

DIGITAL HUMANITARIAN NETWORK

Leveraging Digital Networks for Humanitarian Response Lighthouse Case Study

The tragic earthquake that devastated Haiti in 2010 gave rise to a new way of mobilizing and coordinating disaster assistance. Thousands of “digital humanitarians” converged on the Internet to help first responders collect, triage, and visualize the unprecedented pleas for help that were pouring in from the mobile phones of affected Haitians. These digital humanitarians, now known as the Volunteer & Technical Communities (V&TCs), have responded to numerous crises around the world—but concerns about organizational style, data quality and accuracy, and the utility of end products, have raised barriers to collaboration and partnerships.

The Digital Humanitarian Network (DHN) was launched to serve as an interface between V&TCs and the broad humanitarian community. DHN is now a model of effective collaboration between distributed and digitally-enabled networks of citizens and more formal international organizations.

Table of Contents

Case in Brief	1
Rise of the Digital Humanitarians	1
Haiti: The Disaster that Triggered a Revolution in Humanitarianism	3
The Emergence of Volunteer and Technical Communities	6
Remaining Challenges	7
Barriers to Collaboration	7
Barriers to Growth	9
The Digital Humanitarian Network	13
DHN in Action	14
Implications for Network Leaders	16
Appendix I:Types of Volunteer and Technical Communities	19
Appendix II:DHN Activation Process	20
Endnotes	21
About Global Solution Networks	26





Case in Brief

The tragic earthquake that devastated Haiti in 2010 will forever be remembered for the sheer scale of human misery it caused. It will also be remembered, however, as the humanitarian disaster that gave rise to a fundamentally new way of mobilizing and coordinating disaster assistance. At the time, thousands of “digital humanitarians” converged on the Internet to help first responders collect, triage, and visualize the unprecedented pleas for help that were pouring in from the mobile phones of affected Haitians. These digital humanitarians have since become known as the *Volunteer & Technical Communities (V&TCs)* and have responded to numerous crises around the world. While their contributions are generally viewed as positive by NGOs and international organizations, concerns about organizational style, data quality and accuracy, and the utility of end products, have raised barriers to collaboration and partnerships.

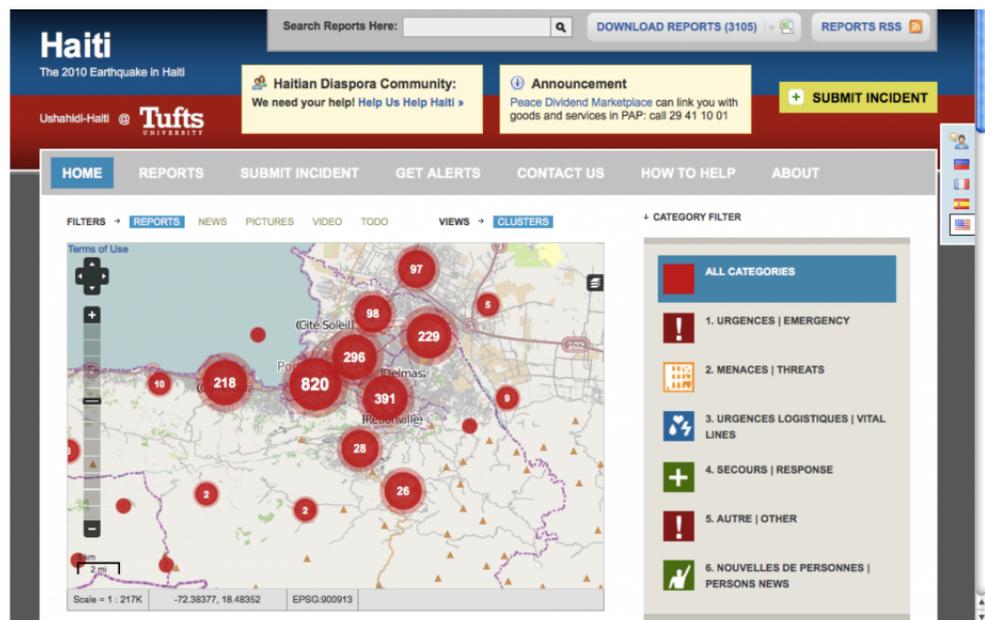
To address these concerns, influential V&TC leaders and key change-makers within the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) launched the Digital Humanitarian Network (DHN), an interface between these networks and the humanitarian system. DHN now functions as a global *Operational and Delivery Network* through which formal humanitarian organizations can access the vast networks and skills of its 18 member V&TCs in disaster response situations. In doing so, it serves as a model example of effective collaboration between distributed and digitally-enabled networks of citizens and formal international organizations.

Rise of the Digital Humanitarians

In 2010, a new dynamic emerged in humanitarian affairs. Following a catastrophic earthquake, Haitians used their readily available mobile devices to seek help via text message, email, and social media. This fast and pervasive source of contact, combined with the presence of the entire United Nations crisis response system and tens-of-thousands¹ of non-governmental organizations (NGOs), resulted in information overload. The traditional system was simply unable to recognize, triage, or take action upon these direct requests for assistance. In order to fill this gap, thousands of volunteers from around the world mobilized and self-organized as “digital humanitarians” to help collate and map the information that was pouring in from the affected communities. The tools these individuals and groups produced proved invaluable to disaster responders and demonstrated the huge potential of new technologies and remote support for disaster response. While one network mapped crisis related tweets, another sent geographic information system (GIS) experts to the ground to begin mapping damage assessments. One group contacted members of the

Haitian diaspora to translate text messages, and another used satellite imagery and social media to determine where roads were blocked and infrastructure destroyed. These efforts combined to give disaster responders the information they needed to make relevant and effective decisions about where, how, and when to deploy resources.

These groups have since become known as the *Volunteer & Technical Communities (V&TCs)* and have responded to numerous crises around the world. However, the reception of V&TCs into the humanitarian community has not been universally positive. Concerns about organizational style, data quality and accuracy, and the utility of end products, raised barriers to collaboration and partnership. For example, data from social media is easily fabricated by individuals and/or malevolent state actors who wish to subvert humanitarian assistance or direct it to their own needs. Formal humanitarian organizations, such as the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), lacked confidence in the verifiability of this data and the accountability of V&TCs. The formal humanitarian organizations also struggled conceptually on how to connect with potentially thousands of volunteers and manage their work.² Ultimately, these concerns resulted in a major disconnect between the vision of a “networked age” for humanitarianism, and the reality.



Ushahidi Crisis Map - Haiti³

To address this divide, a number of V&TC leaders and key change makers within OCHA launched the Digital Humanitarian Network (DHN), an interface between these networks and the humanitarian system.⁴ The DHN is an “Operational and Delivery Network,”⁵ in that it supplements the efforts of traditional humanitarian institutions by delivering technological and information-based solutions that its members create. There are currently





18 members of the DHN, including several types of solutions providers. For example, GNUcoop provides technical solutions such as the crisis-mapping platform Ushahidi; UN Online Volunteers is a networked extension of the United Nations; and Translators Without Borders taps into a diaspora in order to translate vital information during a crisis. These various technological, volunteer, and professional groups have come together under the DHN banner and are working to produce a significant paradigm shift in the field of humanitarian affairs.

The DHN provides a central portal, through which formal humanitarian organizations access the vast networks and skills of V&TCs. Acting as a clearinghouse, the DHN accepts requests for assistance from various organizations, determines whether requests are within the mandate of the DHN and its members, and forms a multi-V&TC “solution team” in order to respond. The DHN also facilitates knowledge sharing between V&TCs, promotes best practices, and enables partnership between the humanitarian system and its members. Since launching in 2012, the DHN has been used multiple times by OCHA, the United Nations High Commissioner for Refugees, and disaster preparedness NGOs to support and enhance crisis response. The recent deployment of the DHN in response to Typhoon Haiyan in the Philippines resulted in an unprecedented level of collaboration between V&TCs themselves, and with the larger system. However, this experience also reaffirmed that humanitarianism is a system in flux and that the DHN will be pivotal to the system’s ability to manage and adapt to change.

