

Integration of Volunteer and Technical Communities into the Humanitarian Aid Sector: Barriers to Collaboration

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ABSTRACT

Volunteer and Technical Communities (V&TCs) with expertise in the collection, analysis and presentation of data and the development of supporting technologies, have potential to inform humanitarian aid organizations and help increase the efficiency of their operations. This study analyzes the role of V&TCs during recent response efforts and identifies a number of challenges of organizational nature that need to be overcome in order for aid organizations to harness the potential of V&TCs. The study finds that V&TCs can broadly be categorized into software platform development communities, mapping collaborations, expert networks and data aggregators. Evidence of collaboration with aid organizations however remains limited, suggesting a number of barriers need to be overcome, including (1) limited resources; (2) the management of volunteers; (3) different levels of engagement; (4) level of commitment by V&TCs; (5) different ways of working; and (6) aid organizations' limited knowledge about V&TCs' expertise.

Keywords

V&TC, interorganizational collaboration, humanitarian aid organization, social media.

INTRODUCTION

Over the last few years, so-called Volunteer and Technical Communities (V&TCs) with expertise in geographic information systems, database management, social media, and online campaigns, have provided disaster support to “traditional” humanitarian aid organizations – organizations that provide material or logistical assistance for humanitarian purposes after a disaster, which could be NGOs like Save the Children and Doctors without Borders, or intergovernmental organizations such as the United Nations and the World Bank. V&TCs have provided this support by aggregating information, translating messages, geolocating, categorizing, sanitizing, and publishing SMS messages and online data to inform relief operations (Baker, 2012). As aid organizations have little experience in analyzing big amounts of data, V&TCs have the potential to increase the efficiency of humanitarian relief. However, the rise of citizen and V&TC participation in humanitarian relief brings new coordination challenges to the traditional mix of state, private sector, and nongovernmental organizations. As acknowledged by the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA), a key challenge in the future is to connect the traditional humanitarian system to these volunteer initiatives (Steets, Meier, Christensen, Kindergan, & Pfister, 2012).

Questions arise such as how do these new participants in the humanitarian sector organize information exchange? In what ways do volunteers participate and in which contexts does information exchange arise? How can aid organizations take advantage of the information that these new actors add to the scene? Answers to these, and many other questions are needed for aid organizations to more effectively coordinate their efforts with these communities and to be able to fully take advantage of the services they provide. This study will start exploring these issues by answering the following questions: What role do V&TCs have in the humanitarian community and what factors impede collaboration between V&TCs and aid organizations?

This exploratory study aims to provide some first insights into these questions by assessing (1) how V&TCs have played a role in disaster response efforts to date; (2) the extent of collaboration between V&TCs and aid organizations; and (3) the challenges experienced in terms of interorganizational collaboration. The study will start with an overview of the literature on the increasing role of social media and crowdsourcing during times of

disaster response, aid organizations' adoption of new technologies, and interorganizational coordination and collaboration. Next, the study will identify and analyze V&TC-based initiatives with regard to their role in recent major relief operations and the organizational challenges V&TCs and aid organizations face in their collaboration. The study will finish with a discussion and practical implications

LITERATURE REVIEW

Information Technology Adoption in the Humanitarian Sector

Researchers are increasingly documenting citizen's use of social media like Twitter and online discussion forums at times of crisis. Studies have highlighted the role they play in information sharing between government and citizens as well as among citizens themselves (e.g. Hughes & Palen, 2009; Palen et al., 2010; Qu, Wu, & Wang, 2009; Tyshchuk, Hui, Grabowski, & Wallace, 2012)). Research on aid organizations' use of social media to inform their relief operations to date remains fairly limited, while the use of ICT in general has by many been acknowledged as an important asset in managing relationships among the various stakeholders involved in humanitarian relief (e.g. Maiers, Reynolds, & Haselkorn, 2005).

