Crowdsourcing and the COVID-19 Response in China: An Actor-Network Perspective

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ABSTRACT

Crowdsourcing, serving as a distributed problem-solving and production model, can help in the response to a disaster. The current literature focuses on the flow of crowdsourced information, but the question of how crowdsourcing contributes to physical disaster workflows remains to be addressed. Based on a case study of China's response to COVID-19, this research aims to explore the role of crowdsourcing stakeholders and how they acted to respond to the outbreak. Actor network theory is applied as the lens to elucidate the roles of different heterogeneous actors. The preliminary results indicate that socio-technical actors activated, absorbed, associated, and aligned with each other to combat the pandemic. We suggest ways to augment the actor network to address potential future outbreaks.

Keywords

Disaster, crowdsourcing, actor-network, social media.

INTRODUCTION

The frequency and scale of disasters across the globe have continued to increase in recent years (United Nations, 2021). Effective response to disasters requires the coordination of a complex set of workflows, including disaster information, physical delivery of relief supplies, the flow of human resources and financial aid, posing serious challenges under huge time pressures (Long and Wood, 1995). In this respect, traditional response systems that tend to involve hierarchical organizations that may not be flexible and agile enough to meet the multifaceted, uncertain, and complex needs that emerge in chaotic environments such as those encountered during a disaster (Nan and Lu, 2014).

Some information systems (IS) practitioners and scholars have suggested crowdsourcing to tackle the challenges faced by authorities during and following disasters. Crowdsourcing is a mechanism that incorporates three stakeholders: the *crowdsourcers* (for example, public emergency management agencies in this case) who outsource tasks they have traditionally performed to the *crowd* (e.g., a group of individuals) via an open-call format through Internet-based *platforms* (Howe, 2006; Schenk and Guittard, 2011). There has been increasing research interest in the use of crowdsourcing in disaster relief, with individuals acting as data sensors in disaster-affected areas by creating, posting, disseminating, and discussing information on online platforms. The relevant authorities collect, organize and analyze these crowdsourced data and develop appropriate relief measures (Ogie et al., 2018; Sheth, 2009). However, there are at least two gaps in the research at the intersection of crowdsourcing and disasters. First, existing research focuses on the flow of crowdsourced information in the aftermath of disasters, but little attention has been paid to understanding the crowdsourcing of material, financial, and manpower flows in disaster response. Such flows are typically taking place in parallel with, or as a result of (crowdsourced) information. However, the heterogeneity of the crowdsourcing stakeholders involved in disaster response makes collective action challenging. Therefore, a second gap requires research into the role

played by crowdsourcing stakeholders in disaster response workflows, and how they interact to form effective disaster response networks. To fill these gaps and contribute to our knowledge of how crowdsourcing can best be used in disaster management, our research aims to address the following question – *What are the roles of crowdsourcing stakeholders in disaster workflows?*

We chose the case of the COVID-19 response in China to explore this question. Due to the lockdowns and social distancing requirements implemented in China, crowdsourcers have primarily relied on internet platforms to mobilize crowds and connect with each other, while subsequently investing in practical actions concerned with prevention and control of outbreaks. We conducted semi-structured interviews with 32 participants, including civic volunteers, community workers, social workers, and school community volunteers, to gain insight into the perspectives of different groups helping with the response to the COVID-19 outbreak.

We elaborate the theoretical lens for this research in the next section. After this, the research methodology is introduced, followed by a brief description of the preliminary results. In the final section, we discuss the limitations and potential contributions of the research.

THEORETICAL FOUNDATION

The term crowdsourcing was first coined by Howe (2006) to describe "*the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call".* Since then there has been widespread official recognition of crowdsourced engagement as an important element of disaster relief and resilience building (e.g., UNDRR, 2015) because of its benefits for accessing large amounts of resources, obtaining cost-effective results, and exploring new discoveries (Brabham, 2012; Kanhere, 2013; Wazny, 2017). For a variety of reasons, such as spatial and temporal distance from the disaster site, delays in decision making, or disasters that exceed response capabilities, formal authorities may not be able to act immediately following a disaster. As a result, government and other agencies sometimes make public appeals for help from the crowd. Individuals and communities close to affected areas are often the first responders, reporting the disaster and helping those who are at risk or suffering (Leong et al., 2015). Online intermediary platforms such as social media are used to reach out to users to participate in disaster relief (Kim et al., 2018). However, how these socio-technical forces (i.e., crowdsourced stakeholders) interact to increase the responsiveness of disaster workflows is under-explored in the current research literature.

