Twitter for Crisis Communication: Lessons Learned from Japan’s Tsunami Disaster

Adam Acar

Yuya Muraki

Abstract

2 weeks after the Great Tohoku earthquake followed by the devastating tsunami, we have sent open-ended questionnaires to a randomly selected sample of twitter users and also analyzed the tweets sent from the disaster-hit areas. We found that people in directly affected areas tend to tweet about their unsafe and uncertain situation while people in remote areas post messages to let their followers know that they are safe. Our analysis of the open-ended answers has revealed that unreliable retweets (RTs) on twitter was the biggest problem the users have faced during the disaster. Some of the solutions offered by the respondents included introducing official hashtags, limiting the number of RTs for each hashtag and adding features that allow users to trace information by maintaining anonymity.

Introduction

Recently there has been much interest in the use of social media in disaster communication. A wide range of studies suggest that information sharing networks, such as twitter, can be very useful in times of crisis by quickly and effectively disseminating relevant news (Vieweg et al., 2010). Most of the past research about this issue had utilized quantitative data collection methods and focused on strategic keyword detection (Vieweg et al., 2010), perception of false RTs (Mendoza et al., 2010), and categorization of the tweets sent during disasters (Sinnappan, 2010). However, there was still confusion among the public about the reliability of the tweets after the great Tohoku earthquake. This study aims to address the problems the users experienced and close the literature gap regarding effective use of twitter by qualitatively analyzing the nature of tweets and assessing the expectations of the users. Particularly, the paper seeks to address the problems experienced by the users and potential solutions that will provide actionable insights for future use of social networking tools during disasters.

Background

The 9.00 scale earthquake that hit Japan on March 11 at 2:45 PM (5:45 AM GMT) was not only the strongest in Japan’s history but also the 5th biggest ever recorded (Cheng, 2011). Tsunamis caused by the tremors already devastated most of the coastline in 3 prefectures and wiped out two towns off the map, claiming the lives of thousands and forcing more than 500,000 people to live in shelters. The Japanese prime minister Naoto Kan declared the incident as the biggest disaster after WWII. A month after the quake, there are 27,000 people dead or missing; not to mention 4 explosions in an earthquake hit nuclear facility and extremely high radiation levels in the surrounding areas (Bloomberg, 2011). Media reported that twitter was the only communication tool functioned properly immediately after the earthquake (Hosaka, 2011)

What is Twitter?

On its website, where over 95 million messages are shared every day (twitter, 2010), Twitter introduces itself as “a real-time information network that connects you (users) to the latest information about what you (they) find interesting (www.twitter.com).” Twitter has many features similar to other online social network sites such as status updates and directed social connections between users (Huberman, 2008); however, unlike other OSNs, it does not require mutual acquaintance between members for any information to be shared. Once a user posts a message on his/her twitter timeline, that message (tweet) becomes public and can be viewed by anyone. Because of this anonymity, some authors
referred to twitter as an information sharing tool rather than a social network platform (Cataldi et al., 2010; Lee et al., 2010; Osch and Avital, 2010).

Whether it is a social network or just a stream of short blog posts, Twitter has received a lot of attention from both industry practitioners and academicians. After its launch in 2006, twitter has grown exponentially, reaching 200 million users and recording over 30 billion messages in only 5 years (Petit, 2011). Currently, a keyword search on Google Scholar, allintitle:twitter, generates more than 3000 hits which indicates that there are more than 3000 academic papers dedicated to twitter. Studies point to the important role of twitter in terms of quickly disseminating information among publics during critical times such as Obama’s presidential election, Iran street protests (Rossman, 2010), great Chile earthquake (Mendoza et al., 2010) and Egyptian revolution in 2011 (Fahim, 2011). Some other uses of twitter can be listed as real-time earthquake detection (Sakaki et al., 2010), prediction of election results (Tumasjan et al., 2010), enterprise microblogging (Riemer, 2010) word of mouth marketing (Jansen, 2009) foreign language learning (Borau et al., 2010) and box-office performance forecasting (Asur and Huberman, 2010).

Why do people Tweet?

When it comes to individual twitter use, motives vary greatly with one important underlying goal: sharing information. Java et al., (2007) found that people tweeted mostly to tell others what they are doing, engage in conversations with other users and report news. After conducting a focus group with the early adopters, Mischaud (2007) came to notice that people used twitter because it allowed them to update everyone about anything, start dialogues with anyone and write diaries effortlessly. Ehrlich and Shami (2010) interviewed with IBM employees who use twitter internally and listed major motivations as a) reaching information quickly, b) gaining higher visibility, c) feeling connected and d) being aware of what is happening around. Naaman et al. (2010) also emphasized the information sharing aspect of twitter noting that the majority of twitter users tend to tweet about themselves (“meformers” versus “inftomers”).