However, technology use comes with various challenges: difficulties to process the vast amounts of data, receiving inaccurate and untrustworthy information, problems with information overload, information security, etc. (e.g. Dugdale, Van de Walle, & Koeppinghoff, 2012; Hiltz & Gonzalez, 2012; McClendon & Robinson, 2012; Palen et al., 2010; Tapia, Bajpai, Jansen, & Yen, 2011).

Partially due to these problems, social media adoption by aid organizations to date remains limited, although many efforts are taken to alleviate some of these problems with enhanced systems to analyze data. Information and computer scientists are increasingly focusing on the design and application of new architectures for social media for crisis response and management (e.g. Jiang & McGill, 2010), as well as the development of for example classification systems that can help aggregate messages to be more easily accessed by organizations (e.g. Caragea et al., 2011; Rogstadius, Kostakos, Laredo, & Vukovic, 2011).

Another more complex challenge concerns the integration of these new technologies and practices into organizational practices and routines that have often been in place for decades. Tapia et al. (2011) identified various challenges that impede adoption. These challenges include organizational support for IT and innovation, and limited IT staff and resources. Furthermore, the highly critical phase of emergency disaster recovery requires a high level of information quality, meaning that organizations cannot easily rely on microblogged data, because data have to be thoroughly verified.

Given these challenges, V&TCs can be very beneficial to aid organizations in verifying and analyzing data and presenting the data in a useful manner to aid organizations, thereby also overcoming aid organizations' limited resources and IT capacity. However, such collaboration requires coordination of efforts between these two different types of organizations, which presents a new array of challenges. As a matter of fact, the integration of information between aid organizations and V&TCs has been coined as one of the key challenges ahead (Hiltz, Diaz, & Mark, 2011).

Interorganizational Coordination Challenges

To understand the extent of collaboration between V&TCs and aid organizations, literature about network formation and interorganizational coordination and collaboration provides a number of insights. A vast amount of literature on interorganizational networks takes an organizational adaptation perspective; meaning that organizations adapt to a changing environment by forming or extending interorganizational relationships and networks to solve problems and improve organizational performance (Kim, et al., 2006). Theories in this tradition include transaction cost theory, resource dependence theory, and neoinstitutionalism (Kim, Oh, & Swaminathan, 2006). These theories argue that when there is a resource gap between an organization and its partners, the organization can use its network to overcome this problem. While an argument like this could indeed explain why aid organizations may collaborate with V&TCs as the latter have data analysis and other IT resources and skills that aid organizations lack, theories taking an adaptation perspective often neglect the costs of establishing new relationships as well as the coordination costs involved in maintaining the relationship.

Organizations face barriers when they form new relationships or dissolve old ones, as these changes disrupt existing structures, routines, and cultures developed during the relationship (Kim et al., 2006). Indeed, a number of scholars studying social media use for humanitarian relief purposes, have pointed out the challenges that

remain ahead in terms of organizing and managing volunteer communities (e.g. Dugdale et al., 2012). Organizations in general show resistance to changing interorganizational ties, as adding new ties or dissolving an old one comes with costs that organizations often are not willing to take. Thus, even though there are positive aspects that may lead to aid organizations' interest in collaboration with V&TCs, aid organizations may also foresee barriers in establishing and maintaining these new ties. One of the levels from which these barriers may stem is the organization's internal context (Kim et al., 2006).

An organization's internal structures, routines, and culture, are known to influence its interorganizational ties. Thus, the stability and complexity of the intraorganizational network will influence interorganizational relationship formation and development (Kim et al., 2006; Oliver, 1990). A known routine in the disaster response context for example constitutes the reliance of aid organizations rely on standard operating procedures that have been in place for decades, which are deemed necessary because of the highly critical first days of the response (Tapia et al., 2011). This could be an instance of a barrier to collaboration with V&TCs, as collaboration might affect standard operating procedures. Structural constraints have also been found to affect coordination and collaboration in the disaster response context. For example, Saab et al. (2008) found that aid organizations' different organizational arrangements affected the extent of information sharing and the scope of collaborative information systems projects.

