostic, March 2011, <http://siteresources.worldbank.org/ANGOLAEXTN/Resources/AICD-Angola_Country_Report.pdf>

46 ESRI, GSI Best Practices for Non-Governmental Organizations, April 2010, <http://www.esri.com/library/bestpractices/non-governmental-organizations.pdf>, 22.

SOCIAL MEDIA
4. AND CROWDSOURCING

Overview

The rise of social media has allowed for greater connectivity and enabled greater sharing of information, opinion, and ideas that serve as important data sets. Using the power of social media and mobile apps, citizens can chart disasters, fundraise, and even fight corruption. Charities can tap the wealth of this free information to roll out better humanitarian aid, stem epidemics, and fundraise. Social media and crowdsourcing also offer a way to collect difficult-to-obtain data and in some instances can be more accurate than other means of data gathering.

Data Collection

Mapping technologies (section 3) and translation tools (section 9) are powerful examples of ways data can be collected via crowdsourcing methods. Crowdsourcing can also be used to gather data for research or surveys.

The NOAA mobile phone app allows citizens to report weather conditions to the Internet. The data can be used by meteorologists like Kim Elmore, an adjunct professor at the University of Oklahoma. She explains, "The [NOAA] app could help severe weather warnings reach certain areas at a faster pace — which is all the more necessary given the lessons learned from Hurricane Sandy last fall and this week's blizzard in the American Plains."[47]

A study conducted by the creators of All Our Ideas, a crowdsourcing platform, revealed the power of crowdsourcing data collection over traditional methods. Surveys and interviews are two of the key methods used to measure attitudes and opinions, but they are criticized for being inaccurate or inefficient. Surveys that offer respondents a set of predetermined questions and a limited range of answers are often too top-down and rigid, not allowing answers to emerge organically. Interviews, on the other hand, are more flexible yet difficult to quantify and expensive to implement. The study revealed that using advanced computing, researchers could use a hybrid form of the survey interview they call a "wiki survey" which uses aggregation technology based on Wikipedia. It offers a more accurate and efficient method of gathering opinions and attitudes and has been used by various charities and governmental bodies, like the Organisation for Economic Co-operation and Development (OECD) and the New York City Mayor's Office.[48]

Catholic Relief Services (CRS), a charity that provides services in 100 countries to those in need, used the site All Our Ideas as a platform to source ideas from their workers and better improve the quality of service. The site is considered "a suggestion box for the digital age." It currently holds 3,081 wiki surveys, 154,042 ideas, and 4.0 million votes.

Since CRS has over 4,000 employees and 150 different offices, a uniform, comprehensive, as well as participatory and bottom-up, feedback assessment would have been very challenging. Using All Our Ideas, CRS wanted their employees to answer the question, "Which phrase better describes an exemplary CRS staff member?" The survey was launched in three different languages: English, French, and Spanish. It received 20,000

47 Guardian US News Blogs, "Citizen Scientists use NOAA Ping app to improve severe-weather warnings," 27 February 2013, <http://www.guardian.co.uk/world/us-news-blog/2013/feb/27/noaa-citizen-scientists-ping-weather-app>
48 Matthew J. Salganik and Karen E.C. Levy, "Wiki Surveys: Open and Quantifiable Social Data Collection," <http://arxiv.org/pdf/1202.0500v1.pdf>

votes and 100 new ideas from a wide range of locations. CRS then used focus groups to process the data, coming up with four key qualities that CRS looks for in an employee.[49]

Networks

While Facebook has connected a billion people from around the world, it has left out significant portions of those who cannot benefit from social networks since they do not have access to the Internet, a smartphone, or a computer. Digital Green's Farmerbook project, however, created its own social media platform for farming villages in India, allowing users to share vital agricultural information.

Launched in 2006 as part of a Microsoft research project, Digital Green is now an independent charity. With additional funding from the Ford Foundation, it created Farmerbook, a social networking platform for farmers. Local facilitators show videos of farming techniques to each of their villages and lead discussions among small groups of 12 to 15 farmers. These facilitators gather a significant amount of data and feedback from the farmers about the videos they were watching and the techniques they were adopting.[50]

The facilitators then print the pages, and share them with villagers in small groups of six to eight in a village of 100. "That may seem small," says Rikin Gandhi, Chief Executive of Digital Green, "but in reality they often operate at caste or familial levels and might not have a relationship with others. Using Farmerbook, and printing off the village pages, facilitators can connect these individuals and groups so they can reflect on why some farmers do one thing or another."[51]

While only facilitators have online access to Farmerbook, the hope is, with the spread of mobile technology, every farmer will be able to access the network in the future. For now, this hybrid online-offline network still works quite effectively. Prior research revealed that compared to other methods, farmers who shared agricultural practices through video were at least five times more likely to adopt new practices.[52]

Photos courtesy of Digital Green:

