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Are you Ready2Help? Conceptualizing the management of online and onsite volunteer convergence

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Citizens have often been found to converge on disaster sites. Such personal convergence is increasingly supported by online informational convergence. The adoption of online platforms represents an opportunity for response organizations to manage these two different manifestations of citizen convergence. We analyse one such platform, "Ready2Help", developed by the Red Cross in The Netherlands. Our research demonstrates that by utilizing platforms, response organizations are able to transcend the boundaries between different types of organized behaviour during disaster. We extend the original conceptualization of organized behaviour, as previously described by the Disaster Research Center, explaining how the development of new platforms channels convergence of citizens and information. As such, platforms provide an interface between established, expanding, extending, and emergent forms of organized behaviour. These developments change the landscape of organized behaviour in times of disaster.

1 | INTRODUCTION

A long-standing tradition in crisis and disaster studies has emphasized that convergence of citizen volunteers plays a major role on disaster sites (Drabek & McEntire, 2003; Dynes, 1994; Dynes & Quarantelli, 1968; Helsloot & Ruitenberg, 2004). Recent studies continue to show how response organizations, such as police, fire departments, and medical services relate to activities of these volunteers in crisis and disaster relief (Albris, In press; Carlton & Mills, 2017; Lorenz, Schulze, & Voss, In press; Strandh & Eklund, In press). The potential of citizen involvement is tremendous, evidenced in literature through examples of citizens who converge on disaster sites to assist in damage assessment, shelter provisioning, search and rescue operations, and providing more general support to professional responders (Kendra & Wachtendorf, 2003; Solnit, 2010; Voorhees, 2008).

Although response organizations are increasingly aware of the advantages of citizen convergence, it remains a challenge to incorporate citizens meaningfully in response operations (Barsky, Trainor, Torres, & Aguirre, 2007). In part, this is because citizen groups have an emergent structure, are comprised of a diverse set of unfamiliar group members, have unstable task definitions, experience fleeting membership, pursue multiple and often conflicting goals, and are geographically distributed (Majchrzak, Jarvenpaa, & Hollingshead, 2007).

Citizen convergence leads to a number of organizational challenges, among others related to the need for response organizations to take on new tasks and extend their organizational structure in an effort to accommodate different behavioural responses to the disaster in question (Dynes & Aguirre, 1979). Traditionally, we have understood such processes in crisis and disaster management from the vantage point of the Disaster Research Center (DRC) typology of organized behaviour (see: Dynes & Quarantelli, 1968; Dynes, 1970). This typology distinguishes four types of established, extending, expanding, and emergent organized behaviour depending on the organizational structure and tasks involved.

However, new developments in online informational convergence are challenging our previous understanding of this phenomenon. In particular, citizens increasingly manifest themselves online during crisis and disaster situations, which gives them a means to leverage information (Majchrzak & More, 2011), and also enables them to organize their own convergence onsite (e.g., Starbird & Palen, 2011; Villemure et al., 2012; Zook, Graham, Shelton, & Gorman, 2010). Likewise, response organizations themselves are provided with new

possibilities to actively reach out to citizens, to connect with them, and to jointly organize a response (Alexander, 2014; Majchrzak & More, 2011). As response organizations and citizens try to develop meaningful collaborations both online and onsite (Hughes & Tapia, 2015), this results in more flexible organizational configurations that incorporate multiple elements of established, extending, expanding, and emergent organized behaviour. These developments warrant a new conceptual understanding of the original DRC typology.

In this article, we focus on the case of Ready2Help, initiated in 2015 by the Dutch Red Cross to actively organize volunteer citizen response. Ready2Help successfully mobilized and organized over 30,000 citizen volunteers during the 2015 refugee crisis. In this initiative, we can recognize a combination of extending, expanding, and emergent organized types of behaviour. We therefore address the following research question: *How can we understand the way in which response organizations adapt to include voluntary citizen response in the era of new digital opportunities?*

Our analysis is based on the online and onsite action during the first Ready2Help field exercise, and subsequently the first large deployment of Ready2Help during the refugee crisis. We utilize multiple methodologies (observations, interviews, and semantic online network analysis) to study the online and the onsite deployment of the Ready2Help platform. Our study contributes to the crisis and disaster literature by explaining how response organizations adapt their organizational structure to engage citizen volunteers. Moreover, by explaining how online platforms transcend and drive organized behaviour, we extend the DRC typology to accommodate new means of online convergence.

2 | ORGANIZING CONVERGENCE ON THE DISASTER SITE

The role of citizens in crisis and disaster research has traditionally been understood from the perspective of convergence. In many disasters, volunteers, media, spectators, and others converge at disaster sites to help, watch, or look out for friends and family (Drabek & McEntire, 2003). Convergence is defined as: *the movement toward the disaster-struck area from the outside (external convergence) and movement toward specific points within a given disaster (internal convergence)* (Fritz & Mathewson, 1957). Fritz and Mathewson (1957) recognize three forms of convergence: convergence of citizens (people), convergence of information, and convergence of material (resources).