Finally, trust and commitment are arguably two of the most cited factors affecting interorganizational coordination, and willingness for organizations to establish collaborative relationships (Ozman, 2009). The level of commitment for information systems collaboration projects by aid organizations has been found to influence coordination patterns (e.g. Saab et al., 2008). And, even though generally speaking aid organizations have made steps forward over the years in terms of information sharing through the use of ICTs in general, the creation of a culture where stakeholders share information and build trust and commitment, has often been found to be a challenge (e.g. Maiers et al., 2005; Saab et al., 2008).

RESEARCH APPROACH

This study has investigated how internal structures, routines and culture of V&TCs and aid organizations affect their collaboration. To this end, the various types of V&TCs that have been active during recent crises were analyzed in order to gain more insight in their actual practices and role in humanitarian relief in general. Second, to obtain a better understanding of the various types of constraints that may arise in the formation of new ties between V&TCs and aid organizations, the organizational challenges that may have prevented collaboration between aid organizations and V&TCs were investigated with a focus on issues related to structure, trust and commitment.

The identification and categorization of V&TCs entailed an exploratory study based on secondary data, obtained from organizations' websites and online reports discussing field experiences, V&TCs were identified through reports from the field evaluating V&TCs, and through exploring V&TCs' homepages looking for references to others, as well as through Google search for "volunteer and digital communities, "V&TCs", and "digital volunteers".

To the extent that information was available, for each identified V&TC the following information has been identified: 1) V&T's purpose or mission; 2) other V&TCs and aid organizations it works with; 3) the (type of) crises the V&TCs has provided support for; and 4) the number of volunteers it consists of. A total of 18 more or less well known V&TCs have been identified. This does not represent an exhaustive list of all V&TCs that exist, but however does include many of the most widely known V&TCs that have been visible during recent major humanitarian relief operations. As such it provides insight into the variety of V&TCs operating in the humanitarian sector today.

During the next step of the study, organizational challenges were identified through reports from the field that discussed aid organizations' collaboration with V&TCs. Reports were primarily identified through a Google search on key terms like "V&TCs", "Volunteer and Technical Communities", and "digital volunteers". Only documents written in English were collected. The documents considered for analysis specifically addressed matters of collaboration between aid organizations and V&TCs.

AN OVERVIEW OF V&TCS

The study found that V&TCs can be categorized into software platform development communities, V&TCs providing mapping and imagery services (hereafter called 'mapping collaborations'), expert networks, and data aggregators.

Software Platform Development Communities

V&TCs that are primarily focused on the development of software platforms generally seem among the oldest V&TCs. Whereas most V&TCs were established over the last few years, the three best known software platform development communities – the Sahana Software Foundation, Frontline SMS, and Ushahidi – were founded between 2003-2008. The Sahana Software foundation was founded in 2004, Frontline SMS, although not only focused on humanitarian relief but more broadly focused on leveraging mobile technologies to “promote positive social change”, was founded in 2005, and Ushahidi was founded in 2008. All three V&TCs have in common that they have developed software products based on FLOSS (Free/Libre Open Source Software).

The Sahana Software Foundation has developed three major products. Its software helps for example to reunite separated families through the registration of missing and found people; tracking requests for help from affected people; tracking relief agencies responding to disasters and the distribution of aid; and sharing information across NGOs, volunteers, donors, and government organizations¹. The Sahana Foundation has had its software deployed during a wide variety of crises; and by a variety of organizations including NGOs, UN agencies, the World Bank, Al Jazeera, etc. The software platforms were used during the 2004 Asian Tsunami, the 2005 Pakistan earthquake, the 2010 Haitian earthquake, and the 2012 Chilean wildfires, among others.²

The Ushahidi platform enables the crowdsourcing of information by using multiple channels such as SMS, email, and Twitter. Ushahidi software was at first deployed to help track violence during the Kenyan elections in 2008. The system enabled citizens to send a message to Ushahidi indicating where violence took place, which was then visualized onto a map.³ Ushahidi has also been deployed to track wildlife sightings, during the Gaza war and during the Haiti earthquake recovery phase, among others.⁴ Both Ushahidi and the Sahana Foundation have their origins in Kenya, and have volunteers from across the globe.