Twitter Usage during Disasters

Recently, there has been an increasing amount of literature on how Twitter, a microblogging site, was used in emergency situations, such as the shooting of police officers (Heverin & Zach, 2010), river flooding (Vieweg et al., 2010), and grassfires (Corvey et al., 2010). Heverin and Zach (2010) analyzed the tweets posted after the shooting of four police officers in Seattle, and found that people mainly useTwitter to share information, rather than mentioning their opinions or personal emotions. Vieweg and Starbird (2010) conducted a similar study during the Red River Flooding and identified three tweet categories; namely, repeated information, linked to information on external websites, and retweets. In another study, Corvey et al. (2010) examined the effectiveness of Natural Language Processing method in identifying important keywords on twitter during the 2009 Oklahoma grassfires. The study drew attention to the problems faced by twitter users who struggled to identify important information during the disaster; however, it was concluded that because of the varying length of entities, annotators cannot be assigned simple rules.

Several studies investigating the use of twitter during earthquakes have recently been carried out particularly in Chile and China. Qu et al. (2011) analyzed the use of a Chinese microblogging site, Sina-Weibo, in response to the 2010 Yushu earthquake. The messages posted on Sina-Weibo were mainly categorized into 5 groups: Opinion-related (33%), situation update (25%), general earthquake related (18%), emotion-related (16%), and action-related (4%). In another study, Mendoza et al. (2010) examined the responses to true and false information that emerged on twitter after the 2010 Chile earthquake. The findings revealed that the propagation of tweets that correspond to rumors differs from tweets that spread factual news because rumors tend to be questioned and denied more than the news by
the Twitter community. Mendoza and his co-authors concluded that there are measurable differences in the way messages propagate, thus it is possible to detect the credibility of tweets, with 70% to 80% accuracy.

Research Questions

Since past studies did not provide any qualitative assessment of how people tweet during disasters and how tweeting experience can be improved based on users’ priorities, we pose these four research questions:

**RQ1:** What kind of messages did twitter users post immediately after the earthquake?

**RQ2:** How different are the messages posted in directly and indirectly affected areas?

**RQ3:** What problems did the twitter users experience when using the service immediately after the earthquake?

**RQ4:** What do the twitter users recommend to improve twitter communication during disasters?

Methodology

Miles and Huberman (1994) suggested that human discourse and action can be better explained with qualitative methods instead of the methods of natural sciences. The authors stated:

“With qualitative data one can preserve chronological flow, see precisely which events led to which consequences, and derive fruitful explanations….Words, especially organized into incidents or stories, have a concrete, vivid, meaningful flavor that often proves far more convincing to a reader – another researcher, a policy maker, a practitioner – than pages of summarized numbers.” (p.1)

In the same vein, Berg (2001) also advised scholars who are attempting to define a problem or develop an approach to use qualitative methods. In this study we have employed two distinct methods: qualitatively categorizing the tweets posted by the victims and summarizing the answers given to our open ended questions sent to the users two weeks after the earthquake. Our method should be considered as “narrative analysis” where “the investigator typically begins with a set of principles and seeks to exhaust the meaning of the text using specified rules and principles, but maintains a qualitative textual approach” (Berg, 2001, p.241)

As a first step, we qualitatively analyzed the tweets sent from the disaster hit areas and the areas that are affected indirectly. For the disaster hit areas, we searched for tweets sent from 15-mile radius of two disaster-struck areas: Kesennuma City and Miyagi Prefecture (we entered these two keywords separately into twitter advanced search) on Mach 11, 2011. We compiled all of the tweets from 2:45 PM to 12 PM which yielded about 100 original messages. For people who are indirectly affected, we retrieved the first 200 tweets posted after 2:45 PM and included the word “earthquake” (地震) by using Twitter Advanced Search option. Searching for disaster related keywords on twitter timeline to identify overall message content was recently used by Sinnapan et al.,2010.

Secondly, we sent tweets with a link to our online survey to randomly selected 200 people from all over Japan and about 50 people from Miyagi prefecture who posted at least 1 message that included the word “earthquake” on March 11, 2011. We have sent invitations to only the first 50 people in Miyagi and the first 200 people nationwide. We did not offer any incentive to participate and received 26 complete responses (20 from the national sample and 6 from Miyagi). We have used surveygizmo.com, a password protected online server, to collect open-ended answers during the dates of March 25-29.
Findings

Qualitative Analysis of Tweets (RQ1 & 2)

We have noticed that the tweets posted in disaster struck areas and the areas that are indirectly affected were somewhat similar. Most of the tweets in disaster –hit areas were about a) warnings b) help requests and c) reports about the environment (tsunami, fire, and communication) and the self while the tweets in other areas were about a) reporting about the self b) reporting about the environment , c) concerns and condolences d) warnings.