Haiti: The Disaster that Triggered a Revolution in Humanitarianism

The Haitian earthquake is marked throughout the literature as a major turning point for humanitarian affairs. On January 12, 2010, a 7.0 magnitude quake struck near the capital city of Port-au-Prince. An estimated 220,000 people died, over 300,000 people were injured, and 1.5 million people were left homeless.⁶ Furthermore, the key sources of information for disaster response—civil servants and government officials—were either missing, deceased, or displaced. As such, disaster responders entered a situation of absolute chaos with a complete absence of baseline data.

Fortunately, despite its immense poverty, Haiti was saturated by mobile phones. In the wake of the earthquake, Haitians used their phones to issue pleas for help, describing, according to a recent report from the Harvard Humanitarian Initiative, “broken bones and lack of food and water...clues about an address or location of people in need...information about missing loved ones.” This unprecedented availability of information technology had the potential to greatly enhance the situational awareness of disaster response agencies. Yet, precisely because it was unprecedented, formal humanitarian organizations did not have the human resources or processes necessary to decipher and act upon the inflow of information.



That said, many of these messages were visible online globally, and thousands of ordinary citizens mobilized to aggregate, translate, and plot this data on maps that in turn were used to support the disaster response. For some, simply making a donation to a relief organization might feel “hollow” and leave them wishing that they could do more to help. Digital humanitarians recognized that they had the skills, and now had the tools, to do more and began to provide remote support.⁷ In one example, a group of students in a Boston dorm room coordinated a crisis map that proved invaluable to disaster responders.⁸ In an email from the Marine Corps in Haiti to those who organized the map, the writer credits the site directly in saving the lives of two elderly women and a young girl.⁹ Examples such as this make the potential of digital humanitarians undeniable.

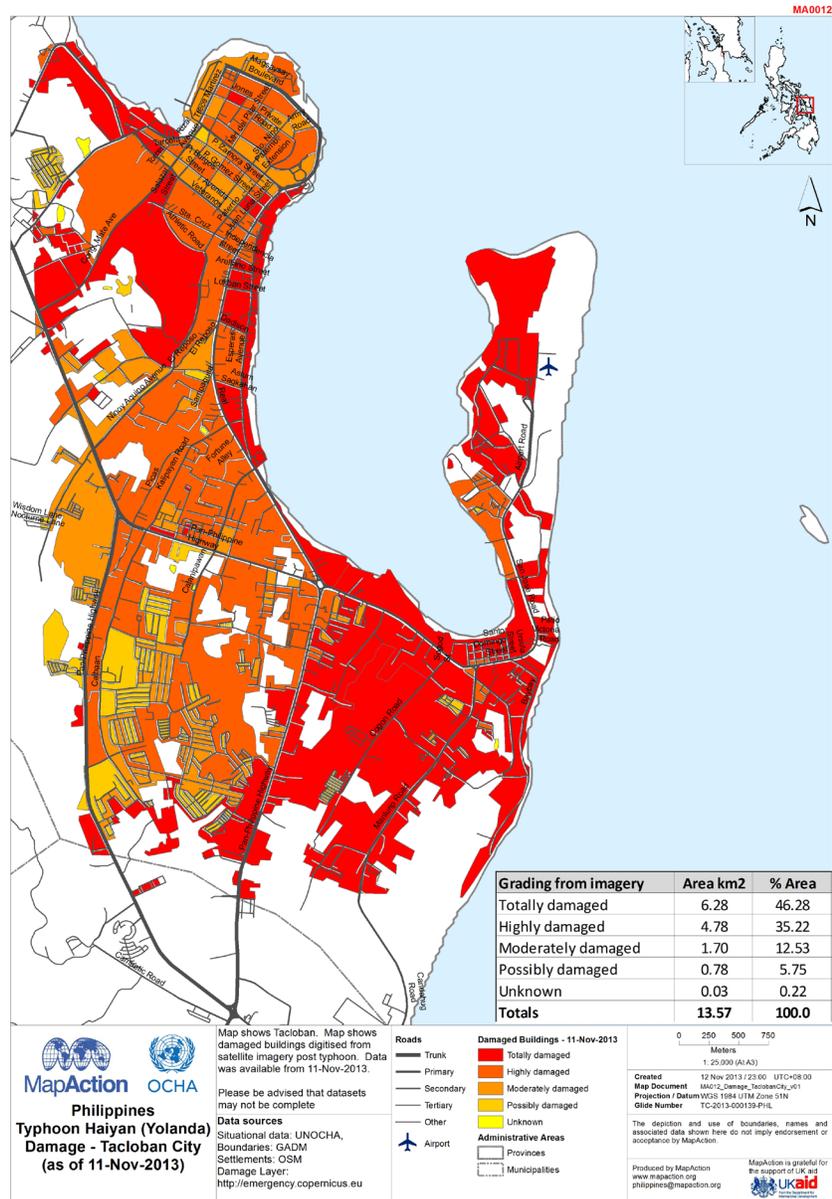


Haitian students in the United States volunteered to translate and relay tweets and texts from the ground.¹⁰

Still, the humanitarian system is struggling to adapt to these ground-breaking achievements. Beyond simply being connected, the ability to manage the available information and translate it into useful knowledge for decision-makers has become a primary concern. As such, the headquarters of organizations like the World Bank and the United Nations have poured millions of dollars into information management systems and capacity building.¹¹ In the field however, despite significant advances in connectivity and technology, disaster responders often remain tethered by ingrained policies and procedures based on the era of paper and pen. There is a sense of urgency at the international level to overcome these challenges in information management. It is expected that climate change, resource scarcity, and increasing urbanization will mean more frequent and more severe humanitarian crises in the future.¹² At the same time, *Humanitarian Horizons: A Practitioners' Guide to the Future* by the Feinstein International Center at Tufts University advises that global austerity and decreasing



commitments from donor countries mean that “the humanitarian system will be asked to address significantly more need with significantly fewer traditional resources.”¹³ Therefore, it will be vital to future humanitarian response to utilize all available information sources and to make informed decisions that use limited resources efficiently.



Damage map of the Philippines produced by MapAction following Typhoon Haiyan¹⁴



“ Within moments of the 2011 earthquake and tsunami in Japan, a specific Twitter hashtag to coordinate efforts was established; OpenStreetMap began a map detailing the status of infrastructure such as roads; and Sinsai.info, an Ushahidi-based crisis map, located needs requests via tweets and emails. ”

The Emergence of Volunteer and Technical Communities

Since the Haitian earthquake, the individuals and networks that responded digitally have coalesced under the term Volunteer & Technical Communities (V&TCs). V&TCs can be defined as “communities of volunteers and/or professionals who seek to leverage their skills and today’s technologies to assist formal humanitarian response and affected populations during times of crisis.”¹⁵ There are roughly four categories of V&TCs: crowdsourcing umbrellas; community centralizers; volunteer connector platforms; and technological solutions providers (see Appendix I).

