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Abstract

Emergency Agencies have shown a significant interest in the use of social media such as Twitter and Facebook for interacting with partner institutions and citizens for distribution of vital disaster information. This paper is a case study about how social media was used in a crisis situation, being the Mitchell factory fire, in Canberra, Australian Capital Territory (ACT). In particular this paper looks at how one social media site; Twitter, was used. Twitter became a way for many Canberran citizens to find out essential information about the factory fire that broke out on September 16th 2011.This case study looks at the correlation of offline events with online events, the impact and effect of social media in an emergency context and the experience of the ACT Emergency Services Agency (ESA) Media team's use of Twitter during the day's events and the lessons they have learnt from this experience.

Keywords: Crisis Informatics, Twitter, Emergency Management, Government.

1   INTRODUCTION

Social media tools and technology that was meant for   purposes such as socialising, have become a very important tool in times of crisis. Social media tools such as Facebook and Twitter have been used as a source of information in many cases in America, India, Chile and Australia.   Information sharing extends to emergencies and natural disasters such as the Australian 2010-2011 floods in Queensland and man-made emergencies such as the 2007 Virginia Tech shootings. This use of social media during an emergency is termed 'crisis informatics', a term that helps to define social media use during an emergency.

Palen and Sutton   (2011) states that throughout history humans have demonstrated that when faced with a disaster they adapt whatever tools and skills they have to help in the response and recovery efforts. More recently with the invention of social media tools such as Twitter and Facebook, a regular user of social media can be just as effective as traditional media sources (for example e news radio and emergency services personnel) in disseminating information about a disaster. Therefore the study of crisis informatics is viewed as an expanded social system in which information about a crisis is disseminated between official channels and public entities (Palen,Vieweg,Lui, and Hughes 2009).

Effective information management is very important for disaster management (Bunker and Smith 2009). The current influx of new technologies and trends such as cloud and social media provide both opportunities and challenges to emergency agencies in making decisions about the effective use of these technologies (Zhang et al 2010). Parameswaran & Whintson (2007) define social computing as "a large number of new applications and services that facilitate collective action and social interaction online with a rich exchange of multimedia information and evolution of aggregate knowledge have come to dominate the web." It has been suggested that "the mediating and social networking technologies of WEB2.0 for example. Facebook, wikis, mashups, and changing telecommunication infrastructure such as mobile applications and cloud computing (the practice of using remote servers to host data) are seen as the means to facilitate crowd-sourcing (the process of using a large number of people to cary out a job) of information and its management and use in disaster scenarios" (Bunker 2011).

In light of this emergence of social media use in an emergency context, this paper presents a case study about how social media was used in a crisis situation, being the Mitchell factory fire, in Canberra, Australian Capital Territory (ACT). In particular this paper look at how one social media site; Twitter, was used. Twitter became a way for many Canberran citizens to find out essential information on the factory fire that broke out on September 16th 2011. This case study looks at the correlation of offline events to online events, the impact and effect of social media in an emergency context and the experience of the ACT Emergency Services Agency (ESA) Media team's use of Twitter during the day's events and the lessons they have learnt from this experience.

2   LITERATURE REVIEW

 In order to understand the complexities of crisis informatics, this paper conducts a literature review. Many case studies have been conducted under the term of crisis informatics; mainly American emergencies such as the 2009 Oklahoma grassfires, the 2008 hurricane season and the 2007 Virginia Tech shootings, as well as two Australian case studies about the 2010-2011 Queensland floods. These are all relevant to this case study.

The research about the related texts that were studied, demonstrated they had similar themes.

These are:
* Situational analysis and awareness.
* E-participation.
* Information dissemination about the crisis at hand.