Hence, this research explores the interaction amongst heterogeneous networks actors during a disaster. We do so through the lens of actor-network theory (ANT) (Callon, 1984; Latour, 2005; Law, 1992). ANT has interdisciplinary methodological and theoretical strengths that offer potential for understanding socio-technical aspects of IS research (Walsham, 1997). ANT treats both human objects (e.g., organizations and individuals) and non-human objects (e.g., laws and technologies) as actors. These heterogeneous components generate connections that form networks in which the nodes are actors (Bosco, 2006; Latour, 2005; Law, 1992; Walsham, 1997). Central to ANT is the process of translation by which the focal actor defines, negotiates, and arranges the interests, roles, functions, and status of other actors through four moments: problematization, interest, registration, and mobilization (Callon, 1984).

We employ ANT to explore the role of crowdsourcing in disaster response for the following reasons. First, ANT provides a framework for understanding the roles of social and technological actors and their interaction, while avoiding the limitations of technological and social determinism (Latour, 1984; Law and Callon, 1988). This fits our research context, in which our aim is to explore how crowdsourcing stakeholders create and maintain disaster relief networks with aligned interests. Official crowdsourcers act as the focal actors, interacting, negotiating, coordinating, and ultimately facilitating disaster relief efforts with other crowd members through the technical resources provided by nonhuman actors (i.e., platforms). Second, the ANT translation approach enables us to reveal the process of human–technology interaction. This helps achieve our research aim of exploring how different crowdsourcing stakeholders contribute to disaster workflows, and, how the focal actor encourages, manages, and mobilizes other actors to build a network for disaster relief. Third, ANT highlights the dissidence in the network. It provides a suitable perspective from which to analyze the claims of various heterogeneous actors, thereby revealing the challenges encountered in disaster response and shedding light on critical disaster management issues. In short, we will use ANT as a sensitizing device to understand the roles of different crowdsourcing stakeholders and the efforts made to form a disaster response network. We will also explore the dynamic interactions among actors, including how they respond to resistance in the process of forming the actor-network.

RESEARCH METHODOLOGY

We decided to use case study research given the exploratory nature of our research project (Eisenhardt, 1989; Siggelkow, 2007). Our case is based on the COVID-19 response in China because it provides sufficient evidence on the crowdsourcing phenomenon in the response to a disaster (Mason, 2002; Myers, 2019). China was the first country to report a confirmed case of COVID-19 and the first to implement a lockdown, hence offering an excellent opportunity to explore and better understand the role of crowdsourcing in disaster response.

The primary data were collected from semi-structured interviews, conducted from February to April 2022. Eligible participants were those who had participated in or organized prevention and control-related efforts after the COVID-19 outbreak. We approached key informants from volunteer groups and the local community in which the first author was involved. Subsequently, a "snowball sampling" strategy was used, which helped us to obtain a total of 32 interviewees, covering fifteen provinces in China, including Hubei province (Myers and Newman, 2007).The interviewees were from a variety of backgrounds, including nonprofits, civic volunteers, college students, community workers, and grassroots government agencies. Each interview lasted an average of 30 minutes. To understand the potential characteristics of the roles of different stakeholders in post-disaster response, we invited the interviewees to share their experiences of anti-epidemic from early 2020 onwards, including motivations for participation, actions taken, challenges encountered, and reflections[1]. In addition, ancillary data were collected from archival sources, including posts related to the outbreak on the interviewees' personal public social media accounts, reported interviews, WeChat posts from their communities or organizations, short videos, and related news coverage. This additional data facilitated an in-depth understanding of the phenomenon of interest (Klein and Myers, 1999).

Due to the exploratory nature of this study, the process of data analysis was inductive and iterative (Walsham, 1995). We followed the temporal bracketing strategy devised by Langley (1999) to identify recurring theoretical mechanisms over time. The logical sequence of translation from ANT (i.e., problematization, interessement, enrolment, mobilization, maintenance) was adopted and extended. We then applied the concept development process described by Gioia et al. (2013) to develop a multi-stage coding scheme with first-order codes, second-order themes, and aggregated dimensions (see Table 1). We conceptualized the process of network formation by heterogeneous participants in each respective time period as activation, absorption, association, alignment, and augmentation (the 5 As).

