Volunteer Technology Communities:

OPEN DEVELOPMENT

THE WORLD BANK

GFDRR Labs

Global Facility for Disaster Reduction and Recovery

Volunteer Technology Communities (VTC)

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Cover photo: RHoK Zambia

"The use of Volunteer Technology Communities (VTCs) made possible by new Web 2.0 technologies present a fundamental shift in how we can support Disaster Risk Management programs and intervene in disaster situations. We are only at the beginning of this story. The seeds planted through initiatives like the Crisis Commons and Random Hacks of Kindness hold great promise for the future."

– Saroj Kumar Jha, GFDRR Manager

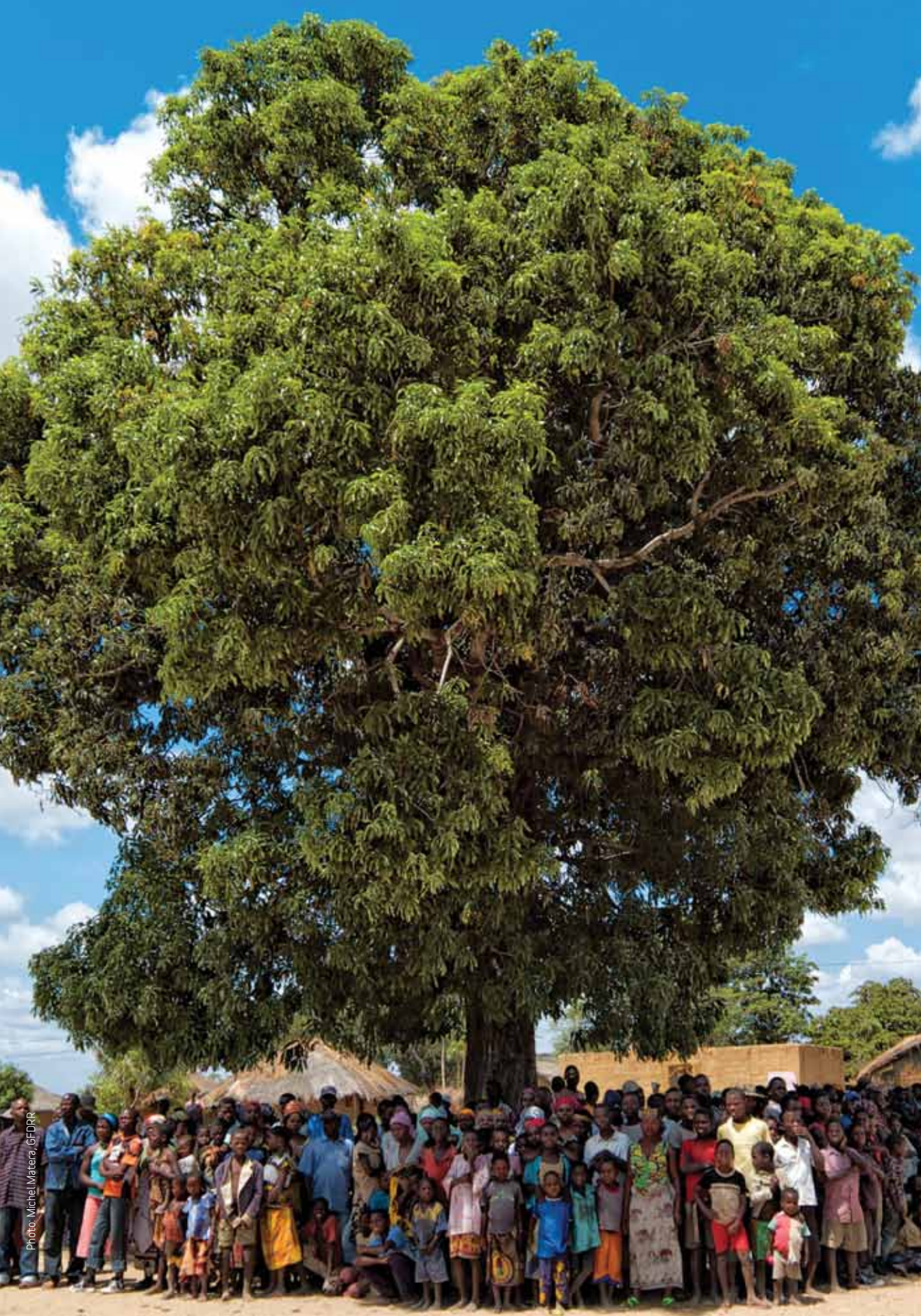

Photo: Michel Matera, GFDRR

OVERVIEW

2010 redefined the role of volunteers during humanitarian emergencies and disaster risk management. Traditionally, civil society organizations–ranging in size from small community organizations to the International Federation of Red Cross–mobilized volunteers to perform a wide range of actions, in order to: manage logistics, provide medical care, and perform community based risk assessments in addition to other forms of direct action. During 2010, a new form of volunteer emerged from the background: the humanitarian technologist. These experts–who are most often technical professionals with deep expertise in geographic information systems, database management, social media, and/or online campaigns–applied their skills to some of the hardest elements of the disaster risk management process.

Working inside communities like OpenStreetMap and Ushahidi, thousands of technologists responded to earthquakes in Haiti, Chile and flooding in Pakistan. Volunteers processed imagery, created detailed maps, and geolocated posts made by the affected population to a myriad of channels in social media. Some deployed under the United Nations Disaster Assessment and Coordination (UNDAC), The World Bank, and International Organization of Migration (IOM), trained Haitians how to use simple tools for remapping their communities. Others provided reachback support to the United Nations (UN), the European Union, United States and across the globe, making their supercomputers and large storage arrays available for processing imagery, managing translation workflows, and serving large data sets.

