

#Emergency: Role of Twitter Hashtags during and after a disaster

Lokabhiram Dwarakanath

Abstract— Twitter, an Online Social Network (OSN) and micro-blogging service has gained much attention recently as users rely heavily on the platform to communicate during and after a disaster like earthquake, floods etc. This is partially due to the real-time nature of the service that enables quick communication between users. In this paper, we explore the behavior of Twitter Hashtags (Hashtag is a word prefixed with a hash symbol (#) used to categorize the Tweets) used in emergency situation in the context of disaster response and how they evolve overtime post disaster. Particularly, we'll look into the factors that influence the origin of Hashtags during an emergency and how they are adapted by the users for communication following a disaster. We consider the recent earthquake that occurred in New Zealand i.e., the Christ Church earthquake in 2011 as an example and analyze the usage of the Hashtag #eqnz. #eqnz was the Hashtag that was started during the earthquake and was widely adapted by the local communities to communicate on Twitter during and after the disaster. We discuss the link between the Hashtag usage and the role of major Twitter accounts (major in the context of the role they played in offering support following the disaster) during and after the earthquake in Christ Church. We discuss about how one can leverage the popularity and wide usage of a Hashtag overtime to prepare the communities for any future disasters.

Index Terms— Social Media in crisis, Social Media, Twitter Hashtags, Twitter in Emergency.

I. INTRODUCTION

"Hashtags are all about getting your tweets in front of people who are interested in like topics but might not already know about you. They are one of the great ways that Twitter allows you to self-identify with like-minded individuals. This is one of the top ways to gain a presence when you don't have one already (or to widen your existing reach)." - Claire Diaz Ortiz, Twitter Official on Chronicle of Philanthropy

Hashtags are words prefixed with a hash (#) that add context to a tweet and are similar to the tags for the blogs. Nowadays, Hashtags are a very important part of the Twitter experience. Hashtags are most often used to organize Tweets around particular events or to share news and knowledge. They are very useful for communicating to the audience while organizing an event, particularly during crisis situations for

sharing news/knowledge across twitter by the end users. By empowering the citizens to publish and distribute user-generated content with the Hashtag, Twitter has enabled the users to act as journalists during crisis situations [1] and bypass or complement the traditional news organizations.

In this paper, we examine how Hashtags are used in an Emergency situation. In Section II, we'll discuss about how Hashtags originate and spread. Not all Hashtags go viral. There are certain key elements that make a Hashtag go viral during an emergency situation which we'll discuss about. In Section III, we'll focus upon crisis and disaster response in context; we'll consider an example Hashtag #eqnz (the Hashtag that was used during Christ Church Earthquake in New Zealand in 2011) [4] and how the Hashtag is being adapted by communities and individuals overtime. Finally in Section IV, we'll conclude with a discussion on how the Hashtags evolve and sustains overtime.

II. THE ORIGIN AND THE SPREAD OF A HASHTAG AT THE TIME OF A DISASTER

While Hashtags are normally started by an individual and is spread across twitter to other users, not all the Hashtags go viral. For instance, during the recent protests in UK, the organizers and participants were using the Hashtag #demo2010. However, it was not trending on twitter as expected [2]. So, clearly a trending Hashtag should have certain characteristics that make it trending during a crisis situation.

The following are the key elements that enable the successful deployment of Hashtags:

- *A. Role of authority:* Hashtags introduced by influencers or any major source goes viral. Fig 1 shows a tweet from a recent Typhoon in Phillipines in December 2012.

Fig 1 Philippines Government introducing the hashtag #PabloPH to the public (Source: www.twitter.com)



In the Fig 1 @govph (Twitter account of Official Gazette Phillipines) introduces the Hashtag #pabloPH and asks the citizens to use it for information dissemination and communication via twitter. The Tweet received 13 Re-Tweets which shows how the Hashtag #pabloPH spread. @govph being a government source easily managed to spread the Hashtag to individuals during the crisis. Because it was from an official twitter account, individuals are more likely to trust and adapt a Hashtag introduced by them.

- *B. Role of Influencers:* When News organizations start adapting a Hashtag, it is highly likely that the Hashtag would spread. Table 1 (the information from [3]) shows the Top News organizations those were involved in twitter for disseminating news and in the overall relief process during the Chile Earthquake that happened in Feb 2010.

Table 1- Top 3 most active users on Twitter who mentioned about the earthquake (Source: [3])

User Account	No. of Tweets	Followers
Breaking News	8584	1665399
NicolasCopano	7004	41324
CNNBreakingNews	4767	2930769

There were about 9810 tweets that mentioned #terremotochile and was mentioned by 4122 users. The Hashtag remained the top amongst all the trending Hashtags [2]. Apparently, the Hashtag was

used by the major news organizations at that point in time. Table 1 shows that these news organizations who mentioned about earthquake had massive followers. Also, as the tweet about the quake increased the followers also increased and vice versa [3]. These explain why the Hashtag #terremotochile is trending following its usage by major new organizations.