One of the consequences of convergence is that many different types of organized behaviour appear on the disaster site. The seminal work on this topic is the DRC classification of organized behaviour (see Table 1), which differentiates between the tasks that groups perform at disaster sites and their corresponding organizational structure (Dynes, 1970; Dynes & Quarantelli, 1968). The first type of organized behaviour in this typology is comprised of *established* organizations that carry out regular tasks. These include traditional response organizations, such as the police force installing roadblocks to restrict access to a disaster site. Second, *expanding*

TABLE A1 Types of group behaviour during disasters, based on: Dynes and Aguirre (1979)

	Regular tasks	Non-regular tasks
Old structures	Type I Established	Type III Extending
New structures	Type II Expanding	Type IV Emergent

organizations for the most part exist on paper before disaster strikes. An example is the Red Cross, which consists of a small-standing organization and a large group of trained volunteers who can be mobilized. Third, *extending* organizations perform tasks outside of their traditional role. In the aftermath of Hurricane Katrina, for example, the supermarket chain Walmart provided food and logistical support to FEMA and other response organizations (Horwitz, 2009). Fourth, *emergent* groups are a form of organization with unstable membership performing non-regular tasks (Majchrzak et al., 2007). For example, in the aftermath of the 9/11 terrorist attacks an emergent group of volunteers provided supplies to emergency responders at Ground Zero (Voorhees, 2008).

Early studies of disaster convergence indicate that emergency managers often perceive convergence of citizens as a nuisance or a burden (Barton, 1969; Wenger et al., 1986). In the eyes of the response organizations, they are unlikely to respond to a disaster in an orderly fashion; rather, the way citizens behave at times of disasters is perceived as a threat to authorities' attempts to bring the situation back under control (Quarantelli, 1988). Over time, however, a change in perception has occurred and it is increasingly recognized that citizens often exhibit prosocial behaviour in times of crises and are more than willing to help professional response organizations (Dynes, 1994; Solnit, 2010). For example, in the wake of 9/11, emergent citizen groups supported response organizations by receiving, cataloguing, and distributing goods (Voorhees, 2008). Similarly, after Hurricane Katrina, an emergent group of civilian boat operators cooperated with the U.S. coast guard in rescuing around 20,000 people from flooded areas (Majchrzak et al., 2007).

Although response organizations increasingly see the utility of onsite convergence, a number of challenges persist, most notably the accountability (who is liable for injuries?) and legitimacy (who do volunteers "belong" to?) of volunteer convergence. When citizen volunteers show up at a disaster site, such challenges can hinder the willingness among response organizations to cooperate with them (Kendra & Wachtendorf, 2003). Other challenges are more technical in nature. For example, convergence can become so all-encompassing that emergency managers become overwhelmed by offers of support, which can frustrate the response operation (Barsky et al., 2007).

Research on convergence has traditionally examined the underlying mechanisms of mobilization, where it has predominantly focused on convergence of citizens and resources (Fritz & Mathewson, 1957). Currently, online convergence of information is becoming increasingly prominent and promising because of the widespread use of social media platforms in disasters (Hughes & Palen, 2009; Liu, Palen, Sutton, Hughes, & Vieweg, 2008). A pivotal example is the

involvement of the Ushahidi platform in providing web-based mapping services in response to the 2010 Haiti earthquake (Zook et al., 2010). The platform was activated within a few hours after the earthquake occurred, enabling Haitians to send (free) geo-tagged text-messages through which they could ask for help, report incidents, or inform friends and relatives that they survived the earthquake. Ushahidi volunteers translated these messages from Creole to English and placed them on a digital map of Haiti. Response organizations were subsequently able to use the available information on the map to coordinate their response operations and relief efforts. Since this initial experience with Ushahidi during the Haiti earthquake, various platforms have become increasingly important in enabling response coordination. For example, during the 2013 Typhoon Haiyan in the Philippines, some 1600 online volunteers used OpenStreetMaps (OSM) to assess damages and identify communities in need (Westrope, Banick, & Levine, 2014). In the aftermath of the 2015 Nepal earthquakes, we also witnessed such an initiative, whereby Kathmandu Living Labs used the quakemaps.org platform to assess the needs and guide initial relief operations (Wolbers, Ferguson, Groenewegen, Mulder, & Boersma, 2016). In both cases, public information was used to tailor the responses of the various organizations and communities involved in the operation (Mulder, Ferguson, Groenewegen, Boersma, & Wolbers, 2016).

Similar to the challenges associated with onsite convergence, online convergence has its own challenges, most notably that of finding meaningful connections to formal response organizations (Hughes & Tapia, 2015). Online initiatives appear to flourish in the chaotic first phase of the search and rescue operation when information is very limited. However, once response organizations set up operations, online initiatives are often pushed to the margin, and response organizations' own information management structures take over to adhere to internal requirements of accountability (Wolbers et al., 2016). This challenges online volunteers to mature and develop volunteer management systems, data management practices, and training for new volunteers (Hughes & Tapia, 2015). As online platforms become more commonplace, their limitations are also becoming visible in terms of representation and implementation. For instance, a study of Philippine voluntary mapping revealed that damage in most locations was underreported by 36% and that in some locations—notably the city of Tacloban—damage was widely over-reported (Reach Initiative, 2014).

In sum, both the opportunities and challenges associated with onsite and online convergence highlight the need to increase our understanding about the changing nature of the collaboration between traditional response organizations and citizen volunteers. A key challenge is the difficulty of developing meaningful and effective forms of cooperation and collaboration between traditional response organizations and onsite and online volunteers. In the light of this challenge, a promising development is the appearance of new forms of collaboration supported by online platforms, which function as an opportunity to forge connections between established organizations and citizen volunteers. For example, St. Denis, Hughes, and Palen (2012) describe such a platform, when emergency managers experiment with a corps of trusted volunteers part of the United States Virtual Operations Support Teams (VOST) in providing emergency response online. Following the DRC typology, this example is a combination of an established and extending organization. Ready2-Help, the case we discuss, is also an example of how a response organization uses an online platform to mobilize and manage citizen convergence prior to a crisis situation. The Red Cross is traditionally an expanding organization, which in this case takes on a new task (extending) of organizing (emergent) volunteer response prior to disaster. As a result, the Ready2Help initiative has characteristics of an expanding, extending, and emergent organization.