The rise of the Volunteer Technology Communities (VTC) brought a new set of organizational designs to problems that have often become snagged in bureaucracy. Instead of working in hierarchies, VTCs used flattened, decentralized structures with decision-making and conflict resolution mechanisms that were adapted from online communities like Wikipedia and open-source software development projects. As a result, the VTCs moved far faster than larger players in nearly all circumstances–and perhaps faster than established protocols will allow. It is here–in the politics and tempo of this new volunteer capability–that the bottom-up, grassroots structures need protocols to work with the top-down systems within large organizations.

This paper provides an introduction to some of the Volunteer Technology Communities (VTC) that made their mark during 2010. It is meant to provide a starting point for discussions of how UN agencies, The World Bank and other organizations might better integrate/use the best parts of these VTCs going forward. Critical to their evolution will be for these communities to move beyond the situation of immediate response and early recovery towards the full disaster risk management cycle including; reconstruction, risk reduction and preparedness.

This paper reviews seven key VTCs and how they operate in three broad areas to assist in emergency response and disaster risk management, including:

Mapping Collaborations

- ***International Network of Crisis Mappers*** is an informal collective of mapping professionals that use their expertise to establish the operational use of maps in times of crisis.
- ***OpenStreetMap (OSM)*** is an online application that allows volunteers to collaborate on geographical data and download that data. It is often called the "Wikipedia of Maps".
- ***The Global Earth Observation -Catastrophe Assessment Network (GEO-CAN)*** consists of hundreds of volunteer engineers and scientists catalyzed by The World Bank's remote damage assessment in Haiti. Immediately following the earthquake, these experts utilized high resolution imagery to develop an initial building-by-building damage analysis.
- ***Google Map Maker*** allows people to collaboratively create maps using different mapping tools. Some of these maps have been later published in Google Maps.

Online and on-site contribution and collaboration

- ***Ushahidi*** is an open-source crowd sourcing crisis information platform, easily deployable to suit local needs.
- ***Crisis Commons*** is an international network of professionals drawn together by a call to service. Members aggregate during Crisis Camps in different cities around the world and work collaboratively on online information sharing tools.