A Local films two farmers sharing agricultural techniques for Farmerbook (Source: http://www.youtube.com/watch?v=5FHurcUTITU)
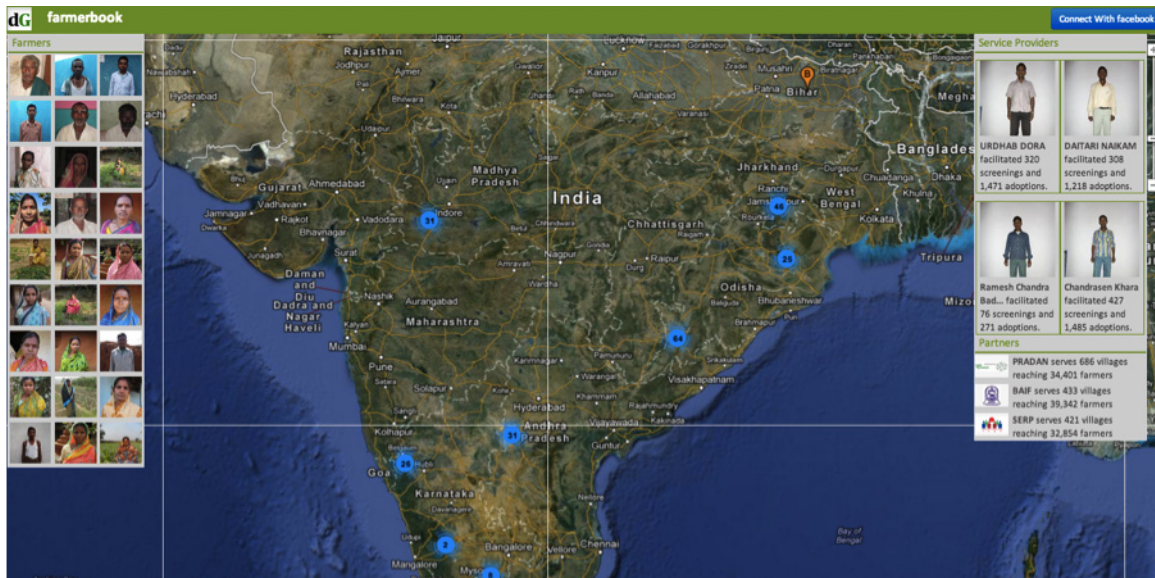
49 Catholic Relief Services, All Our Ideas Blog, 6 July 2011, <http://blog.allourideas.org/post/7300721979/catholic-relief-services-and-allourideas>
50 Caspar van Vark, "New Versus Old Media: how best to get information to smallholder farmers," Guardian, 7 February 2012, <http://www.guardian.co.uk/global-development-professionals-network/2013/feb/07/smallholder-farmers-radio-mobile-social-networking>
51 Ibid.
52 Ibid.

Screenshot of the Farmersbook site.

Human Rights and Corruption

I Paid a Bribe is a crowdsourcing platform developed by Janaagraha, a charity based in Bangalore, India, that works with both the government and citizens to improve urban infrastructure and boost civic engagement. The bribe crowdsourcing platform works as a completely anonymous site where people can report incidences of bribery across various government departments and sectors.

Even when a bribe is reported, it must remain completely anonymous. Janaagraha's goal is not to seek arrest or prosecution but to find systematic corruption and work with the government to fix the problem. The charity also hopes that by allowing bribers themselves to freely report without fear of prosecution, Janaagraha will be able to note bribery trends and find large-scale solutions for these problems.

With the data, Janaagraha creates an analytics report that shows which cities in India are plagued with the most bribes, the branch of government they belong to, and whether or not the bribe was paid, unpaid, or not asked. Bangalore leads a list of 305 cities with 5,261 bribes to date. On average, the site gets around 25 to 50 reports a day in their bribe section, whether or not it was paid.[53]

The site is not all bad news, however. It offers citizens a chance to report good deeds by reporting under, "I met an honest officer." It has also received some attention from the government as a potential way to reduce corruption, and members of the site were invited by the Central Vigilance Commission to present a report at a national level.

"I Paid a Bribe" sites are also available in Kenya, Greece, Zimbabwe, and Pakistan and will launch in countries like Azerbaijan and Tunisia as well.
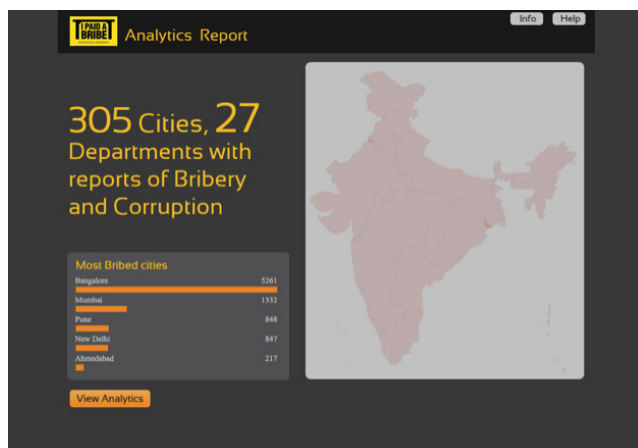
Photos courtesy of I Paid a Bribe

53 I Paid a Bribe, <http://www.ipaidabribe.com/bribepatterns/>
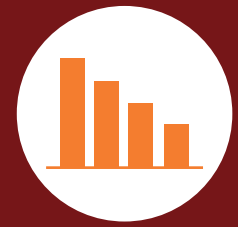
5. DATA MANAGEMENT TECHNOLOGIES

Overview

With the rise of social media and open-source platforms, and the instantaneous speed of mobile phone technology, data has never been more readily available. Yet along with this rise of what experts call "big data," there are difficulties in its collection and management. Charities are in constant need of organizing, processing, explaining, and updating their data, whether it be for advocacy, policy analysis, measuring impact, or appealing to donors.

Management

In Uganda, bad accounting literally cost lives, making available medicine inaccessible to local clinics simply because of muddled supply lines.

A new initiative known as mTrac, a collaboration between UNICEF and the World Health Organization, is revolutionizing the way Uganda's healthcare system manages its data, shifting its laborious, paper-based system to an electronic one.

