"Voluntweeters": Self-Organizing by Digital Volunteers in Times of Crisis

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ABSTRACT
This empirical study of "digital volunteers" in the aftermath of the January 12, 2010 Haiti earthquake describes their behaviors and mechanisms of self-organizing in the information space of a microblogging environment, where collaborators were newly found and distributed across continents. The paper explores the motivations, resources, activities and products of digital volunteers. It describes how seemingly small features of the technical environment offered structure for self-organizing, while considering how the social-technical milieu enabled individual capacities and collective action. Using social theory about self-organizing, the research offers insight about features of coordination within a setting of massive interaction.

Author Keywords
Computer-mediated communication, crisis informatics, crowdsourcing, disaster, emergency, microblogging, organizing, risk communication, self-organizing, volunteers

ACM Classification Keywords
H.5.3 Groups & Organization Interfaces—collaborative computing, computer-supported cooperative work, K.4.2 Social Issues

General Terms
Human Factors, Theory

INTRODUCTION

The new behaviors of mass interaction that information and communication technology (ICT) enable are affecting the way we seek and provide information, as well as the way we imagine our roles and responsibilities in such matters. Here we empirically consider the emerging role of the "digital volunteer" as an element of the phenomena popularly known as "crowdsourcing." We relate these behaviors to the social science theory of collective behavior [2,9], and show how microblogging platforms serve as a new arena for self-organizing.

We examine this phenomena in the context of disasters—specifically, the January 12, 2010 Haiti earthquake—when onset of the presence of such volunteers was rapid and their activities often remarkable. Previous research and development efforts have emphasized the potential for "crowdsourcing" via social media to increase situational awareness during crisis events [10,15]. However, use of the popular umbrella term risks both obscuring the underlying behaviors that constitute "crowdsourcing," and erroneously casting them as novel by-products of new media. Spontaneous volunteerism is not a new feature of crisis events [2,4,8,20]— disaster events in the pre-ICT era were places where such large-scale self-organizing phenomena could previously be seen. This paper attempts to unpack "crowdsourcing" in crisis response by applying an existing framework of self-organizing in disaster settings [9] to new digital volunteer behaviors. In so doing, it reveals new forms of volunteerism that were not previously possible.

This work extends previous research on the use of social media during crisis, e.g. [5,7,17,19,21]. We begin with an overview of a disaster-response initiative based on the Twitter platform—one that our group helped deploy. Though the initiative was not widely used, the innovation nevertheless served as an opening to seeing and subsequently studying the broader sphere of digital volunteerism. This overview then sets the stage for describing the multi-phased empirical study of digital volunteerism and self-organizing behavior.

TWEAK THE TWEET: INNOVATION AND DEPLOYMENT

A Brief Overview of Twitter Functionality

Twitter is a communication platform that allows users to broadcast 140-character messages (*tweets*) to groups of other users who subscribe to their accounts (*followers*). In turn, Twitter users (*twitterers)* receive tweets from the set of users they elect to follow. For twitterers whose accounts are not explicitly set as private, every tweet is also posted to a public, searchable timeline.

In a process of crescive adaptation, twitterers have developed a variety of linguistic conventions to meet communication needs, including addressed tweets, the retweet, and the hashtag. Twitterers began to use the @ sign preceding another user's account name as a way of mentioning or addressing tweets to that user. This convention, termed *addressivity*, allows users to engage in one-on-one, yet still public, conversation [6]. The retweet (`RT @` or `/via @`) emerged as a forwarding technique whereby twitterers pass on tweets with attribution to the original author. Promoted to enhance the searchability of tweets [12], the `#hashtag` convention is now used by

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twitterers to mark up tweets with thematic keywords of their choice.

An Emergency Micro-Syntax for Twitter

During the 2007 Southern California wildfires, Messina explained how hashtags could be particularly helpful during disasters [12]. Messina, Boyd and others have gone on to propose other microsyntaxes for increasing the information capacity of the 140-character tweet, some with specific application during emergencies [13].

The Tweak the Tweet (TtT) syntax is another entrant to the field of Twitter microsyntax proposals, designed to assist in computational filtering and classification of emergency-related information tweeted during an event [18]. The original TtT concept, generated in November 2009 at the *Random Hacks of Kindness* barcamp, proposed an extension to the role of the hashtag, encouraging users to mark up tweets in a way that would allow computers to easily identify and parse key pieces of information, such as the type of report, location, contact, etc. By placing specific hashtags preceding words related to those hashtags, the information can be automatically identified and parsed into a record.

The original TtT proposal suggested using accounts from formal response agencies and news media to distribute *prescriptive tweets*. The hope was that instructive tweets would teach twitterers how to use the syntax [18]:

```
proj_acct: To report a need: #eventtag #need [list
your needs, like: rescue, or food and water] #loc
[location or GPS coords] #contact [email, @ or #]
```

The 2010 Haiti Earthquake

On January 12, 2010, a 7.0 magnitude earthquake struck Haiti near its Port-au-Prince capitol. Due to the earthquake's intensity and shallow depth, as well as Haiti's vulnerable infrastructure, the destruction was catastrophic. Economic damage has been estimated at up to $13.9 billion [1] with 200,000 to 250,000 lives lost [14]. In the aftermath, thousands were trapped beneath collapsed structures, hundreds of thousands were injured, and nearly 1.5 million people had been displaced [14]. Relief agencies struggled to meet basic needs in this catastrophic event.