Reverting to the DRC typology, in utilizing these online platforms response organizations exhibit multiple characteristics of established, extending, expanding, and emergent organizations. In the past, the DRC typology has mainly been used to categorize citizen convergence rather than informational convergence. However, when studying informational convergence, the boundaries between different types of organizational behaviour seem to be more permeable than the typology suggests (see also: Scanlon, 1999). While the DRC typology offers a useful categorization of organized behaviour, new technological developments necessitate a renewed examination of this phenomenon. We therefore seek to explain how response organizations develop new organizational structures and take on new tasks in incorporating online and onsite voluntary citizen response.

3 | METHODOLOGY

This paper is aimed at understanding how response organizations adapt to include voluntary citizen response to disaster. To answer this question, we adopted an explorative research design as a way to inform the current disaster debate with new perspectives derived from observations in the field. We selected an organization that theoretically matched our research purpose, and which both represented a formal response organization and facilitated voluntary involvement within a crisis context. This led us to identify the Dutch Red Cross and its initiative of "Ready2Help" as an appropriate research context.

Having secured access to the organization through our professional network, we first conducted an archival analysis of documents describing the organization's policies in terms of formal response, citizen involvement, and social media usage. The Ready2Help website and media reports also proved a useful source of information for our preliminary understanding of the context. We then conducted eight interviews with key informants at the Dutch Red Cross and observed the first Ready2Help operational exercise (described in more detail below). These interviews, conducted in a semistructured manner, were aimed at gaining understanding of the organization's perspective on voluntary citizen response, also in relation to its "regular" response activities.

Our research design reflects the ambition to capture the multi-faceted account of organizing voluntary response to disaster onsite and online. To study the organization of onsite convergence, we conducted two observations. The first consisted of a field exercise

organized by the Dutch Red Cross aimed at testing the Ready2Help response systematic. Another part of the exercise focused on testing how Twitter as a form of social media was used in a crisis situation. We observed the exercise and collected tweets that were shared throughout the exercise. The second observation consisted of a real-life crisis situation, whereby again we collected tweets shared in real time.

We analysed the tweets in an interpretive manner, first manually and next through a semantic network analysis. In semantic analysis, relationships between words are the central unit of analysis, whereby word pairs are comparatively analysed by applying clustering algorithms to identify word frequencies, and subsequently "semantic clusters." These clusters can sometimes reveal latent discourses through word patterns that interpretive qualitative analyses might overlook (Diesner & Carley, 2004. It therefore offers a useful and relatively efficient means for analysing social media samples, or, as in this case, to verify qualitative interpretive analyses.

Semantic network analysis is gaining popularity in view of increasingly sophisticated computational methods, and the availability of digital data sources such as the data used towards our analysis. For our analysis, we used a combination of tools to ensure optimal insight into each step of the analytical process. First, we used fulltext.exe to identify word frequencies and word correlations (Leydesdorff & Welbers, 2011) in each of the two Twitter data sets, removing stop words prior to our analysis. Next, we analysed the outcomes through factor analysis to more clearly demarcate core frames, deleting factor loadings lower than .40, or with high cross-loadings on other factors (Hinkin, 1998), and conducted a pattern and reliability analysis of the results (included in the Appendix). Finally, we visualized the results using Pajek (Batagelj & Mrvar, 2004) and VosViewer (Van Eck et al., 2010). Finally, we compared the outcomes of the semantic analysis with the outcomes of our interpretive analysis to gain a deeper understanding of both data sets.

4 | RESEARCH CONTEXT

Ready2Help is a citizen network developed by the Dutch Red Cross. It is based on similar platforms in other countries, such as Team Österreich, an initiative of the Austrian Red Cross. Interested citizen volunteers can register themselves through the Ready2Help website (https://ready2help.rodekruis.nl/), where they are asked to provide some personal information and contact details. In case of a crisis situation, volunteers are subsequently contacted by the Red Cross via e-mail, SMS, or automated calls. Volunteers are then asked whether they are available to provide specific assistance at a designated time (filling sand bags, cleaning a refugee shelter, etc.). This allows volunteers to decide for themselves whether they can perform a certain task. From experience, the Red Cross has learned that in most areas about one in 10 volunteers will be available to help (Red Cross, 2015). In other words, prior to any disaster or crisis, the Red Cross in 2015 had a pool of 30,000 potential citizens volunteers at their disposal which they can mobilize (alongside their regular, trained volunteers) to assist in operations at times of crisis.

5 | RESULTS AND ANALYSIS

In this section, we discuss the results from our analysis. We first focus on the Ready2Help exercise and then turn to the analysis of the refugee crisis. In both cases, our qualitative results are followed by the results of the semantic network analyses.

5.1 | Ready2Help Exercise: managing the convergence of citizens and information

Ready2Help was tested in a field exercise on 14 March 2015. Volunteers were called into action by the Red Cross to combat the fictional flooding of the Dutch town of Dordrecht. The exercise consisted of an onsite operation with volunteers, who were tasked with reinforcing a dike, clearing a neighbourhood of debris, and rescuing valuable art items from a museum. In addition, the exercise tested a Red Cross Web Monitoring Team, which responded to mock questions posed by volunteers under the Twitter hashtag #R2Hoefening ("#R2Exercise").

