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Crisis 2.0 in the Australian Context: The i-Survive Project

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ABSTRACT

In the face of disasters and emergencies, Internet-enabled mobile phones (or 'Smartphones'), coupled with Web 2.0 social networks are swiftly becoming not only a means to personally chronicle the events being experienced, but are also being used to disseminate information, educate and inform civilians. The aim of the i-Survive project was to investigate the use of mobile social media during recent Australian disaster and emergency situations. Participants in the pilot study were representatives of key community stakeholders in the crisis event. The quantitative and qualitative findings of from the study's survey questionnaire will be discussed in this paper. Participants' extended qualitative responses to the follow up interviews and the digital artefacts contributed will be detailed in two separate papers.

Keywords: Crisis 2.0, Crisis Informatics, Disaster Sociology, Disasters, Emergency Response, Internet-Enabled Mobile Phones, Mobile Learning, Smartphones, Social Media

INTRODUCTION

In recent years, the effects of bushfires, floods, cyclones, and storms have endangered the lives of many civilians and those participating in emergency response teams. In such situations, simply surviving the emergency, disaster or catastrophe becomes the paramount consideration for those involved. However survival can be hampered at the height of the crisis when one cannot obtain up-to-date information through formal media channels concerning the changeable and hazardous local conditions. Understanding the local conditions, knowing

what to do, receiving warnings and guidance, and/or have informal learning opportunities at one's fingertips in the face of adversity, may help reduce fatalities and minimise personal injury, livestock, property, and business losses.

In the face of such extraordinary events, Internet-enabled mobile phones (also referred to as Smart phones, iPhone, 3G or 4G phones) coupled with Web 2.0 social networking technologies are swiftly becoming not only a means to personally chronicle the events being witnessed and/or experienced, but are also being used to disseminate information, educate and inform the public and emergency

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services. Through such technologies, civilians, media personnel and emergency response teams have the ability through the viral capacity of the technology, to alert those in danger and educate them in informal and formal ways more swiftly than traditional broadcast media and telecommunications methods may be able to accomplish.

This article reports on the *i-Survive Project*, a pilot project which aimed to investigate the use of Web 2.0 social networking technologies such as *Facebook* via mobile, hand-held, Internet-enabled mobile phones (Smartphones) during recent Australian emergency and disaster events. Better understanding of the adoption of this first response ‘mobile’ strategy has the potential to save lives, as well as to improve emergency services responses. The findings of from the study’s survey questionnaire will be discussed in this paper. Participants’ extended qualitative responses to the follow up interviews and the digital artefacts contributed will be detailed in two separate papers.

THE SOCIAL NATURE OF CRISES

In Australia, the term crisis (plural ‘crises’) is understood to be an umbrella term which encompasses both the *type* of and the *scale* of the situation. In relation to the type, crises can occur due to the result of human action and/or inaction, in addition to the result of such naturally-occurring phenomena as fires, storms, floods, and cyclones (DBCDE, 2011). In relation to scale, crises also occur on a scale or a ‘continuum of magnitude’ (Oliver, 2010). These range from an emergency at the lower end of the scale, through to a catastrophe at the other. In large scale crises, there are ripple effects that extend beyond the locale itself, affecting aspects ranging from public health, economies, and civilisations (Howe et al., 2011).

As such, crises are understood to be multifaceted events which affect individuals and communities, businesses and livestock, and the environment. Churchman (1967) eloquently

describes them as ‘wicked problems’. They are ‘wicked’ in that they are complex, contradictory, and changeable. Additionally, the needs in one locale may be very different to the needs in another. For this reason, responses to crises need to be informed by a ‘bottom up’ approach, rather than a ‘top down’ approach.

First-responders in crises are often “people from the local and surrounding communities who provide first aid, transport victims to hospitals in their own cars, and begin search and rescue” (Howe et al., 2011). Disaster sociologist, Russell Dynes (1998), observes that in examining events in and around emergencies and disasters, the community needs to be the locus of analysis. It is the community – wherever that community is – which has the capacity and resources to activate a response to the disaster. Further, such analysis has cross-national and cross-cultural applicability (Fischer, 2003). One way of examining community as the locus of analysis is in examining the communications – or ‘crisis informatics’ – which occur during the event.

CRISIS INFORMATICS

While official, ‘front channel’, communications are often considered the most reliable source of information during crises, challenges lie in and around issues relating to time delays in keeping up-to-date with rapidly changing local conditions. Crises require flexible responses (Mackey, Gilmore, Dabner, Breeze & Buckley, 2012) and creative problem solving (Plotnik, Turoff & Van Den Eede, 2004), rather than standard formal first-response communications. So-called ‘back channel’ communications offer this possibility. Back channel responses enable the spontaneous adoption of existing social communication and networks when formal channels of communication are disrupted during a crisis situation (Mackey et al., 2012), or where they do not provide those in the ‘front line’ with the essential localised or up-to-date information during the crisis (Willems, 2011; Willems, 2012).

Plotnik et al. (2009) suggest the need to have in place the philosophically-appropriate technology to support the response best suited for flexibility and creativity. Around the globe, ownership of handheld technologies as the choice of internet access is growing, and Australia is no different. While figures vary, Mackay (2012) estimates that 80% of Australians would own a smartphone by end of 2012, with a projected estimate of 84% by mid-2013, and Ericsson (2010) has claimed that by 2015, 80% of people around the globe will be accessing the Internet from their mobile devices. Using mobile devices to connect to the Internet affords access to information anywhere, anytime. In disaster and emergency situations, hand-held portable devices are likely to be the only communications provision accessible to individuals in the crisis situation. As such, the implementation of this 'mobile' strategy has the potential to save lives, as well as to improve emergency services responses (Jennex, 2010; Willems, 2013).