Tweak the Tweet Campaign in Response to Haiti

With a desire to assist the response in Haiti during a time of overwhelming need, and in collaboration with the CrisisCamp initiative (crisiscommons.org), our research group deployed the Tweak the Tweet (TtT) syntax on January 14, 2010 at 19:51 EST.[1] We activated a Twitter account to distribute prescriptive tweets at regular, automated intervals (hourly), in both English and French. At the same time, several team members began to tweet information from various sources, including other tweets as well as email messages from disaster-related lists, using TtT syntax. We used the dedicated account as well as personal accounts to maximize audience reach. We updated our project website to explain how the syntax worked, developed a web-based editor that helped people generate tweets in the syntax, and created how-to screencasts posted to YouTube. We issued a press release to encourage broad attention to and adoption of the syntax.

Though the effort to support syntax use continued for several weeks, we ended our active campaign and sent our last prescriptive tweet on January 24, due to the recognition that the syntax was hard to use from the ground, and that we could not assure users that TtT tweets were being channeled to people and agencies who could respond.

Unexpected Activity of Tweak the Tweet Translation

The TtT syntax was originally intended for use during a disaster by those directly affected by the event. We deployed the idea during the aftermath of the Haiti earthquake knowing that only a small percentage of the population of Haiti were Twitter users, and that using a syntax could be difficult, but hoping that the structured data format could nevertheless be useful in some fashion. Not surprisingly, few people used the syntax from "the ground."

However, what was unexpected were the many twitterers located around the world who emerged as "translators"—those who translated information from multiple sources into the syntax and tweeted it out to their followers. Previous research indicates that "synthetic" information activity—where users modify and synthesize information from multiple sources, including Twitter itself—is an important form of information production on Twitter [19]. We recognized this synthetic information generation in the activity of translation from raw, unstructured information to structured data forms as the basis for a new form of the volunteerism that pervades disaster response [2,4,8,16,20]. We initiated this study to investigate the behavior and motivations of the TtT translators.

Note that for this paper, *translating* and *translator* specifically refer to TtT syntax translation, though many digital volunteers contributed by offering classic language translation to assist in this international response.

METHOD

We employed a multi-step process for data collection, beginning with large-scale tweet data collection using Twitter APIs, then a preliminary tweet content analysis to identify the target study population, and finally email-based interviews with a sample of the population to understand their motivations and experiences while tweeting during the immediate aftermath of the Haiti earthquake.

Tweet Collection and Analysis

Twitter Data Collection

During the active TtT campaign period (January 14-24), we used the Twitter Search API to collect every tweet that contained both the `#haiti` hashtag and at least one specialized TtT hashtag (e.g., `#need`, `#offer`, `#loc`). On February 1, we identified every twitterer who had at least one tweet in that set and, using the Twitter REST API, captured their entire Twitter status update streams

[1] All times are reported in local Haiti time, which was Eastern Standard Time (EST) at the time of the quake.

(*contextual* streams) from January 10–February 1. These streams contain *all* of a user's public tweets, including public tweets addressed to other users. This initial data set consists of 339 twitterers, six of whom were from our research group, and a total 292,928 tweets.[2]

Qualitative Analysis and Coding of Tweets

We conducted an analysis of tweet content in the contextual streams to better understand the behavior of twitterers in our data set, and to identify how each was using TtT syntax. We manually coded every tweet that contained a TtT hashtag, excluding prescriptive tweets, as: 1) *original tweet* (a user putting her own offers or needs into the syntax); 2) *TtT retweet* (of another's TtT syntax tweet); 3) *translation tweet* (a user translating information from another source into TtT syntax); and, 4) *non-TtT tweet* (a tweet that contained one of these tags, but was not in the TtT format). Discerning between TtT translations and retweets could not be done computationally because some retweets are not "properly" credited using one of the known conventions, and because many of the twitterers in our sample generated *tag-added retweets*, meaning that they began with a conventional retweet, including the `RT @` marker, but then modified it by inserting TtT tags. Table 1 shows the number of tweets in each category, excluding those sent by our team. Of 2911 total tweets in the syntax, 1040 were translations of information found in other sources, including other, non-TtT tweets.

Total TtT tweets (not including from our team)	2911
Translated (including *tag-added* retweets)	1040
Original (from affected people & remote organizations)	39
Retweets of TtT tweets	1732
Unknown – cannot classify as RT or Translated	100

Table 1. Coding for TtT tweets

Identifying the Translators

This tweet coding differentiated people who were using TtT on their own behalf, those who were translating other information into TtT, and those who were only retweeting messages already in the syntax. Table 2 shows the frequency of the different TtT user types. Though only ten twitterers (four in Haiti) used TtT syntax for directly tweeting their own needs, 74 of the 333 twitterers were found to have translated at least one tweet into TtT syntax.

Other Remote Digital Volunteers

Though non-translators were not included in the interview portion of the data collection (described next), qualitative analysis of their tweet streams suggests that many exhibited similar remote volunteer behaviors as those in the primary participant pool. Many were members of the volunteer networks that we describe below and acted as remote operators during the event, directing the flow of critical information. It was these consistent, Twitter-abetted, volunteering behaviors that became the ultimate subject of this research, with the TtT syntax serving as one vehicle with which these new behaviors were exhibited.