The exercise was designed to mimic the actual deployment of the Ready2Help platform as much as possible. In the days leading up to the exercise, all 2,314 then-registered Ready2Help volunteers were contacted via text message, automated calls, and emails; 1,723 volunteers answered, of which 213 registered their attendance (Red Cross, 2015). As the organizers had no previous experience with Ready2-Help, they were not sure what that would mean for the actual turnout. Would those who registered actually show up? Would they be on time? What would they expect from the Red Cross? Adding to the uncertainty, the system used for contacting volunteers experienced a number of glitches. Despite these initial challenges, 137 volunteers turned out for the exercise, proving that the system could work indeed. This provided a sufficient baseline for the Red Cross to test how they would manage the convergence of citizens.

The Ready2Help exercise itself started with a briefing for all new Ready2Help volunteers. As an expanding organization, the Red Cross already had its structures in place to manage the convergence of citizens. Volunteers were divided into groups and assigned a Team Leader (i.e., a trained Red Cross member). It was not immediately clear for volunteers what tasks they should perform, as they were not used to work on a disaster site. Volunteers therefore turned to Team Leaders for guidance and supervision. Once tasks were explained by the Team Leaders and divided over the groups of Ready2Help volunteers, they spread out across the exercise site and immediately started to clean up debris from the flooding. The tasks provided were fairly simple and straightforward, clearly defined, and well structured. For example, volunteers were tasked to clean up branches lying across the road, fill up sandbags for dike reinforcement, and remove art from a museum exhibition prone to flooding. While carrying out these tasks, it was difficult for Team Leaders to

keep an overview of "their" volunteers. As a result, for example, one volunteer inadvertently crossed over to another team without his Team Leader or himself being aware of this. Not until the coffee break did the volunteer realize that something had gone wrong, suddenly encountering people he did not know. In a real crisis situation, this could have turned into an issue of accountability, since the Red Cross took responsibility for the actions of its volunteers, but also for their safety and whereabouts.

We also observed how the Red Cross used the Web Monitoring Team (WMT) to manage simulated informational convergence online. Ready2Help and Red Cross volunteers acted as mock citizens, who tweeted aid requests. The goal of the WMT was to communicate clear advice to affected citizens. During the exercise, 2,275 tweets were sent that needed to be processed by the WMT.

The online aspect of the Ready2Help exercise illustrates the difficulty of incorporating informational convergence in an ongoing response operation. This quickly became evident when the WMT struggled to keep up with the information posted by citizens. For instance, tweets received in the morning were only answered much later. For example:

9:05u: victim1   Can somebody help us!!! Everything is flooded! Wife is not mobile. #R2Hexercise

11:47u: Ready2

Help_NL @victim1   If possible move to top floor. Pick a room where you can escape through the window. #R2Hexercise ^MV.

To cope with the many messages, the web monitoring team used three predefined answers to deal with the many requests that came in.

Ready2Help_NL   If possible stay in your house. Check if you have sufficient food and water for the coming three days. #R2Hexercise.

Ready2Help_NL   Shut off gas, water and electricity. Leave the curtains open and let relatives know where you are going. #R2Hexercise.

Ready2Help_NL   Tune to the regional disaster broadcasting agency on 93.4FM or check the crisis website http://www.crisis.nl #R2Hexercise

Despite the standardized response format, the WMT noted that it was difficult to react to all the messages. When confronted with the inability of the WMT to respond on time, citizens started to help each other out by providing advice on what to do.

Victim2   I am soaked, shivering from the cold and lost my insulin in the mud. Where can I go for help? #R2Hexercise

Helper1 – @victim2   can you put on something dry? #R2Hexercise try to take off your wet clothes and wrap a blanket around you

Victim2 – @helper1   I don't have anything dry in the car and the water is coming in #R2Hexercise

Helper1 – @victim2   Whatever you do, don't stay in the car. Can you climb on the roof? If necessary walk/swim to higher grounds #R2Hexercise

In addition to observing what challenges the WMT faced in managing convergence of information, we were also interested in the type of information posted online. Our semantic network analysis (see Figure 1 below) shows a distinction between prominent words used before the start of the exercise (circular nodes) and prominent words used during the exercise (triangular and square nodes). Here, we see a clear distinction between managing the convergence of citizens and information. The pre-crisis tweets (circles) focused on the organization of the convergence of citizens. This entailed providing citizens with information about the date ("Saturday" & "today"), the location (city of "Dordrecht"), scenario ("disaster simulation", "storm", "fictional"), how to sign up ("via"), and the organizer ("Red Cross"). This process was characterized by the Red Cross asking for attention to the exercise in order to stimulate citizens to participate as Ready2-Helpers.

During the exercise itself, the Red Cross switched from managing the convergence of citizens online to managing the convergence of information. It is noteworthy that the type of words used (triangular and square nodes) altered significantly after the Red Cross changed its focus. Namely, we now identified a high prominence of verbs, such as "help", "need", "knows" and "going". "Help" was, for example, used 363 times. "Helping" (157) and "aid" (136) were also used relatively often. These words signal specific actions from volunteers, or responses by the WMT. The change indicates that the management challenge involved with informational convergence transformed from managing the mobilization of citizens to responding to individual questions and needs. That is, the Red Cross had to shift from a familiar task (expanding its organization) to a new task (extending and managing emergent online citizen groups). As we discussed earlier, the Red Cross struggled to take on this new responsibility. It especially demonstrated to the Red Cross how difficult it was to react in real time to the convergence of information sent during a disaster situation. In this case, a relatively small number of messages were sent, but it quickly overwhelmed the WMT. In any real crisis situation, with potentially hundreds or thousands of messages posted per minute, a much larger team of people would be needed for the WMT to be successful. The Red Cross simply had no resources to facilitate this. Following its own after-action evaluation, the Red Cross therefore decided to disband the WMT (Red Cross, 2015).