Health workers use simple, low-end mobile phones to text information that they would have normally recorded on paper. They may send information on drug supplies and disease outbreak. The data is then coded and transferred to an online platform that can be viewed by healthcare workers and public health officials, among others. [54]

One strength of the mTrac program is that it doesn't require additional work for Uganda's overburdened healthcare providers. Instead of filling out a form, workers send in an SMS, making it a subtle not drastic shift in their duties. Another strength is that mTrac is sustainable. While the U.K.'s Department for International Development provides the initial investment, such as building the mTrac software, training local workers, and setting up an Internet connection, the maintenance cost for the Ugandan government is low. Since the workers use their own phones, the monthly cost of mTrac may be as little as US$14 per month for each of Uganda's 113 districts. That's only US$182 a month to address the entire country.[55]

The Earth Institute's Modi Research Group is also working on addressing the need for timely and accurate data, citing it as the "single greatest component of making socially impactful decisions."[56] It created a free data management application known as FormHub that also collects texted data online.

Matt Berg explains, "The big question is: Can we replicate a paper registry on a phone?"

A charity utilizing FormHub first creates a survey by using Excel. After the Excel file is uploaded to FormHub, it is transformed by the site into an easy-to-use survey. Field workers then collect data either on a laptop or through a web-based application on their phone. Finally, FormHub offers ways to visualize and analyze the data through maps and photos, as well as upload the data to software analysis tools.

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54 Belinda Luscombe, "Tracking Disease, One Text at a Time," Time, 15 August 2012, <http://healthland.time.com/2012/08/15/disease-cant-hide/>
55 Ibid.
56 Formhub, < http://formhub.org/faq/>

Analysis and Visualization

As outlined in section 3, mapping software is one of the most powerful ways to visualize data. Another popular tool is infographics, a visually appealing method for displaying data, usually for marketing purposes.

Various charities use infographics to visualize their data and make more effective campaigns.

Source: http://50.usaid.gov/learning-out-of-poverty/

Good/Corps is a media and community platform that works with charities on better marketing their campaigns. Data visualization is one of their areas of expertise.

Tools like Infogr.am allow any user to quickly make online charts and data visualizations, making it accessible to everyone, not just designers. This Latvian-based startup is only a year old, yet it has created close to 600,000 infographics to date.

6. RADIO/TV

Overview

While radio is nearly a century-old technology, it has resisted the test of time and is still one of the most universal mass communication mediums. It plays a particularly important role in disseminating information across rural, developing communities. While Internet penetration in Africa is only 15.6 percent across the continent, compared to 37.7 percent worldwide, radio penetration ranges from 70 percent to 90 percent.[57] The national radio is still often the first choice for getting news.[58] Now, coupled with newer technologies like mobile phones, it is being adapted to improve agricultural techniques and fight corruption.

Which of these media do you personally regard as the MOST IMPORTANT in keeping you well-informed about events in...?

Regional median for 23 countries in sub-Saharan Africa
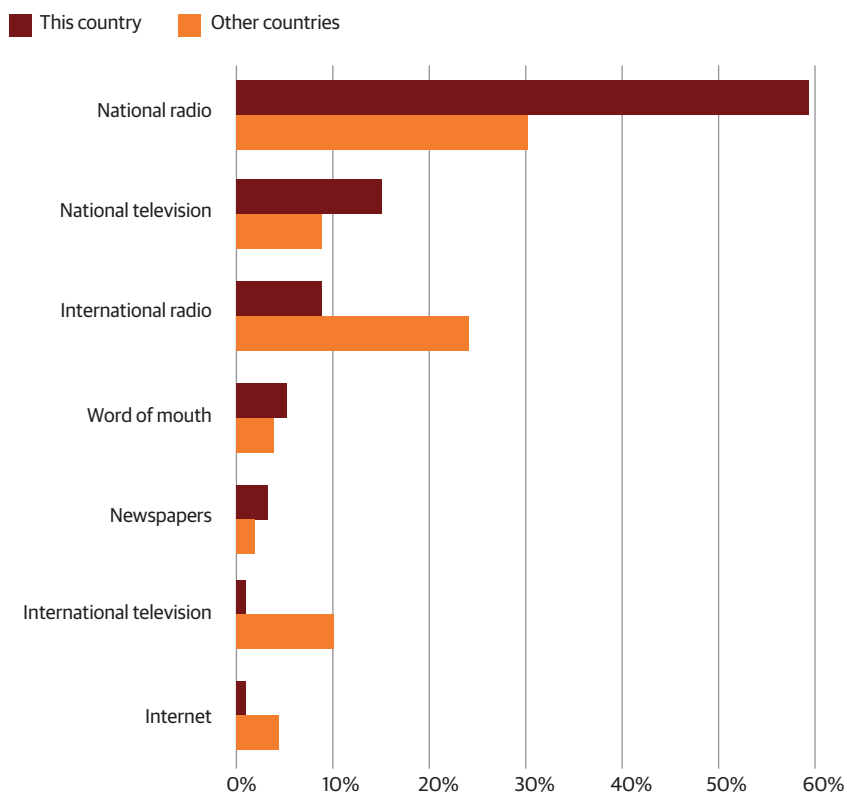
Source: http://www.gallup.com/poll/108235/radio-chief-medium-news-subsaharan-africa.aspx. Reprinted with permission of Gallup, Inc.