Mapping Collaborations

Mapping seems a key area of focus among V&TCs, in which relatively many V&TCs are active. V&TCs include the Humanitarian OpenStreetMap Team (H.O.T.), CrisisMappers, the Standby Taskforce (SBTF), GEO-CAN, GISCorps and MapAction. Typically, these V&TCs provide maps to support aid organizations that request their help. These maps identify locations of interest with supporting textual or visual information about the impact of the disaster, and show where help is needed. Visual information such as pictures of damaged buildings may be provided through satellite or aerial imagery, or through pictures sent in by citizens or other organizations. Textual information may be provided through analysis of Twitter or SMS data. To date a wide variety of organizations has used mapping services, including the World Bank, UNICEF, and UNOCHA. Further, mapping services have been provided during many recent crises, including the conflict situations in Libya and Central African Republic (2013), the earthquakes recovery operations in Christchurch, New Zealand and in Haiti, and the hurricane Sandy recovery efforts.

The use and provision of live mapping services have grown popularity over recent years, as suggested by the founding years of all identified V&TCs, namely between 2009-2010⁵, with the exemption of MapAction, which was already founded in 2002⁶, and GISCorps, which was founded in 2003⁷.

The identified mapping collaborations vary in terms of the number of volunteers that they use. While MapAction has approximately 50 volunteers, others vary from a few hundred volunteers (e.g. the Standby Taskforce and GEO-CAN) to over 5000 (CrisisMappers); where the latter one primarily acts as an informal collective of mapping professionals.⁵

¹ See <http://sahanafoundation.org/products/> Last accessed February 2, 2014.

² See <http://sahanafoundation.org/about-us/our-team/>

³ See <http://ushahidi.com/about-us> Last accessed February 2, 2014.

⁴ See <http://www.theguardian.com/news/blog/2011/apr/07/ushahidi-crowdmap-kenya-violence-hague> Last accessed February 2, 2014.

⁵ See <http://blog.standbytaskforce.com/>, <https://www.eeri.org/projects/learning-from-earthquakes-lfe/geo-can/>, <http://crisismappers.net/>, https://wiki.openstreetmap.org/wiki/Humanitarian_OSM_Team. Last accessed February 6, 2014.

⁶ See <http://www.mapaction.org/10-years>

⁷ See <http://www.giscorps.org/> Last accessed February 6, 2014.

Some mapping collaborations send their volunteers into the field. For example, 40 out of 50 volunteers at MapAction are deployable⁸, whereas others primarily have volunteers that are active through providing digital support services. While the former organization is based in the UK and primarily deploys volunteers from within the UK, in order to be able to provide them training, other mapping collaborations have their volunteers dispersed across the globe. A few mapping collaborations have just a very small core of volunteers that is deployable to the field. GISCorps stands out in that it does not only focus on humanitarian crises, and has its volunteers located in the U.S. and Canada.⁹ Its volunteers deal directly with agencies that request their help.

While most crisis mapping collaborations have ‘organically’ sprung up, the Standby Taskforce was more of an ‘organized’ effort (Meier, 2012): the organization was founded when the UN reached out for help for the development of a crisis map for Libya, while it had no personnel on the ground yet, in order to get a better picture of the unfolding situation (Meier, 2012).

Expert Networks

A variety of expert networks were founded between 2009-2011. They have in common that they bring together many experts, which may be volunteers only or volunteers and aid organizations. The focus of expert networks varies in the extent to which they focus on primarily aligning activities across V&TCs and aid organizations, or on collaborative technology development. V&TCs focused on expert networking include CrisisCommons, CrisisMappers (also identified as a mapping collaboration), Random Hacks of Kindness, Geeks Without Bounds, and DataKind.