Social networks enable "communication among ever-widening circles of contacts [and] inviting convergence among the hitherto separate activities of email, messaging, website creation, diaries, photo albums and music or video uploading and downloading" (Livingston, 2008, p. 395). Social networking sites and the media utilised (such as wikis, blogs and *YouTube*), are increasingly important conduits for individual and group communications. Social media has emerged in recent reports on crisis events around the world as having played an integral component in supporting individuals and communities both during and after the event (Dabner, 2011; Freeman, 2011; Palen et al., 2009; Qu, Wu & Ward, 2009; Willems, 2011; Willems, 2012). Further, Belblidia (2010) has noted that social media can be used to build sustainable communities online. Indeed anecdotal evidence suggests that social media has provided supports for affected individuals far beyond the aftermath of the crisis. In addition to informal communications channels, Jennex (2010) also argues that the social media are resources which can be harnessed by organi-

sations for better knowledge management in crisis response. Indeed, increasingly, social media is the interface at which formal and informal channels of crisis communications have become blurred.

On the flip side, there are limitations of using social media during crises. Jennex (2010) noted three limitations: the reliability of information, the trustworthiness of information, and the lack of managerial control by organisations who wish to utilise social media during crises. Additionally, Bressler, Jennex and Frost (2012) identified three further limitations the use of social media. These issues relate to informational overload as a potentially distractive influence, the security of information, and the inadequacy of search capabilities within the social media for crisis response. Finally, Jennex (2012) has also noted the limitations of the resilience of connection and technology interface issues which may hamper the use of social media during crises. In relation to the issue of trustworthiness of information in the social media during crises, Howe et al. (2011) have highlighted the dilemma when both the perpetrators and the victims of human crises are using the same technology.

Two Australian emergency services which actively respond to emergency and disaster situations at the state and national level, and provide formal front-channel communications, are the Country Fire Authority (CFA) and State Emergency Services (SES). Both organisations have already begun to respond to the potential of this technology by creating applications (apps) or creating a status on sites such as *Facebook*. Where official messages from the organisation can be posted, and a channel through which individuals in the midst of the crisis can share their experiences. This creates a blurring of formal and informal channels of communications during crisis situations. Preliminary research indicates that knowing further information about the use of these technologies in the field, and how such technologies might be employed to an even greater effect in disaster and emergency situations, will be beneficial for strategic planning purposes (Willems, 2013).

METHODS

The aim of the *i-Survive Project* was to characterise the usage of Internet-enabled mobile phones and social networking in emergency and disaster situations. The project drew upon auto-ethnographic methodologies (Ellis & Bochner, 2000; Sparks, 2002) and ethnographic methodologies (Tedlock, 2000) for the exploration of the use of Smartphones and mobile social media in the context of disaster situations. This methodology is ideal and appropriate for this research study as, from a sociological viewpoint, human behaviour stems from a social consciousness. Prior to commencing the pilot study, research ethics approval was sought and obtained.

There were a number of different types of data collected for this research project (as noted above). These were the quantitative and qualitative data captured in participants' responses to the survey questionnaire, including their extended responses; the digital artefacts that respondents submitted with their survey questionnaire; and the extended interview responses from the participants.

The first data collection instrument was the online survey questionnaire. After much consideration over the different online survey data collection possibilities available, *SurveyGizmo* (<http://www.surveygizmo.com>) was finally chosen. There were a number of reasons behind this. First, it is a free data collection instrument. At the time, the researcher had limited funding and access to alternatives. *SurveyGizmo* neatly collates the data from each research participant nicely into a PDF and also collects analytics on the participant which has been useful for reporting purposes. Data collection from the study's survey questionnaire, including the extended answer responses, will be discussed in this paper.

Second, data was also collected in the form of digital artefacts. Unlike some of the other collection instruments available at the time, *SurveyGizmo* allowed for the attachment of digital images in its free baseline option. Predominantly these digital artefacts were of photographs, printscreens, and PDFs of texts

and instant messages; however, some video segments were also contributed in the study. These digital artefacts added an important dimension to the respondents' stories as eye-witness accounts of the unfolding emergency, catastrophe or disaster. The contribution of the study's digital artefacts will be discussed in a separate paper.

Third, after invitation on the completion of the survey questionnaire, extended interviews were conducted. The resultant responses provide rich qualitative data concerning participants' experiences during crisis events. These interviews formed a separate phase of the research and, as such, will also be detailed in a separate paper.

PROJECT PROMOTION AND THE RECRUITMENT OF PARTICIPANTS

Recruitment of research participants for the *i-Survive Project* was through a purposive sample of those who had used a Smartphone connected via a Web 2.0 social network on the Internet during a disaster or emergency event in Australia within the bounded period of January 2008 and December 2011 for the purposes of disseminating information, to teach or train, or to help or warn others. This recruitment strategy was aimed at individuals who were representatives of the key stakeholder groups in crises: the civilian population, disaster response teams, broadcast media personnel, academic researchers, emergency services personnel, and representative of key agencies such as a local Country Fire Authority (CFA) and State Emergency Services (SES). Participants were adults above 18 years of age who were able to provide their own consent.

Promotion of the project was by snowballing recruitment, either via word of mouth or via the sharing to friends of friends on social media sites, and poster and bookmark materials, directing interested persons to the purpose-built research website. In addition, the project was advertised by the Country Fire Authority on their website (<http://www.cfaconnect.net.au/>

news/i-survive-project.html). Due to the CFA's promotion of the research project, the project was subsequently profiled by a reporter for the Prime (Channel 7) commercial news network and then aired on local network channels in Victoria, Australia.