Original twitterers - tweeting on their own behalf	10
Original twitterers located in Haiti	*4*
Original twitterers not located in Haiti	*6*
Retweeters	215
Translators	**74**
Our Own Research Team Members	6
Twitterers whose #hashtag use was not TtT	38

Table 2. Number of Twitterers by TtT user type

Interview Data Collection

Participants

The 74 translators were identified as candidates for the interview phase of the study, designed to better understand volunteer translating behavior. We attempted to contact participants through their Twitter accounts, the only available point of access, using "direct messages" ("DMs" are private person to person twitter messages) to those who were "following" our account (which is required for DMs), and publicly addressed tweets to those who were not. Between the Haiti earthquake and the commencement of the interview study in the summer, two accounts were deleted, and several others became inactive, making it likely that many of our addressed tweets went unread. 37 of the 74 twitterers responded; 27 of these consented to participate and 19 completed the full interview. Respondents were widely distributed across volume of TtT tweets, from one TtT tweet sent to 171 TtT tweets sent. The response rate among those who were reachable was 51%. Eight initial respondents did not complete the interview for reasons including ongoing involvement in Haiti relief efforts, illness, and others not specified.

Email Interview Instrument

The interviews were conducted via email for all participants, though participants were given the option of a verbal interview. Each participant was sent a message with the same set of open-ended questions.

There were six sections to the interview (which were untitled in the instrument): 1) general Twitter use; 2) Twitter use during Haiti; 3) use of TtT syntax; 4) awareness of Twitter followers; 5) other volunteer experience; and 6) further comment and suggestions for future use of social media during crises. The section themes and the questions within them were derived from the prior qualitative analysis of the contextual tweet streams.

Because our analysis began to reveal that Twitter connections served critical functions in volunteering behavior, respondents whose tweet streams showed interactivity with other translators were sent a follow up email inquiring about their twitter-related social connections. For several participants, this second round led to an ongoing exchange with unscripted follow-up questions, just as in a face-to-face open interview. Due to

[2] The Twitter API allows us to collect only the most recent 3200 tweets from each user. For some high-volume users (20 of the total and 2 from our interview set), we could not go back as far as Jan 10 for their contextual streams.

the back-and-forth nature of most exchanges, we felt the term "survey" was not representative of the data collection method and instead use the term "email interview."

A Note on Treatment of Data

For this paper, we have anonymized all interview response data. Because Twitter data is public and searchable, we have carefully disassociated the interview identities and responses from Twitter accounts and their data streams. For Twitter data reporting, we asked each participant to choose between three kinds of anonymity. We treat three participants under the default, using a pseudonym and altering the language of their tweets to reduce searchability. Two participants elected to use a pseudonym but maintain original tweet language. Fourteen participants indicated that they wanted their original tweet content attributed to their real Twitter account name. We also changed usernames for all twitterers who are mentioned in tweets but were not participants in this study.

FINDINGS

The Participants

We asked gender and age questions and used tweet analysis to capture basic demographics for our interview group and make comparisons to the larger group of TtT translators.

A majority of twitterers who translated information into TtT syntax tweets are women. In our interview pool, there are 17 females and two males. To determine if this breakdown is representative of all translators and not due to other factors, we coded each twitterer for gender by analyzing the name and photo associated with the Twitter profile and the content of the account owner's tweets. For the entire 74 TtT translators, we found 46 females, 16 males, one account that was operated by two people (one male and one female), and 11 accounts where gender could not be determined. Where we could determine and assign gender in the entire translator group, 74% are female.

Though most were located in North America during the event (nine in the US and six in Canada), our interview group includes one twitterer each from Turkey, Australia, Switzerland, and the UK. The average age is 40.1 years.

Previous Twitter Use

Figure 1 shows the date that each study participant joined Twitter. Three participants created their accounts after the earthquake, though one operates another account started nine months earlier. Two others joined Twitter earlier, but they did not send their first tweet until after the event. The remaining 15 interviewees were actively tweeting from their current accounts before January 12, 2010.

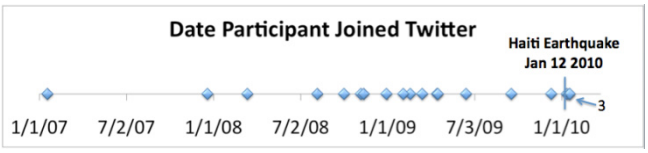

Figure 1. Twitter Join Date for Interview Respondents

The experienced twitterers in the study offer a variety of reasons for joining Twitter, including promoting a cause with which they are personally connected, and keeping up on pop culture and politics. Three report tweeting during previous disasters or crises and two of those specifically mention the political protests in Iran (June–December 2009) as their entry point to "crisis tweeting."

Personal Motivations for Haiti Tweeting

For those who began tweeting after the earthquake, all three cite personal connections to Haiti during the earthquake as motivation for creating accounts:

> *Emily: "My brother, a volunteer teacher in Port-au-Prince, had arrived in Haiti two days before the EQ. We… were not able to contact him and not sure where he was staying... As you know, the news was horrific and we were beyond worried. I joined Twitter approximately 12 hours after the EQ in order to try and communicate with surviving students from his school to find out if they had any news on him."*

Three other participants cite connections to people in or from Haiti as reasons for starting to tweet. Four of the five personally connected twitterers began with a single cause—a person or place with specific needs—and later branched out to communicating about other needs and issues.