One notable case is Sutton's and Palen's study about the 2007 California wildfires. This case is a very good example of all three themes above. Sutton's and Palen's theory about social media is that social media support's backchannel communications which allows civilians   to have the ability to share information on various 'back channel' mediums such as Flickr, personal blogs and mashups. Even though the mentioned back channels in this case study were frowned upon by public officials due to the fact that rumours could occur and spread incorrect information, a majority of people used a mix between traditional media and social media to get information about the emergency.In this case study it is interesting to note a small minority of those surveyed said that traditional media was not catering to their needs. This included a bias towards the more metropolitan areas in news broadcasts instead of the outlying areas that were also wildfire affected. Sutton and Palen also commented on the timeliness of news straight from the authority's website, finding that even websites of emergency service agencies had a time delay, meaning that once something was published, the people in the affected areas had no time to prepare therefore by using social media they would get timely information from their peers. This was a great way for people to understand the situation at hand.

Another case where situational awareness was found to be a factor in an emergency situation is the case study conducted by Hughes (2011) during the Oklahoma Grassfires and the Red River floods in America in 2009. Hughes (2011) found that situational awareness gave people a coherent full picture about a particular situation just by looking at small vignettes of information such as geo-tagging on mciroblogging websites. Geo-Tagging is a method where geographic information about place names, street addresses and landmarks are put on a tweet. It was found that 78% of Twitter Oklahoma users and 86% of Red River users Tweeting used geo-tagging as part of their Tweets. This percentage of surveyed results suggests that in these cases the individuals using Twitter at the time felt that geo-tagging was an important part of gaining situational awareness. This case is similar to another case study conducted by Vieweg Palen ,Lui ,Hughes and Sutton (2008) which looked at social media use in the aftermath of the 2007 Virginia tech shootings where situational awareness was needed for people to feel empowered with information. The 2007 Virginia Tech shootings had similar findings to Sutton's and Palen's and Hughe's case study. In this case the high amount of e-participants let Vieweg et.al made a timeline of events that pinpointed communications on a number of social media and Web 2.0 sites such as Facebook and Wikipedia which allowed people to gather information about victims before the media got the official list of victims. What was interesting to note about this case, was that there was no government or official involvement on social media. However all information given on these websites was correct and preceded media and officials due to 'collective intelligence', where a 'large, distributed number of people who exhibited problem solving capabilities came together online' (Hurtz and Turoff, Quoted in Vieweg et.al 2008) meaning information was easily disseminated across many sites in a matter of hours.

Information dissemination was also very important in Hughes's (2009) case study of the 2008 Hurricane season. This case study found that a majority of Twitter messages that were sent out during the season that were relevant to the hurricanes were quite high. This iscompared to the general tweets that were sampled during that time which included Uniform Resource Locator's (URL's) which were gaining popularity as it was a new feature of Twitter. What is interesting to note is that in the time frame of May 2007 when Java found only 13% overall had a URL (Java 2007, quoted in Hughes 2009) had changed in 2009 to have 24.75% of all Tweets having a URL . This suggests that Twitter's role in society is more substantial   than just using tweets for daily activities.

This also leads us back to Sutton's and Palen's paper where respondents to their questionnaire found that some people found a 'need to contribute on social media sites in order to cope with the enormity of the situation' (Sutton and Palen 2011). However so far none of these American case studies have looked closelyat the government or emergency authorities role in Twitter, with one case study commenting with the valid point of one authorities disdain over the use of social media sites over fear that rumours could arise from information sharing on such sites. We however see a change when we look at two Australian case studies.

Once again situational analysis and awareness and information dissemination was important in Cheong's social network analysis of Tweets during the 2010-2011 Queensland floods (Cheong and cheong 2011) however in this case there was a greater emphasis on e-participation and the participation of government entities such as politicians and government agencies participating in the social media scene, particularly with Twitter. In this study Cheong found that Twitter is not just a social network, but also a news service (Yates and Paquette quoted in Cheong et.al 2011) where information from official and reputable sources is regarded as valuable and is actively sought after and propagated especially in emergency situations for example the Queensland flood (Cheong et.al 2011). In this case study it was found that participation and interaction between government bodies, politicians, general public, public commentators and non-government bodies was high, with high interactions such as followings, tweets and retweets. However the Queensland police media's review of Twitter use during the 2010-2011 Queensland floods (Royal Commission Report 2011) focused more on information dissemination as a key source for both media outlets and the civilians affected by the floods. The Queensland police media unit found that using Twitter, they had the ability to push out large volumes of information to large numbers of people, they didn't have to rely on using media to get specific information out to the public in affected areas and was able to 'kill' rumours quickly by using the #mythbuster hashtag. The Queensland police unit also noted that many media outlets also used their Twitter feeds to get trustworthy information from an authoritative source.