V&TCs have been involved in numerous crises since 2010, in various capacities. Within moments of the 2011 earthquake and tsunami in Japan, a specific Twitter hashtag to coordinate efforts was established; OpenStreetMap began a map detailing the status of infrastructure such as roads; and Sinsai.info, an Ushahidi-based crisis map, located needs requests via tweets and emails. Corporations also got involved. For example, “Google launched its Person Finder platform and mobilized 5,000 volunteers to create over 600,000 personal records during the 90 days the platform was live.”¹⁶ V&TCs have provided their services to the 2010 wildfires in Russia, the 2012 flooding in Pakistan, civil crises in Libya, Egypt, and Syria, and more recently, the 2013 typhoon in the Philippines. In places where state capacity is weak, V&TCs and new technologies have facilitated crisis management for local populations and disaster responders.¹⁷ However, this ground breaking dynamic is not limited to the developing world context. In 2012, an estimated 20 million tweets were issued in relation to Hurricane Sandy. It became clear at this point that populations around the world expect disaster responders to react to requests for assistance via social media quickly and effectively.¹⁸

Before, during, and after Haiti, the various V&TCs have evolved and matured. The oldest V&TCs, MapAction and GISCorps, have been working with humanitarian agencies since the early 2000s to improve the use of geospatial technologies. In October 2009, the first International Conference of Crisis Mappers took place and “brought together geospatial experts from the United Nations, the private sector, and the public sector—including multiple governments.”¹⁹ This meeting established the relationships necessary for the participants to engage, collaborate, and coordinate rapidly in response to the Haitian earthquake.²⁰ More recently established V&TCs have quickly grown into vast volunteer networks. The Standby Task Force (SBTF) established in 2010, for example, has since grown to include over 800 volunteers in over 80 countries.²¹

V&TCs have clarified their roles and responsibilities, designed specific workflows, and established more official relationships with formal humanitarian organizations. For example, V&TCs have typically delineated responsibility for volunteer management, data verification, and organizational coordination. Some have legally incorporated so that they may “receive funding, sign contracts, and limit their members’ liabilities.”²²



“...not all V&TCs adhere to the humanitarian principles of impartiality, neutrality, and independence. These principles are often vital to the humanitarian community’s ability to work in certain areas of the world. A failure to respect them can potentially endanger the lives of relief workers.”

Others have chosen to remain loosely affiliated networks in order to retain flexibility and agility. Regardless, V&TCs have demonstrated their value and utility to disaster response—to the point where in 2011, the head of OCHA’s Information Services Section specifically requested the assistance of the SBTF in order to gain insight into the unfolding situation in Libya.²³ As OCHA did not have any staff on the ground and information through official channels was limited, OCHA relied on the SBTF to gather what was available in online forums in order to attain a basic level of awareness. The capacity and skills provided by V&TCs are increasingly recognized as a valuable asset to disaster responders.

Remaining Challenges

Better integration of emerging response organizations into the traditional humanitarian system has proven a formidable challenge. First, there are significant barriers to collaboration posed by the V&TCs acquired allegiance to the humanitarian principles, their informal organizational structures, a lack of trust in the data provided by V&TCs, and an inability to merge the information provided by V&TCs into existing processes. Second, there are formidable barriers to the growth of V&TCs created by competition between the various networks and the process—sometimes painful—of professionalization that they must undergo in order to be seen as reliable members of the humanitarian system. It was these remaining challenges that led to the recognition that the Digital Humanitarian Network was needed.

Barriers to Collaboration

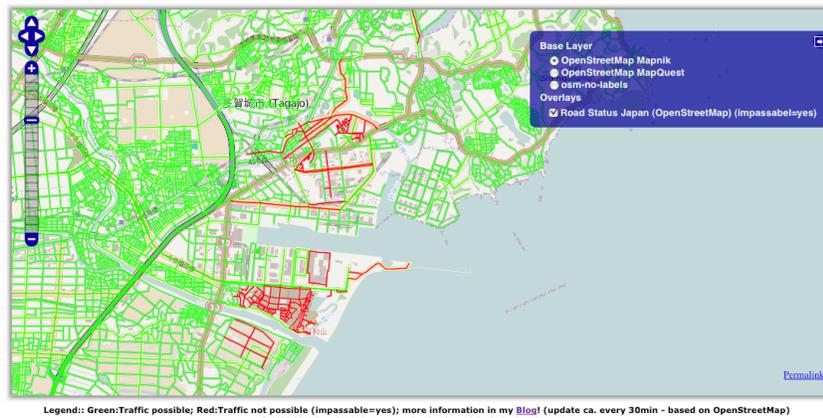
A primary disconnect between V&TCs and formal humanitarian agencies exists on the foundational aspects of what is required to participate in the humanitarian system. A fundamental problem: not all V&TCs adhere to the humanitarian principles of impartiality, neutrality, and independence.²⁴ These principles are often vital to the humanitarian community’s ability to work in certain areas of the world. A failure to respect them can potentially endanger the lives of relief workers.

In addition, while some networks have certainly established themselves, formal disaster response agencies have a difficult time working with networks that emerge from the grassroots due to their lack of organizational structure, internal quality controls and lines of accountability.²⁵ In order for disaster response to be efficient and effective, it must be based on “reliable, consistent, and sustainable” partners—criteria which not all V&TCs have been able to deliver.²⁶ When disaster strikes, there is no time to determine which actors still exist. It has also become apparent for V&TC leaders that it is difficult to sustain momentum behind volunteer engagement and that they must contend with potential burn-out and even rogue volunteers.²⁷ That



being said, the problem also lies with formal humanitarian organizations which are failing to adapt to “more diverse and bottom-up forms of decision-making.”²⁸ At best, formal organizations have regarded V&TCs with cautions optimism; at worst, they have responded with “anti-body reactions.”²⁹

There are also significant concerns surrounding data itself. For example, the privacy of citizen data and sensitivity of relief information is of significant concern—especially in conflict zones. In some circles, Big Data is called “the biggest-ever threat to human rights.”³⁰ There are also questions about the credibility and accuracy of the data products that V&TCs produce. For example, during the Haitian response, there were multiple instances of individuals tweeting and texting about sounds of survivors in the rubble when the objective was to gain faster attention for recovery of a loved one’s body.³¹ Furthermore, while V&TCs and the GSN project focus on “the Internet for good,” repressive regimes and other actors are also becoming increasingly adept at monitoring and interfering in these efforts for their own purposes.³² Ensuring that the data gathered respects all ethical and legal standards, while also protecting it from manipulation, is of the utmost importance in gaining the trust and respect of formal humanitarian agencies for V&TC



The Humanitarian OpenStreetMap Team produced this map of roads that were passable/ impassable following the Japanese earthquake and tsunami in 2011. It is unclear, however, if this map was used by disaster responders, or if the information provided was helpful.³³

Finally, while V&TCs may have begun to solve the problem of information management for formal humanitarian organizations, the capacity of those organizations to receive and take action upon new sources of information remains limited. On the one hand, disaster responders aren’t necessarily aware that V&TCs and the products they produce exist.³⁴ On the other hand, if they are aware, there may be no established protocol or process for connecting with V&TCs and integrating their products into established systems. A lack of coordination across V&TCs can mean a duplication of effort or varying conclusions provided.³⁵ As a result, V&TCs can unintentionally add to the “information overload problem” faced by disaster responders.³⁶



It became clear that despite recognition on both sides that the assistance provided by V&TCs was valuable, there is a major gap between vision and outcome. Throughout the literature, the need for an “interface,”³⁷ a “participatory marketplace,”³⁸ or a “coordination body”³⁹ for V&TCs is articulated. V&TCs acknowledge that standards and quality must be guaranteed in order for them to be considered trust-worthy partners. Formal humanitarian organizations recognize that “the ways in which people interact will change, with or without the sanction of international humanitarian organizations.”⁴⁰ Without adaptation, they risk irrelevance. As such, based on a partnership between the leading V&TCs and OCHA, the Digital Humanitarian Network was established to bridge the gap.