5.2 | Refugee Crisis

Following the March 15 exercise, the Ready2Help team was able to refine its operational procedures in response to a range of minor incidents. Around the same time, the 2015 refugee crisis overwhelmed national authorities, which triggered the first large-scale active deployment. The refugee crisis reflected a significant
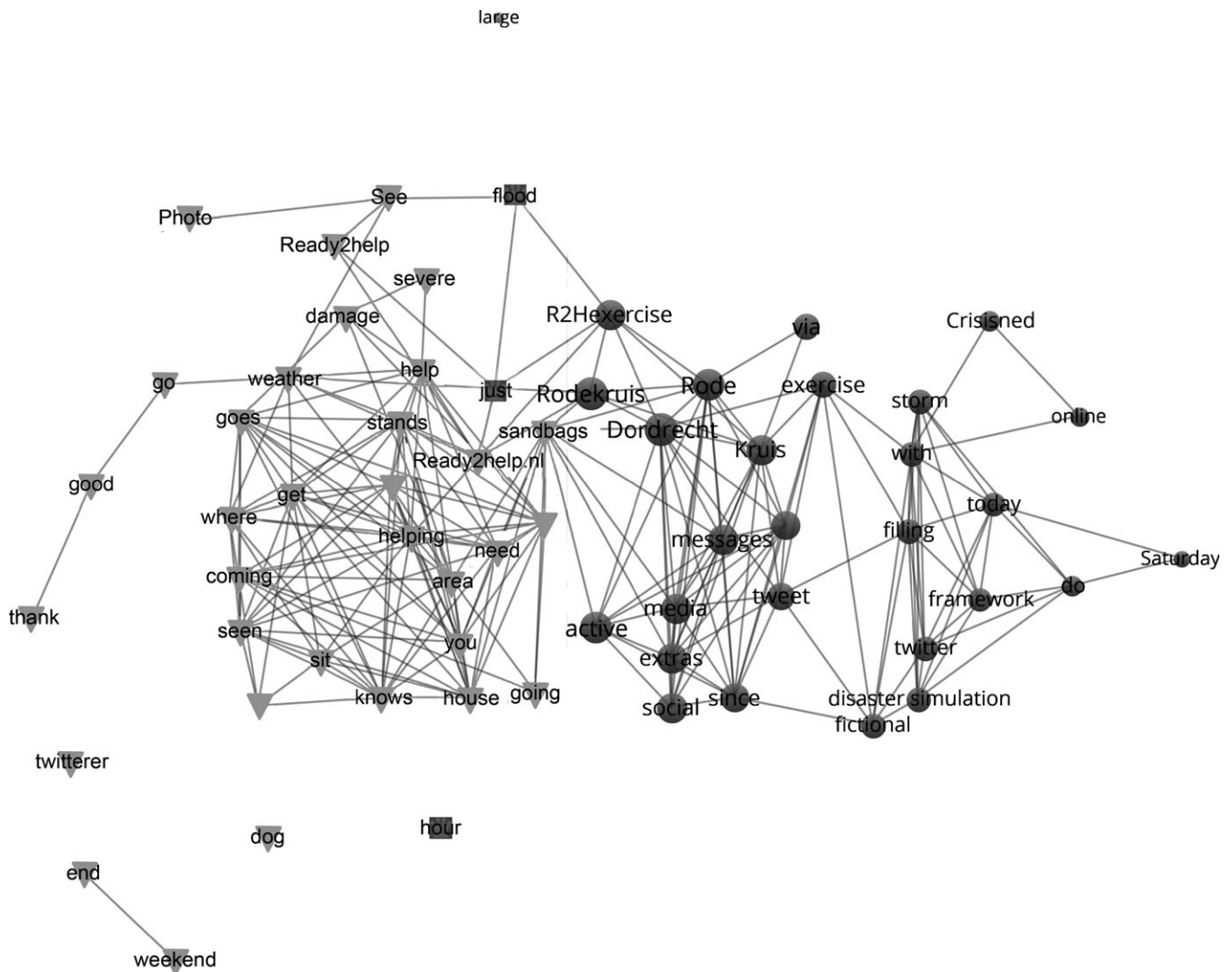
FIGURE 1 Semantic Network Analysis of #R2HExercise

challenge for the Dutch authorities: how to organize shelter, medical help, food and other basic necessities, often at short notice? It became clear that the Dutch government was ill-equipped to address this challenge on its own. Organizations tasked with processing refugees—from checking their documents, to performing medical tests and building shelters—had faced budget cuts over the past decade, consequently lacking resources to deal with the continuous arrival of new refugees. Thus, the Immigration and Naturalization Service (IND) and the Central Agency for the Reception of Asylum Seekers (COA) were quickly overwhelmed by requests for food and shelter for hundreds of refugees at once. In September 2015, the authorities therefore turned to the Red Cross and Ready2Help for emergency assistance. At the height of the refugee crisis, Ready2Help volunteers were mobilized on an almost daily basis.