Despite this excellent coverage, promotion and interest, the completed response rate was unexpectedly low. In all, 44 participants commenced the survey questionnaire; however, only 20 of these completed the survey in full. Nonetheless, there is still some very rich data in the remaining 24 half-completed surveys. Of the 44 commencing respondents, approximately one quarter added photographs and/or short videos captured on their Smartphones of their experiences. This data adds rich visual dimension of the experiences of the respondents.

Of the 20 participants who fully completed the survey questionnaire, all 20 (100%) agreed to be interviewed for the final stage of the research study. They were subsequently contacted by the means that they had requested (phone call, email, or private message on social media) and a time for a telephone interview was arranged. However, when these 20 were contacted in the requested manner, 5 declined to be interviewed, leaving 15 interviewees in total. These interviews took place via telephone and were captured with a digital voice recorder. The interviews took, on average, 20 minutes in duration, and expanded on the feedback given in the participant's survey questionnaire. While beyond the parameters of this paper, the thematic analysis of the qualitative data has enabled the identification of patterns and the reduction of the

qualitative data into themes for the facilitation of interpretation (Boyatzis, 1998), and these findings will be detailed in a separate paper.

RESULTS

While 44 respondents commenced the survey, only 20 completed it in full. A weakness in the study design was that other than the informed consent, there were no forced answers, resulting in variance in the response rates on each question.

Part A: Mobile Phone Ownership and Service Provision

Section A of the survey questionnaire related to mobile phone ownership and service provision. The first question asked respondents what type of Smartphone did they own and/or use during the crisis event to be described, and to please list the make and model if known. Over half who answered this question owned an 'Apple' device, reflecting the market ownership trends at the time of the research. The next largest group owned a Samsung handset, as seen in Table 1. In addition to their mobile phone ownership in the crisis event being described, one respondent said that they also used their laptop computer as an additional mobile device, and another said that they also used their iPad2 3G.

The next question asked participants to name their service provider used at the time of the crisis event being described as seen in Table 2. The answers relate to Australian providers. Half relate to Optus as the main carrier although

Table 1. Mobile phone ownership

iPhone 3	4
iPhone 4	4
iPhone 4s	7
Samsung Galaxy	2
Samsung Galaxy 5	1
Total	18

Table 2. Mobile service provider

Optus	10
Telstra	6
Extel	1
Three	1
Bendigo Community Telco	1
Total	18

current trends have the main Australian mobile telecommunications carrier Telstra listed as the main provider (Access Communications, 2011).

Relating to the service provider, the next question related to how participants would rate their Smartphone network's coverage? Eight of the 17 responses to this question felt that mobile reception was generally good or excellent and 6 felt that it depended upon their locale. 3 respondents felt that their mobile service had either intermittent or poor coverage, as seen in Table 3.

As an extension on the previous question, participants were then given the opportunity to extend their responses on the previous Likert scale. 17 participants also added additional comments and of these 17, and in contrast to the Likert scale responses above, over 14 responses related to 'poor' or 'patchy' service coverage issues which in turn impacted on issues they experienced during emergency and disaster events. Two exemplar comments from this group of responses include "[Service] was deplorable, particularly from the rear of my house [western metropolitan area, Melbourne]"; and "Since local tower was replaced (supposedly upgraded),

our mobile reception has been sporadic which is concerning when you are in the midst of an important phone call and even though you are stationary, the call simply drops out".

Part B: Details of the Crisis Event

Section B of the survey questionnaire related to the crisis event itself. The first question in this section inquired over the type (category) of emergency or disaster event had participants experienced? There were 29 responses to this question. Of these, 23 of the responses considered the crisis to be the result of acts of nature. These particular events included floods, storms, wind, and bushfires. The second main category related to crises that were considered to be brought about by human actions or inactions, whether these be intentional (such as in acts of arson) or unintentional through recklessness or neglect. Three responses related to a crisis precipitated by human actions. One example of this related to the respondents' house catching on fire due to the reckless actions of a neighbour in their forested suburb. The family of 7 managed to escape with their lives. The respondent

Table 3. Mobile network coverage

Generally excellent coverage	6
Generally good coverage	2
Depends on the locale	6
Generally intermittent coverage	2
Generally poor coverage	1
Total	17

explained: “[Our] Neighbour poured petrol onto his garden, and it dribbled [downhill onto our property and then] into our hot water system pilot light, and [it] blew up [causing our house to catch on fire].” The third main category of responses was those crises considered to be combination events, and there were three responses in this final category. As an exemplar, one participant described their particular incident as involving the interrelationship between natural and human factors as a catastrophic bushfire that was the result of “drought, high temperatures and gale-force winds combined with arson”. A summary of the responses to this question is in Table 4.

The next question, as seen in Table 5, asked participants if the emergency or disaster event that they were part of was known by a generic umbrella name associated with the larger emergency, disaster and catastrophes, such as “Black Saturday”, “Cyclone Yasi”, “Toowoomba Floods”, etc. ? These generic titles encompass all that took place in and around the event.

Participants were also asked to list what best described their circumstances or role during the particular emergency or disaster situation? 28 responses were received on this

question, with the majority of those responses indicating that the respondents were civilians caught in the crisis situation. The next largest category was emergency services personnel, such as those from the state emergency services as seen in Table 6.

Part C: Social Networks

Section C concerned the social networks used by participants both in general and during the crisis in question. This group of questions related to access to social networks. The first question in this section asked what social networks did respondents generally access via their Smartphone? Some respondents listed more than one answer to this question, with Facebook being the most frequently used social network of those listed as seen in Table 7.