- *C. Value addition:* This is probably the most crucial element that makes a Hashtag successful especially for a sustained period of time. For instance, during the earthquake in New Zealand in 2011 the Hashtag #eqnz went viral. This Hashtag genuinely added value during the crisis situation and over a period of time people started using it for every tweet they posted related to relief operations [4]. We'll discuss more about the #eqnz in later sections. In a nutshell, a Hashtag that adds value gets noticed even if its started by someone who is not influential.

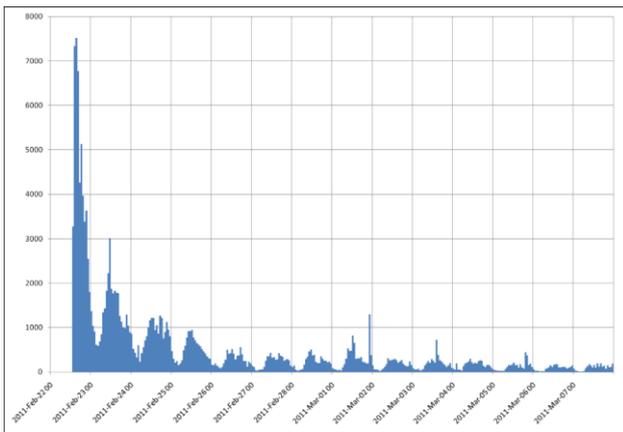
III. CRISIS AND DISASTER RELIEF IN CONTEXT

In this section we'll discuss about a specific event that happened in Feb 2011, the Christ Church Earthquake in New Zealand. On 22 February 2011, Christ Church was hit by a major earthquake of magnitude of 7.5. The quake claimed about 200 lives and costed about NZ\$15 billion for reconstruction [4]. Social media remained a very important platform for disaster response and support during the quake. Individuals started sharing information about trapped persons, medical emergencies, images of damaged buildings etc. on various platforms like Twitter, Facebook, Instagram, Flickr etc. Of these platforms Twitter remained the most important platform for relief efforts (probably because of its 140 characters post nature).

A: Hashtag #eqnz in context:

The locals responded to the disaster on Twitter by organizing the Hashtag #eqnz and were adapted by the users for co-ordination and relief efforts. About 100 Tweets were posted per minute within few hours after the disaster [4].

Fig 2 Tweets mentioning #eqnz at the time of crisis and for 2 weeks since then (This graph is adapted from the source [4])



The spike in Fig 2 indicates that approximately about two tweets were posted per second with the Hashtag #eqnz few hours after the disaster. This went down over a period of time during the following weeks to come. So, it clearly shows the role of Twitter as a medium for breaking and spread of news [5].

Fig 3: Top active accounts using #eqnz at the time of crisis (This graph is adapted from the source [4])

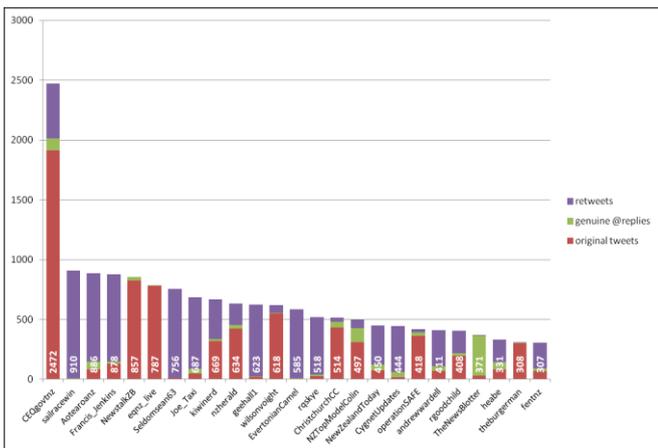


Table 2: Details of Top accounts that use the Hashtag #eqnz

Twitter Account	No. of followers
@CEQgovtnz (alias @CERAgovtnz)*	4945
@ChristChurchCC	7631
@NZHerald	92K

From Fig 3 and Table 2 one can see that the accounts @CEQgovtnz* (Twitter account of Canterbury Earthquake Recovery Authority) and @ChristChurchCC (Twitter account of Christ Church City Council) played a major role

in using the #eqnz Hashtag and for disseminating information.

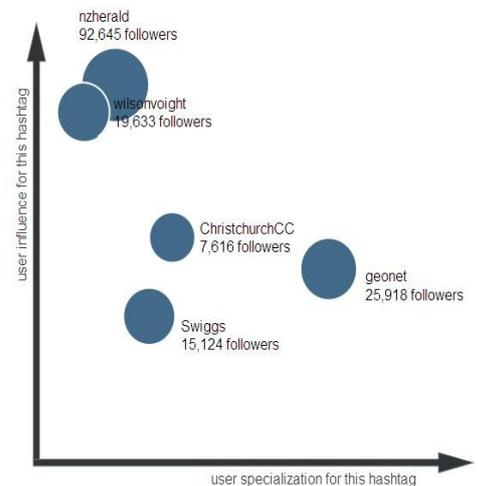
*Note: Twitter account CEQgovtnz has been replaced by CERAgovtnz (<https://twitter.com/ceqgovtnz>)

Fast forward 3 years from then, one can see in Fig 4 that the accounts @NZHerald, @Geonet, @nz_quake and @ChristChurchCC are still using the #eqnz as on March 2014. Note that @CERAgovtnz who was a major contributor in relief operations hours after the earthquake (Fig 3) is not displayed in Fig 4. This is not displayed for unknown technical reasons. However, the usage of #eqnz by @CERAgovtnz is well explained in the Tweets from @CERAgovtnz (Fig 7) that is yet to be discussed in the following sub-section.