Barriers to Growth

In addition to the barriers to collaboration with formal humanitarian organizations, V&TCs have also struggled with barriers to growth and collaboration among themselves. As the following two examples of DHN members outline, the need to achieve reliability and effectiveness for partnership with formal humanitarian organizations has forced V&TCs to formalize their operations to a certain extent. This process has led to both positive and negative experiences for V&TCs. Instant success, strong personalities, and conflicting visions can result in stagnation and even destruction of a network. Because of this, the DHN was also established to ensure communication and knowledge sharing between V&TCs so that lessons learned by one network can benefit all digital humanitarians.

The CrisisCommons Experience

CrisisCommons, a member of the DHN, was one of the first V&TCs and quickly grew to be one of the largest and most well recognized. Inspired by BarCamp, an “ad-hoc un-conference born from the desire for people to share and learn in an open environment,”⁴¹ the first CrisisCamp was held in the spring of 2009.⁴² This event, hosted by the World Bank in Washington DC, provided an:

*open forum for practitioners, first responders, humanitarian aid workers, technologists, academia and the private sector to come together to explore opportunities to enhance the capabilities of citizens, communities and crisis response organizations [and their] capability and capacity to respond to, recover from, mitigate against and prepare for crises.*⁴³

The event established a network of creative and innovative thinkers on crisis response and spawned countless local CrisisCamp groups around the world.



“When the Haitian earthquake hit, the now ‘CrisisCommons’ network responded en masse. This was described as ‘both a blessing and a curse for the organization.’”

CrisisCommons Strategy 2012



When the Haitian earthquake hit, the now “CrisisCommons” network responded *en masse*. This was described as “both a blessing and a curse for the organization.”⁴⁴ The power of digital volunteer networks was made abundantly clear as thousands of global citizens collaborated to collect, aggregate, and produce valuable data for disaster responders. But at the same time, this tremendous growth occurred via an organization that had not yet defined itself, its mandate, or parameters for action. The instant success of CrisisCommons drew a great deal of attention from the media and other observers—and often, credit that was due to multiple V&TCs was attributed to CrisisCommons alone, raising tensions between separate groups. Furthermore, the reluctance of the founders to establish a governance structure resulted in the network’s leadership being left in the hands of one individual who had the time and financial flexibility for sustained involvement. While probably well-intentioned, this individual did not necessarily have the technical, non-profit, or humanitarian experience required to head such a network organization. Ultimately, this individual unilaterally controlled the direction of the network and made decisions on behalf of its members.

In the years that followed, CrisisCommons groups around the world continued to hold CrisisCamps in response to multiple emergencies. However, as the network tried to better integrate itself with formal humanitarian organizations such as the UN and the World Bank, clearer delineations of responsibility and accountability were needed. The Sloan Foundation awarded the Woodrow Wilson Center (on behalf of CrisisCommons) a \$1.2 million dollar grant in 2010 with the goal of developing the underlying infrastructure of CrisisCommons.⁴⁵ In order to administer this grant, the Wilson Center hired the aforementioned



leader to produce the required deliverables. This development was not communicated to the wider CrisisCommons community, was not decided upon democratically, and as a result, internal and external relationships soured. According to a number of prominent individuals in the V&TC community, the direction CrisisCommons took was not true to the original vision and many qualified and committed individuals disassociated from the network during this time. In the end, under the control of a single individual, Crisis Commons failed to meet the expectations set by the grant and the network's reputation was severely damaged.

Inevitably, the self-declared leader left CrisisCommons and the organization has since been trying to rehabilitate its image. In May 2012, an Interim Management Team met in Toronto, Ontario “for a strategic planning session focused on helping the organization transition effectively to incorporation as a non-profit corporation.”⁴⁶ The current leadership of CrisisCommons sees the project as a platform which should serve to facilitate, rather than direct, digital crisis response. This includes fostering a global network of CrisisCamps, but also improving communication between V&TCs themselves and formal humanitarian organizations. The CrisisCommons 2012 strategy explicitly addresses the problem of “recent history” and the likely questions of relevant stakeholders as to whether CrisisCommons is “the right organization to effectively fill [this] role.”⁴⁷ The strategy discussed the consensus among V&TCs that “connective tissue” was needed, and that the independence and uniqueness of each individual V&TC were to be respected.

However, there are still residual tensions between CrisisCommons and other actors. And despite the stated goal of the V&TC community to model itself after Anonymous or Wikipedia, there are strong personalities leading these groups and clashes of opinion about how to proceed are unavoidable. Competition may drive each organization to improve its services and operations, but collaboration has been a defining feature of humanitarian affairs since it was established prior to World War One. As stated by Andrej Verity, “as long as the mutual goal of improved crisis response is kept in mind, disagreements are usually negotiable.”⁴⁸

The Standby Task Force Experience

The Standby Task Force (SBTF) was launched in 2010 at the International Conference of Crisis Mappers. Led by one of the key thought leaders on digital humanitarianism, Patrick Meier, the SBTF is aimed at “assisting crisis affected communities through co-operation with local and international responders.”⁴⁹ The SBTF liaises with disaster responders to determine exactly what kinds of products would be most useful, in what format, and through which channels. The SBTF also provides an umbrella for global volunteers with a wide variety of skills in crisis mapping, geographic information systems, social media monitoring, data management, and research. During times of crisis, the SBTF puts these together to produce timely, effective, and efficient assistance.

As a more recently established V&TC, the SBTF benefited from the lessons



learned in previous crisis contexts and observed the organizational development experiences of other organizations. While initially the SBTF sought to maintain a loose organizational structure, in 2013 the leadership of the network launched an updated version: SBTF 2.0.⁵⁰ The SBTF 2.0 document recognizes the need for the V&TC community as a whole to acknowledge the various groups that have emerged, and their areas of strength and expertise. Meaning that the SBTF needs to clarify and hone the services it offers formal humanitarian organizations, essentially defining its comparative advantage. The new strategy also states that the network will be incorporated into an NGO in order to receive funding and that it must ensure the utmost quality of its products, or risk being deemed irrelevant.

In order to achieve its vision, the SBTF has organized itself in three tiers:

Standby Task Force Organization										
Tier One	Advisory Board (4 individuals)									
Tier Two	General Coordinators (2)	Volunteer Engagement (2)	NGO Incorporation and Fundraising (2)	Online Presence (2)	New Partnerships and Technology (1)	Verification Team Leaders (2)	Geo-Location Team Leaders (2)	Data Mapping and Analysis Team	Task and Research Team Leaders (2)	Monitoring and Evaluation Team
Tier Three	Volunteers (800+)									

Tier one—the Advisory Board—is made up of the SBTF’s key founders and works to assist tier two—the Core Team—with “strategic guidance, establishing partnerships and promoting the network.”⁵¹ The Core Team consists of experienced and highly capable SBTF volunteers who dedicate their time to either the overall administration of the network, or to the leadership of tier three—the SBTF’s numerous volunteers. For example, the “NGO Incorporation & Fundraising” core team members work to move the SBTF toward incorporation as a legal entity, while the Verification Team ensures that the data products produced by digital volunteers are accurate and reliable. This modular structure allows the SBTF to remain flexible and adaptive, while the delineation of responsibility ensures the quality of their work. The SBTF has also created its own apps, such as MicroMappers, to assist volunteers in cataloging information and reducing human error. The SBTF demonstrates the importance of responding to lessons learned and working with established organizations to ensure that the common goal (in



this case, improved disaster response) is met.

The Digital Humanitarian Network

The Digital Humanitarian Network (DHN) was created in order to improve collaboration between V&TCs and formal humanitarian organizations, to facilitate communication between V&TCs, and to support the development of all. Officially, the DHN is an umbrella organization for V&TCs and their networks of digital humanitarians. The stated purpose of the DHN is to “leverage digital networks in support of 21st century humanitarian response.”⁵² The DHN refers to itself as a “network-of-networks,” and aims to provide a unified interface between V&TCs and formal humanitarian agencies.