Among those without personal connections, interview responses and tweet streams reveal the singular motivation of trying to help out, in any way possible:

> *Alena: "Why I did it? has no other explanation other than I had to. One part of the world was in pain and I could not sit back watch others do something when I had a little chance to send some drinking water to people if I could."*

> *Maria: "I think that's when I went on Twitter and started tweeting. Then I discovered a whole bunch of people tweeting for Haiti and started doing it myself and building up connections as much as I could in order to try to save some lives if possible. ... As you'll see some of us tweeted 16 hours a day or more... I just hoped what I was doing was helping. I'll never know if my tweets actually helped but that's ok as well."*

As these excerpts suggest, many of these people began tweeting for Haiti as a way of volunteering their time—sometimes entire waking days—from areas far removed from the event. Most, like Maria, entered the space with little direction or knowledge about how to help. Maria mentions that one of her first volunteer activities was to build up connections. We will return to these connections at length below to explain how volunteers were able to begin with little more than a Twitter account, yet end up helping in remarkable ways.

Using Tweak the Tweet Syntax

We asked participants where they first saw or heard about TtT syntax, why they decided to use it, and where they got the information that they translated into TtT tweets.

Discovering Tweak the Tweet

The majority of respondents learned about the TtT syntax from a tweet—many of these were prescriptive tweets from our team members' accounts found through hashtag searches, or seen in an RT from another twitterer they follow. Five participants report being directed to the syntax instructions by other twitterers in their networks and two

mention receiving help from another twitterer who "explained" the format to them, or "taught" them how to use it. A few interviewees appear to have learned the format by mimicking its use in others' tweets. One of these did not realize she was using TtT syntax, though her tweet streams show that she began to use the `#location` and `#contact` data tags. Another explains that she discovered TtT when one of her tweets was retweeted in the format:

Emily: "Another Haiti volunteer on Twitter retweeted my post with the correct syntax, and I went to the "Tweak the Tweet" website, read up on it, and started using it for all my Haiti tweets and retweets except personal responses to people looking for information or offering help to [Haitian village] directly."

It is interesting that this respondent refers to the retweet of her information as being in the "correct syntax." This statement implies that the syntax was somehow more correct or more official than her original tweet. This theme shows up in several of the responses about TtT use.

Reasons for Adopting TtT Syntax

We asked all interviewees why they chose to use TtT, giving examples to each from their own Twitter stream. Several replied that it just "made sense":

Susan: "Because it standardized everything. It gave a SOP/ Standard Operating Procedure or MO/ Modus Operandi of doing tweets. I thought it made perfect sense."

The statement above suggests that this twitterer welcomed a standardized method for her tweeting and it echoes Emily's comment about "correct syntax." When these twitterers say that TtT made sense, they may not be talking about the rules of the syntax, per se. In fact, many of the same report that it was quite hard to use. What seems to appeal to them was the idea of standardization. The syntax itself became an object of authority—an organizing feature in the socio-technical milieu of Twitter activity. This is an idea we return to in the Discussion.

Some participants saw the syntax as a way to manually filter and identify key information for themselves, from within an inherently noisy information space:

Claire: "Myself having been searching using hashtags and keywords thought this was an excellent way to filter out (most likely) credible sources directly involved in the effort from possible citizens of Haiti or family members just sharing information and sorting through the chatter."

Some felt that using the syntax marked their own tweets as authoritative and helped their accounts rise above the fray:

Claire: "I realized my impression of those using the syntax was to take them more seriously, so once I had confirmed information it was translated into syntax."

A few noted that the format could be used as a way to make individual tweets more useful, regardless of back-end tools for filtering. By formatting or "syntaxing" their tweets in this way (as some came to call it), they made sure tweets had the necessary pieces of information. They could use the syntax as a way to instruct others to do the same:

Jenny: "I choose to tweet with the syntax because uniformity in messaging is essential in high pressure, emergency situations ... I also noticed that people ... spent a lot of time trying to decipher messages with missing info and what the source of the info was…. In short the time spent looking for missing parts to a message could be avoided by using TtT."

These responses suggest that some Haiti twitterers adopted TtT as another resource in their own volunteer work. The syntax helped them format tweets to include all the necessary pieces of information, such as contact number, location, and source. It was a signal they could give to say that the information in their tweets had been verified by someone who had experience in the space. ("Experience" might only amount to days worth, which can be enough to warrant credibility and even develop mastery relative to the newness of the volunteering tweeting phenomenon). TtT also helped some do manual filtering by allowing search on certain hashtags to identify important, actionable information, a topic we return to later.

Source Material for TtT Tweets

For their own translated TtT tweets, interviewees reformatted and passed on information from a variety of sources. Most report using other tweets as a key source. They first located tweets with key information that were not initially in TtT format, then added the TtT tags and retweeted them. Several mention verifying the content before passing it along. The example below shows how one twitterer took the information from a tweet she saw and translated it into TtT syntax, noting her source.

(Original) **`Delmon:`** `Marie Girard @ Institut FR, Ruelle Robin PaP needs food water 4 children, toddlers + pregnant woman 5555-5555`

(Translation) **`barbaraslavin:`** `#haiti #needs food H20 #name Marie Girard #loc Institut Franse, Ruelle Robin P-a-P #info 5555-5555 #source @Delmon TwT`

Participants also listed public blogs and Facebook posts, as well as DMs, emails and phone calls from contacts (some on the ground in Haiti), as sources for their TtT tweets.