57 Internet World Statistics, <http://www.internetworldstats.com/stats1.htm>; Future Radio Africa, <http://futureradioafrica.org/about-fra>
58 Cynthia English, "Radio Chief Medium for News in Sub-Saharan Africa," Washington Post, 23 June 2008, <http://www.gallup.com/poll/108235/radio-chief-medium-news-subsaharan-africa.aspx>

| 1980-1982 | 1983-1987 | 1988-1992 | 1993-1997 | 1998-2002 | 2003-2007 | **2008-2012** |

The maps displayed on the World Bank web site are for reference only and do not imply any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.
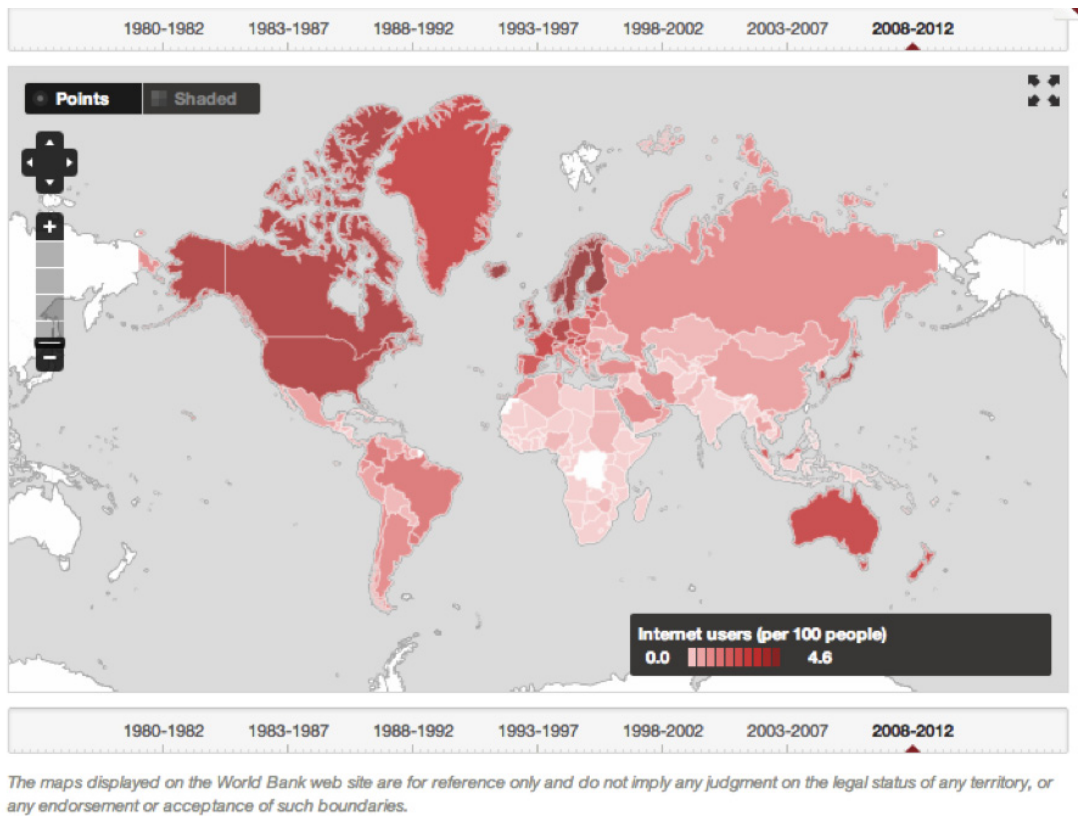
Data courtesy of The World Bank:
Source: http://data.worldbank.org/indicator/IT.NET.USER.P2/countries?display=map
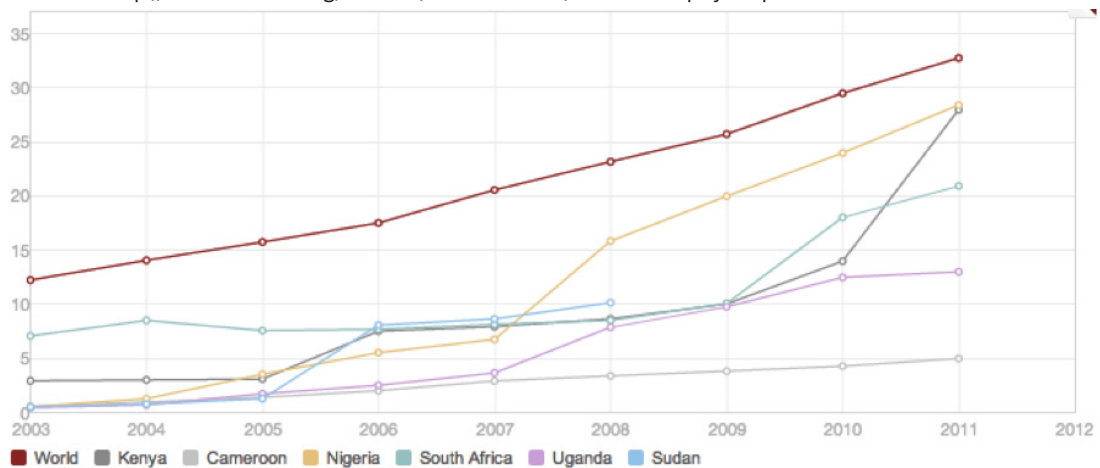
Internet users (per 100) across the world and in the six countries in Africa that have highest Internet usage
Source: http://data.worldbank.org/indicator/IT.NET.USER.P2/countries/1W-KE-CM-NG-ZA-UG-SD?display=graph

Agriculture

Kevin Perkins, executive director of Farm Radio International (FRR), explained, "Radio has been used to provide agricultural extension services to smallholders in Africa for decades."[59] FRR created a participatory radio campaign (PRC), allowing farmers to actively select and develop a range of agricultural topics for their radio stations. FRR worked with 25 radio stations in five countries to create 49 PRCs that reached 40 million smallholder farmers.[60]

In 2007, the African Farm Radio Research Initiative (AFRRI) began a 42 month research project in partnership with World University Service of Canada (WUSC) and with funding from the Bill & Melinda Gates Foundation. Specifically, AFRRI looked at whether FRR's PRC actually had an impact. It discovered that farmer participation in creating radio broadcasts led to greater adoption of the practices.