At its most basic, the DHN provides a portal for humanitarian organizations to articulate needs and activate assistance from V&TCs (see Appendix II). DHN coordinators receive a request and determine if it is consistent with the mandate of the DHN and whether it is within DHN’s ability to assist. DHN then contacts the particular V&TC that can best manage the request, or if necessary, compiles a solution team of multiple V&TCs.⁵³ DHN provides humanitarian organizations a one-stop-shop for its vast network of experts, professionals, and volunteers, with a range of skills including social media-monitoring, crisis mapping, and big data analysis.⁵⁴ Ultimately, this new dynamic provides humanitarian agencies the “surge capacity” necessary for managing the explosion of data that occurs following a disaster.⁵⁵

DHN Members		
Connected Development [CODE]	GNUcoop	PeaceGeeks
Crisis Commons	Help Earth Foundation	Standby Volunteer Task Force
DataKind	Humanitarian OpenStreetMap Team	Statistics Without Borders
Disaster Tech Lab	Humanity Road	Translators Without Borders
Esri	Info4Disasters	UN Online Volunteers
Geeks Without Bounds	MapAction	URISA GISCorps

However, DHN does a great deal more than simply connecting disaster responders to V&TCs. The DHN also promotes knowledge exchange between different V&TCs and ensures that lessons learned in one context result in operational improvements across all organizations.⁵⁶ It promotes best practices such as creating a Code of Conduct for volunteers and developing



data protection policies that consider new tools such as crowdsourcing.⁵⁷ Furthermore, DHN works with formal humanitarian organizations to determine the types of end products that are most useful and ensures that datasets and programs are compatible. DHN lends credibility to its member organizations and this reassures formal humanitarian organizations that the V&TCs they are working with have developed the processes and protocols necessary to ensure quality and reliability. Overall, DHN provides the connection port between V&TCs and humanitarian organizations that mitigates many of the challenges identified above.

The DHN as an organization is light—it relies on four coordinators, the co-founders, and other invested individuals to operate the portal, facilitate interaction between members, and produce relevant materials. DHN has no headquarters—and most of its members do not either. V&TCs typically style their organizational models after online communities like Wikipedia, meaning that they use modular, flattened, and decentralized structures for decision-making and operations.⁵⁸ While this is not universally true—some V&TCs resemble for-profit corporations or NGOs—DHN and many of its members utilize cloud computing and collaboration tools such as Google Docs and Loomio to conduct their affairs based on consensus decision making.

DHN in Action

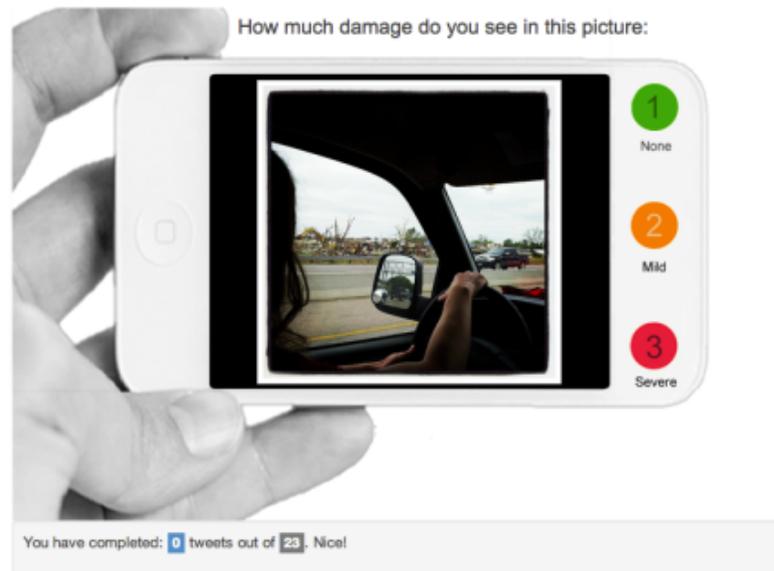
Since establishment, DHN has been activated numerous times, by various types of stakeholders, in very different contexts. OCHA has activated DHN in response to renewed conflict in South Sudan and to the 2013 flooding in Uttarakhand, India.⁵⁹ The United Nations High Commissioner for Refugees used DHN to quickly translate their website into Arabic in order to provide localized response information regarding the Syrian refugee crisis.⁶⁰ DHN has also been used to improve disaster preparedness by gathering information about the Democratic Republic of Congo on behalf of the Assessment Capacities Project (ACAPS).⁶¹

In November 2013, DHN was activated by OCHA to help with the humanitarian response to Typhoon Haiyan (also known as Typhoon Yolanda) in the Philippines. The most powerful storm to hit the disaster-prone Philippines in decades, Typhoon Haiyan killed over 6,000 people⁶² and destroyed over 2 million homes.⁶³ DHN was activated by OCHA on 7 November 2013, just prior to the Typhoon making landfall.⁶⁴ Eight DHN members participated in the response: the SBTF, Humanitarian OpenStreetMap Team, GISCorps, Humanity Road, Info4Disaster, MapAction, Translators Without Borders, and Statistics Without Borders. The SBTF estimates that it filtered 55,000 tweets in real-time through a tool it has created called MicroMappers, which allows volunteers with limited tech skills to tag tweets and images with basic information such as “not relevant” or “mild damage.”⁶⁵ The Humanitarian OpenStreetMap Team mobilized over 1,500 contributors to make over 4 million changes to the OpenStreetMap for disaster affected areas based on damage reports from information gleaned by other DHN members.⁶⁶ While Humanity



Road provided social media listening skills, Info4Disaster monitored media sources, and Translators Without Borders provided translation support. MapAction deployed two GIS experts to the field to assist disaster responders with geolocation software. Ultimately, these combined efforts represented an “unprecedented level of collaboration.”⁶⁷

Image Clicker : MicroMappers



Micromapping at work using mobile technology⁶⁸

DHN was also activated by OCHA to augment the traditional Who, What, Where—or 3W—process that formal humanitarian organizations undertake during each disaster response.⁶⁹ Volunteers were used to scour the internet for information on what assessments or surveys had been produced in the Philippines already, what meetings were taking place where, and who else was on the ground. Andrej Verity, cofounder of the DHN and Programme Officer at the OCHA Information Services Section, estimates that for the initial round of 3W products, DHN members provided about 50% of the data.⁷⁰ This clearly demonstrates the capability of V&TCs to augment the existing humanitarian system.

With every crisis that digital and formal humanitarian organizations respond to, new gaps and trends are identified. Patrick Meier points out two particularly interesting aspects of the response to Typhoon Haiyan: that digitally-savvy locals began coordinating mutual-aid online faster than anyone else; and that the once nebulous V&TCs have become formalized to the extent that new digital humanitarians are circumventing the structures that facilitated this “unprecedented collaboration.”⁷¹

Crisis-affected populations have always been the first responders to disasters. As these populations become increasingly adept at coordinating



their own relief, both formal humanitarian organizations and digital humanitarians have found themselves taking a back seat to local ownership. It is vital that the formalized V&TCs determine how to channel the surge of what Meier calls “World Wide (Good) Will.” Following the completion of the SBTF’s formal activation by OCHA, shutting down the volunteer operation proved impossible. In fact, their “volunteers simply kept going, they used (hacked) the SBTF Skype Chat for Yolanda (which already had over 160 members) to self-organize and support other digital humanitarian efforts that were still ongoing.”⁷² While this isn’t necessarily a bad thing, it is outside of the control of the SBTF leaders, the DHN, and OCHA—potentially making missteps, causing harm, and eroding the hard-earned relationships that these groups have established since 2010.

