**Emergency management in the changing world of social media: framing the research agenda with the stakeholders through engaged scholarship**

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**Abstract**

The use of social media and Web 2.0 platforms is proliferating and affecting different formal and highly structured organisations including public safety agencies. Much of the research in the area has focussed on public use of social media during an emergency as well as how emergency agencies benefit from the data and information generated by this process. However, there is little understanding of “what are the operational implications of this public use on emergency management agencies and how does social media either positively or negatively impact these operations”? In order to progress research into this topic, we chose an *engaged scholarship framework* to shape a research agenda with the active participation of stakeholders. Hence, we conducted a series of workshops primarily involving over 100 public safety practitioners working in the area of disasters and emergency management who work in public safety agencies, humanitarian organisations, volunteering online platforms and volunteer groups in addition to 20 academics working on this area of enquiry. The findings highlight six different challenges that emergency responding organisations currently face in relation to social media use. We conceptualise these challenges as creating six *operational tension zones* for organisations. We discuss these tensions and their implications for future research and practice.

**Keywords:** Web 2.0, digital platforms, social media, emergency management, flash volunteering, emergency response, community volunteering, engaged scholarship

# Introduction

Emergency management is a field of operations and enquiry. Emergency responders work in a highly volatile and uncertain environment. They rely on intense communication and coordination and structured processes that are heavily regulated. They work under different types of pressures including time, uncertain and unexpected developments of the situation, unfolding impact and heavy political and societal scrutiny (Farazmand, 2014; McGuire and Silvia, 2010; Pangarkar, 2016; McEntire, 2004). Within this complex environment, the use of social media and Web 2.0 technologies in society has promoted high connectivity, user generated content and fast information exchange. Research shows that citizens use social media to offer and obtain crisis-related information (Palen and Liu, 2007; Ehnis and Bunker, 2012b; Ehnis and Bunker, 2013; Potter, 2016) as well as to participate emotionally, physically and financially in disaster response and recovery efforts (Heverin and Zach, 2010; Qu et al., 2011; Vieweg et al., 2010; Hughes et al., 2008; Bunker et al., 2013; Shahid and Elbanna, 2016; Shahid and Elbanna, 2015). While research has focused on how the public use social media in emergency situations (Simon et al., 2015; Kim and Hastak, 2018), it has paid less attention to the complications of this use in relation to the operational needs of emergency management agencies (Ragini et al., 2018).

In addition, previous research has also largely adopted a unidirectional identification and interpretation of problems where researchers assume a superior position over research participants and the research participant’s role at best is limited to verifying research findings (Elbanna, 2018; Mathiassen, 2017).

To address these gaps, this paper reports on our efforts to define a research agenda that is focused on the operational environment and the needs of emergency management agencies arising from developments in social media use. It specifically questions: what are the operational implications of the public use of social media on emergency management agencies and how does social media either positively or negatively impact these operations? We believe that addressing these questions can only be achieved by seriously involving participants as active research partners of equal level of knowledge and expertise, rather than spectators of, or subjects in the research process (Van de Ven, 2007). Therefore, we followed an engaged scholarship framework using *live research methods* to involve a wide range of stakeholders in identifying current challenges that require scholarly attention. These methods narrow the practitioner-scholar knowledge dissemination gap and produce some novel insights into the phenomenon (Wolfberg and Lyytinen, 2017). Hence, we conducted a series of workshops from 2015-2017 run by members of the *Interoperability for Extreme Events* *Research Group*[[1]](#footnote-1) (IEERG) from both the University of Sydney and Royal Holloway University of London. The workshops were held in Sydney (Australia), London and Egham (UK) and were attended by 89 practitioners and 20 scholars working in relevant fields (total of 109 attendees excluding the research team). The findings of these workshops reveal how social media use by the general public in emergency and disaster situations impacts emergency management agencies and the significant and challenging changes emergency responders face as a result, i.e. changes in public expectations, the communication process and regulatory arrangements in addition to the overall emergency management framework. The management theory of paradox or tension emerged during the workshops and attendees identified different tension zones (Poole and Van de Ven, 1989; Smith and Lewis, 2011; Denison et al., 1995; Jaffee, 2001). This resulted in the revealing of new challenges and hence areas and directions for investigations, interventions and future research. In documenting our findings, this paper demonstrates the importance of engaging stakeholders in shaping the research agenda and contributes to the current debate on engaged scholarship and responsible research.

The paper is organised into seven sections. Following the introduction, section two provides a brief overview of the unique context of emergency and disaster management as well as the impact that social media use during emergencies and disasters is having. Section three presents the debate on engaged scholarship and responsible research, while section four presents the methodology employed in actively engaging stakeholders in shaping the research agenda. Section five presents our workshop findings while section six offers our interpretation of these findings, the implications on framing the research agenda in social media and emergency management and the contribution of this research to the current debate on engaged scholarship and research. Section seven concludes the paper.

# Background to Emergency and disaster management

Emergency and disaster management is a challenging area of practice. Floods, hurricanes, typhoons, volcanoes, fires, landslides and man-made events such as terror attacks, chemical contamination and the like threaten individuals and communities and generally require fast responses under limited information conditions and continuously unfolding situations. Emergencies and disasters are experienced around the world and are typically characterised by high uncertainty and high risk under increased time pressure, urgency and sudden severe pressure on resources (Chen et al., 2008; Blum et al., 2014). They are also characterised by a high degree of complexity involving many different stakeholders that need to develop a common and changing picture of the disaster’s evolution (Benali and Ghomari, 2016).