CrisisCommons was founded in 2009. Comprised of a global informal network of volunteers, CrisisCommons focuses on the advancement of the use of open data and V&TCs to stimulate innovation in crisis management.¹⁰ In addition, it focuses on coordination of V&TCs and crisis response organizations.¹¹ CrisisCommons started in June 2009 with the organization of a CrisisCamp in Washington DC to gather those interested in using technology to assist in crisis preparedness and recovery.¹² Attendants included humanitarian aid workers, academics, and people from the private sector; including the World Bank and UN agencies. Following this, multiple CrisisCamps were organized; often soon after a disaster has hit.¹³ Informal networks established during these CrisisCamps have responded to following disasters to collaboratively see how they could provide support. CrisisCommons has been at the basis of the launch of CrisisMappers, and has initiated the establishment of DataKind and Random Hacks of Kindness.

Many expert networks have in common that they bring together volunteers in camps to focus on (ad-hoc) problem solution through hackathons. For example, Random Hacks of Kindness has already brought together over 6000 participants in 170 hackathons, in 50 cities across the world.¹⁴ Geeks Without Bounds also organizes hackathons, and every other year it chooses the three most promising solutions to further develop.¹⁵ Often, these camps are based on real problems put forward by humanitarian agencies that are then being solved. During these camps not only technology volunteers but also representatives from humanitarian agencies as well as UN agencies and the World Bank are involved. Examples of solutions generated during these camps include for example an app that automatically tracks the whereabouts of volunteers (Random Hacks of Kindness).¹⁶

While V&TCs acting as expert networks are rather informal and based on the involvement of solely volunteers, a number of V&TCs such as for example DataKind with its DataCorps have volunteers conduct paid work on specific data projects for a certain amount of time.

⁸ See <http://www.agi.org.uk/storage/GeoCommunity/AGI12/Papers/ChrisEwing.pdf> Last accessed February 6, 2014.

⁹ See <http://www.giscorps.org/> Last accessed February 6, 2014.

¹⁰ See <http://crisiscommons.org/about/> Last accessed February 6, 2014.

¹¹ Idem.

¹² Idem.

¹³ Idem.

¹⁴ See <http://www.rhok.org/about> Last accessed February 6, 2014.

¹⁵ See <http://gwob.org/about/theory-of-change/> Last accessed February 6, 2014.

¹⁶ See <http://www.rhok.org/solutions> Last accessed February 6, 2014.

Whereas CrisisCommons can be seen as a sort of meta-network; being at the basis of the launch of a number of V&TCs and acting primarily as an informal network, the Digital Humanitarian Network is a more formalized expert network that acts as a network of networks: It is a consortium of V&TCs that acts as an interface between humanitarian agencies and V&TCs¹⁷; when an agency has a request for help, the Digital Humanitarian Network connects the agency to V&TCs. Organizations such as OCHA, local governments, UNHCR and Save the Children request activation.¹⁸ V&TC members of the Digital Humanitarian network include DataKind, GISCorps, HOT, the Standby Taskforce, Humanity Road, MapAction and Esri.¹⁹

Data Aggregators

A final category of V&TCs comprise those organizations that leverage technology to facilitate effective communication between people, communities and stakeholders, and to educate the public with up to date information. Whereas mapping collaborations also provide real-time information, it is usually at a 'lower' level than data aggregators. Data aggregators typically bring together information from various sources into situation reports, etc., to provide a broad picture of the situation. Two well-known organizations in this respect include Humanity Road and ICT4Peace. Humanity Road for example uses the Internet and mobile communication to collect, verify and disseminate information to humanitarian organizations.²⁰ ICT4Peace aims to facilitate effective communication between stakeholders, for example through developing wiki's for humanitarian organizations, media, and policy makers to be used with situation reports, GIS reports, etc.²¹

ORGANIZATIONAL CHALLENGES

A number of organizational challenges have been described in reports that contain discussion about collaboration between aid organizations and V&TCs. These challenges relate to (1) limited resources; (2) the management of volunteers; (3) different levels of engagement between V&TCs and aid organizations; (4) level of commitment by V&TCs; (5) different ways of working between V&TCs and aid organizations; and (6) aid organizations' lack of knowledge about V&TCs expertise.