Another key source for TtT tweets noted by six of our interviewees was Ushahidi. Ushahidi is a collaborative reporting environment that aggregates and maps information provided by citizens [15]. Originally developed during violent political unrest in Kenya in 2008, Ushahidi was used during the Haiti crisis in conjunction with an SMS shortcode to collect incident reports from the ground. Ushahidi organized and encouraged volunteers to help process the raw SMS messages into structured reports [10]. Some of our respondents monitored Ushahidi incident reports, identified new or newly verified information, and then tweeted it in TtT syntax. A few also directed these tweets to users they felt could act on the information.

Remote Operators: Mechanisms of Emergence

Analysis of interview responses revealed two types of digital volunteers within our translator group. The first was the type we identified at the onset of this research study, digital volunteers whose primary activity was the translation of other information into TtT tweets. For the other type, TtT was merely another resource adopted as

part of a diverse tool set. In this second group, twitterers were not simply translating information, but instead were acting as *remote operators*, moving information between many sources using a variety of tools. TtT was only a small part of that activity. Many exerted considerable effort into building and leveraging connections to move information—and in some cases supplies—between affected people on the ground, response agencies in Haiti and abroad, and other volunteer crisis workers all over the world.

None of the twitterers in the second category were able to simply log on to their Twitter account and start acting like remote operators. Instead, they progressed from simple activities (e.g., retweeting or translating tweets) to more complex ones (e.g., verifying or routing of information).

Ushahidi was a key bridge between information-based activities (similar to TtT translation) and the more complex volunteer work of remote operators. Over time, some volunteers shifted from taking information from Ushahidi incident reports and tweeting it (sometimes in TtT syntax) to other activities, including verifying details, especially the origin date, and following up on contact email addresses and phone numbers to confirm reports. Others began to monitor Twitter by searching for certain hashtags, including TtT tags, and then used that information to create new Ushahidi reports or update existing ones. This shift between translating and pure data entry to information verification is one we see in several interview responses.

Though TtT translation and Ushahidi data entry were the primary entrance points to crisis tweeting for many, others began with different types of tweet-driven activities. One started her Haiti volunteer work by adding minutes to Haiti residents' cell phones as requested by other twitterers who were in Haiti or had connections to people there.

MelyMello (Jan 15 24:26): @ayitiJo we can top up your phone, can't we? add more minutes to it for you? Just need your phone #

MelyMello (Jan 16 17:38): @jean123 please let 50955555555 know that 630HTG were just added

deJacmel (Jan 16 ~19:00): @MelyMello Please Add min 2 ths cell numbers for me. They R helping Amer families to contact their haiti relatives.

MelyMello (Jan 17 13:11): @janeSM want to help? Help me add minutes to a WACK of phone numbers I have been sent!

MelyMello (Jan 17 14:32): @janeSM - please send any urgent request to help locals to @deJacmel - we're adding $ to cells of his local contacts to do just that

MelyMello (Jan 17 20:33): @Meira_Davi just emailed you the updated list - Paypal is almost empty again - have two more numbers to do - then we're at $0 :(

MelyMello (Jan 17 21:00): @deJacmel - can UR ppl help? At Brochette (Carrefour), 1500 ppl have nothing to eat or drink since Tues evening. Call 509.337-53-2154

As the sequence above describes, @MelyMello enlisted the help of other remote twitterers in her effort. She created a PayPal account and requested donations. She established digital relationships with other twitterers (@deJacmel) who had connections to people on the ground in Haiti. Later, she would use these contacts on the ground to get information on ground conditions, verify reports, and even request help for other needs she identified.

The interview excerpt below shows the evolution of isolated activity to a set of network connections and expanded set of activities:

Linda: In the beginning, I worked alone ... I started recognizing ppl who seemed to have good info and we would support each other, RT each other and help to find info for each other.

The exchange below, taken from the contextual streams of one of our translators and another twitterer in our initial 339 (the latter was not coded as a translator), demonstrates how some volunteers came to use connections and information on Twitter in combination with contacts on the ground to act as remote emergency operators.

CarolB (Jan 18 10:53): @IstanbulTWSTVL who needs the truck? What type of truck? Where in clercine?

IstanbulTWSTVL (Jan 18 11:04): @CarolB @janeSM Needs a truck by Clercine and help with & UN DRS that need ride at rue de l'enterrement #xx

CarolB (Jan 18 11:07): Okay made contact with someone should be sending truck.

IstanbulTWSTVL (Jan 18 11:21): @CarolB Second situation was stevePs people on the way to Clercine had no phone contact he has posted number @steveP is this solved

CarolB (Jan 18 11:27): @IstanbulTWSTVL It has been arranged. Truck has been arranged.

In this example, @IstanbulTWSTVL routes information gleaned from Twitter sources to @CarolB, who has a connection to people on the ground. Volunteer twitterers like @IstanbulTWSTVL would find information that had not yet been acted on through Twitter and Ushahidi reports, then act on it themselves in one of two ways. Some would follow up with contact numbers directly, calling affected people or responders on the ground in Haiti to confirm and update their reports. Others tried to find another twitterer to whom they could direct the information, getting it closer to those who could physically act on it.