DHN Supporting Partners	UNOCHA	NetHope	Ushahidi
	TechChange	ICT4Peace	Google Crisis Response

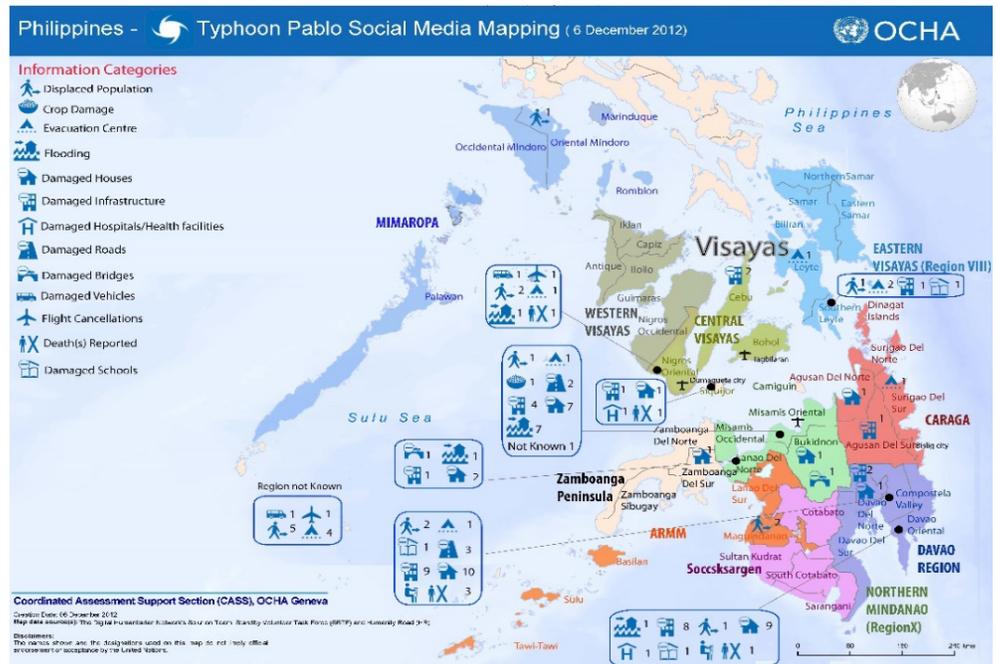
Therefore, it is vital that DHN and its members continue to be innovative, seek new methods of inclusion, and work to empower local communities. The ever-evolving nature of humanitarian affairs demands a dynamic relationship between emerging actors and established organizations. As V&TCs will continue to be the early-adopters of new technology, they will be the drivers of humanitarian innovation.⁷³ DHN is a vital solutions provider to the humanitarian sector as it provides a flexible and evolving sealant between formal humanitarian organizations, formalized V&TCs, and future entrants into the system.

Implications for Network Leaders

Crowdsourcing and volunteer networks demonstrate significant potential to augment and enhance traditional problem solving. V&TCs have emerged almost overnight to play a substantial role in international humanitarian affairs. These groups did not ask permission to become involved—decreasing barriers to entry facilitated by new information and communication technologies have allowed them to simply begin participating. The value of their work was recognized and internal change makers have been instrumental in integrating V&TCs into the existing humanitarian system—improving upon it. In other sectors, there may already be networks or existing technological solutions that could improve institutional problem solving. IBM recently launched an iPhone app for crowdsourcing water quality—information that would be of significant value to institutions that monitor pollution and are concerned with environmental protection.⁷⁴



Another example is the value that crowdsourcing or “citizen sensors” could play in the healthcare and disease prevention sector. In the months that followed the Haitian earthquake, an outbreak of cholera claimed the lives of over 6,500 people.⁷⁵ Research has shown that if social media monitoring had been in place for the symptoms of cholera, twitter could have alerted health agencies to the outbreak long before it became official through traditional means—potentially saving many lives.



Following activation by OCHA, DHN assembled a solution team using the SBTf and Humanity Road to produce this dynamic map for crisis responders ⁷⁶

Self-organization is powerful, but partnerships between networks and traditional institutions will often provide the best long-term solution for enhancing the world’s capacity to respond to global problems.

Crowdsourcing and volunteer networks present a tremendous opportunity to enhance and improve traditional problem solving. However, in many sectors, it will not be possible for these self-organized networks to replace the traditional institutions altogether. In the case of humanitarian affairs, international institutions such as the UN and Red Cross command vast resources and have the unique ability to garner international political support for their efforts. In order to participate in this system, emerging networks must adhere to the founding principles of the system and meet the same expectations of quality and reliability, or risk having their efforts ignored. DHN and its members have shown that it is possible to mitigate this potential conflict by focusing on the need for collaboration and partnership between the old and new. Only by meeting each other half way was it possible for V&TCs to begin significantly improving disaster response. DHN and OCHA are leading by example and showing other international institutions, non-profits, and public sector entities how institutional renewal can be accomplished.



Governance and incorporation are important long-term considerations for nascent solution networks. As evidenced by the CrisisCommons experience, a failure to consider governance, leadership, and organizational structure can result in co-option of the network by inappropriate individuals. Damage to reputation and legitimacy can be irreparable. A basic delineation of roles and responsibilities can prevent this possibility as well as lend credibility to the organization. A reliance on volunteers for network management is a possibility, but limits the organization to being run by individuals who have the time. Incorporation offers the potential for networks to raise the finances required to sustain their operations, but also requires the organization to adopt formal administrative and governance capabilities. These are important trade-offs that the visionaries in global solutions networks need to take into consideration.

Coordination bodies, or a “network-of-networks,” can be a vital tool to enhance the success of individual networks. Although each V&TC has its strengths, each also has its weaknesses. Competition is important to ensuring that organizations continue to hone and improve their services. However, as the post-Haiti experience has shown, too much competition and fragmentation of effort can lead to significant redundancies and a lack of coordination that diminishes the overall effectiveness of the digital humanitarian ecosystem. DHN was established in order to reduce potential conflicts and redundancies between V&TCs, as well as to prevent multiple V&TCs from clamoring for the attention of the formal humanitarian system at the same time. This streamlines the relationship between formal humanitarian organizations and V&TCs, allows them to flourish and change without disrupting this relationship, and improves the quality of the system overall. Indeed, the DHN experience suggests that there could be analogous opportunities to establish coordinating bodies in other domains where redundancy and overlapping roles are a problem, such as in the provision of foreign aid. However, establishing an agreement to be coordinated can also be a challenge and requires careful consideration of governance, voice, and decision-making in order to be sustainable.

The empowerment of individuals means that participants at the local level may increasingly drive global solution networks. While certain challenges will continue to need global coordination, global solutions providers should consider how to better support and facilitate grassroots initiatives, particularly in light of the recent experience in the Philippines where local residents were the driving force behind the coordination of global relief efforts. For some networks, the growing power to organize locally may lessen the need for their services. Network leaders will need to consider how they can best add value in a world where bottom-up problem solving is increasingly the norm. Otherwise they risk falling into the same trap that many international organizations and public sector entities have encountered—that ensuring their own sustainability could become more important than actually solving the problem.