First, just like aid organizations, V&TCs lack access to many resources (Capelo, Change, & Verity, 2012). While the limited availability of resources by aid organizations could actually be a factor favoring collaboration, because V&TCs can provide services that aid organizations do not have resources for, the limited availability of resources by V&TCs also has its effects on collaboration. An example concerns the staffing of V&TCs. For example, MapAction has indicated that it needs to be able to employ larger staff numbers in order to run 24/7, and that it needs to be able to deploy field staff for a longer period of time (Julian, 2008). Such limitations could affect willingness to collaborate.

The second challenge, the management of volunteers, presents challenges both for the V&TC internally, as well as between the V&TC and aid organization. Finding volunteers can be difficult, particularly because for certain tasks some V&TCs need as many as several hundred volunteers (e.g. Searle & Wynn-Pope, 2011). Meier (2011) indicates that typically only 20% of a volunteer base is active. This has led to instances where V&TCs did not have enough available volunteers, which has left active volunteers subject to burnout due to heavy workloads (IFRC, 2013; Meier, 2011).

Finding skilled volunteers has also been challenging at times. V&TC members often do not have a humanitarian background. While some do, many have very different types of expertise. There is an increasing need for those to understand the humanitarian context (Capelo et al., 2012; Searle & Wynn-Pope, 2011). For example, V&TCs do not always know humanitarian principles including neutrality, impartiality and independence, and is the extent of accountability (and to what extent they see themselves really engaged in humanitarian action) unclear (IFRC, 2013). Thus, challenges by in finding a large enough number of volunteers with the right expertise.

Related to finding good volunteers is the challenge of reliability and predictability of volunteers. Standards of information security have not always been met due to V&TCs' internal processes and volunteers have not

¹⁷ See <http://digitalhumanitarians.com/> Last accessed February 6, 2014.

¹⁸ See <http://digitalhumanitarians.com/page/activation-diagram> Last accessed February 6, 2014.

¹⁹ See <http://digitalhumanitarians.com/page/interaction-diagram> Last accessed February 6, 2014.

²⁰ See <http://humanityroad.org/aboutus/> Last accessed February 6, 2014.

²¹ See <http://ict4peace.org/> Last accessed February 6, 2014.

always delivered expected results (Capelo et al., 2012). Closer collaborative relationships and clear guidance from aid organizations could help, as well as a greater sense of inclusivity by both volunteers and aid workers (Capelo et al., 2012).

The number of volunteers also presents problems for aid organizations' own staffing. Active volunteers dispersed across the globe may lead to an 'always on' need for aid organizations that have to respond to questions from volunteers around the clock, which puts a heavy burden on these organizations (Harvard Humanitarian Initiative, 2011; Meier, 2011; Searle & Wynn-Pope, 2011). This leads to additional work in terms of coordination and management of volunteers, and managing and adjusting expectations and traditional ways of working (Searle & Wynn-Pope, 2011). For example, during the Haitian earthquake response a number of aid workers who were involved with V&TCs became so overloaded with their work, that they did not have sufficient time to focus on their immediate responsibilities (Harvard Humanitarian Initiative, 2011).

A third challenge concerns humanitarian organizations' need for commitment (Harvard Humanitarian Initiative, 2011). In establishing relationships with V&TCs, humanitarian organizations need to know what to expect; e.g. how long they will be around, will it be a longer-term effort worthwhile investing in, etc. This is not always clear.

A next challenge lies in the different levels of engagement among V&TCs and aid organizations. Aid organizations tend to have a broader view on the operational response; including on the ground logistical challenges and budgetary constraints. Volunteers however tend to be focused on enabling citizens to help each other. Due to these differences, for example OCHA experienced tensions between the level of engagement, activity and priorities between these different actors (Meier, 2011).

The fifth challenge concerns the different ways of working between V&TCs and aid organizations. While aid organizations work in hierarchies, V&TCs have flattened, decentralized structures. As a result, V&TCs move faster than aid organizations that rely on protocols. According to GFDRR (2011), V&TCs need protocols to work with top-down aid organizations.