Public-Private-People-Partnerships

- ***Random Hacks of Kindness (RHoK)*** is a partnership between Google, Microsoft, Yahoo! NASA, and The World Bank which organizes and hosts biannual two-day events where volunteer technology experts develop software solutions for disaster risk management.

This list is not meant to be comprehensive. Many other communities made significant contributions to operations during the past year, including Sahana, FrontlineSMS, InSTEDD, the Thompson-Reuters Foundation, STAR-TIDES, and Synergy Strike Force. These will be discussed in other forums.

VTCs have caught the attention of disaster risk management professionals. They have demonstrated resourcefulness, agility, depth of response, and measurable results in their actions. This led The World Bank and other organizations to begin development of an informal platform for engagement between their institutions and the VTCs. Our challenge now is how to best enable continued measurable results from these new groups with multiple layers of knowledge, creativity and passion.

MAPPING COLLABORATIONS

International Network of Crisis Mappers

The International Network of Crisis Mappers is a global hub for Crisis Mapping and humanitarian response. The network brings together a diverse set of individuals from the humanitarian, development, human rights, policy, technology, and academic communities. They catalyze communication and collaboration between a wide range of different communities with the purpose of advancing the study and application of crisis mapping worldwide.

The Crisis Mappers network was launched in October 2009 at the first International Conference on Crisis Mapping (ICCM 2009) in Cleveland, Ohio. These annual conferences facilitate collective engagement and dialogue that helps construct the boundaries of this emergent new discipline. At the conference, participants also brainstorm how to solve real problems and initiate projects that help advance this new field.

Throughout the year, the network facilitates continuing virtual interaction among its members[1]. Participants engage through webcasts, create and browse profiles, email their needs through the dedicated mailing list, write blogs, and share other announcements with the group. The group believes that the network and conference series is just the start of many new collaborative ideas that only emerge when different organizations come together rather than work in isolation from one another.

The ICCM triggered into action within minutes of the Haiti earthquake. Conversations that began only three months earlier in Cleveland forged a culture of sharing, trust, openness, dialogue, and a commitment among members that helped enable a remarkable volunteer community response. Initial efforts focused on connecting the ICCM with organizations and individuals to respond to the crisis efforts and concrete action began almost immediately.

Members shared the very latest aerial and satellite imagery, contributed their professional and technical expertise, and committed thousands of hours of volunteer labor. They processed over 9 Terabytes (TB) of raw imagery, integrated OpenStreetMap data with data from the UN's Virtual On-Site Operations Coordination Centre (OSSOC), and created workflows for machine translation of data. If someone requested help of the network, within less than an hour someone in the community would offer their assistance. Thousands of emails, tweets, blog posts, and Skype chats directly helped facilitate the humanitarian response on the ground.

[1] http://www.crisismappers.net/

Since Haiti, the community has demonstrated its continuing capacity to contribute to effective disaster response in the wake of destructive floods, typhoons, conflict, chronic poverty, a cholera epidemic, snowstorms and devastating oil spills.

ICCM sponsors include Humanity United, the Open Society Institute, the United States Institute of Peace, the Knight Foundation, Google, ESRI, Ushahidi, The World Bank, the Hitachi Center, the Fletcher School at Tufts University, and GeoTime.

OpenStreetMap

OpenStreetMap (OSM) was created in response to the fact that maps in many parts of the world are not free and easily accessible. Instead, geographic data is often locked up by commercial vendors or within governments, or in some cases the data does not even exist. Often called "the Wikipedia of Maps" OSM allows anyone to edit, add missing information or correct mistakes. OpenStreetMap currently has over 300,000 members and thousands of regular contributors.