"From our research we know that the more farmer voices are featured on a given program, the more likely farmers will listen and subsequently gain knowledge," says Perkins. "This is even more so when radio programs are designed with farmer input, and when broadcasters solicit feedback from farmers and use it to improve their programs."[61]

The AFFRI research project revealed an average 39 percent of farmers adopted the practices discussed on the radio in communities that engaged with local radio station programming.[62] Engagement could be as simple as phoning into the station to request a topic or providing information. Due to the scalability of radio, participatory radio campaigns have the potential of encouraging thousands or even millions of farmers to utilize better agricultural practices.

Good Governance

In Bukavu, a small town located in eastern DRC, a group of young Congolese women formed the South Kivu Media Association or Association Rwandaise des Femmes des Médias du Sud Kivu (ARFEM), using radio to fight violence against women. Since 2003, they have provided educational programming and journalism training to arm women with tools and skills. They work with 350 women who are a part of local radio communities.

In 2006, they created a radio program called "Challenging the Silence: Women Media Against Sexual Violence" and for the first time, literally broke the silence on rape and violence. While it was incredibly difficult to encourage women to share experiences of rape with a broader audience, one testimony led to another. Chouchou Namegabe, the director and co-founder of AFREM, has since testified before The Hague International Court of Justice and the U.S. Senate Foreign Relations Committee about rape and violence against women in the DRC. While the statics are not definitive, publicly documented stories do serve as powerful testimony to fight human rights violations and widespread atrocities.[63]

Education

Over the last several years, radio and other broadcast stations have begun providing a new brand of programming — one that both entertains and educates. These soap operas or telenovelas address critical issues surrounding HIV/AIDS, disease, nutrition, contraception, and even conflict.

In Rwanda, Urunana disseminates important health information through comedy and powerful storytelling. "People can laugh at the way the issues are addressed and the language we are using. It's an entertainment — a blend of education and entertainment," says Narcisse Kalisa, the show's Director.[64] The show won the U.K. One World Media Award for Development Media in 2008. A report from the World Bank in 2007 revealed an 8 percentage point drop of HIV/AIDS in 2000 — from 3 percent to 11 percent — and cited grassroots education as having played a significant role in combatting the spread of HIV/AIDS.[65]

59 Caspar van Vark, "New Versus Old Media: how best to get information to smallholder farmers."
60 Ibid.
61 Ibid.
62 Ibid.
63 Wanda O'Brien, "Women Use Radio to Fight Sexual Violence," Guardian, 30 May 2012, <http://www.guardian.co.uk/journalismcompetition/longlist-women-use-radio-to-fight-sexual-violence>
64 BBC, "Rwandan Sex Soap Opera Wins Award," 13 June 2008, <http://news.bbc.co.uk/2/hi/africa/7453044.stm>
65 Ibid.

In Ethiopia, the radio soap opera "Yeken Kignit" ("Looking Over One's Daily Life"), focuses on health issues, and has reached millions of Ethiopians since 2005. Men who tuned into the program, and a similar one called "Dhimbibba" ("Getting the Best Out of Life"), sought HIV testing four times more often than nonlisteners. Among married women tuning into the program, the demand for contraceptives increased by 52 percent.[66]

While television penetration is not as deep as radio across Africa, at least two-thirds of Kenyans watch television on a fairly regular basis, while educational programming is also very popular among television networks.[67] The educational show "Makutano Junction" currently reaches 6.5 million with its stories of "loves, frustrations, and successes in a small African community living in a context familiar to tens of millions of people in the continent." The show aims to teach listeners about basic rights and injustices while also providing answers and best practices. Makutano also offers an interactive SMS text interface for listeners to ask questions to development experts and find more detailed information on each show. [68]

66 César Chelala, "Learning from Soap Operas," The New York Times, 3 June 2010, <http://www.nytimes.com/2010/06/04/opinion/04iht-edchelala.html>
67 Audiencescapes, <http://www.audiencescapes.org/country-profiles/kenya/media-and-communication-overview/television/television-324>
68 Mediae, <http://www.mediae.org/makutano_junction>

7. TRANSLATION TOOLS

Overview

The first challenge that many charities face, particularly those working globally, is how to communicate with locals and assess their needs. While digital translation tools work to a certain extent, charities often operate in regions that speak local dialects and need quick, accurate translations for lifesaving information on disaster preparedness, healthcare, and agriculture. There are now several companies providing translation work specifically for the needs of the such communities.

Health

Dotsub is a for-profit company that provides video translation and subtitling services for a wide range of charities. For example, they translate or add subtitles to videos for organizations like TED so they are accessible to a global audience. They only use human translators, however. "Nothing involved is automatic translation," said Michael Smolens, founder of Dotsub. "It's technology that allows professionals and crowds. Quality of machine translation is inconsistent and poor."[69]

In June 2011, Dotsub was called to action when a Paris-based charity needed immediate translations for its "Let's Go" or Yalla Film Festival competition that challenged Arabic filmmakers to create two- to three-minute videos using mobile phones. Judging the competition was a panel of renowned filmmakers from the U.S. and France who did not speak the various Arabic dialects. Dotsub was able to quickly translate all of the materials and make them accessible to the judging panel.

Dotsub's particular strength is translating already complicated health materials into challenging dialects and languages.

Healthphone is an organization in India that provides mobile information for women's health. It utilized Dotsub to translate health-related materials into 22 different Indian dialects. In addition to the translations, Dotsub also enabled the phone to use its GPS capabilities to select a language based on where the user was located. "So if Malalian is the primary language in a region, it will default to Malalian," said Smolens.