Finally, aid organizations have limited knowledge about V&TCs expertise. V&TCs do not yet have well-established networks with aid organizations, and accordingly, information flow between V&TCs and aid organizations is limited (Capelo et al., 2012). For example, during the Haitian earthquake response, many field workers did not know of the existence of V&TCs (Harvard Humanitarian Initiative, 2011).

Overall, while generally acknowledged that resource constraints are a major impediment to quick technology adoption, large aid agencies including UNOCHA, the Red Cross and the World Bank tend to agree on the promise of new technologies and hence the need for humanitarian organizations to make better use of them (e.g. Steets et al., 2012)

DISCUSSION

This study has shown that a variety of V&TCs exists that have the potential to benefit situational awareness and needs analysis of aid organizations. V&TCs were shown to be active in a variety of areas. Four types of V&TCs have been discerned: (1) software platform development communities; (2) mapping collaborations; (3) expert networks; and (4) data aggregators. Even though four categories were identified, within each category V&TCs were also found to differ in terms of organizational objectives; the number of volunteers and core staff they work with, as well as the data sources used (satellite imagery; Facebook, twitter, SMS sourcing; and volunteer data collection). While all V&TCs rely significantly on social media for volunteers to coordinate their work (e.g. through social mapping software) and to communicate among themselves, V&TCs by far do not always crowdsource data like help requests etc. from the affected community. Some of the mapping collaborations do, like Ushahidi that used Facebook and Twitter to inform its missing persons overview, although some V&TCs also primarily rely on using satellite imagery, or rely on data sent to them via SMS.

Given the variety of areas that V&TCs are active in, as well as the recent growth in numbers in recent years, V&TCs arguably are taking an increasingly important role in disaster relief. However, while quite some collaboration among V&TCs themselves seems to occur, relatively little evidence has been documented to date about collaboration between aid organizations and V&TCs. The aid organizations involved most include the United Nations (UN OCHA in particular) and the World Bank. Other humanitarian organizations mentioned in reports, besides local governments, include WFP, UNHCR, and Save the Children. This suggests that to date primarily large organizations collaborate with V&TCs. The underlying reason could be the lack of resources available to humanitarian organizations to invest in establishing new relationships.

Further, given the lack of knowledge of aid organizations about V&TCs, questions about volunteers' and

V&TCs' commitment, suggest that collaboration with aid organizations can be further improved. Findings of the study indicate that typical barriers to interorganizational collaboration are at play: trust, commitment, and structural constraints, in addition to a number of other constraints, were found to provide barriers to collaboration and coordination. In particular, the management of volunteers was found to be challenging; different levels of engagement between V&TCs and aid organizations exist; different ways of working between V&TCs and aid organizations make collaboration difficult; and aid organizations' lack of knowledge about V&TCs expertise and commitment entail barriers to collaboration. This is perhaps not surprising, as disaster response is highly critical in nature, making organizations rely on standard operating procedures that have been in place for decades (Tapia et al., 2011), and information sharing across organizations in the humanitarian sector has been a challenge (e.g. (IFRC, 2013; Saab et al., 2008). Thus, although a number of commonly found barriers for interorganizational collaboration are at play, the role of volunteers presents a number of challenges specific to the V&TC-aid organization relationship.

Nevertheless, many of the challenges of organizational nature such as those identified in this study have to be better understood in order to create a fuller understanding of how humanitarian organizations can better harness the possibilities of V&TCs. The secondary data collected online for this study likely do not provide an exhaustive overview of all barriers to collaboration, nor do they provide highly detailed insights into the various challenges experienced. This calls for further empirical studies through e.g. in-depth interviews with, or case studies of V&TCs' collaboration with aid organizations, to gain a better picture on how volunteer communities and social media are changing humanitarian relief.