Founded in 2004, the original impetus for OSM was that data from the UK Ordnance Survey was costly and came with restrictions on use. Citizens started collecting data through surveys with GPS units and OSM was born. Since then, OSM has evolved into a large community that houses a variety of interests. The Humanitarian OpenStreetMap Team (HOT) is just such a community within the larger OSM ecosystem. The group started as an informal collaboration between interested individuals, was active during the Haiti earthquake response, and formalized into an incorporated organization in August 2010.

Almost immediately after the 2010 Haiti earthquake, OSM contributors began tracing road information from pre-earthquake satellite imagery and within 24 hours, imagery providers began releasing raw imagery. In the first month after the earthquake over 600 global volunteers helped add information to the raw imagery that was being released. Volunteers created geographic products such as files for loading onto GPS units, maps to be printed, online maps and components for map-making in GIS systems. Information created on the OSM platform was then integrated into systems created by other VTCs. For example, Sahana and OSM coordinated the geolocation of hospital information between their systems and Ushahidi utilized OSM in locating of SMS message sources. OSM data was also used across the organizational spectrum; including by search and rescue teams, the UN, The World Bank and Pan American Health Organization.[2]

After the initial response the Humanitarian OSM Team began traveling to Haiti to train people in data collection and utilization. Supported by the Educational Concerns for Hunger Organization (ECHO), The World Bank and the International Organization for Migration (IOM), the HOT group hosted training in many areas within Haiti. Over 400 people were trained from diverse

[2] Accessed from http://wiki.openstreetmap.org/wiki/WikiProject_Haiti#Uses_of_OpenStreetMap_data_by_crisis_responders

groups such as workers from the UN Cluster System, local Haitian NGOs, and members of Haitian civil society. While the OSM team was in Haiti, additional uses of the information collected were developed. For example, IOM is responsible for registering the over a million internally displaced persons within Haiti, when an individual is registered that record is linked to road information within OSM. In addition IOM has begun placing information kiosks within the camps and are in the process of including an OSM within the kiosks. HOT plans to continue capacity building in Haiti and eventually transition all OSM work to Haiti.

Beyond Haiti there are broader goals for the Humanitarian OSM Team. Largely a capacity building organization, the group plans to continue to provide training in countries that need a mechanism for collecting free geographic data. To increase global penetration, HOT will continue to formalize relationships between response agencies and serve as a bridge between those groups and the larger OSM community. The group will also continue obtaining compatible licenses for already existing data for import into the OSM platform. Finally, HOT will deepen and increase their partnerships with international development organizations such as The World Bank to explore how OSM data can be used in risk assessment.

Global Earth Observation – Catastrophe Assessment Network (GEOCAN)

In the hours following the Haiti earthquake, the full scope of damage was only beginning to be understood. Governments and multi-lateral organizations realized the level of damage was dramatic; however, they were unable to obtain the complete picture of damage and its effect on the people of Haiti. It was clear that an impact assessment using remote sensing was the most viable option to achieve this, due to the spatial scale and magnitude of the Haiti disaster.

In response to this challenge the Global Earth Observation - Catastrophe Assessment Network (GEO-CAN) formed around The World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR) remote damage assessment. GEO-CAN consisted of expert volunteers that individually analyzed small assigned segments of imagery that were acquired through the WB-ImageCat-RIT and the Google aerial remote sensing campaigns. Via meticulous visual comparison of this post-event imagery with pre-event satellite imagery within a week GEO-CAN produced a building-by-building assessment of the damage caused by the earthquake.

The damage assessment assessed both collapsed and heavily damaged (Grades 4 and 5, EMS-98) buildings in Port-au-Prince, Carrefour, Delmas, Léogâne, Jacmel, Grand Goave and Petit Goave. The analysis identified corresponding pre-earthquake building footprints digitized into a GIS database of nearly 30,000 building footprints.

The data was independently verified using field ground surveys and remote surveys by organizations including the United Nations Institute for Training and Research (UNITAR)/Operational Satellite Applications Programme (UNOSAT), the European Commission Joint Research Centre (JRC), the Centre National d'Information Géo-Spatial (CNIGS) representing the govern-

ment of Haiti, and other teams from Cambridge University, Stanford University and Betero-Fierro-Perry, Inc.