Videum was created in 2011 and is a joint effort between Dotsub and Publicis Healthware International to build a social network for health videos that is accessible in any language and on any video-enabled device, including mobile phones. It's a new effort to provide universal healthcare information in a world where most of the healthcare-related videos are in English or in other common Western languages.[70]

Smolens is also pioneering a project called Video for Villages, which is still in its initial stages. He is working with Translators without Borders, Healthphone, and Video Volunteers in India and has so far piloted the program in three Indian villages. They aim to deliver content to people in their native villages, whether it be educational, entertainment, or spiritual.

"There are now 3 billion people living in villages and none of the big media companies are addressing their needs. These people don't have smartphones and probably don't

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69 Interview with Michael Smolens, Founder, Dotsub.
70 Videum, <http://www.videum.com/spread/358/transcribe-and-translate-spread-the-knowledge.html>

have enough bandwidth to play videos but we've discovered a way to deal with this," said Smolens, about the Video for Villages project. He hopes to get the project off the ground in late summer.

Education

Amara is a nonprofit company that offers crowdsourced translations for videos created by other charities. Nicholas Reville, Amara's co-founder, considers it "a Wikipedia for subtitling and video."[71] It currently has a community of over 14,000 volunteers translating materials for TED alone. Since its launch two years ago, it has attracted around 100,000 volunteers from around the world to provide quality translations for charities in esoteric languages like Cree, Quechua, and Manx.

Reville believes that the reason for such a high volume of quality volunteers is that it is usually fans doing the translation work, eager to help out with a particular charity. "There are very few translation opportunities online that bring benefits back to the charity," he said. "It's hard for charities to find volunteers and fans to help you do to spread message and spread your work. Subtitling is a concrete way to get volunteers to work for them."

71 Interview with Nicholas Reville, co-founder, Amara.

8. CLOUD TECHNOLOGY

Overview

With the global nature of development work, speed and access to information is essential. Cloud technology has become an essential tool in making the administrative functions of charity organizations more efficient and cost-effective.

Cloud technology is considered computing that allows users to access software and information via the Internet instead of a hard drive or computer network, making the information accessible anywhere with an Internet connection.

According to TechSoup Global, over 90 percent of charities are using cloud technology at some level, even if there are some barriers to its use like logistical availability in remote areas.

Disaster Relief

During the Haiti earthquake, some relief workers used the Eagle Suite for Disaster Management system to create a single crisis map that could be shared with various charities. This technology also allowed them to share information with other relief workers. The Eagle system was a collaborate effort, using technologies developed by Microsoft, Geodan, a Dutch geo-information consulting company, and Esri, a company that produces geographic mapping software. [72]

When Microsoft launched the HelpBridge, a disaster-relief mobile application, it used cloud-based services to partner with five charities to assist with the multiple components of the application. Mobile Giving Foundation handled all the donation-related texts; Guide Star and Network for Good dealt with providing a PayPal donation function; Aid Matrix assisted with the donation of goods and supplies portion of the mobile app; and Volunteer Match worked to share opportunities to help with volunteers.[73]

Education

The Kalgidhar Trust, based in Northern India, provides various social services to remote rural areas in the region. The trust operates 70 educational facilities and 16 universities using cloud technology to integrate its various academies through one management system. It also used cloud technology to create an education portal and develop a virtual classroom for remote learning. It aims to open 500 more schools in the future and needs an efficient way to coordinate activities and communicate with each other.

Since the Kalgidhar Trust operates as a self-sustaining organization, staffed with a slew of dedicated volunteers rather than paid management, and only a 2.75 percent annual expenditure on overhead, cloud technology was crucial in creating a sustainable management system that was accessible to all of its schools and academic institutions.[74]

72 Sarah Murray, "Disaster Relief: Technology Can Help Get Aid Where it is Needed," Financial Times, 13 October 2011, <http://www.ft.com/intl/cms/s/0/c5d3462a-ef38-11e0-918b-00144feab49a.html>
73 Interview with James Rooney, program manager for Microsoft Citizenship's Technology for Good.
74 Harjit Singh Lamba and Gurdev Singh, "Cloud Computing-Future Framework for E-management of NGOs," International Journal of Advancements in Technology, (July 2011): Vol. 2, No. 3.

9. PORTABLE NETWORKS

Overview

Less than a third of the world population has access to the Internet, and achieving global access is not proceeding quickly enough to match needs. Many in developing countries cannot afford to wait. Oftentimes, remote areas also do not have basic communication networks like telecommunication. Around 1 billion people worldwide cannot even connect to a mobile phone due to lack of electricity or power. Portable networks, however, can create communication networks where none are available or in situations where networks have been destroyed or damaged.

Substituting Destroyed Networks

The Vodafone portable network allows relatives to communicate with each other and enables aid agencies to carry out lifesaving emergency work. When Typhoon Pablo hit the Philippines in December 2012, it wreaked havoc on the mobile tower lines, disrupting all the mobile networks in Eastern Mindanao, the second largest island in the Philippines. Mobile operators determined it would take several weeks before the network would be restored.[75] Télécoms Sans Frontières (TSF), partnering with Vodafone Foundation, used a 100-kilogram portable network — transported via three suitcases — which created a 1-kilometer-radius network and was operational within 40 minutes. It was the first time a portable network had been used in a disaster situation.[76]

For the 17-day deployment, citizens and emergency responders sent a total of over 290,000 calls and over 570,000 SMS messages over the Instant Network. TSF also worked with the Red Cross to set up free call centers through satellite phones for those unable to utilize the portable network.[77] The network allowed displaced families to reconnect with each other, make mobile payments and receive money while enabling relief workers to respond more efficiently to needs of those affected.