-Warnings (Miyagi & Kesennuma)

A number of warning tweets and retweets were posted during the day of the disaster. In Miyagi, one particular user stood out and got retweeted many times which was @bosai_kesennuma: an official twitter account set up by the local authorities. Apparently the city sent out several tsunami warnings. Here are some of the tweets from @bosai_kesennuma

-An alarm of BIG tsunami : Coast of Miyagi prefecture. Escape to any high place.
-6 meters tsunami is expected to come. Immediately, escape to any high place.
-We’ve been having frequent aftershocks. A tsunami alarm has been announced. Escape immediately.
-Tsunami is coming to near the City Hospital.
-Tsunami hit us again. It came to the downtown. Escape to any high place.
-We’ve got information that the second wave is bigger than the first. Escape immediately.

-Help Requests (Miyagi & Kesennuma)

The tweets about help requests were heart-breaking. People mostly asked for help either for themselves or their loved ones by indicating location.

-We’re on the 7th floor of Inawashiro Hospital, but because of the risen sea level, we’re stuck. Help us!!
-I may die. Why no one comes to help me?
-Thirty people are stuck at Ozaki shrine. It seems the roads are shut down. Anybody, please call - police and fire department. Anyways, I’m OK.
-Help my younger brother. He called me that he is under a broken house and since I live in a remote place, I can’t go there. His address is…. (including building/apt. number).

-Reporting about self & environment (Miyagi & Kesennuma)

People constantly reported what was happening to them and what was happening in their environment. Interestingly there were more messages about the environment rather than self especially during the first hours of the tsunami.

-I hear the tsunami alarm. I’m gonna escape.
-I’m barely alive. I was about to die.
-I can see people in the flames and smoke.
-Buildings are burning and this is like a battlefield.
-Kesennuma has been completely destroyed.
-The sea level is falling rapidly. I think we’re gonna have tsunami soon.
-A building exploded. It’s south of Kesennuma-Minami station
-In front of the Fish Market is burning.

After analyzing about 200 tweets from randomly selected people nationwide and the messages that were sent from the disaster-hit areas, we came to conclude that the level of disaster naturally affects what messages are sent during the times of crisis. People in Miyagi posted messages about their uncertain situation whereas people in Tokyo tweeted to inform others that they’re safe. Secondly, people in directly hit disaster hit areas tend to focus on survival related topics: mostly what has happened/been happening in the environment unlike the rest of the tweeters who mentioned their concerns about indirect and future outcomes of the earthquake (transportation, communication, hoarding, nuclear plant risks, communication problems etc.). Please refer to Appendix I for the sample tweets from the indirectly affected areas.

Qualitative Analysis of Open-ended Survey Responses

-Problems encountered when using twitter

The biggest problem the Twitter users pointed out was the reliability of tweets. Many users mentioned that they couldn’t tell true information from false, especially when they saw emergency messages, such as, “I’m about to die.” or “Can anybody help me?” After a while, some of those tweets turned out to be false. The reliability of Twitter was the biggest concern for the users and this made them hesitate to use it. Some of the respondents stated:

- I couldn’t ReTweet... even when people were asking for help.
- I had ReTweeted a message, which said “I am about to die”, but it turned out to be a lie.
- There were many 〈拡散希望〉 messages, which means please spread this message to as many people as possible, but I couldn’t tell wrong information from reliable one. I regret that I also spread those messages without thinking carefully.

Another problem that the users brought up was the low S/N (signal-to-noise ratio) with the hashtagged messages. This probably led to a difficulty in finding important messages in the areas earthquake hit directly. Some Respondents mentioned that irrelevant information was tweeted with #disaster hash tag. Additionally, a large number of informal RTs (retweets with extra directed messages) made the problem even worse. Once an informal RT is spread widely, it’s almost impossible to control them. One of the respondents stated “I saw the same RTs so many times and there was no way to stop them spread.” Other respondents mentioned that, the same RTs which asked for help were kept spreading even after the victims were rescued. On the other hand, some respondents blamed the government for not sharing information which left greater room for rumors:

- Though people complain about rumors during the disaster, the thing is that the government and the mass-media didn’t spread any reliable and true information immediately.

The problems above were reported from both the directly and indirectly hit areas and it seems Twitter users had the same problems regardless where they lived. However, some respondents from Miyagi region complained about the accessibility of Twitter soon after the earthquake. Two of the respondents claimed that they could not access twitter for a while after the tsunami even though they admitted that; overall, twitter was a more reliable communication tool than TV, radio, landlines, mobile phones, and email.