Facilitated by ImageCat Inc., GEO-CAN quickly grew to over 600 volunteers representing 131 private and academic institutions in 23 different countries. Several strategic organizations participate in forming the community, each with their own established expertise in engineering or remote sensing, including the Earthquake Engineering Research Institute (EERI), the UK-based Earthquake Engineering Field Investigation Team (EEFIT), MCEER and LESAM at the State University of New York at Buffalo, Georgia Tech University, Cambridge University (UK), the University College London (UK), and Rochester Institute of Technology (RIT).

The global response to the Haiti earthquake was remarkable in many ways. Within days, the most recently collected satellite and aerial imagery was publicly available through Google, Yahoo! and Bing searches and by the end of January, anyone could access up to half a dozen post-event images for any one area around greater Port-au-Prince. Data from different missions, including: The World Bank-ImageCat-RIT Remote Sensing Mission (15cm optical and 2 pt/m2 LiDAR); Google (15cm optical); NOAA (25cm optical); Pictometry; and satellite imagery from GeoEye and Digitalglobe, allowed damage from the Haiti earthquake to be viewed through multiple sensors and at different times. It was through these international understandings and the dedication of time and resources by GEO-CAN affiliates that a comprehensive and scientifically rigorous damage assessment was achieved via this VTC.

Google Map Maker

It's a unique challenge to provide maps and local information to users in countries where there has never been any detailed digital map. This was the motivation behind the launch of Google Map Maker in May 2008. Google Map Maker empowers people to share their local knowledge and expertise in 59 languages, which represents the primary or secondary languages of more than a half a billion people in over 180 countries and territories.

Google Map Maker supports user-generated online map-making by allowing anyone to add or edit roads, businesses, parks, schools and more. People can visually mark places and add detailed information about these locations, or edit contributions by others. These edits reach millions of people worldwide through integration in Google Maps and Google Earth. Mappers from around the world have contributed local knowledge with everything from mapping entire countries to adding details like one-way streets to make maps drivable.

In times of disaster, relief activities are carried out in chaotic and dynamic conditions in which multiple groups need to interact. First responders need to quickly build a picture of where people are, what condition they are in, what their needs are, and what services are still available. This helps responders target their efforts and mobilize their equipment, personnel, and supply resources. Unfortunately, basic map and geographic data that may be a key component to response is often not readily available in the onset of a disaster, which leads to duplication of efforts–organizations collect the same data in the same area, city or region.

For this purpose Google Map Maker was first put to use in June for the Cyclone Nargis in Myanmar, a disaster for which data accessibility was limited[3]. There were no publicly accessible maps of roads, hospitals, or cities to guide response efforts. At Google, 40 volunteers mapped 100,000 km of roads and 3,000 points of interest, in just four days. This was just the beginning of many more powerful applications.

Only two years after its launch, Google Map Maker has made important contributions to the disaster response community[4,5]. Relief organizations and communities are able to produce helpful composite maps for areas where detailed information is usually unavailable by leveraging the high-quality, up-to-date information provided by users in Google Map Maker. In addition, the "crowd community" was tasked with targeted mapping to meet the most pressing needs in affected areas. Fast and accurate mapping data provided by Google Map Maker volunteers has not only raised the utility of high quality maps in times of humanitarian need, but also demonstrated the ability of this tool to be a source of quality maps in the developing world[6].