Related to this was the question, the participants were asked which social network they used during the particular crisis situation that they had previously described. There were fewer responses to this question than the previous question. Three quarters of respondents answering this question used Facebook. Again,

Table 4. Category of the crisis

Crisis events considered to be brought about by ‘acts of nature’	23
Crisis events considered to be brought about by ‘acts of humans’	3
Crisis events considered to be brought about by a combination of both natural and human factors	3
Total	29

Table 5. Generic title of the crisis

Type of Crisis	#	Generic Name
Fire	6	Black Saturday (5); Gippsland Fires (1)
Water	10	Ipswich Floods (1); Gippsland Floods (1); Brisbane Floods and Toowoomba Floods (1); Victorian Floods (2); Brisbane Floods (1); Kerang Flood (1); 2010/11 Victoria Floods (1); North East Floods (Nathalia) (1); Penrith Floods (1)
Wind	2	Wind storm Western suburbs Melbourne (1); Severe micro wind storm/ mini tornado (2)
Not known by generic name	2	Not applicable (this included a house fire emergency)

Table 6. Stakeholder representation during the crisis

Civilian	13
Emergency services personnel	6
Volunteer	5
Academic/researcher	2
Business owner affected	1
Nurse	1
Total	28

Table 7. General participation in social networks

Facebook	19
Twitter	5
LinkedIn	2
Skype	1
CFA Connect	1
Emergency Information Victoria	1
Community forum on their business website	1
Total	30

Facebook was the most frequently used social network during the crisis with these groups of responses as seen in Table 8.

Participants were then asked in what ways did they connect with this social networking site during the emergency or disaster? There was more than one possible answer from each respondent. Responses such as providing images of the event, leaving warnings, and giving instruc-

tions to others were the top answers in order of response to this question as seen in Table 9.

Additionally, participants were asked who had they sent their messages/images/learning material/warnings/etc. to on the social networks during the crisis? The three major responses to this question were anyone incorporated anyone in their immediate social network, which included friends and family as seen in Table 10.

Table 8. Social networks used during the crisis

Facebook	16
Twitter	2
LinkedIn	0
Skype	0
CFA Connect	1
Emergency Information Victoria	1
Community forum on their business website	1
Total	21

Table 9. Types of communication within the social network during the crisis

Provide images	15
Leave warnings	12
Give instructions	7
Provide learning opportunities	3
Provide safety instructions	3
Provide first aid instructions	1
Provide live-to-air transmissions	1
Provide video recordings	1
Letting family know what I was up to as I was away from them	1
Looked up road closures, river heights, etc.	1
My own personal situation	1
Search/view additional information including video/photo images	1
Total	47

Table 10. Social network dissemination

Immediate social network	14
Friends and family	12
Anyone who would read/watch my post	12
Anyone who it was forwarded to	1
Total	39

Participants were also asked how would they rate the dissemination of their messages/images/learning material/warnings/etc.? All respondents felt that it was better than or equal to being 'neither effective nor ineffective' with

most replying greater that 'somewhat effective' as seen in Table 11.

In relation to the sharing of information on their social networks, participants were asked the question: "Did your message/image etc. go

Table 11. Effectivity of dissemination

Very effective	3
Effective	3
Somewhat effective	5
Neither effective or ineffective	8
Somewhat ineffective	0
Ineffective	0
Very ineffective	0
Total	19

viral and, if so, please explain how?” Only 12 of the 17 responses to this question answered that their message went viral. Sample responses from those whose messages went viral explained that “Yes. It was forwarded on by a number of [my] Facebook friends to friends in their own networks”, and that their “Images were shared by friends to others outside my own networks”. One respondent, whose message did not get spread onwards, said that it “would have been good if it did as many people commute to and from Melbourne airport and the wind damage was close to and within the airport precinct.”

Participants were then asked if they had experienced any challenges when connecting to social networks via their Smartphone during the midst of the emergency or disaster event, and if so, how might these be overcome in future? 17 respondents answered variously to this question, as seen in Table 12. Five of the responses were related back to the challenges of telecommunications access, for example in and around network stability and reception while others noted the crashing of official websites due to high volumes of traffic. As one stated, that there was “congestion of network due to ageing infrastructure”. Another said that due to the “busy network [it was] slow to load everything”. Another group of respondents discussed limitations with the mobile handset itself in terms of battery life. On this issue, one respondent said, “if my phone wasn’t charged properly at the time, that [it] might have been a problem”. Another said that the potential loss of phone power was a challenge and that “[I] could not recharge as I was down the end of

the street watching the firefront as we could not get up-to-date information over the traditional media”. A third theme in the responses to this question was about the user of the technology themselves. As one respondent stated, “I wasn’t overly familiar with my phone - it was new. I’m more familiar and can use it better now.” This last response indicates the need for training for community in handheld technologies as not everyone has time to learn how to use it at the point of purchase nor has those around them who can assist in learning basic skills.

For the final question in this section, participants were then asked how, following their experience, would they rate the possibilities of using Smartphones and social networking sites during emergency and disaster events? 19 respondents answered this question, with over a quarter replying ‘essential’ and a further half replying ‘good’ as seen in Table 13.