These situations suggest that e-participation and situational analysis and awareness are very important and needed in a time of crisis. In these cases we find that people who know what the situation is and can participate with what is happening can feel more in control and be more informed about current situations.

3   RESEARCH METHOD AND EVALUATION FRAMEWORK

This is a single case study approach as this enabled an exploratory interpretive investigation into what is a unique situation. In general, case studies are the preferred strategy when the focus is on a contemporary phenomenon within some real-life context (Yin 1994). Yin argued that case studies are good for when the available or existing knowledge base is poor, in essence, "when the boundaries between phenomenon and context are not clearly evident". Use of Twitter during an emergency is still an emerging event, and hence case study approach was suitable for a qualitative analysis.

To research this issue one of the authors held an interview with the ACT Emergency Services Agency (ESA) public media liaison officer. Through this interview critical issues and measures around the Twitter use during the fire unfolded. Further the interviewer was provided with supplemental information on Twitter usage, follower data, the sudden surge in Twitter use and organisational policy documentation around social media usage. They also provided a set of popular and significant tweets for the fire. To gain more information about the crisis of focus, further information was collected from newspaper articles, news bulletins and relevant blogs (Thomler 2011).

In the context of this study to measure the success of the use of Twitter during the 2011 Mitchell factory fire, an evaluation framework can be used. There are many evaluation frameworks available in associated literature. As social media is all about e-participation by citizens in a government context, Grubner's (2011) criteria of success and Leitner's and Torok's (2011) e-participation Euro zone award evaluation criteria is relevant for this study.

Grubner's (2011) criteria's of success looks at six factors for assessing how social media, in particular Twitter, was used during the student protests in Vienna in 2009. Grubner stated six criteria to evaluate and measure what role social media online had in enabling the offline events. The criterions are:
- sufficient number of participants,
- efficient flow of information and discussion,
- mobilisation,
- the impact,

- effect and sustainability.

Leitner and Torok (2011) stated six criteria which are usually used to assess the effectiveness of e-participation for European e-participation awards; by looking at the relevance, impact, innovation, potential to re-share, management and communication and dissemination of information in an e-participation environment. Leitner and Torok also add sustainability, usage and public value of e-participation as further criteria to measure success of e-participation applications to further measure the success. . This paper looks at ACT ESA's use of Twitter in an emergency context. It looks at ways Twitter contributed to the success and effectiveness of dissemination and management of the factory fire in Mitchell. Therefore it would be useful to use a subset of Grubner's, Lietner's and Torok's criteria as deemed to be relevant for this study. To evaluate the success and impact of Twitter usage during emergency scenario, the paper uses the following criteria:

- Sufficient number of participants and public values of e-participation.
- Efficient flow of information.
- Dissemination of information.
- Potential to re-share, manage and communicate the communications throughout the day.

4   THE MITCHELL FACTORY FIRE

4.1   Background to the event

In the early hours of September 16th 2011 a factory fire broke out in the industrial suburb of Mitchell in North Canberra. This had the potential to cause a toxic plume of smoke to rise into the air of North Canberra. Traditional media sources were notified, as well as using for the first time the Emergency alert system, which is a text message and telephone message program that sends out messages to all people who had phone numbers registered by their telecommunications provider, in the affected geographic area. This, plus their use of social media was widely criticised by many prolific Australian bloggers such as Craig Thomler (2011) and newspapers such as the Canberra Times.