[3] http://google-latlong.blogspot.com/2008/05/myanmar-maps-update.html

[4] Reuters interview with UNOSAT, http://www.reliefweb.int/rw/rwb.nsf/db900sid/ASHU-867P99?OpenDocument

[5] Blog post about disaster volunteer efforts, http://google-latlong.blogspot.com/2010/06/map-makers-respond-to-pakistan.html

[6] https://sites.google.com/site/mapyourworldcommunity/map-your-world

ONLINE AND ON-SITE CONTRIBUTION AND COLLABORATION

Ushahidi

Ushahidi, which means "testimony" in Swahili, was launched during the post-election violence in Kenya in January 2008. Ushahidi is a free and open-source platform for collaborative live mapping that integrates information collected by email, voicemail, SMS, Twitter, web forms, YouTube, Flickr, Facebook, Skype, and other social media. The purpose of the Ushahidi platform is to democratize mapping by creating a live map of needs.

The Ushahidi platform is used by professional organizations and volunteer-networks around the world to create more transparency and accountability across multiple sectors. Since its launch, Ushahidi has been used in over 30 countries, for uses including:

- Community mapping of social services in slums
- Documenting armed conflict
- Monitoring election fraud
- Assessing the impact of major environmental disasters
- Tracking crime in metropolitan areas

These maps have proven to be invaluable tools for first responders. After the 2010 Haiti earthquake, the U.S. Marine Corps used the Ushahidi mapped information and stated that the data helped them save hundreds of lives. The U.S. Coast Guard also used the information mapped on Ushahidi-Haiti for operational response. FEMA Administrator Craig Fugate called the Ushahidi-Haiti map the most comprehensive and up-to-date map available to the humanitarian community.

It is worth noting that student volunteers, not disaster response professionals, were behind the Ushahidi-Haiti map. The same is true of the Ushahidi maps created for Chile and Pakistan.

Ushahidi is supporting the launch of a Standby Volunteer Task Force to provide humanitarian organizations with a surge capacity in crisis mapping following a disaster. In addition, Ushahidi is also launching the Universities for Ushahidi (U4U) initiative to train teams of students at universities around the world on how to use the Ushahidi platform.

CrisisCommons

CrisisCamp began as an idea to bring together people who were interested in using technology and telecommunications systems to assist communities in times of crisis. In June 2009, the first CrisisCamp was held in Washington D.C. as an open forum for an interdisciplinary group of practitioners. First responders, humanitarian aid workers, technology experts, academia and the private sector all participated. CrisisCamps have since 'gone viral' and over 50 events have been held since in direct response to earthquakes in Haiti and Chile, flooding in Pakistan, and the Gulf Coast oil spill.

Within minutes of the Haiti earthquake, the informal networks that supported the first CrisisCamp event began to connect with organizations and individuals to form new crisis camps for response. Within 24 hours of the earthquake, CrisisCamps were announced in two cities to take place the following Saturday, followed by cities in California, New York and Colorado. A week later, 13 other cities around the world created their own CrisisCamps.

Technology volunteers of all levels work together during CrisisCamps. They build tools, search and translate data, and solve unique challenges brought forth by the particular crisis. For example, projects supporting Haiti included: i) creation of a software solution to expand long distance Wi-Fi connectivity; ii) development of the first Kreyol mobile translation application; iii) establishment of an online social network to connect the Haitian diaspora.

CrisisCamps also provided support for the already existing volunteer technological communities whose projects or volunteers were supporting the Haiti response efforts, such as: i) CrisisMappers; ii) OpenStreetMap; iii) Sahana Foundation; iv) Ushahidi. CrisisCamps for Haiti hosted mapping sessions to contribute edits to the first post-earthquake base map of Port au Prince. Many of these volunteers had never contributed to a mapping project before; so tools were created from scratch to help CrisisCamp volunteers to quickly learn how to map crisis data for the OpenStreetMap community.

Once the crisis had passed, several lessons learned were identified and addressed to improve upon the performance, relevance, efficiencies, capacities and capabilities of CrisisCamp events. Several disaster risk management organizations (e.g. The World Bank, United Nations and International Federation of Red Cross/Red Crescent (IFRC)) suggested that the time to create relationships, explore potential problem definitions and share lessons learned was during non-crisis mode. This signaled the need for a more permanent and long-term coordination. CrisisCommons was established to improve capacity to work with crisis response organizations on a long-term basis. The focus of the organization is to improve and grow the capability of CrisisCamp events and volunteer contributions to better meet the needs of disaster affected actors.