Table 1. Excerpt of Coding Scheme

1st Order Concepts	2nd Order Themes	Aggregated Dimensions
Purchasing and donating PPEs	Emergent spontaneous response	Activation
Traveling to Hubei to support the fight against the outbreak		
Spontaneously guarding at transportation stations		
Assembling on standby		
Setting up a team for pandemic prevention and control services	Official response	
Arranging manpower based on the number of administrative residents		
Calling for crowd power		
Defining the goal of collective action to resolve the crisis		
Services like PCR testing require short-term and large numbers of helpers	Identification of needs	Absorption
Epidemic services have become routine work that requires stable forces		
Absorption through word of mouth from social connections	Diversification of channels	
Social media and website subscriptions and retweets		
Offline posts of announcements		
Monetary rewards	Stimulation with incentives	
Non-monetary rewards such as souvenirs and thank you letters		
Volunteering activities credited for curriculum		

[1] The details of interviewees and interview questions are placed in a cloud repository. Visit via https://doi.org/10.17608/k6.auckland.20819941.v1

Inspired by the efforts of frontline workers To help people in need		
Top-down notification of work requirements Bottom-up reporting on work progress and social feedback	Duty configuration	Association
Governments invite social organizations with experience and resources Emergent groups join with each other to act collectively	Collaboration	
Group leaders act as bridging coordinators across levels or organizations The key is problem solving through negotiation of benefits	Coordination	
Team leaders play a pioneering role Continuously calling for people around them to action	Demonstration of credibility	Alignment
Guidance on public opinion to reduce social panic Unified deployment and vertical management Inspection of grassroots efforts Official recognition of the work of social organizations and individuals	Effective governance	
Conducting professional training and qualification exams Advocacy education as invisible training	Training	Augmentation
Recording volunteer hours and implementing a time bank mechanism Community and corporate partnerships to absorb participants Use of social media campaigns to express appreciation for donating companies and to stimulate more donations	Ways on innovating	

PRELIMINARY RESULTS

Using the ANT perspective, the crowdsourcing stakeholders involved in the disaster relief in China can be classified into different categories of actors. We defined the focal actors as having more resource advantages, greater authority and stronger organizational, management and dispatching capabilities than other actors. Due to the resource advantages and leadership granted by the administrative system, the various government agencies were the focal actors, initiating the outbreak response network and actively involved in the implementation of relief measures. The main actors in building the network were spontaneous social voluntary groups. In our case study, these were not only the active responders to the call from the focal actors, but also the network expanders who put the call out for broad crowd involvement. They assisted officials in integrating information, interfacing with communities, disinfecting and sterilizing, providing psychological support, and raising and allocating resources, amongst other efforts. Volunteers and social workers from all walks of life were important supporters and task performers for the crowdsourcers. As in previous research, internet-based crowdsourcing platforms remained important co-actors in the relief network, serving as an effective and viable crisis information intermediary between the crowdsourcers' appeals and the crowd's response. In China, popular mobile applications such as WeChat and Alipay have taken on the function of an emergency pandemic service, with officials and developers releasing a "three codes and one record" (health code, itinerary code, vaccination code, and COVID-19 test feature). Social media groups are used by community workers to identify the health status of residents in their jurisdictions and by residents to obtain local outbreak policies.

Problematization Stage: Activation. The actor-network responding to the pandemic began with problematization. In the face of the sudden outbreak, government sector agencies, as the focal actors, identified the need for the country to work together to resolve the crisis and maintain social order as quickly as possible. It was imperative in this stage to clarify the status of the pandemic and mobilize the materials and manpower needed to launch relief efforts, as well as set up traffic control points as appropriate to prevent the spread of outbreak. The government call activated a broad set of actors to participate in pandemic control and rescue efforts. In this stage, the pre-established relationships between the public sector, business, and administrative organizations provided an important base from which these focal actors could activate networks and define their roles.