What is interesting to note, and is the focus of this paper, is that the ACT Emergency Services Agency, which is the overarching agency that looks after four emergency services providers; the ACT Ambulance Service, ACT Fire Brigade, ACT Rural Fire Brigade and the ACT State Emergency Service, used its social media account for the first time to broadcast information to the concerned residents of North Canberra. The reason why ESA's social media accounts were never used before the day of the fire was because the social media policy that had been under development was due to be released on the day of the fire outbreak, which proved to be unfortunate timing. The Emergency Services Agency was later due that afternoon to let the redeveloped ESA website 'go live'. This new website was linked to their corresponding social media accounts using a tool called dlivr.it. Unfortunately due to the bad timing of the incident, the ESA media team had to manually update the Twitter feed, therefore this paper describes the use, the lessons learnt and the early adoption of a social media platform of an Australian Emergency authority, which in turn suggests how other emergency authorities across Australia and the world can use social media during a crisis.

4.2   The ACT Emergency Services Agency Social Media Policy

To understand the case which this paper discusses it is necessary to mention the ACT ESA's social media policy. The ACT Emergency Services Agency (ESA) social media guidelines state that all information given to the public needs to follow the principals of :

- Trust
- Transparency
- Timelessness
- Accuracy
- Accessibility

- To be the single source of truth

Also according to ACT ESA policy all social media accounts that are related to the Emergency Services Agency have the following purpose:

- To disseminate whole of ESA real time emergency information such as alerts and updates to the ACT community.
- Educate the general public, using their community education campaigns such as prepare, act and survive bushfire safety campaign.
- Provide a way to promote recruitment programs.
- Give a way for Chief Officers of each service a way to communicate to the volunteers and workforce of each service.
- Provide a means to promote the work that each service conducts on a daily basis.

4.3   The experience of the use of Twitter from the ESA media team

In an interview with the Emergency Services Agency public media liaison, the use of Twitter in an emergency was being researched and policies regarding social media usage in emergency services were being written long before this emergency happened. On the 16th of September 2011, there was supposed to be an official unveiling of the social media accounts along with the unveiling of a new website that would link the Twitter feeds in, so that whenever the website was updated so would the Twitter account be updated. This would mean members of the public would get timely detailed information in the online world about offline events (or in other words the emergency). This correlation would mean people would be empowered with the information that they would receive about a dangerous situation in real time.

The aim of having a Twitter account is to act as a supplementary device that would allow ESA to refer people to their website, which can be considered to be their single point of truth. This is to ensure that no confusion occurs between mainstream media, the civillian and ESA, with all parties getting similar information, allowing for the fact that it is up to the community to seek updates from whichever source they feel is necessary to keep informed about an emergency. This also allows people who are disadvantaged such as people who cannot have access to technology, still get the same information for example as someone who doesn't have access to the internet. This would enable them seek out news radio as they would be getting similar information as well as the people who use Twitter.

Twitter would also be used in times of emergency for ESA to conduct a situational analysis which uses a type of collective analysis technique to understand where and what is affected just by looking at followers and non follower's tweets. The Twitter account would also be used in times of non emergency to inform people about high profile incidents. Other Twitter accounts that are linked to the ESA's such as the ACT Ambulance Service would use Twitter for community education and recruitment.

In regards to communication between agency and the public through the ESA Twitter account, ESA has a strong view that not all questions directed at them would be answered, as the Twitter account is not monitored because of the link set up between the ESA website and their Twitter account. For example, citizens were asking questions in Twitter, but these were not responded.

> @stuffandwhatnot: So. Reverse cycle aircon should it be on or off? #Mitchell @ACT_ESA

On the day of the fire however the link between their new website and the Twitter account was not perfected, therefore all tweets had to be manually done with links to their website also manually entered, which caused some time issues for the four person media team. However their efforts were well accepted by the community as evidenced in the following tweets:

> @j-corrin: @ACT_ESA Great job in keeping people informed and updated regularly. Much appreciated. Thanks!