Maria: "It didn't matter if I actually helped directly; the important thing was figuring out who to send the help requests to and depending who was online at the time…"

Connections Between Translators

The ability to leverage connections was a powerful part of the work process for the digital volunteers in this study. When we examine their contextual tweet streams, we see that the TtT translators were a highly interconnected group. Figure 2 shows a visualization of the entire network of translators (80), including our own research group members (in black). Edge thicknesses represent the (natural log of the) amount of interactions between each pair of twitterers as determined by *addressed tweets* or *mentions* within the contextual tweet streams. This is not a measure of Twitter *followers* and *followings*, but rather of who was publicly "talking" to whom during the January 10-February 1 time window. Four translators were *unconnected* to the network, translating tweets without direct interaction with other

volunteer twitterers. Nine others were connected to one other twitterer within the group. The rest had direct interactions with multiple members of the network. The network is dense, with each translator connecting with, on average, 7.7 other translator-volunteers (excluding our researchers), and some of these connections are leveraged repeatedly, with over 40 mentions.

Our accounts (in black) are visible on the top right of the dense part of the network cluster. Note that we are not central to the network, and that the density exists elsewhere (in the lower left quadrant). In fact, when we create another graph removing all of our researchers from the network, the core of the network remains intact.

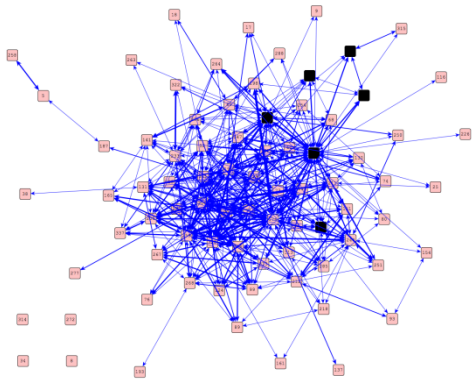

Figure 2. Connections between TtT Translators

To understand when and how these connections were formed, we sent each interviewee a list of all the other translators that they addressed a tweet to during the study time window in a follow-up email. We asked whether or not they knew each twitterer in real life or through Twitter prior to the earthquake. Though a few listed one or two previous connections, a clear majority replied that they had never previously connected with these other twitterers.

Julie: "We all came together by circumstance."

Karen: "All of these people I had never spoken with, prior to the Earthquake. I would have found all of them via the #Haiti #HelpHaiti or other Haiti hashtags, or occasionally a retweet from someone already in my Haiti network."

In the latter excerpt, Karen explains how she created her volunteer network, using hashtag searches to identify other twitterers with whom she wanted to connect, and sometimes used established connections to find new ones.

Karen: "I met many people through them whom I also came to trust. We worked on Twitter, Skype, Google Wave, Ushahidi & email - and during one emergency, on the phone when Skype failed us."

Features of Ad-hoc Communications Infrastructures

Participants we identified as remote operators incorporated a variety of social media and communication tools into their work practice, including email, Twitter, Skype, Google Wave, and Ushahidi. Within the Twitter platform, they used different affordances for different communication needs: public updates for broadcasting or seeking a wide range of help; addressed tweets for making connections, directing information, and challenging misinformation; DMs for moving resources, exchanging other contact info, and confronting possible hoaxers. Several cited the need to verify and manage misinformation as rationale for moving to tools with more access control, like Google Wave.

Sarah: "It was difficult to keep up with the stream at times, and some of us tried to branch [off] a "core" team to Google Wave, so we could have conversations without strangers butting in and confusing matters."

Without previous training, crisis tweeters cobbled together sophisticated, ad-hoc, digital infrastructures by appropriating existing tools.

Carla: "Social media will evolve to meet the needs that present during a crisis. ... Ppl say a crisis isn't the time to learn a new technology. That may be true but that's when solutions are inspired. Like meatball surgery in a war zone, you make do with what you have and along the way, you might invent a better way of doing something"

Volunteering through Tweeting: Role Identity, Momentum & Consequences

For many respondents, crisis tweeting during the Haiti event became and continues to be a significant part of their Twitter identities. Over half of interview participants report or have evidence in their recent tweet streams indicating continued volunteer tweeting during crises. Five still appear active in their Haiti tweeting (Aug 15-Sept 10) and seven have tweeted for other, more recent, crisis events. In their profile descriptions, @rachellehoude now refers to herself as a *voluntweeter*, @Meira_Davi claims to be a *crisis tweeter*, @MelyMello states that she is "heavily involved in Haiti relief via working w/ an amazing, effective, dedicated group of volunteers," and @cait proclaims that she "won't forget Haiti." Their crisis tweeting—a term we have adopted from the practitioners to describe this behavior—has come, in some ways, to define their Twitter personas.

Self-Identifying as a "Voluntweeter"

Between January 21 and January 23, twitterers throughout our translator dataset began to tweet or retweet updates with the terms "voluntwitter" and later, "voluntweeter."

janeSM (Jan 21): Am stunned-have gotten sups in-saved people fr rubble-brought them drs-we have best team! We R voluntwitters!

rachellehoude (Jan 21): I HEART VOLUNTWITTERS!

These tweets show a growing self-identification with the role of crisis tweeting as crisis tweeters, or voluntweeters. For those who embraced this role, the connection between their publicly enacted crisis tweeting behavior and their Twitter persona seems to contribute motivation for continued participation. A few participants displayed another layer of awareness, that these digital volunteer activities represented the birth of a new phenomenon.

@rachellehoude, from her blog: "Everyone over the past few weeks has felt that buzz, that collective energy flowing through each one of us, inspiring action and involvement. It's been incredible to be part of it and connect with like-minded people. It's been awesome to witness the birth social media's soul."

Long-standing research on the sociology of disaster suggests that the desire to help in times of crisis is age-old, and in fact is a behavior in disaster response that is critical to response and recovery [2,3,20]. Large numbers of people are known to converge onto the site in the wake of a disaster event to observe or to help [4,8]. Currently, novel forms of this phenomenon result from the affordances of social media tools, which allow more and remote people to contribute in ways not previously possible [16].