Interessement Stage: Absorption. After some consensus on the pandemic response had been reached, the focal and main actors sought to define and stabilize the identity of the other actors by reasonable vesting in interests, so as to absorb more actors into the network (Callon, 1984). The most popular channel for absorption was online

platforms. Almost all respondents mentioned the role played by WeChat in delivering crisis information and appealing to the crowd. This occurred in two main ways. The first was updates from the official accounts to which crowd members were subscribed, and the other was through the proliferation of online social circles (community, work, school, business contacts) to recruit more actors. In terms of incentives, along with monetary subsidies, the government and other crowdsourcers rewarded the other actors in the form of honorary certificates, public reporting of their good deeds, and so on. In addition, many interviewees indicated they joined the relief network through self-interessement, i.e., rather than being driven by external factors, they aimed to realize their instrumental value through taking control of reality, out of a sense of guardianship of social morality, law, and responsibility.

Enrolment Stage: Association. Enrolment occurs after successful interessement. In this stage the focal actors attempted to identify and coordinate the roles they had assigned to others. Due to the heterogeneity of actors, enrolment involves the coordination and cooperation of various actor nodes to reach a stable network of aligned interests (Callon, 1984; Madon et al., 2004). Our case demonstrates three processes for linking the network nodes. The first is duty configurations, that is, through top-down notification (i.e., cascading arrangements from central government to the local level, or within organizations) or bottom-up reporting (i.e., grassroots actors reporting to higher levels). The second is cross-organizational collaboration. In China, collaboration between government and emergency social groups was largely driven by the former with the aim of improving efficiency by inviting actors with skills and resources to participate in outbreak services. Here, official credibility and unofficial resources complemented each other in a win-win situation. In contrast, collaboration between social groups was the result of joint efforts. Such organizations are nodes where strengths and donations converge, originating from and spreading care and support to the social community. The third is coordination, where the regional directors acted as coordinators between participants across levels or organizations, resolving problems on both sides by negotiating interests.

Mobilization Stage: Alignment. During this phase, the focal actors were widely recognized as representatives of the network (Callon, 1984). Other actors were mobilized and aligned in the pandemic response network. Our case highlights two approaches used by focal actors to achieve successful mobilization. The first was demonstrating credibility. The focal actors not only took the lead in the front line of the action, but also guided the direction of public opinion and secured the credit accumulated by their actions to gain reputation. Officials used social accounts to report on the progress with patient treatment and the implementation of pandemic policies, so that others would be convinced that an effective disaster response was being led by the focal actors. The second was effective governance, as reflected in the following aspects: 1) vertical management by a dedicated pandemic prevention and control center to arrange the work of other functional departments; 2) effective supervision on the work by other actors, based on public evaluation and accountability mechanisms in grassroots communities; 3) official recognition, especially for social groups and emergency individuals, whose efforts are recognized to enhance gratification and active participation.

Maintenance Stage: Augmentation. Given that temporary regional lockdowns in response to imported cases of COVID-19 have become the norm in China, our interviewees provided insights on ways of enhancing the actor network to respond to potential localized outbreaks. The first step is retaining current actors through training. In addition to skills training, the civic education they receive is an intangible form of training that facilitates the development of moral and ethical qualities, which then further promotes the retention of these groups as an investment in future public service activities. The second step is expanding the actor network through innovative approaches. Many interviewees suggested governments, communities, businesses, schools, and public welfare organizations should introduce time bank volunteering. This involves volunteers depositing their time for public service into a time bank, from which they can withdraw time served when needed. This mechanism not only calls for the crowd to participate in the outbreak response but also serves as a reserve for potential future actor networks. Seeking community and corporate partnerships and leveraging the power of social media to stimulate action are other methods for expanding the network of actors.

CONCLUSION

This paper has presented the preliminary results of research into how crowdsourcing can help in the response to a disaster. Our case study focused on the response to the COVID-19 pandemic in China, revealing how different actors activated, enrolled, connected, and formed interest alliances to fight COVID-19. The next step of our project is to focus on the resistance crowdsourcing stakeholders encountered in this process and how they responded. There are of course limitations in our research. For example, the results of our study may not be generalizable to other countries or other disasters. However, we hope that this study will contribute to research at the intersection of crowdsourcing and disaster management, through identifying the potential of crowdsourcing not only in relation to crisis information, but also in broader disaster workflows. The study also extends the applicability of ANT by delving into the interaction and coordination process of socio-technical actors in dynamic disaster contexts.

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