In managing the convergence of Ready2Help volunteers, the Red Cross applied its previously tested procedures. Onsite, volunteers were provided with fairly simple, well-structured, but labour-intensive tasks, such as of setting up shelters for refugees, cleaning, and assisting with various logistical tasks (Red Cross, 2015). To a much lesser extent, volunteers performed specialized activities, such as translation (Arabic to Dutch) or medical help. Online, Ready2Help took a different approach. Having disbanded the WMT, the Red Cross online presence was more tilted towards marketing of the Ready2Help platform, mobilizing, and registering citizens. Our semantic network analysis of the Twitter data (Figure 2) demonstrates that now a shift has occurred from managing informational convergence to managing convergence of citizens. We now see two clusters with a different focus. The first cluster consists of twitter messages sent by Ready2Help volunteers about their involvement (triangular nodes). These messages were usually only met by encouragement of the Ready2Help twitter account, if at all. The second cluster (square nodes) depicts that a range of societal actors encourage their members to support the Ready2Help initiative. A clear example of such an actor is Scouting Netherlands.

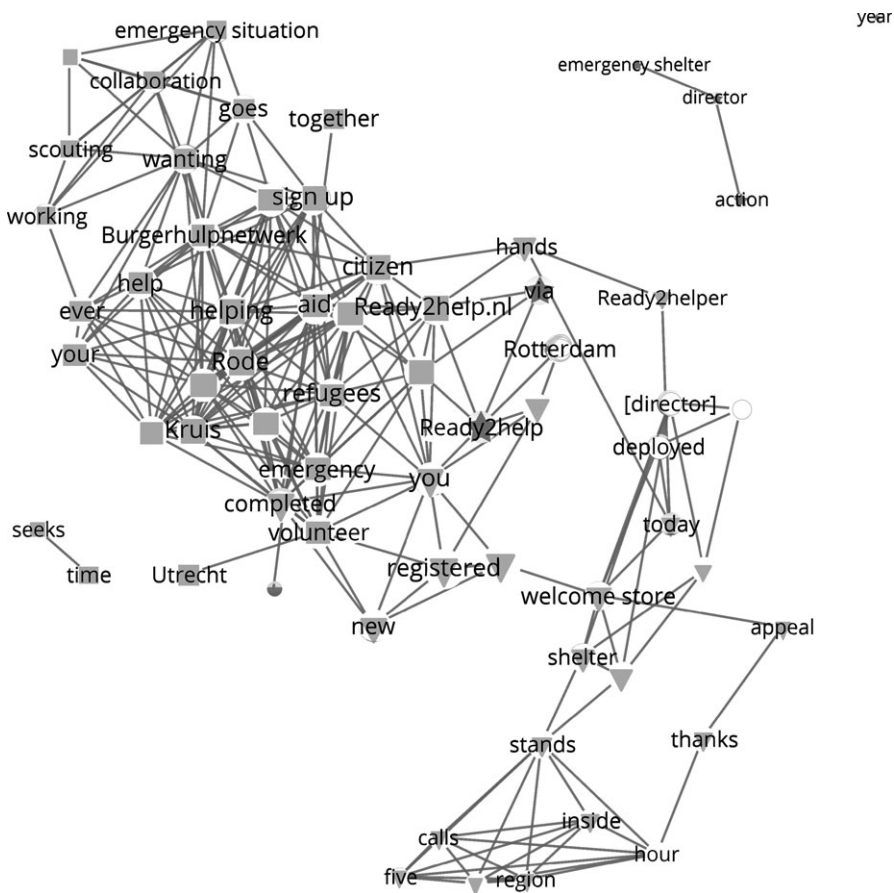Specific tweets illustrate this dynamic.

FIGURE 2 Semantic Network Analysis of #Ready2Help during Refugee Crisis

| @RodeKruis | #Ready2Help volunteers step up for #refugees. Want to help out? Register for @Ready2Help_NL |
| Nice news @ worldscouting | Plan for Dutch Scouts and Red Cross to work together during emergency situations. http://t.co/mowbGIb92N |

In retrospect, the Ready2Help platform was very successful for the mobilization of new citizen volunteers. The deployment of the Ready2Help platform functioned as a bridge between a response organization and (online) emergent citizen groups. As such, it serves as a promising example of how citizen convergence became increasingly embedded in official response operations.

6 | DISCUSSION AND CONCLUSION

In the aftermath of disasters, response organizations continue to struggle with citizen and online informational convergence. Increasingly they experiment with different ways to incorporate citizen volunteers in response operations. This study was guided by the research question: *How can we understand the way in which response organizations adapt to include voluntary citizen response in the era of new digital opportunities?* Our findings highlight a programme aimed at mobilizing volunteer support, initiated by the Red Cross, and serve to illustrate how this particular organization tried to manage

volunteer response through their Ready2Help platform. We found that the Red Cross was able to successfully organize disaster convergence through Ready2Help by mobilizing citizen volunteers in support of Red Cross relief efforts and that this was to a large extent attributable to the organization's ability to manage convergence of citizens and information.

Conceptually, these findings indicate that in order to manage volunteer convergence, response organizations are transcending the boundaries between different types of organized behaviour as previously described in the DRC typology. We identified that online and offline platforms progressively drive the convergence of citizens and information in crisis and disaster situations. In our case, we have demonstrated how the Red Cross as expanding organization used the Ready2Help platform to perform a new task, extending itself in terms of organizing emergent volunteer response to the 2015 refugee crisis. The platform also allowed the Red Cross to structure most activities of volunteers, enabling coordination of where they were to meet and facilitating task allocation. In so doing, the platform provided an interface between expanding, extending, and emergent forms of organized behaviour. Consequently, platforms enable more flexible forms of managing citizen volunteers and often exhibit multiple characteristics of organized behaviour. In Figure 3, we illustrate this development.