Part D: Applications (Apps)

Section D in the survey considered the potential of applications (apps) on the participants’ mobile devices during the crisis event. The first question asked participants if they had used any additional applications (apps) on their Smartphone during the particular emergency or disaster situation that they were part of and, if so, to list the apps used and explain why they were useful in this particular situation. Only six participants reported on accessing apps at the time of the study. Of these, the extended responses helped elaborate on the usage. One respondent, who had to traverse flooded roads

Table 12. Challenges in connecting to social networks

Mobile reception was intermittent / network stability	5
Congestion of the network / overloading of webpages	4
Potential loss of power	4
No	2
Local telecommunications grid was actually flooded	1
The phone was new at the time and I was unfamiliar with it	1
Total	17

Table 13. Importance of mobile social networks during crises

Essential	6
Good	11
Neither essential or non-essential	2
Poor	0
Non-essential	0
Total	19

between two work locales, explained that “There was a flood app for my iPhone that was useful.” Another replied that they had chosen an app that gave “Internet to access the [Bureau of Meteorology] site, accessed mainly for accuracy [such as] rain[fall] to quickly determine local weather, [and also] Oz Weather. [Another good app was] Knots: helpful to learn various ways of tying things off.” Another respondent stated that they had accessed “Elders weather, 7 news, 9 news, [and the Country Fire Authority] app” A business owner affected by approaching bushfires stated that “Facebook was handy as [we] had staff in fire areas and it gave them the ability to let everyone know they were ok. [Also, the] weather app [was useful] as it was during a Melbourne heat wave”. One respondent said “I used my Google web search to access road closures on my way home from work. I had to take a 10 [kilometre] detour to get home and using Google to access the [Road Traffic Authority] RTA site helped me do this safely.” Another participant who was a member of the emergency services personnel stated that one useful resource that they used was, “a Spirit Level app to sight a line for [the placement of] sandbags” for preventative measures against flooding.

Building upon the previous question which had asked which app participants had found useful in their particular crisis situation, participants were then asked, that upon reflection and considering the type and scale of the crisis event that they had experienced, what apps would have been beneficial to have on their Smartphone at the time, and to explain why. The majority of responses to this question

(7) related to having access to apps that could deliver up-to-the-minute crisis information for the specific affected locality. As one respondent noted, “The CFA fire ready app [could help supply] up to date [information] on fire activity”. Another participant suggested that “an emergency services scanner would have been very useful, especially as I was driving home from work at 3am in the rain”. A third participant provided a detailed list of what might have been useful additions in the particular situation that he faced. He suggested that:

It would have been good to have installed the Emergency Information Victoria app, with real time water levels, weather, SES resources, incidents and responses, road closures, integrated services responses with AIIMS Agency ICC leadership (not highjacked by 3rd party agencies). GPS tracking sendable to sector commanders and ICC would give greater control and response of resources. [As an emergency services volunteer, aspects concerning] My safety in [the] event of [an] accident (fall, levee failure, road accident) could be improved also.

Several responses specifically concerned the issue surrounding road access and closures alone as this is crucial information in being able to maintain safety for self and others in the community. One stated that it would be useful to have an app for “somehow finding out immediately what roads are open and where the fires are”, while another noted not only the challenge, but also a potential solution “It would have been useful to have an app that told you about road closures using [your phone’s]

geolocation”. “CFA for up to date info[rmation and the] ABC for the same reason”; A third participant offered that:

There needs to be an emergency app for issues in your location in your region. Your phone has a GPS in it, so that all in the vicinity [could] be advised [of what is happening] and they can access details of the situation.

Another respondent touched on the possibility of apps to assist the injured. She wrote:

Though it wasn't of use at the time - and I don't know if apps were available in 2009 - there are a number of apps available today which may have enhanced the situation if for example there were any injured people to assist.

Finally, one respondent related a potentially useful mobile app to personal medical and survival help during emergencies and disasters:

Perhaps the flash light app to use as night fell due to being without power. And [also] a basic [cardio-pulmonary resuscitation] app for help if anyone was injured by the storm, falling trees of being electrocuted in the water where the line power lines had fallen, [etcetera].

Part E: Limitations of Using Social Media in Crises

Participants were asked if they foresaw any limitations, disadvantages or personal dangers in using social networks and Smartphones during emergency and disaster situations and, if so, what were they? The question also asked if there were foreseeable limitations, if the advantages mitigate these in any way? The first theme in the responses to this question related to the potential for false reports and information accuracy. As one respondent stated: “misleading info[rmation] from just anyone could be harmful...you'd want 'spot on' apps, not always just info[rmation] from any 'Joe Blow'.” Another

contributed that “accuracy of information [was an issue]. I did not note the road itself just to watch out. Would have been helpful if I could have noted the exact GPS coordinates”. One respondent echoed that they saw that the potential disadvantage as being in “Relying on information that might not be verified or may not be correct. Do you trust the source of the information?” Similarly, another respondent stated that “I think there is the potential for false information to be circulated but I think that the community puts pressure on those individuals that would do that. [However] The advantages definitely mitigate the issues”. On the issue of the advantages outweighing the risks, one participant noted that “A[n] [a]dvantage [is that you can be] getting up-to-the-minute and localised information way ahead of when authorities or traditional media outlets can advise’.

This validity of information issue had ramifications for those sending information and desiring their communications to be accepted as bona fide. As one emergency services volunteer state: “[I had] Problems [with] trust in [the] Commanders [versus] their trust in me”. This emphasises the tensions between ‘top down’ and official information in contrast to those in the emergency situation who might not be deemed as having the appropriate authority, yet are able to provide crucial and potentially life-saving information in current time. Similar themes on the validity of information have emerged in the growing pool of literature about the use of social media during crises.

A second theme of responses to this question related to the limitations on Internet overload during crises. As one respondent stated: “There is also the issue that the service gets overloaded due to heaps of people trying to access the same site [such as the] CFA to try and get updates on fire situations”. Similarly, “Yes! Network overload is [and] will be a MAJOR problem. The [National Broadband Network] will be unlikely to solve that particular problem”.