IMPLICATIONS AND PRACTICAL RECOMMENDATIONS

Based on the various identified challenges to collaboration, a number of recommendations can be derived. First, findings suggest that V&TCs need to focus on strengthening ties with aid organizations, particularly by working on building trust, and showing commitment. One way of doing this would be to partner with aid organizations prior to a disaster happens. As also already suggested by Capelo et al. (2012), this enables the development of a better understanding of each other's objectives and internal processes and ways of working, which in turn helps develop better management structures, better alignment of expectations of both V&TC and aid organization, and easier initiation of collaboration once a disaster strikes (Capelo et al., 2012). Through partnering a certain depth of relationship is thus established. This can be achieved through for example engagement in expert/metanetworks where V&TCs and aid organizations get better acquainted, or through more formal relationships. In all likelihood, the more formal the relationship becomes, the better parties get to know each other. While a better mutual understanding is positive, close partnerships also may have negative consequences. Establishment of a close relationship between two parties may exclude the development of relationships with others as it takes time to maintain the relationship. This means that after a disaster strikes there is less flexibility in developing collaborative relationships between formerly unconnected organizations. Further, given that one of the major drivers to collaboration between V&TC and aid organization is the fact that the V&TC can offer a service that the aid organization does not have the resources for, a construction of very strong formal relationships between aid organization and V&TC will likely also mean that only the large aid organizations can take advantage, while leaving out the smaller ones. Furthermore, because so far V&TCs primarily seem to work with larger organizations such as the World Bank, UN Ocha and Save the Children, it is recommended that V&TCs actually extend their scope to this group. Since services from V&TCs can be particularly useful to smaller aid organizations as they tend to have little resources, education about their activities (and e.g. the availability of maps) might be particularly useful.

V&TCs' participation in expert/metanetworks is likely to increase aid organizations' understanding of V&TCs. However, because likely to date primarily V&TCs are active in expert metanetworks such as described here, representatives of (metanetworks of) V&TCs could try to reach out to well-known networks and conferences where many aid organizations go to increase awareness of the role of V&TCs. This type of participation can also increase aid organizations' trust in V&TCs, and enhance their perception of the level of commitment of V&TCs.

Training can enhance the relationship between V&TCs and aid organizations as well, by helping to align levels of engagement. Aid organizations or V&TC volunteers with significant experience can train volunteers to better understand the humanitarian perspective. Similarly, training for aid organizations can help them better understand the perspective of V&TCs. Further, training by V&TC volunteers can also add a new layer of participation within the V&TC. Previous research has shown that in online communities often a core and periphery exists, and that engagement is stimulated by different layers of participations (e.g. Wagner and Majchrzak, 2007). For example, those with experience could provide (online) training to other volunteers.

Given V&TCs' extensive experience with (and reliance on) technology; with technology being used as a method to communicate internally with all globally dispersed volunteers, as well as technology often a product or primary means for being able to provide their services, this experience with technology can possibly be further extended. First, as already mentioned, V&TCs could for example provide online training to their volunteers. In addition, online communities of practice could help increase aid organizations' awareness of V&TCs activities. More research however is first needed to gain a better understanding of current technology uses for communication purposes between V&TCs and aid organizations, as well as for management purposes within V&TCs.

Finally, the recent growth in number of V&TCs as well as large aid organizations' interest in V&TCs suggest that the role and also impact of V&TCs will potentially further increase. This has a number of implications for the future development of the humanitarian sector. First, the more professional V&TCs grow, the more need there seems to be to not only work on a volunteer-basis such as for example the MapAction example already shows. As V&TCs' role continues to grow, and the more responsibilities they get, the more likely the number of paid staff is going to grow. In the long run, this would likely also mean that V&TCs need a steadier flow of income (through donors most likely), which, in turn, will increase competition in the humanitarian sector as they will have to compete with aid organizations for donor funding.

Second, as V&TCs continue to grow in numbers and level of activity during crises, they possibly have to grow into more 'regular' organizations as well, as their resource demands grow. As Boehmer (2010) indicated: relief organizations may have difficulty funding V&TCs when they "do not formally exist". Indeed, the Harvard Humanitarian Initiative (2011) indicates that some V&TCs begin to worry that they need to make changes to their mission and organizational design to chase resources and transforming their volunteer organizations into formal institutions, with potentially destructive competitive dynamics as a result.

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