This development is not only limited to the Ready2Help case in The Netherlands. In other contexts, platforms also channel volunteer
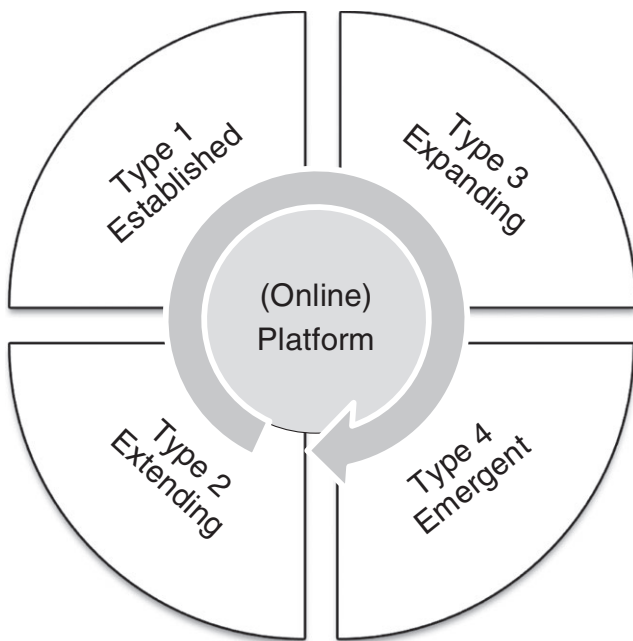
FIGURE 3 Platforms as drivers for channelling convergence

convergence at disaster sites. For example, in the United States, FEMA is educating and training citizens in *Community Emergency Response Teams* (CERT) on life-saving skills, rescuer safety, and organization of response teams (Barsky et al., 2007). By doing so, FEMA as an established response organization hopes to better channel the convergence of citizens at disaster sites. Another example can be found in the clean-up effort in the aftermath of the Rena grounding and oil spill in New Zealand, where the government Incident Control Centre took up the role of coordinating the volunteer clean-up effort (Hunt, Smith, Hamerton, & Sargisson, 2014). They communicated with and registered citizen volunteers through the platform "ReadyNet," which provided updates and information about the clean-up operation of the beaches. In this way, the response organization used a platform to channel convergence of citizens and information. In the same country, the aftermath of the Christchurch Earthquakes also shows how formal authorities instructed and managed both contractors and student volunteer groups by mobilizing volunteers through multiple platforms. They linked with ongoing efforts on a Facebook group and organized this by making use of the "GeoOp" mobile workforce management system (Villemure et al., 2012). Again, we witness how a platform was used to bridge the various activities of established (government), emergent (students), and expanding (contractors) organizations.

Clearly, all around the world response organizations are engaging in efforts to manage convergence by making use of platforms. Understanding to what extent, in what kind of contexts, and how response organizations are actually successfully managing convergence is a relevant next step for crisis and disaster studies. The Ready2Help case provides us with more insight into some of the challenges these organizations face, and how these challenges might be overcome, both in organizing

onsite and online convergence. We will discuss these challenges in the next section.

7 | FUTURE CHALLENGES: TOWARDS A RESEARCH AGENDA

7.1 | Governing self-organization

When response organizations try to manage citizen convergence, they will be challenged to adopt new management attitudes, to be flexible, and to quickly adapt to changing circumstances. In trying to forge meaningful connections with citizen volunteers, response organizations will have to learn how to engage with citizens on a short-term basis as well as foster longer-lasting connections. In a continuously changing online environment, response organizations will also be challenged to adapt their organizational structures so as to incorporate new tools and technologies in a way that benefits both first responders and volunteers (Boersma, Comfort, Groenendaal, & Wolbers, 2014). The governance of self-organization can therefore be considered as promising area for new research.

7.2 | Connecting online platforms with onsite response initiatives

As new digital opportunities become more readily available, online crisis management platforms developed by citizens flourish. Still, the question remains when the goals pursued by citizens online have real consequences in onsite response operations. Many successful collaborations, like Ready2Help, have been developed by, or in collaboration with, traditional response organizations. At the same time, the potential of informational convergence is much larger and more diverse. Unfortunately, online initiatives often fail to meaningfully connect with onsite response organizations (Hughes & Tapia, 2015). Researchers might therefore focus on the conditions under which the virtual becomes actual (cf. Shields, 2003).

7.3 | Fostering inclusiveness

A potential issue that the Ready2Help platform, and similar cases, raise is that these platforms have the potential to exhibit exclusionary characteristics. Should response organizations organize and formalize volunteer response (e.g. via recruitment), or should they become more adaptive, aligning themselves with emergent initiatives? As our case shows, both forms have benefits and drawbacks. Often the reason for the abandonment of emergent citizen initiatives is that they do not adhere to the formal response organizations' internal information sharing and accountability structures. The inclusion of citizen initiatives in formal response structures also risks diminishing the flexibility and serendipity that make these initiatives so effective in turbulent disaster situations. The question is then as follows: How do online platforms relate to other spontaneous volunteering efforts?

7.4 | Managing information

When engaging in online efforts, response organizations are confronted by a number of information management challenges. One of the most pressing issues is information overload. Where private companies employ large-scale Web Care Teams to deal with this challenge, this is generally out of reach for most response organizations. Indeed, this was also the case for the Red Cross when experimenting with the Ready2Help initiative. Setting up and training a professional Web Monitoring Team that could rapidly gear up in the aftermath of a crisis proved to be too costly and labour intensive. In addition, another challenge is that emergency managers struggle to make sense of information (Wolbers & Boersma, 2013). This is magnified because response organizations often have little knowledge about the way in which social media platforms work, what benefits they have, and what kind of audiences they can reach on a given platform (Eriksson & Olsson, 2016). Similarly, emergency managers do not always have the right software and training to effectively use social media (Hiltz, Kushma, & Plotnick, 2014). Researchers might look for promising developments and collaborations in the field of crisis informatics to develop tools to support response organizations with these challenges (cf. Imran, Elbassuoni, Castillo, Diaz, & Meier, 2013).