A third group of responses to this question related to the theme of service supply and

connectability during the crisis. This included “dead spots in mobile reception coverage”. Another respondent stated that “Slow network due to busyness is a problem”. This theme was exemplified in the following response: “Better service coverage and stability would be great. Even with the 3G [or 4G] capabilities, service can be patchy. [This is especially] Not useful if you live in rural or semi-rural areas”. One respondent who was an emergency services personnel and whose own whom was affected as part of bushfire activity while he was absent protecting other properties stated: “During a disaster the infrastructure can be set to limit to emergency communication. Despite being in an emergency service my phone can be kicked off the tower for extended periods” causing major communication issues for those in the field.

The fourth theme was the vagaries of whether the message itself would get transmitted via social networks. As one respondent so aptly noted:

Getting the messages disseminated on your social networks [can be a challenge]. If others aren't in the area or don't connect the potential or actual danger with themselves, they might not comment or share it on with others in their social networks. Perhaps I should send such contact with a “Please share” or “Please forward to others” or even “Urgent news” - just something to flag to others to pass on.

Fifth, battery supply and other handset issues that may affect the phone itself during the crisis were raised. As one noted, “Battery power might be a problem if you lose electricity”. Another simply said “batt[e]ry”. A third expounded that a very real danger was in “running out of power without ability to recharge”. One respondent touched on the fallibility of the handset itself. He stated that:

In flood and fire systems [crisis situations, your mobile handset] may not be robust [for example] not waterproof. In other words the

tool should not be seen as a replacement for other protocols and systems. I would like to see the technology there as a tool of choice - same as we choose to use radio and pagers as part of our systems.

Finally, a sixth theme to emerge concerned one's personal safety in reporting on social media. One participant who had to be evacuated from her home, and who was regularly posting to her large social media following on *Facebook* about what was happening and where the family were being evacuated to, noted that “I guess if people know that you have had a house fire, and that you have left for a motel, then someone could come and break it while you are away”. As another respondent stated:

I see a danger in posting your home address on these sites and I did see a fair bit of that in regard to [the] Wagga [Wagga] and Yarrawonga flooding. [M]essages such as ‘I cannot get home to check on my house at 123 Google St[reet]. Could someone please check if it's flooded or not?’ This opens up avenues for burglary and people need to be reminded how dangerous this is.

Related to the personal and property safety of those using social media during crises was the issue of the safety of suspected perpetrators and their friends and family. As one respondent wrote:

There was a lot of anger in the community over these fires especially as the fires in and around the town were deliberately lit (arson). A lot of this spilled into Facebook. While social networks can offer an outlet to work through these intense emotions, it could also serve to stir up more community hostility.

In summary, there are a number of limitations and dangers about using and/or relying on social media during crises which require further exploration.

Part F: Digital Artefacts Including Images

Part F of the research design asked for copies of any of the digital artefacts that participants had posted on social media during the emergency or disaster event. Digital artefacts were defined for the research participants as an example of the text, images, video, audio, photos, print-screen, etc. that were posted/uploaded during the disaster or emergency event that could be shared in the reporting of this research? If participants had no digital artefact that they wished to share, they were instructed to move on to the next section of the survey. Participants were asked to firstly upload any digital artefact. The system allowed the loading of file types such as png, gif, jpg, doc, xls, docx, xlsx, pdf, txt. While *SurveyGizmo* allowed smaller file sizes of attachments, larger digital attachments such as normal photo sizes were blocked due to the file size limitation. Participants were advised that there was a maximum file size of 500KB on this question with only one upload possible. If participants' digital artefacts were greater than 500KB, participants were invited to either compress their data before uploading, or alternatively save their image(s) in either PDF or Word doc format for uploading in the one document. Alternatively, for larger audio and video files, participants were invited to send these as an email attachment directly to the researcher, noting the "Attention i-Survive Project – Digital artefact" in the subject header. Due to privacy concerns, participants were also advised that where individuals other than the research participant appeared in an image provided, they would be cropped or pixelated in any subsequent re-use of the image to ensure privacy.

The subsequent question invited those who had chosen to upload a digital artefact of the crisis to explain what they had chosen, how it related to the emergency or disaster event, and in what ways this representation important to the respondent and/or others. Seven respondents chose to answer this question. The discussions

in and around these digital artefacts will be the subject of a future article.

Part G: Participants' Final Comments

The final question of the research related to any last minute thoughts or comments that participants wished to make concerning if in connecting to their social networks via their Smartphone, did they experience any challenges during the midst of the emergency or disaster event, and if so, how might these be overcome in future?

One participant stated that "[I] Think that smartphones and social media have much to offer in emergency and disaster situations including training people on-the-spot and in the field." Another commented about the synergies between social media and community involvement. He replied that "I joined the SES to make a difference to the community, if this [research] helps push that, I'm all for it". Another contributed that "I have found the information other people put on Facebook very useful during the recent floods and also back during the Black Saturday fires." They then added a timely caution: "But people have to be a bit careful about how much personal info[rmation that] they put [up] on Facebook."

Another respondent articulate:

[I] Think that this is a very important area of research as it can be difficult to get this sort of information and often you can feel alone if you are the only person at the scene of the incident to share the information or warnings but also to get advice from, and feel supported by, others in the community even if they are not there in person. Also lets others know where you are and describes the unfolding incident as a historical record in case of potential risks to oneself after the event.