Kelly: "I don't have a lot of money and I'm not brave enough… to travel to Haiti, but this was an opportunity to get involved and, with the use of twitter, in a big way! I was already impressed with the reach twitter had, but seeing what it could do during a crisis like Haiti BLEW my mind away."

Emotional Impact

In their initial responses, few interviewees mentioned the emotional impact from their digital volunteering. Follow up comments were far more likely to touch on this, even though we did not ask specifically about these experiences. Some remarked about rescue attempts that arrived too late and calls for help that went unanswered:

Maria: "It was horrid to hear all these cries for help; it haunts me to this day and I still have nightmares about it."

One respondent told us that she had not continued crisis tweeting and remarked that she was not sure that she could do it again, because the work was too "emotionally draining." Another respondent, one who had participated in crisis tweeting during the political unrest in Iran, talked about how she backed away from her account after that event, before starting all over again for Haiti.

Carla: "During Iran, I got very caught up in it and was on twitter constantly. I dropped off after that when I changed my [Twitter] name. I kept my follower count low, stayed away from politics and emotional issues."

Though we could not reach the people who had ceased tweeting from their Haiti-focused accounts, we can speculate that some, like Carla, had abandoned their Haiti-tweeting identities purposefully, suffering from emotional and perhaps also physical exhaustion.

Frustration with Formal Response

Another theme that emerged is a frustration that some volunteers began to feel towards the formal response effort:

rachellehoude (Jan 21): This is getting frustrating. I keep seeing the same calls for help, day after day. Can the NGOs at least HIRE us so we can do this for them?

After over a week in the space, coordinating small-scale response using ad-hoc networks and over-the-counter digital infrastructures, this voluntweeter felt unappreciated and even obstructed when the "formal" response moved into place. Another explains how the new "organization" of response prevented them from accessing the resources that they had been using for their "informal" response activities.

Sarah: "…after that stage, it became clear that the larger NGOs were locking down streams of access for individuals. UN Cluster meetings were mandatory in order to obtain aid from the storage facilities. It became harder to help and our teams started to crumble due to feelings of powerlessness. It was a very frustrating time and most of my efforts turned more to shedding light on the broken system than trying to fight against it to get little done."

In follow up comments, many participants said they hoped the formal response would learn how to better coordinate with social media volunteers in the future.

DISCUSSION

The activities of the crisis twitterers are a new form of previously recognized organizing behavior made possible through the availability of new media. Sociologists of disaster, including Dynes [2], call organizations that did not exist prior to a major disruption of the social order *emergent organizations*—groups of people that previously had no standing structure or defined tasks. (The other organizational types—*established*, *expanding*, and *extending*—have varying degrees of pre-existing structure and task definition.)

Emergent groups are usually self-organizing, and come about in disaster settings to meet some unmet need. *How* they come together is the subject of Kreps and Bosworth [9], who discuss a "theoretical tool" to explain collective behavior and organizing through a progressive manifestation of key features: Domains (D), Activities (A), Resources (R), and Tasks (T). Organizations can arise out of any sequential permutation of these mechanisms (though some arrangements are more common than others), as Kreps and Bosworth [9] empirically describe in a historical survey of accounts of emergent organizations in numerous disasters. Employing their framework to the behavior that many have come to call "crowdsourcing" we believe helps better explain and identify the underlying phenomena behind this term, including what makes it possible in disaster, and perhaps in other aspects of social life as well.

The temporal sequence that we believe best explains the behavior of the emergent voluntweeter population we studied is the $R \rightarrow A \rightarrow T \rightarrow D$ configuration of self-organization, with the Resources and Activities mechanisms of self-organizing being most developed, and with some indications of progression to the Tasks and Domain mechanistic stages. Groups that begin with Resources or Activities appear less often in Kreps and Bosworth's empirical taxonomy; this might be a type we see arising more often from today's ICT-supported environments. Note that not all emergent organizations endure long enough or organize completely enough to manifest all four attributes in their lifespans.

Resources (R) as Mechanisms of Self-Organization

For the "voluntweeters" in crisis events as described here, the means by which they began to work as volunteers in the Haiti event was the medium of Twitter. In other words, their initiation into the space was through the accessibility of *resources,* which are the "individual capacities and collective technologies of human populations" [9, p. 25].

Twitter was the gateway into an information space that itself contained resourceful features that helped would-be volunteers navigate within it, and begin to self-organize with others in an evolving practice of crisis tweeting.

Hashtags

Hashtags were used by many as an entrance into the space to find key information and identify the people participating in relevant conversations. Hashtags can be used to filter information to help narrow the focus of search. They were an important basis for the eventual organizing of activities (stage 2 in Kreps and Bosworth's organizing model). For example, `#rescuemehaiti` signaled a particular kind of help request, and became a tag around which people organized:

> *Alena: "One of them…proposed an idea; to use #rescuemehaiti hashtag. Promptly me and him made sure people asking for help would tag this word and within half hour everyone was following and using this tag. He said one day later officials contacted him and said this tag was very helpful so we should continue using it."*

Increasingly, it appears that the hashtag is employed as a mechanism for identifying useful social connections.