In February 2012, when severe droughts hit Kaikor in Northern Kenya, the portable networks were used to assist in aid delivery. TSF also partnered with the Red Cross to use the Vodafone Instant Network to provide telecommunication networks to a community of 15,000. They had previously lived without power, running water or reliable communications yet needed food delivery, medical, educational support, and sanitation. Over the 47 days of aid relief, over 260,000 calls were made through the Instant Network.[78]

During the Haiti earthquake in 2010, Microsoft's Twisted Pair Wave software also allowed humanitarian professionals to communicate in any location and on any device by connecting them across a broad range of networks and devices. For example, relief workers could locate and speak to other teams or organizations from around the world, regardless of whether they were using mobile phones, radio systems, or laptops.[79]

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75 Interview with Laure Crampé, Communications and International Relations for TSF
76 Matt Warman, "Mobile in a Suitcase helps Typhoon Pablo refugees," Telegraph, 14 December 2012, <http://www.telegraph.co.uk/technology/mobile-phones/9743488/Mobile-network-in-a-suitcase-helps-Typhoon-Pablo-refugees.html>
77 Interview with Laure Crampé.
78 Matt Warman, ""Mobile in a Suitcase helps Typhoon Pablo refugees."
79 Sarah Murray, "Disaster Relief: Technology Can Help Get Aid Where it is Needed."

Leapfrogging Infrastructural Deficits

In Zambia, networks are built along main highways or urban areas, leaving around 65 percent of its 13 million inhabitants uncovered or at best, with an unreliable connection.[80] A small 4-kilogram network device known as CompactRAN was created by Vanu, a technology company based in Cambridge, Massachusetts. It can connect up to 1,000 people through two GSM carriers using only 50 watts of power, allowing it to run on solar energy or battery power. It requires, however, a backhaul device that can connect CompactRAN to the main network. This particular device is designed to connect to a variety of devices that can serve as a backhaul: microwave, wireless broadband, cable modem, DSL, and satellite connections.[81]

Ushahidi, the Kenya-based charity that developed a crisis-mapping platform, has designed a portable network device that functions independently and from anywhere in the world. They refer to this device as the BRCK and consider it a "backup generator for the Internet." It is a traveling wireless router that can run on eight hours of battery in case of a blackout, supports up to 20 devices, and is powerful enough to cover multiple rooms. By inserting a SIM card, the BRCK can be turned into a 3G and 4G network and can create a hotspot for up to 20 devices. It also works by connecting to any detectable existing networks.[82]

Juliana Rotich, the Executive Director of Ushahidi explains that the next layer of BRCK will be expanding its capacity to become an "on ramp Internet of things," where BRCK could "be deployed in rural Indonesia but could be fully managed at an office in Paris or vice versa."[83] Unlike the Vodafone portable networks, BRCK works on a smaller scale but is a device that would be able to extend the satellite reach provided by larger telecommunication companies. "Our device is like the last mile extension of the Internet connection," said Rotich.

As for the future users of BRCK, Rotich explains that most of the interest so far has been from aid and development workers but that there remains "a lot of potential for small and medium businesses to continue doing their businesses."

80 David Talbot, "A Tiny Cell-Phone Transmitter Takes Root in Rural Africa," MIT Technology Review, 29 May 2013, < http://www.technologyreview.com/news/515346/a-tiny-cell-phone-transmitter-takes-root-in-rural-africa/>
81 Vanu, <http://www.vanu.com/solutions/rural/>
82 BRCK, <http://brck.com/>
83 Interview with Juliana Rotich, Executive Director of Ushahidi.

10. DRONE TECHNOLOGY

Overview

More often than not, "drone" is a troubling term, associated with war and surveillance. But at their simplest, drones are unmanned aerial aircraft that are increasingly used for good purposes like aid delivery and tracking environmental damage. Their use in research is also increasingly important, such as their ability to track storms and hurricanes, allowing for a greater level of disaster preparedness. Finally, the relative simplicity and low cost of drones puts power in the hands of citizens who can use them to ensure greater accountability.

Leapfrogging Infrastructural Deficits

According to Matternet, 1 billion people live cut off from access to major infrastructure like road networks, particularly during rain or storm seasons when floods turn roads into lakes or rivers. It still takes trains and trucks to bring goods to remote villages that don't have roads. It took centuries for our roads to be built. This means, according to Matternet, that one-seventh of the world population is literally centuries behind in developing modern infrastructure.[84]

When a drone or unmanned aircraft is used in aid delivery, it can reach targeted areas efficiently and quickly, acting as the FedEx for the developing world, where roads are often flooded, destroyed, or simply nonexistent. The Matternet device, a fusion between a drone and a GPS, would be able to drop off much-needed medicine from a hospital or aid agency to a local clinic or home, all within a matter of minutes, not hours or months.

The concept for the Matternet arose out of a Google Solve for X challenge held at Singularity University. A diverse group of entrepreneurs, engineers, and hackers identified a major issue in transporting goods in developing countries, noting that in some areas, it could take up to a month for an HIV blood test to get to a lab and back.

Matternet team member Arturo Pelayo envisions Matternet as more of a business than a charity, charging organizations for "point-to-point" delivery services. He notes that the system would be aimed at the developing world and might end up being cheaper than motorcycles, which some transport companies currently use.[85]

Citizen Mapping

Drone technology is also playing an incredibly important role in environmental research. While GIS and traditional methods of mapping often use high-tech equipment like satellites and airplanes, balloon mapping allows citizens to create "grassroots" maps that can even challenge the maps they feel were created unfairly by governments, businesses, and others in positions of power.[86] In some cases, balloon mapping provides better images. The Red Cross prefers using balloon mapping on uneven terrain because airplanes, which incur more movement than balloons, may render distorted photos. When the terrain is sloped, airplanes often move too quickly and miss details that a balloon, with its slower range of motion, would not.[87]

84 Ariel Schwartz, "The Matternet: A Flying Autonomous Delivery System for the Developing World," 30 August 2011, <http://www.fastcompany.com/1776951/matternet-flying-autonomous-delivery-system-developing-world>
85 Ibid.
86 Public Laboratory, "Balloon and Kite Mapping," <http://publiclaboratory.org/tool/balloon-mapping>
87 Interview with Achala Navaratne.