As a summary comment of the responses in general to this final question, one respondent stated:

I live on my Facebook page. I access it not only from my phone but also from my laptop. All my friends are on Facebook. It is the way we contact each other now in my group of school friends - more than SMS and phonecalls.

Finally, one respondent touched on the need for agency and government responsibility in this arena. He noted that:

I think agencies [such as the] SES, CFA, and the Minister [for Police and Emergency Services], should continue to work hard to facilitate and moderate useful emergency channels, apps, websites and pages including on Facebook., [This includes agencies] responding actively to privately generated emergency pages as I have noticed [that] some may be either well-intentioned but ill-disciplined or else, worse, [are created] with ulterior motives to manipulate emotionally vulnerable citizens. [Also] Gov[ernmen]t and sector stakeholders should be clear about which agency is responsible for flood, earthquake, storm v[ersus] fire!

CHALLENGES AND LIMITATIONS OF THE RESEARCH

The challenges experienced not only during the data collection phase of this research, but also in the analysis and write up of the research findings, have resulted in unanticipated time delays in the reporting of this research. Nonetheless the research findings are important to contribute to the field and, as such, warrant reporting. Some of these challenges are detailed below.

First, the clarification of a Goods and Services Tax (GST) by the receiving institution at the time of research funding receipt brought about unexpected delays in commencing the paperwork for the research ethics and which, in turn, delayed the commencement of the data collection. Second, due to the set up in the

online survey questionnaire of the pilot study, there were no forced answers other than the consent question itself. In the larger study to follow, forced answers on key elements will be considered. Third, while *SurveyGizmo* enabled the upload of digital images in the online survey, there was a maximum file-size of 500KB limit. At first, the implications of this were unnoticed by the researcher until someone wanted to upload multiple images; another wanted to upload a video snippet, and so on. Most simple digital photographs are around 650KB each if research participants did not compress these files before uploading. In order to circumvent this file size attachment limitation, several alternatives were suggested to participants. One was to ask participants to convert any digital photo(s) that they wish to share into either a word or a PDF doc. However, not all participants were able to do this, plus this solution did not help those who wished to upload videos as part of their survey responses. The alternative is to ask respondents to send their digital artifacts directly to the researcher. A related issue was that individuals other than the participant may be in the digital artifact, and thus be potentially identifiable. Thus some of the images submitted would subsequently require pixilation or cropping to help protect the identification of those involved prior to reporting the findings.

Finally, it was anticipated that data collection would yield a large number of responses, especially due to the promotion of the research in the public arena. However this was not the case despite a great deal of expressed interest in the research. While 44 commenced the research, only 20 completed it in full. In qualitative surveys, such a low number of responses would be considered problematic. However, as a pilot study, the responses reflect merit in pursuing this research field. Further, as qualitative research, and in spite of the lower than expected participant numbers, the data gathered was rich in nature, and provides a basis for future research. Indeed, those same 20 participants did

stay on for the second phase of the research – the extended interview component – yielding further rich data which will be thematically explored in a separate article.

ANTICIPATED FUTURE RESEARCH DIRECTIONS

In due course, research funding will be sourced for a larger project entitled ‘*i-Survive Too*’. This project will refine and build upon the *i-Survive Project* by seeking to incorporate global research partners to collect comparative data from countries including Australia and New Zealand. It is anticipated that the research findings of the larger comparative study will help guide and instruct the development of crisis informatics and mobile learning strategies during emergencies and disasters, including applications and protocols, in order to help better plan and prepare for the use of these technologies in future disaster situations.

CONCLUSION

Learning from past issues in and around saving lives, properties, resources and livestock is essential in preparing civilians and emergency response teams for future disasters. What contribution can Smartphones and social networks make to emergency and disaster responses? This research project evaluated the use of messages, images and videos sent during recent Australian disaster and emergency situations from Internet-enabled mobile phones to Web 2.0 social networks (for example, *Facebook*) in order to help better plan and prepare for the use of these technologies in future situations.

The data suggests strategies and useful apps to educate and communicate during the height of such events. It is anticipated that this research will ultimately benefit all citizens in Australasia, for the purposes of saving lives in emergency and disaster situations through m-learning approaches. It adds to the growing

field of global research on the use and abuse of social media during emergencies, disasters and catastrophes.

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REFERENCES

- Belblidia, M. S. (2010). Building community resilience through social networking sites: Using online social networks for emergency management. *International Journal of Information Systems for Crisis Response and Management*, 2(1), 24–36. doi:10.4018/jiscrm.2010120403
- Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage Publications.
- Bressler, G. H., Jennex, M. E., & Frost, E. G. (2012). Exercise 24: Using social media for crisis response. *The World Financial Review*, 77-80.
- Churchman, C. W. (1967). Wicked problems. *Management Science*, 14(4), 141–142. doi: doi:10.1287/mnsc.14.4.B141
- Churchman, C. W. (1967). Wicked problems. *Management Science*, 14(4), 141–142. doi: doi:10.1287/mnsc.14.4.B141
- Dabner, N. (2011). Breaking ground’ in the use of social media: A case study of a university earthquake response to inform educational design with Facebook. *The Internet and Higher Education*, 15(1), 69–78. doi:10.1016/j.iheduc.2011.06.001
- Department of Broadband, Communication and the Digital Economy (DBCDE). (2011). *Natural disasters*. Retrieved from http://www.dbcde.gov.au/policy_and_legislation/responsibilities_under_the_telecommunications_act/natural_disasters