-Future Recommendations
Many users pointed out the need for improving the reliability of information on Twitter. As it is mentioned earlier, Twitter users had a big trouble tackling with a sheer amount of false information. Some users emphasized that this is an ethical issue and individuals without moral values might keep spreading false information no matter what. On the other hand, other users proposed to introduce an information-traceability-system to make Twitter more reliable noting that anonymity should definitely be preserved even if the system is implemented.

- All users should have the responsibility for their tweets.
- Everyone should realize that he/she is using a public communication tool.
- To make the source of information clear will improve Twitter; however, anonymity should be maintained.

Some respondents emphasized the necessity of improving the use of hashtags. They claimed that there are many people who don’t know the proper usage of hashtags yet. Consequently, so many kinds of hashtags related to the disaster were created by different individuals after the earthquake, and this made it confusing to decide which hashtag is better to use. One of the users referred to the necessity of controlling the hashtag usage by making official hashtags.

- Understanding the right usage of hashtags is important.
- When a disaster happens, it is necessary to make formal hashtags and inform it to all users.
- It would be better to make a temporary page on Twitter which deals disaster topics only, such as about earthquake, shelters, hospitals, and the missing people.

Another recommendation was regulating RTs. Some users pointed out that in order not to see the same RTs frequently, a new function should be introduced. Since there were many informal RTs, some respondents recommended introducing a new system which can delete a large amount of informal RTs when needed. Lastly, there were some who didn’t agree to improve Twitter at all claiming that it would be too complicated to use it effectively.

- There is no need to improve because unskilled people wouldn’t be able to use it anymore.

Conclusions

In this paper, first, we have shown how Twitter was used by people who are either from directly hit (Miyagi) and indirectly hit areas (rest of Japan (mostly Tokyo)). We have concluded that tweets posted in Miyagi were about the users’ unsafe situation and survival related topics whereas people in Tokyo tweeted to inform others that they’re safe. People in indirectly affected areas tweeted more about secondary effects of the earthquake including transportation, nuclear plant risks, and so on. Next, we have revealed what kinds of problems people experienced after the earthquake and how they felt or thought about it. We have found that most problems caused by the imperfectness of Twitter, such as uncontrollable informal retweets, and uncertainty about Twitter reliability.

To take care of these problems some users recommended creating official hashtags and introducing information-traceability-system to Twitter. Others suggested that government should be more active providing reliable information on time. Respondents also propose to limit the number of RTs with hashtagged messages as twitter was inundated with the same RTs which were obviously false and misleading. On the other hand, quite a few users mentioned that adding more features to twitter or regulating it might make the service more complicated or difficult to use.

Further research is needed to assess if announcing official hashtags during disasters would solve the problems. Additionally, we recommend social media scholars to conduct more qualitative studies about user problems in different disaster situations and with larger samples. Our study had a very small sample size and low response rate (about 10%) since we solicited participation right after the whole nation went through the triple disasters.
Appendixes

Appendix I

Reporting about Self (National)

Since I’m at the 10th story in the building, the swing is bigger than that of 1st story.
I’m at Waseda University and all students have been evacuated from inside of the building.
The swing made me sick, like seasickness. I almost feel to puke.
I’m home. My room is not in a mess as I expected.

Reporting about the environment (National)
The magnitude was corrected to 8.8.
The seismic intensity was 5 in Tokyo.
An aftershock is still continuing. Be calm.
Chiba has also been struck by many aftershocks.
Conflagration at Odaiba, Tokyo.
Miyagino is burning.
JR will not work all day.
I’m at Haneda Airport. It seems that all flights will be cancelled.

Concerns and Condolences (National)

Are people in Miyagi OK?
I was deeply saddened to hear some people was killed by the earthquake in Miyagi.
If the plant wouldn’t be cooled, melting down may happen.
I think the government is concealing something important about the plant. If there’s possibility of melting down, officials should evacuate more people.

Warning (National)

Be careful of the leakage.
When earthquakes happen, you’re supposed to open the windows. Keeping water in your bath tub is also necessary.
If you’re living in a safe area, do not use the telephone right now in order to give victims the priority of using it. Plus, victims and their families and friends can call 171. At 171, you can record your voice and your family and friends can hear the message.

Appendix II List of the Open Ended Questions

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<th>Question</th>
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<td>What kind of trouble did you have when using Twitter during the disaster?</td>
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<td>How should people tweet during disasters?</td>
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<td>How should government, NGOs and NPOs tweet during disasters?</td>
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<td>How should companies tweet during disasters?</td>
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<td>How can twitter communication be improved in the future?</td>
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References


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