8 | CONCLUSION

In the era of new digital opportunities, response organizations increasingly adapt to include voluntary citizen response by making use of online and offline platforms. These platforms are gaining traction in terms of driving the convergence of citizens and information in crisis and disaster situations. Our case study of Ready2Help highlights the enormous potential in fostering volunteer involvement. Platforms function as an interface between established, expanding, extending, and emergent forms of organized behaviour, which enables a more flexible form for managing citizen volunteers. It also signals a trend that response organizations will be increasingly challenged to find new ways to connect with emerging initiatives, engage with new technologies, and find new ways to forge meaningful collaborations. Our new conceptual understanding of the DRC typology can be used as a starting point for studying the way in which these developments change the landscape of organized behaviour in times of disaster.

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APPENDIX

TABLE A1 Pattern analysis of exercise semantic network

Rotated component matrix[a]
R2H exercise

	Component	
	1	2
KOMEN	0.802	
GAAT	0.798	
HOND	0.793	
FOTO	0.793	
GEZIEN	0.776	
WAAR	0.775	
WEET	0.763	
KRIJG	0.763	
SCHADE	0.756	
GA	0.755	
HULPDIENSTEN	0.750	
MENSEN	0.749	
TWITTERAAR	0.749	
GOED	0.744	
ERG	0.740	
DANK	0.737	
ZIT	0.720	
STAAT	0.719	
JULLIE	0.719	
WEER	0.718	
GEBIED	0.718	
EINDE	0.716	
HELPEN	0.710	
WEEKEND	0.707	
HULP	0.700	
HUIS	0.679	
GAAN	0.678	
WATER	0.675	
NODIG	0.663	
ZIE	0.653	
READYHELPNL	0.569	
READYHELP	0.569	
NET	0.494	
ZANDZAKKEN	0.479	
ZATERDAG		0.828
DOE		0.815
CRISISNED		0.797
ONLINE		0.793
KADER		0.793
VANDAAG		0.789
STORM		0.781
RAMPENOEFENING		0.781

(Continues)

TABLE A1 (Continued)

Rotated component matrix[a]
R2H exercise

	Component	
	1	2
TWITTER		0.773
MEE		0.748
VIA		0.745
VULLEN		0.734
FICTIEF		0.705
INFO		0.678
KRUI		0.659
OEFENING		0.649
VANAF		0.633
BERICHTEN		0.623
TWEET		0.618
RODE		0.600
SOCIAL		0.577
FIGURANTEN		0.551
DORDRECHT		0.549
MEDIA		0.548
ACTIEF		0.437
RHOEFENING		0.425
RODEKRUIS		0.423

Extraction method: Principal component analysis.
Rotation method: Varimax with Kaiser normalization.
[a]Rotation converged in five iterations.

TABLE A2 Reliability analysis of exercise semantic network

Reliability statistics	R2H full component 1	R2H full component 2
Cronbach's Alpha	0.972	0.952
N of Items	34	30

TABLE A3 Pattern analysis of refugee crisis semantic network

Rotated component matrix[a]
R2H full

	Component		
	1	2	3
SCOUTING	0.858		
WERKEN	0.858		
OOIT	0.858		
JOUW	0.853		
SCOUT	0.843		
SAMENWERKING	0.843		
WILLEN	0.841		
HELP	0.841		
NOODSITUATIE	0.840		
ZOEKT	0.836		
GAAN	0.816		
BURGERHULPNETWERK	0.815		
MELD	0.800		
MENSEN	0.784		
NODIG	0.783		
KRUIS	0.781		
HELPEN	0.780		
RODE	0.779		
AANMELDEN	0.777		
TIJD	0.775		
NEDERLAND	0.740		
HULP	0.713		
SAMEN	0.699		
UTRECHT	0.698		
MERLIJNSTOFFEL	0.693		
VLUCHTELINGEN	0.691		
NOOD	0.662		
KLAAR	0.653		
BURGER	0.636		
VRIJWILLIGER	0.555		
READYHELPNL	0.484		
RODEKRUIS	0.468		
REGIO		0.854	
ROEPT		0.851	
UUR		0.850	
VIJF		0.849	
ONDERSTEUNING		0.848	
BINNEN		0.839	
STAAN		0.813	
BEDANKT		0.798	
OPROEP		0.773	
BURGERHULPVERLENER		0.738	
OPVANG		0.734	

(Continues)

TABLE A3 (Continued)

Rotated component matrix[a]
R2H full

	Component		
	1	2	3
WELKOMWINKEL		0.725	
VANDAAG		0.686	
HULPVERLENER		0.675	
PARAAT		0.662	
AANGEMELD		0.610	
READYHELPER		0.580	
NIEUWE		0.575	
AANMELDINGEN		0.488	
JIJ		0.471	
HANDEN		0.410	
JAAR			0.847
DIRECTEUR			0.794
NOODOPVANG			0.768
ACTIE			0.768
VIA			0.574
READYHELP			0.469

Extraction method: principal component analysis.
Rotation method: varimax with Kaiser normalization.
[a]Rotation converged in 5 iterations.

TABLE A4 Reliability analysis of refugee crisis semantic network

Reliability statistics	R2H full component 1	R2H full component 2	R2H full component 3
Cronbach's Alpha	.976	.954	.835
N of Items	32	26	6