- Dynes, R. R. (1998). *Dealing with disasters in the 21st century*. Newark, DE: Disaster Research Center, University of Delaware.
- Ellis, C., & Bochner, A. P. (2000). Autoethnography, personal narrative, reflexivity: Researcher as subject. In N. K. Denzin, & Y. S. Lincoln (Eds.), *The handbook of qualitative research* (2nd ed., pp. 733–768). London, UK: Sage Publications.
- Ericsson. (2010). *Mobile subscriptions hit 5 billion mark*. Retrieved from <http://www.ericsson.com/thecompany/press/releases/2010/07/1430616>
- Fisher, H. (2003). *The sociology of disaster: Definitions, research questions, & measurements in a post-September 11, 2001 environment*. Retrieved from http://www.allacademic.com/meta/p_mla_apa_research_citation/1/0/8/1/6/pages108165/p108165-1.php
- Freeman, M. (2011). Fire, wind and water: Social networks in natural disasters. *Journal of Cases on Information Technology*, 13(2), 69–79. doi:10.4018/JCIT.2011040105
- Howe, A. W., Jennex, M. E., Bressler, G. H., & Frost, E. G. (2011). Exercise 24: Using social media for crisis response. *International Journal of Information Systems for Crisis Response and Management*, 3(4), 36–54. doi:10.4018/jiscrm.2011100103
- Jennex, M. E. (2010). Implementing social media in crisis response using knowledge management. *International Journal of Information Systems for Crisis Response and Management*, 2(4), 20–32. doi:10.4018/jiscrm.2010100102
- Jennex, M. E. (2012). Social media—Viable for crisis response? Experience from the Great San Diego/Southwest blackout. *International Journal of Information Systems for Crisis Response and Management*, 4(2), 54–68. doi:10.4018/jiscrm.2012040104
- Mackay, M. M. (2012). Australian mobile phone lifestyle index (8th ed.). *AIMIA Mobile Industry Group*. Retrieved from http://www.aimia.com.au/getfile?id=4422&file=AMPLI+2012+Report_FINAL_September+17.pdf
- Mackey, J., Gilmore, F., Dabner, N., Breeze, D., & Buckley, P. (2012). Blended learning for academic resilience in times of disaster or crisis. *Merlot Journal of Online Learning and Teaching*, 8(2), 35–48.
- Oliver, C. E. (2010). *Catastrophic disaster planning and response*. Boca Raton, FL: CRC Press.
- Palen, L., Anderson, K. M., Mark, G., Martin, J., Sicker, D., Palmer, M., & Grunwald, D. (2010). A vision for technology-mediated support for public participation & assistance in mass emergencies & disasters. In *Proceedings of the 2010 ACM-BCS Visions of Computer Science Conference*. Swinton, UK: British Computer Society.
- Palen, L., & Vieweg, S. (2008). The emergence of online widescale interaction in unexpected events: Assistance, alliance and retreat. In B. Begole & D. W. McDonald (Eds.), *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work* (pp. 117-126). New York, NY: Association for Computing Machinery. doi:10.1145/1460563.1460583
- Palen, L., Vieweg, S., Liu, S. B., & Hughes, A. L. (2009). Crisis in a networked world: Features of computer-mediated communication in the April 16, 2007, Virginia Tech event. *Social Science Computer Review*, 27(4), 467–480. doi:10.1177/0894439309323202
- Plotnick, L., Turoff, M., & Van Den Eede, G. (2009). Re-examining threat rigidity: Implications for design. In R. H. Sprague, Jr. (Ed.), *Proceedings of the 42nd Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society. doi:10.1109/HICSS.2009.365
- Qu, Y., Wu, P. F., & Wang, X. (2009). Online community response to major disaster: A study of Tianya Forum in the 2008 Sichuan earthquake. In R. H. Sprague, Jr. (Ed.), *Proceedings of the 42nd Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society. doi:10.1109/HICSS.2009.330
- Quarantelli, E. L. (2002). The disaster research center (DRC) field studies of organized behavior in the crisis time period of disasters. In R. A. Stallings (Ed.), *Methods of disaster research* (pp. 94–126). Philadelphia, PA: Xlibris.
- Rittel, H. (1972). On the planning crisis: Systems analysis of the ‘first and second generations’. *Bedriftskonomen*, 8, 390–396.
- Shirky, C. (2003). *A group is its own worst enemy: Social structure in social software*. Retrieved from http://www.shirky.com/writings/group_enemy.html
- Sparks, A. (2002). Autoethnography: Self-indulgence or something more? In A. P. Bochner, & C. Ellis (Eds.), *Ethnographically speaking: Autoethnography, literature, and aesthetics* (pp. 209–232). Walnut Creek, CA: Alta Mira Press.

Tedlock, B. (2000). Ethnography and ethnographic representation. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 455–485). London, UK: Sage Publications.

Willems, J. (2011). i-Survive project: Investigating the use of Internet-enabled mobile phones and social networking in disasters and emergencies. In G. Williams, N. Brown & B. Cleland (Eds.), *Changing Directions. Proceedings ASCILITE Hobart 2011* (pp. 1319-1321). Retrieved from <http://www.ascilite.org.au/conferences/hobart11/procs/Willems2-poster.pdf>

Willems, J. (2012). Sustainable futures for learning in a climate of change: Mobile apps, social media, and crisis informatics during emergencies and disasters. In M. Brown, M. Hartnett and T. Stewart (Eds.), *Future challenges, sustainable futures. Proceedings ASCILITE Wellington 2012* (pp. 1056-1060). Retrieved from http://www.ascilite2012.org/images/custom/willems,_julie_-_sustainable_futures.pdf

Willems, J. (2013). M-learning via smartphones and social networks during emergencies and disasters – An Australian story. In Z. Berge, & L. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 511–523). London, UK: Routledge.

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