@ACT_Community: Well done to @ACT_ESA for their coverage of the #Mitchell fire this morning. They're new to Twitter but obviously fast learners.

4.4   Findings from the use of Twitter during the Mitchell factory fire

Using the Evaluation Framework that was mentioned earlier we know that Twitter was a good medium to use in an emergency.

4.4.1   *Sufficient Number of participants and public values of e-participation.*

It was apparent that a sufficient number of participants were involved in the online events during the fire and many people were tweeting about the events during the course of the day. On Thursday, the day before the event there were only 15 participants following the almost empty ESA Twitter feeds. By Monday morning, three days after the event, about 1,777 participants were following ESA's Twitter account. There became two standout hashtags during the event which were #CanberraFire and #Mitchell; there were 513 tweets with these hashtags.

4.4.2   *5.3.2 Efficient flow of information.*

As mentioned in the previous sections and in the interview with the ESA media liaison officer, that the new ACT Emergency Services Agency Website, which uses the tool dlivr.it, a tool that automatically updates social media accounts when a new update goes on the ESA Website, was to 'go live' the afternoon of the 16th of September (the day of the fire). Due to the emergency, which as mentioned happened in the early hours of that morning, there was no other way to efficiently disseminate information, other than to manually update the ESA Twitter account and the old ESA website, as well as update all local and national media outlets regarding the fire. This was a huge effort considering the media team is small compared to most Emergency Service Media teams across Australia.

Since the fire the new ESA website has gone live and the ESA Twitter feed is updated automatically using dlivr.it. The team put a lot of effort into making sure that information efficiently flowed to the public, as well as making sure that the public also had other avenues of information to gravitate to such as radio and television, in case the team was unable keep up with ever changing circumstances of the fire and the constant need for information to the public and media.

4.4.3   *Potential to re-share, manage and communicate s as well as dissemination of information during the day* .

With the total tweets for the incident reaching 107 tweets going out to 1,777, participants just made by ESA , in a matter of 22 hours, it can be assumed that there was efficient flow of information because there were a sufficient number of participants. Two tweets alone got 39 retweets by their followers. Therefore is can be assumed that dissemination of information was widespread because   more information got out to people who might not have been following ESA on Twitter that day. The ESA Twitter account also got 355 mentions on Twitter meaning more information was disseminated Whether or not it was accurate is unknown. However it was evidence that citizens were sharing and thus assisting in disseminating disaster information. Most popular tweets by @ACT_ESA shows that important messages were being retweeted. These were as follows:

act@esa: Some reports suggesting that ACT Fire Brig has declared the smoke is not toxic are incorrect the smoke is still potentially toxic #Mitchell (19 retweets)

act@esa: The #Mitchell #canberrafire is out 22 hours after it started. Great work ACTFB. Mitchell exclusion zone to remain in place for the weekend. (20 retweets)

It should be noted that ACT ESA could have used a similar approach to Queensland Police (@QPSMedia) by eradicating myths or misinformation by using the hashtag #mythbuster.

As mentioned above links to ESA's website had to be manually put into each tweet, as the ESA media liaison said in interview, the website is the single point of truth with 127,285 views and 41,241 unique visitors over Friday to Sunday during the event. However it is not known if Twitter or other social media mediums were the cause of this surge of people going to the ESA website. Other social media was being used by citizens as well. There were approximately 30 videos of the fire uploaded to YouTube.

One interesting aspect was the way the public was trying to point to the right information sources for the fire. This can be seen in the following tweet:

> @PJVANVLIET: for those of you have been following @ACTEmergencyInf suggest switch to @ACT_ESA the latter actually tweets during an emergency.

Other government agencies also offered help through Twitter. These tweets have helped to increase the number of followers.

> @tamsmediaroom: RT @actcomms Follow @ACT_ESA for updates on situation in Mitchell

> @QPSmedia: People wanting the latest info on the #canberrafire should follow the ESA on twitter https://twitter.com/ACT_ESA

5   DISCUSSION

The use of Twitter in the Mitchell fire empowered people with the information that allowed them to understand the situation and allowed ESA to disseminate information to a wide group of people.