Syntax

Among our population, the TtT syntax also served as an organizing feature (though not the primary one) within the network of crisis tweeters. TtT added structure to tweet information; even when the syntax wasn't used in full, it helped voluntweeters to remember to include—and teach others to include—the necessary pieces of information into a single tweet to make it complete.

There was also indication that some saw the syntax as imparting a kind of authority because of its perceived rigor and assumptions about attention to accuracy by those using it. The manner in which some interviewees referred to the TtT syntax suggests an important structuring effect. One participant speaks about "syntaxing" as a task; another refers to the syntax as a kind of language, as in "translated into syntax." Though TtT syntax users may not fully understand what a syntax is, this co-opting of the term into language about voluntweeting suggests the syntax's role as an organizing feature.

Data Entry & Data Movement

"Individual capacities" are another resource that can initiate self-organizing, particularly among social action types of activities. Here, stepping into the Twitter space as well as the disaster volunteer role (typically for the first time), the basic activities of retweeting and entering data into a syntactical form using TtT, or entering data into Ushahidi's records, were the origins of a crisis tweeting practice.

Activities (A) as Mechanisms of Self-Organization

Activities are defined as "conjoined actions of individuals and social units" [9, p. 25], and we find this to be the second organizing mechanism in a large sector of the crisis tweeting network. It is in this stage when those drawn to Twitter, having discovered and used initial resources, begin to coordinate activities.

Data, Translation, Filtering, Verification, Cross-Referencing

The activities described in this paper—tweet translation, information filtering, information verification, as well as cross-referencing data records between Ushahidi and TtT-formated information—mark a graduation from data entry to coordinated activity with other people and groups.

Action Work

In addition, the hybrid virtual-physical "action" work of @Melymello, for example, who leveraged her Twitter social connections to obtain goods and services of direct benefit to those in Haiti, is an instance of conjoined action.

Conjoining Activities with other Organizations

A few notable organizations were entities to which the emergent band of voluntweeters began to connect. These included Ushahidi, Crisis Commons and Shaun King, an Atlanta, Georgia pastor of a faith-based organization. @ShaunKing's account was the most mentioned in our entire dataset. Thirteen of the 19 interview respondents mention or address him in their tweets, and two talk about him in their interviews. His activities began during the early aftermath of the quake and are ongoing in September 2010, with his aHomeInHaiti.org website serving as a place to coordinate donations and provide shelter for Haitians.

The self-organizing mechanisms of resources (R) and activities (A) seem to be clear in this emergence of a coherent, productive group of voluntweeters. In some cases, we begin to see introduction of division of labor—which in part describes tasks (T)—and some instances of movement to more formal collectives of domains (D).

Tasks (T) as Mechanisms of Self-Organization

Tasks are defined as "collective representations of a division of labor for the enactment of human activities" [9, p. 25]. As a core set of crisis voluntweeters gained experience with this emergent practice, some broke off to have extended and more private conversations elsewhere. These interviewees note that Skype and Google Wave became the means by which coordinated activity was discussed. Conversational excerpts provided earlier, including that between @CarolB and @IstanbulTWSTVL, demonstrate some division of labor, as does @MelyMello's activity of adding minutes to cell phones.

Some establishment of norms, especially with respect to how and when to retweet and verify information, begins to occur with the newly experienced, acting as mentors, pointing out to less experienced people what constitutes the most helpful tweeting behavior. Volunteers also began to challenge possible hoaxers, a Twitter behavior that Mendoza et al. recognize as occurring during the aftermath of the February 27, 2010 earthquake in Chile as well [11].

Domains (D) as Mechanisms of Self-Organization

Finally, for Kreps and Bosworth, domains are "collective representations of bounded units and their reasons for being" [9, p. 25]. For emergent, self-organizing groups, "bounded social collections" may or may not come about. Our investigation reveals some mix of consequences in social sub-groups of the broader crisis twitterer population.

There are volunteers who did a good amount of work for Haiti, but then fell away after a time. With Haiti as the sole focus of their Twitter use, their accounts go dormant or are even deleted entirely after their event participation ceases.

Still, others started reflecting on what it meant to be a good "crisis tweeter," and publicly identify as such. Though some of these multi-event crisis tweeters continued to work without affiliating with an organization, others found emerging organizations like *Humanity Road* as digital "places" to focus their volunteer activities. Humanity Road (humanityroad.org) is a virtual organization that was sparked by digital volunteering activities during the 2009 political unrest in Iran, but then formalized during the Haiti event [personal communication, Christine Thompson]. Its members, two of whom were interview respondents, describe themselves as performing crisis tweeting during disaster events, as well as mentoring crisis tweeters between events. The formation of Humanity Road represents the full culmination, as described by Kreps and Bosworth, of the graduation from resources and actions (for them, during the Iran unrest) to "domain"-driven features of organization (during the Haiti event).

CONCLUSION

The empirical examination of the products and motivations of crisis tweeters who emerged in the aftermath of the 2010 Haiti Earthquake reveals important features of self-organizing in a highly networked world. The broad attribution of social media-related behaviors to "crowdsourcing" can be more finely understood, in this case, as a collection of resources, capacities and a progression to increasingly more defined tasks and even organizational identity. In the matter of sudden and tragic events, the desire that some feel to help is newly enabled by resources like Twitter, where assistance can be provided remotely. Information creation and movement as the basis for social connection and subsequent collective action is at the core of these operations. The emergent ICT-abetted behaviors we have documented here and their consonance with knowledge about existing self-organizing mechanisms suggest that the digital volunteer will become a common and likely influential feature of social life.

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