Fig 4: This Graph was generated on March 28 2014 (Source: Generated using Hashtagify[6])

The top 6 influencers for #eqnz

1. nzherald
2. wilsonvoight
3. nz_quake
4. ChristchurchCC
5. geonet
6. Swiggs



B. Related Hashtags and mentions:

While #eqnz remains a very important Hashtag during and after the disaster, there are other related Hashtags which people have started using. Fig 5 shows the Top Hashtags that were used in the context of earthquake and other natural disasters in New Zealand.

Fig 5 shows the Top Hashtags related to #eqnz generated on March 28 2014(Source: Hashtagify[6])

The top hashtags related to #eqnz

Hashtag	Popularity	Correlation	Weekly Trend	Monthly Trend
#eqnz	45.4	100%	-9.7 ▼	+3.9
#chch	40.1	13.7%	-4.6	-0.3
#Wellington	46.4	2.3%	+0.6	-0.6
#NZquake	21.1	2.2%	0.0	-0.1
#Christchurch	40.1	2.2%	+7.1 ▲	-0.2
#NZ	52.3	0.9%	+2.6	-2.4
#earthquake	65.3	0.6%	-14.5 ▼	+5.8 ▲
#chchtraffic	14.2	0.6%	0.0	-1.0

These Hashtags graph is current i.e., it is generated in March 2014. Note that there are some related Hashtags that are not necessarily linked to the Christ Church earthquake in 2011 i.e., Hashtags like #NZQuake, #Wellington etc. These Hashtags were used during other earthquakes like the recent Wellington earthquake in 2012 [7]. This shows that #eqnz is more generic and is being used throughout NZ for any natural disasters since its introduction and not necessarily confined to Christ Church earthquake.

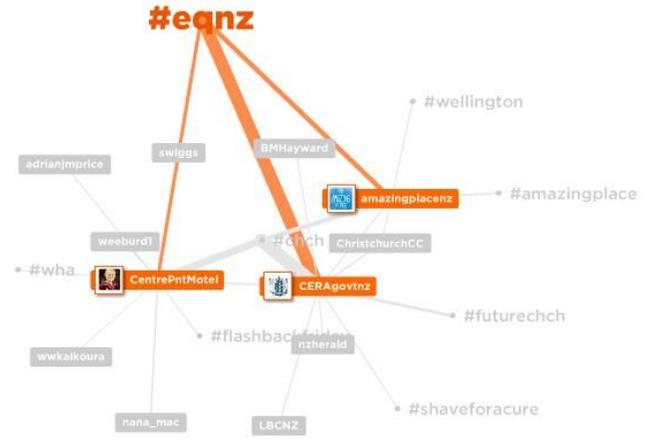
On the other hand the Hashtags #chch and #christchurch received more attention from the locals i.e., it is being used more by individuals within the city overtime during rebuilding the city.

C. Hashtag Mention maps explored:

In this sub-section we generate the Mention map [8] for the major Hashtag #eqnz and #chch and for the major account that used #eqnz - @CERAgovtnz (Mention map definition: Mention map is a web app for exploring a Twitter network. It allows one to discover which people a particular account interact the most and what they're talking about).

Fig 6 and Fig 8 shows the generated mention map for #eqnz and @CERAgovtnz respectively.

Fig 6 #eqnz Mention map generated using mentionmapp.com [8]



In the above generated mention map the colors indicate the strength of connection. For instance orange color indicate strong link between #eqnz and the major accounts (which means more mentions about #eqnz by those accounts) and the grey color indicates relatively weaker ties (which means less mentions about #eqnz by those accounts). The above mention map shows that @CERAgovtnz used the #eqnz to the maximum. There were also other accounts, for instance @centreptnmotel is a motel in the heart of Christ Church who actively tweets about rebuilding the city that use the #eqnz (Fig 7). This indicates that its not just the large news organizations but also the smaller organizations that take part in tweeting about the relief and rebuilding of the city. This confirms our earlier statement that Twitter enables citizens to act as journalists.

Fig 7 Tweet on rebuilding Christ Church from @CentrePntMotel mentioning #eqnz (Source: www.twitter.com)



while doing this paper.

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Mr. Lokabhiram Dwarakanath is a Social Media Consultant based in India. He holds a B.Engg degree in Electronics and Communication Engineering from Madras University, Chennai, an M.Tech in Digital Communication from SRM Institute of Science and Technology, Chennai and an MS degree in Wireless Enterprise Business Systems from Brunel University, West London, UK. Apart from his work as a Social Media Consultant he does his research on various domains in Computer Science. His research interests include Social Computing, Human Computer Interaction, Augmented Reality and Social Media Data Mining.