CrisisCommons provides a forum to bring together communities, advance innovation in both technology and business processes, create capability, and greater situational awareness for crisis response organizations, diasporas and informal networks who seek to aid people in

crisis. These objectives are achieved through the incorporation of lessons learned from the VTCs, dialogue and exercises, collaborative prototypes and toolsets, best practices, data and technical standards development.

The organization builds upon and supports the crisis focused CrisisCamps to create a participatory culture of innovation supporting crisis management and global development. At the same time, CrisisCommons seeks to connect volunteer technology communities to crisis management structures such as the UN system.

PUBLIC-PRIVATE-PEOPLE-PARTNERSHIPS

Random Hacks of Kindness (RHoK)

Random Hacks of Kindness (RHoK) is a collaboration between Google, Microsoft, Yahoo!, NASA and The World Bank dedicated to building a volunteer community of innovation focused on creating software solutions to disaster risk management challenges.

RHoK was conceived in June 2009 at the inaugural CrisisCamp Bar Camp held in Washington D.C. At that camp, an industry panel spoke about software and disaster risk management, agreeing that certain issues of global importance take precedence over competitive business concerns. That panel included representatives from Microsoft, Google, and Yahoo!, who agreed to work together and to collaborate with The World Bank and NASA in mobilizing their developer communities to volunteer to create practical software solutions to real world problems.

A RHoK event is an intensive weekend marathon of brainstorming and programming, drawing together the talent and initiative of some of the best and brightest developers in the world. They volunteer their time to collaborate with subject matter experts in disaster risk management to develop software solutions that can have concrete impact.

RHoK held its inaugural event in Mountain View, California in November 2009, resulting in software solutions that were used on the ground following the devastating earthquakes in Haiti and Chile in early 2010. One winning application allowed mobile phone users to send a message to a broad network of contacts through email, SMS, and social networking tools letting family and friends know that they were OK, with the click of a single button. Another solution allowed earthquake responders in Chile to crowdsource information about the earthquake's impact using a community-developed Twitter syntax.

In June, 2010 the initiative went global, with a main stage event in Washington D.C. and simultaneous satellite events in Kenya, Brazil, Indonesia, Australia and Chile. Hundreds of volunteers around the world, spread across five time zones and working in multiple languages, collaborated for forty-eight hours of intense brainstorming and programming. The winning hack from the Washington D.C. event, a visual tool to map and calculate landslide risk, is already being piloted by The World Bank in landslide-affected areas, and other hacks have received interest and support from governments and risk management specialists worldwide.

Since its inception, the RHoK community has been expanding to incorporate an ever-growing number of developers, subject matter experts and organizational partners. The December 2010 RHoK event took place in over 20 cities around the world in collaboration with hacker groups, NGOs, civil society organizations, private companies, multinationals and local, state and federal governments.

As the community grows, RHoK will continue to collaborate with other VTCs to work together in creating a new development model that can effectively harness the talents, expertise and volunteer initiative of technology experts on a global level, while connecting their community to the governments, agencies and vulnerable populations who need immediate solutions.

Photo: RHoK São Paulo

CONCLUSION

When Thomas Kuhn defined paradigm change in *The Structure of Scientific Revolutions*, he described a state where a traditional framework and several experimental approaches existed in parallel–a period when the explanatory power of the old system wanes while some inchoate new system explores and codifies the methods that are strong enough to begin replacing the old ones. While VTCs will never replace the current institutional frameworks, crisis response and other elements of the disaster risk management cycle are approaching a state resembling a shift in paradigm.