By Mary Milner for Global Solution Networks



Appendix I: Types of Volunteer and Technical Communities

Type	Organization Chart	DHN Members
<p>Crowd Sourcing Umbrellas act as conductors for large networks of global and digital volunteers. These volunteers typically have a wide range of skills and expertise, are distributed, and are activated by the crowdsourcing umbrella in response to a specific crisis, problem, or need. The crowdsourcing umbrella acts as a collective brand for volunteers and helps to connect their work to disaster responders.</p>		<ul style="list-style-type: none"> • Standby Task Force • Humanitarian OpenStreetMap Team • Humanity Road • Info4Disasters
<p>Community Centralizers cultivate networks of individuals with specific technical skills and bring these individuals physically together for an event or deployment where the community is directed toward addressing a specific problem.</p>		<ul style="list-style-type: none"> • CrisisCommons • DataKind • Geeks without Bounds • MapAction • PeaceGeeks
<p>Volunteer Connector Platforms do not themselves get involved in disaster response, but act as a connection agent between requesting agencies and volunteers who want to offer their skills or expertise. These organizations tend to develop a skilled volunteer roster and build established relationships with humanitarian institutions.</p>		<ul style="list-style-type: none"> • Statistics without Borders • Translators without Borders • UN Online Volunteers • Help Earth Foundation • URISA GISCorps
<p>Technological Solutions Providers develop software or technological infrastructure aimed at allowing users to better collect, aggregate, analyze, and present the information which may be gleaned from new ICTs.⁷⁷</p>		<ul style="list-style-type: none"> • Esri • Connected Development • Disaster Tech Lab • GNUcoop



Appendix II: DHN Activation Process⁷⁸



Activation Process Example Version 1

The chart demonstrates one of the purposes of the DHNetwork: facilitating remote Information Management support requests to the V&TCs. Within 24 hours coordinators review activation requests and rapidly liaise with the different V&TCs who are members of the DH Network to build an appropriate Solution Team. The solution team is then managed directly by the requesting organization.



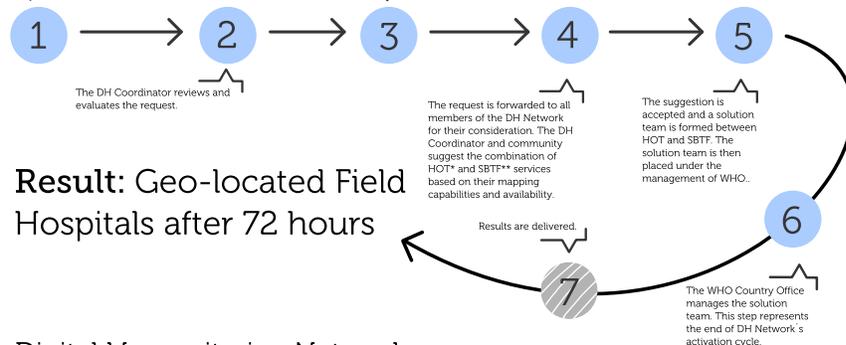
Request: "Geo-locate Field Hospitals"*

* The information managed by WHO regarding field hospitals is sensitive. In order to collaborate with V&TCs, WHO establishes a set of rules that grant the organization full control over the data manipulated by V&TCs.

DH Network Activation
When a WHO Country Office formulates the request, it can activate the DH Network to acquire the information it needs.

**World Health Organization
Country Office**
The World Health Organization Country Office requests V&TCs services through the DH Network by accessing the website: www.digitalhumanitarians.com

→ Online Form
<http://digitalhumanitarians.com/page/activate>



Result: Geo-located Field Hospitals after 72 hours

Digital Humanitarian Network

The Digital Humanitarian Network (DH Network) aims to leverage digital networks in support of 21st century humanitarian response. More specifically, the aim of this network-of-networks is to form a consortium of V&TCs and to provide an interface between formal, professional humanitarian organizations and informal yet skilled-and-agile volunteer & technical networks. Services offered by members of the DH Network are listed in our website (www.digitalhumanitarians.com).

^{**}HOT = Humanitarian OpenStreetMap Team | ^{**}SBTF = Standby Task Force



Endnotes

- 1 United Nations Office for the Coordination of Humanitarian Affairs, “OCHA Policy and Studies Series, Humanitarianism in the Network Age, Including World Humanitarian Data and Trends 2012,” last modified 2013, accessed 9 December 2013. <http://unocha.org/node/11528>>, p 17.
- 2 Interview with Andrej Verity, Programme Officer, Field Information Services, United Nations of the Coordination of Humanitarian Affairs, Digital Humanitarian Network Co-Founder, 12 February 2014.
- 3 Screenshot captured March 2010, Patrick Meier, <http://newswatch.nationalgeographic.com/2012/07/02/crisis-mapping-haiti/>
- 4 Ibid.
- 5 The Global Solution Networks program identifies 10 types of global solution networks. Operational and Delivery Networks are one of the ten types. See taxonomy chart on last page of this report.
- 6 United Nations Office for the Coordination of Humanitarian Affairs, “OCHA Policy and Studies Series, Humanitarianism in the Network Age, Including World Humanitarian Data and Trends 2012,” p 17.
- 7 Ibid.
- 8 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” *International Review of the Red Cross*, Vol 93, no. 883, last modified December 2011, accessed 9 December 2013. http://journals1.scholarsportal.info.myaccess.library.utoronto.ca/pdf/18163831/v93i0884/1239_nitatioths.xml
- 9 Ibid, p 1245.
- 10 Photo credit: Ushahidi, <http://irevolution.files.wordpress.com/2012/02/haitiandiaspora.png>
- 11 Andrea H. Tapia, Edgar Maldonado, Louis-Marie Ngamassi Tchouakeu and Carleen F. Maitland, “Coordinating humanitarian information: The problem of organizational and technical trajectories,” *Information Technology & People* 3 (2012): 240-258, <http://simplelink.library.utoronto.ca/url.cfm/375862>, 241.
- 12 John Holmes, “Building effective humanitarian responses for the 21st century,” p 33-34, G8 - G20, the 2010 Canadian Summits, June 2010, p 33.
- 13 Feinstein International Center, Tufts University, “Humanitarian Horizons: A Practitioners’ Guide to the Future,” last modified 2010, accessed 28 March 2014, <http://fic.tufts.edu/assets/Practitioners-Guide-Future.pdf>, p 25.



- 14 http://www.mapaction.org/?option=com_mapcat&view=mapdetail&id=3012
- 15 Mary Milner and Andrej Verity, “Collaborative Innovation in Humanitarian Affairs: Organization and Governance in the Era of Digital Humanitarianism,” last modified 1 October 2013, accessed 28 March 2014, <https://app.box.com/s/oq2gdcy466j6bpdvzyxt>, p 16.
- 16 Lois Appleby, Internews, “Connecting the Last Mile: The Role of Communications in The Great East Japan Earthquake,” last modified 2013, accessed March 28, 2014
- 17 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” p 1250.
- 18 John Crowley, Commons Lab, Wilson Center, “Connecting Grassroots and Government for Disaster Response,” last modified October 2013, accessed March 31, 2014, http://www.wilsoncenter.org/sites/default/files/crowley_updated2.pdf, p 22.
- 19 Ibid, p 29.
- 20 Global Facility for Disaster Reduction and Recovery, “Volunteer Technology Communities: Open Development,” last modified 2011, accessed March 28, 2014, <http://www.gfdr.org/sites/gfdr.org/files/publication/Volunteer%20Technology%20Communities%20-%20Open%20Development.pdf>, p 5.
- 21 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” p 1246.
- 22 John Crowley, “Connecting Grassroots and Government for Disaster Response,” p 29.
- 23 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” p 1250.
- 24 John Crowley, “Connecting Grassroots and Government for Disaster Response,” p 28.
- 25 Ibid.
- 26 Harvard Humanitarian Initiative, “Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies,” last modified 2011, accessed March 28, 2014, <http://www.unfoundation.org/assets/pdf/disaster-relief-20-report.pdf>, p 13.
- 27 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” p 1260.
- 28 United Nations Office for the Coordination of Humanitarian Affairs, “OCHA Policy and Studies Series, Humanitarianism in the Network Age, Including World Humanitarian Data and Trends 2012,” p 2.
- 29 Harvard Humanitarian Initiative, “Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies,” p 35.
- 30 Patrick Meier, “Strengthening humanitarian information: the role of



technology,” World Disasters Report: Focus on technology and the future of humanitarian action, International Federation of Red Cross and Red Crescent Societies, last modified 2013, accessed March 28, 2013, <http://worlddisastersreport.org/en/chapter-3/index.html>.