In 2010, when little public information was available on the extent of the Deepwater Horizon oil spill, the Public Laboratory for Open Technology and Science (Public Lab) decided to find out themselves. Armed with helium balloons and kites, Gulf Coast residents took high-resolution photos of the region and assembled over 45 maps of the spill, which were ultimately added to Google Maps and also used by The New York Times.

The Public Lab is an organization that provides affordable do-it-yourself technologies for what it calls "environmental exploration and investigation." A balloon mapping kit, for example, only costs US$95.

In partnership with a local advocacy group in Brooklyn, Gowanus Canal Conservancy, Public Lab also created a map of the Gowanus Canal in an effort to move cleanup plans after the canal was designated a Superfund site by the Environmental Protection Agency in 2010. Every year, 300 million gallons of untreated sewage is released into the canal, which also suffers from decades of coal tar accumulation in its sediment. The map of the canal was likewise adopted by Google Earth. Shannon Dosemagen, the co-founder of Public Lab, explained its significance: "That a group of local activists could create a high-resolution map of an area they care about — and that such imagery could replace commercial and government data as a recognized representation of that place — is a powerful example of the civic science mission of Public Laboratory."[88]

Photos courtesy of Public Laboratory:
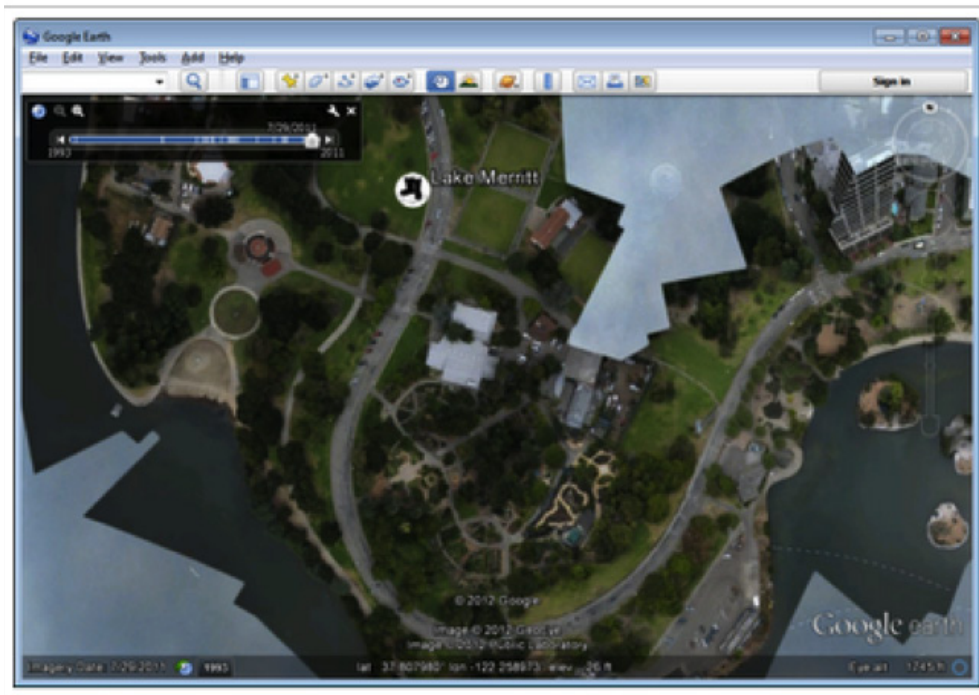
Public Laboratory Image of Lake Merritt, Oakland, CA (July 2011), in Google Earth

88 Shannon Dosemagon, "Public Lab's Community-Created Maps Land on Google Earth," PBS, 19 April 2012, <http://www.pbs.org/idealab/2012/04/public-labs-community-created-maps-land-on-google-earth109.html>

A balloon mapping toolkit for US$95

Balloon mapping captures aerial imagery of spill-affected sites in Louisiana, Mississippi, Alabama and Florida

Source: http://google-latlong.blogspot.com/2012/04/balloon-and-kite-imagery-in-google.html

CONCLUSION

Technology is increasingly used in the developing world to improve livelihood, from boosting productivity in agriculture, to creating greater access to education, to delivery of needed aid and supplies. It has resolved long-standing issues like tracking the displaced, accessing areas of high conflict, organizing vast amounts of data, and responding to disasters in real time. The increasing affordability of certain technologies allows average citizens to take development into their own hands, whether it's using a mobile phone to study for a college entrance exam, paying bills when a bank is unavailable, or even fighting corruption. Finally, technology connects people in remote areas and allows them to benefit from information sharing.

Technology still remains a tool, however, with its effectiveness dependent on political will and context, clear communication of needs, and, simply, the right intentions. The increased use of technology in development work also requires that charities collaborate increasingly with industries they traditionally do not interact with, such as engineering, technology, and business. These cross-sector alliances will help advance the goals that an individual sector might not be able to independently pursue.

As with all tools, however, technology must be sustainable. This requires that it continue to be affordable and simple to use. It must also be able to operate without many infrastructural constraints such as access to the Internet, computers, roads, and even electricity. The various technologies covered in this report often do not work in isolation but in tandem with each other — radio with mobile or social media platforms with mapping. Coupled with innovation and creativity, technology will only continue to bridge gaps between the developing and developed worlds as well as create new possibilities for development professionals to make far-reaching impacts.

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