When comparing this case study to the definition of crisis informatics given by Palen, ESA has embraced the definition of expanding the social system in which information about a crisis is disseminated between official channels and public entities, as well as keeping to the traditional ways of disseminating information.

In the Literature review it was mentioned in the California bushfire case that it took time for information to be published. In this case disseminating information on the ESA website is almost instantaneous now with a few second delays between the tweet being published on Twitter, although in the case of the Mitchell factory fire this was difficult to do due to the fact that all tweets had to be done manually.

In the interview conducted with the ESA media liaison officer, it was mentioned that collective intelligence could be used in times of emergency, similar to the Virginia Tech shootings case but this time used by for the public, government agencies and media, instead of just for the general public. This would also ensure that what was observed in the Virginia Tech case where the public knew the names of the victims before officials and media knew that more than the public knew about the event. Having collective intelligence for all parties will allow for transparency of information for all. However not having ESA communicate back to the public when a question is asked is somewhat disconcerting, as communication between all parties is an important part of e-participation.

What is also interesting to note in the discussion is the ESA's social media policy is that with the main account mainly for emergency information it allows for Ambulance, Fire and State Emergency Service to focus on recruitment and education programs. This is similar to Golbeck's (Golbeck et al. 2010, cited in Larsson and Moe 2011 page 5) Twitter study of members of the US congress during 2010

where Golbeck found that most Twitter accounts were either used for self-promotion or dissemination of information where we see that Twitter use by an emergency service is no different to other government bodies/officials.

6   OBSERVATIONS AND LESSONS LEARNT SINCE THE FIRE

Since the September Mitchell factory fire as of June 1st 2012 there have not been any large scale incidences which have affected many people or have had significant public interest. The Twitter account has only been intended to be used for dissemination of information and not interaction with members of community. This could be due to the small size of the media team, therefore the need for a similar tool like dlivr.it is necessary to give timely information to the ACT community, while having to also disseminate information to traditional sources such as the ESA website and the press. This is now in full use.

The study has some limitations. Firstly, the research is based on the views of the particular agency, it does not take into consideration views of the citizens other than that provided by the agency or seen in tweet samples. The twitter feeds during the fire were not collected by the researcher or the agency, hence the tweet feeds could not be analysed. Only a subset of the tweets was made available to the researcher. Some suggestions to further the study of crisis informatics could include the adoption rates of emergency authorities in the use of social media and the reasons why the adoption rate is the way it is, the readiness of emergency authorities to use social media in times of emergency and the perceptions of both authorities and citizens regarding the use of social media during an emergency.

7   CONCLUSION AND RECOMMENDATIONS

As time goes on, society will see the benefits and disadvantages of using social media for emergency communication. It is interesting to note that there was a lot of criticism of the Emergency Services Agency in their not announcing that they had a Twitter account earlier. For example, on a Canberra forum called "The RiotAct" there was a posting saying that there was no announcement of such a Twitter account, however others had said such an event like the Mitchell fire had forcibly put the knowledge of such a Twitter account in their minds, similar to what happened with the Queensland flood example where their theory of organic growth through word of mouth made their Twitter account become popular during such emergency events.

In the future the ACT ESA will expand and improve their social media content to allow for videos and other social media trends as well as constantly updating their social media policy to keep up with society. As The Queensland Police Media team noted that without the manpower to have two way conversations with the general public and a way to have constantly monitored activity during an emergency, support of people in high positions for use of such mediums and ways to prove such worth of using media accounts to disseminate information, the general public will not be able to see why there is a need for such communication. From the Mitchell fire the ACT government, general public and media have learnt that Twitter and social media accounts are another way to disseminate information across in an innovative way. It should be noted that it does not replace something already used like a website or press release. Canberrans learned many lessons in the aftermath of this singular emergency in the backyard of Canberra.

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