- 31 Harvard Humanitarian Initiative, “Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies,” p 42.
- 32 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” 1259.
- 33 March 2011 http://neis-one.org/wp-content/uploads/2011/03/Japan_osm.png
- 34 Harvard Humanitarian Initiative, “Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies,” p 11.
- 35 Patrick Meier, “New Information technologies and their impact on the humanitarian sector,” p 1261.
- 36 Harvard Humanitarian Initiative, “Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies,” p 18.
- 37 Ibid.
- 38 Matt Stempeck, “Participatory Aid Marketplace,” (Master of Science in Media Arts and Sciences diss. Massachusetts Institute of Technology, 2013), <http://www.mattstempeck.com/wp-content/uploads/2013/06/Matt-Stempeck-Participatory-Aid-Marketplace.pdf>.
- 39 Erin Boehmer, Science and Technology Innovation Program, Woodrow Wilson International Center for Scholars, “Coordinating Efforts by Volunteer and Technical Communities for Disaster Preparedness, Response, and Relief,” last modified July 22, 2010, accessed March 28, 2014, http://www.sts.virginia.edu/pip/research_papers/2011/Boehmer.pdf.
- 40 United Nations Office for the Coordination of Humanitarian Affairs, “OCHA Policy and Studies Series, Humanitarianism in the Network Age, Including World Humanitarian Data and Trends 2012,” p 7.
- 41 BarCamp, “The Rules of Bar Camp,” last modified June 2013, accessed March 28, 2014, <http://barcamp.org/w/page/405173/TheRulesOfBarCamp>.
- 42 CrisisCommons, “Our Story,” accessed March 28, 2014, <http://crisiscommons.org/learn-more/our-story/>.
- 43 Ibid
- 44 Interview with senior member of CrisisCommons, March 2014.
- 45 Philanthropy News Digest, “Sloan Foundation Awards \$1.2 Million to Woodrow Wilson International Center for Scholars.” Last modified December 19, 2010. Accessed March 28, 2014. <http://www.philanthropynewsdigest.org/news/sloan-foundation-awards-1.2-million-to-woodrow-wilson-international-center-for-scholars>.
- 46 CrisisCommons, “CrisisCommons Strategy,” May 2012, print, p 1.



- 47 Ibid, p 5.
- 48 Interview with Andrej Verity.
- 49 The Standby Task Force, “About,” accessed March 28, 2014, <http://blog.standbytaskforce.com/about-2/>.
- 50 The Standby Task Force, “Launching SBTf 2.0: The RoadMap,” last modified Dec 03, 2013, accessed March 28, 2014, <http://blog.standbytaskforce.com/2013/12/03/launching-sbtf-2-0-the-roadmap/>.
- 51 Digital Humanitarian Network, “Advisory Board,” accessed April 9, 2014, <http://blog.standbytaskforce.com/about-2/advisory-board/>.
- 52 Digital Humanitarian Network, “Purpose,” accessed March 28, 2014, <http://digitalhumanitarians.com/about>.
- 53 Interview with Andrej Verity.
- 54 Digital Humanitarian Network, “What We Do,” Accessed March 28, 2014, <http://digitalhumanitarians.com/content/what-we-do-0>.
- 55 Patrick Meier, iRevolution, “Opening Keynote Address at CrisisMappers 2013,” last modified November 20, 2013, accessed March 28, 2014, <http://irevolution.net/2013/11/20/opening-keynote-crisismappers-2013/>.
- 56 Interview with Andrej Verity.
- 57 Patrick Meier, “Opening Keynote Address at CrisisMappers 2013.”
- 58 Global Facility for Disaster Reduction and Recovery, “Volunteer Technology Communities: Open Development,” p 23.
- 59 Digital Humanitarian Network, “Media Guide,” accessed March 28, 2014, https://docs.google.com/document/d/1lx4sp8aFZG2QtgypQ_-3AtkKvGH5wS8AMHMvKVczVBw/edit?pli=1.
- 60 Patrick Meier, “Strengthening humanitarian information: the role of technology,” *ibid*.
- 61 CrisisMappers NYC, “ACAPS crisis indicators: SBTf deployment 21st-30th September 2012,” last modified September 12, 2012, accessed March 28, 2014. <http://www.meetup.com/Crisismappers-NYC/messages/41324832/>.
- 62 Government of the Philippines, Official Gazette, “Official list of casualties: Typhoon Yolanda,” last modified November 10, 2013, accessed March 28, 2014, <http://www.gov.ph/crisis-response/updates-typhoon-yolanda/casualties/>.
- 63 Government of the Philippines, Official Gazette, “NDRRMC Situation Report on the Effects of the typhoon Yolanda, Nov 16, 2013 (8:00 a.m.),” last modified November 16, 2013, accessed March 28, 2014, <http://www.gov.ph/2013/11/16/ndrrmc-situation-report-on-the-effects-of-the-typhoon-yolanda-november-16-2013-800-a-m/>.
- 64 Digital Humanitarian Network, “Super Typhoon Yolanda.” Last modified 2013. Accessed March 28, 2014. <http://digitalhumanitarians.com/content/super-typhoon-yolanda>.
- 65 McMahon, Felim. Storyful.blog, “Saving lives one click at a time: Hanging



out with the Digital Humanitarians.” Last modified December 3, 2013. Accessed March 28, 2014. <http://blog.storyful.com/2013/12/03/reflections-on-our-open-newsroom-digital-humanitarianism-hangout/>

66 Ibid.

67 Patrick Meier, “Opening Keynote Address at CrisisMappers 2013,” *ibid.*

68 <http://irevolution.net/2013/09/18/micromappers/>

69 Interview with Andrej Verity.

70 Ibid.

71 Patrick Meier, “Opening Keynote Address at CrisisMappers 2013,” *ibid.*

72 Ibid.

73 Patrick Meier, “Strengthening humanitarian information: the role of technology,” *ibid.*

74 Kerry A. Dolan, *Forbes*, “IBM Launches iPhone App For Crowdsourcing Water Quality,” last modified November 04, 2010, accessed March 28, 2014, <http://www.forbes.com/sites/kerryadolan/2010/11/04/ibm-launches-iphone-app-for-crowdsourcing-water-quality/>.

75 Daniela Hirschfeld, *The Guardian*, “Twitter data accurately tracked Haiti cholera outbreak,” last modified January 12, 2012, accessed March 28, 2014, <http://www.theguardian.com/global-development/2012/jan/12/haiti-twitter-tracked-cholera-outbreak>.

76 6 Dec 2012, <http://irevolution.net/2013/07/29/spam-filter-for-disaster-response/>

77 Hirschfeld, *ibid.*

78 http://www.luiscapelo.info/docs/Activation_Process_Example_v1.pdf



About Global Solution Networks

Global Solution Networks is a landmark study of the potential of global web-based and mobile networks for cooperation, problem solving and governance. This research project is a deliverable of the GSN program, offered through the Martin Prosperity Institute at the Rotman School of Management, University of Toronto.

Program Management

Don Tapscott, Executive Director
Dr. Joan Bigham, Managing Director
Anthony Williams, Executive Editor

GSN Program Membership

Membership in Global Solution Networks offers unlimited access to gsnetworks.org program deliverables including project plans, research publications and multi-media presentations, all posted for member use, review and feedback. Webinars on current research are held quarterly. Please visit our web site at www.gsnetworks.org or contact info@gsnetworks.org for information on participation.



Ten Types of Global Solution Networks