When dealing with the challenges of mapping and coordination in post disaster Haiti, decentralized VTCs were faster and more adaptable than centralized bureaucracies. Instead of publishing a request to build a new map of Haiti to be delivered in a few months as a traditional institution would, OpenStreetMap simply went about making maps. It negotiated intellectual property licenses with commercial satellite providers to trace aerial imagery and scoured map libraries to build a new map in a matter of days. In similar fashion, Ushahidi performed its role of aggregating social media reports. Instead of waiting to see if it could deploy staff under UN Disaster Assessment and Coordination (UNDAC) to support the urban search and rescue teams, Ushahidi coordinated with the emergency shortcode 4636 initiative to aggregate SMS reports from Haiti and created an RSS feed that the US Coast Guard and UNDAC integrated into their own protocols.

For all the exciting possibilities that exist for VTCs to accelerate the tempo of humanitarian response and disaster risk management, they face important challenges that will shape their ability to define a new paradigm. It is an open moment for the traditional operators to ensure that we make best use of this rich resource. There are at least five questions that need to be asked:

1. **How will the new VTCs ensure that the lessons learned from decades of international development and humanitarian operations will be integrated into the tools and practices that they are creating?** Many of the technologists that are building new platforms for imagery, mapping, and information sharing have limited field experience, and have an engineer's approach of "just do it." Traditional players will need to ensure that these technologists are exposed to the wisdom of old hands and that these communities are developing tools that meet the direct needs of the 'clients'.

2. **How will VTCs integrate with both traditional development and humanitarian organizations and the affected populations?** Most international operations occur within the official context of government to government or government to international

institution interaction. If VTCs link citizens to citizens directly and mobilize assets across borders, they may run afoul of the national and international systems that are already in place. Combined with the tendency of engineers to "just do it," this paradigm shift may be welcome in some areas and not in others.

3. **How do we broaden the agenda of the VTCs to encompass the full disaster risk management cycle and thus increase their impact?** While it is obvious to say that risk reduction is a more effective strategy than a better response to save lives, it is not obvious how to put the right incentives in place to engage these communities during 'peace' time to leverage their capabilities. There is great potential to include these communities and technologies within the preparation stage. VTCs like RHoK, MapMaker and OSM are achieving this, but it is only the beginning.

4. **How will these VTCs become sustainable partners?** Humanitarian operations require substantial resources, especially for teams that deploy to the field. Many VTCs have budgets less than $100K per annum to run communities that serve purposes beyond crisis response. For example, OpenStreetMap also maps bike routes and enables territories like Palestine to build completely free and open maps. The question of how these institutions will be reliable partners to response operations without a significant increase to their resources is a key area of inquiry that all partners must explore.

5. **How will the VTCs scale?** Along with the question of sustainability, VTCs need to determine how they will scale as decentralized organizations. While it is generally easy to recruit new technologists, building durable decision-making processes and dispute resolution mechanisms that scale from hundreds of volunteers to tens of thousands of people requires careful planning (it has been done: one need only look at Wikipedia). Discussions among some VTCs about how to adapt these existing methods are in their infancy.

VTCs have quickly become a critical asset. In Haiti, Chile, Pakistan, and beyond, they developed creative solutions to informational and technological challenges. The output from their work continues to directly benefit vulnerable populations, response agencies and governments. Their "maps and apps" are helping to save lives and property. Moreover, their solutions can be leveraged to inspire the international community to introduce a new modality of working, "Development 2.0" or "Open Development." Following the established notion of Web 2.0, Open Development is also built on the central premise that mass collaboration changes everything. It is community not technology that distinguishes this new modality and VTCs are a wonderful example.

The international community stands at the beginning of this partnership with the VTCs, and we are just beginning to understand how to effectively harness their energies. A process is understood not by stopping it, but by moving and flowing with it. Thus, to realize the full potential of the VTC community, it is imperative that we enter into the process as a committed partner and member of this community.

Community is central to OpenStreetMap. Central to that spirit of community is the running meme of cake slicing at its Mapping Parties. This cake was shared at the Marikina, Philippines Mapping Party.

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