There are typically four phases of emergency and disaster management including prevention (mitigation), preparedness, response and recovery or “PPRR” (Kennedy et al., 2008; Vivacqua and Borges, 2012). Communication, coordination and cooperation are required between stakeholders throughout these stages with different levels of intensity and numbers of stakeholders involved. Hence, public safety agencies and communities have an imperative to better understand how to utilise all available communication tools and platforms during each stage of a disaster event. Figure 1 shows the stages of disaster management and the intensity of disaster response at the initial onset of an event. It highlights the stages of a disaster and the requirement for an effective and instantaneous communications “interface” from the general public to relief and recovery agencies. During the onset of a disaster, accurate information about the disaster, impact on loved ones and the community as well as the general status of critical infrastructure is generally in short supply. As indicated within Figure 1, the level of communications activity rises sharply with the onset of a disaster event and the need for a robust and reliable communications interface that provides accurate and timely information to and from both agencies and the general public alike, becomes critical.

The development of an effective disaster communications interface between the general public and disaster and emergency management agencies is a means to improve the efficiency and effectiveness of agency processes and to target resources and render assistance in the most optimal manner. This interface may also enhance community resilience in times of disasters. In this regard, Web 2.0 technologies, social media and mobile devices have increased connectivity and user-generated content and provided fast channels for information exchange. This has been further accelerated by the accessibility of communication tools, channels and platforms, low transaction costs of sharing information, low cost of mobile devices and little requirement of personal time investment to use these technologies and platforms (Bunker and Sleigh, 2016).



**Figure 1:** Effect of disaster in ongoing community development and interface with relief and recovery – reproduced from 2011 Australian Emergency Management Handbook Series Community Recovery Handbook 2 Third Edition

The use of social media platforms and applications by the general public during a disaster has been widely studied by academics since the Haiti Earthquake in 2010 (Kim and Hastak, 2018). Research in crisis communication has examined the difference in community use between social media and traditional media (Austin et al., 2012) and argues for incorporating social media in crisis communication (Veil et al., 2011). Much of the research focuses on the analysis of social media data from Twitter (Martínez-Rojas, del Carmen Pardo-Ferreira & Rubio-Romero, 2018) to understand the spread of rumours (Oh et al., 2013), the public sense making process (Stieglitz et al., 2018a; Stieglitz et al., 2018c), information propagation patterns (Li, Zhang, Tian & Wang 2018) behavioural archetypes and convergence behaviour of people during emergency events (Hughes and Palen, 2009; Chew and Eysenbach, 2010; Mirbabaie et al., 2018). Research has also considered social media impact on public empowerment during disasters (Leong et al., 2015). The view of how useful publically generated data and information generated from social media is to disaster management agencies for critical decision making has been a major area of focus to researchers (Stieglitz et al., 2018d; Stieglitz et al., 2018b; Wukich and Mergel, 2016; Houston et al., 2015; Power and Kibell, 2017).

There has been little research, however, to understand disaster and emergency agency operations in light of the new public environment of social media and the impact of this on agencies’ operations and processes. Research in this area is dominated by a communication perspective of social media rather than identifying the opportunities for emergency management agencies to engage with the general public in a robust way. The operational perspective and the understanding of how agencies can follow their protocols and business processes in light of this new environment of citizens’ social media use remains largely underdeveloped. This situation requires examination and in particular investigation that engages emergency management agencies in the process.

# Engaged scholarship

To answer this question we followed an *engaged scholarship* approach involving diverse stakeholders and scholars in understanding the research problem (Van de Ven, 2007). Engaged scholarship as presented by Van de Ven (2007) focuses on an approach that scholars in professional schools such as business, engineering, medicine, and law might take to their research, with IS scholars being seen to fall within this category (Mathiassen and Nielsen, 2008). This approach highlights that academic and professional knowledge represents very different, but related domains and that research relevance and rigor cannot be separated but should be achieved hand-in-hand. The basic idea of engaged scholarship is that *relevance is a process to be embedded in the research and not an outcome of research*. Hence engaged scholarships stands for an interactional relationship in which professionals and research practices are “intermingled” and contribute to each other’s development throughout the research process. Van de Ven (2007) explains that engaged scholarship could take one of four forms; informed basic research, collaborative basic research, evaluation research and action research. We opted for a collaborative form of engaged scholarship research in order for all partners to gain insight from each other and develop deep understanding of the phenomenon. This is particularly the case as we believe that practitioners hold valuable knowledge and expertise in their areas. This expertise is just as valuable as the academic expertise of the research teams involved in order to assess the operational impact of social media on agencies, which could be heavily influenced by laws, national frameworks and procedures. We also believe that diffracting academic and professional expertise contributes to each other’s development and can contribute to generating innovative ideas.

# The Research Engagement Method: using workshops as a data co-creation method

We designed a series of workshops involving co-production and framing of a research agenda with practitioners to consider the highest level of practitioners’ engagement (Martin, 2010). These workshops focussed on surfacing the key issues that emergency management agencies face in relation to social media. A workshop structure was adopted using the *live* research method of *imprography* (Tarr et al., 2018). Imprography is a combination of improvisation and choreography that combines unstructured and structured planned approaches to a workshop and resulting research. Once a workshop begins, researchers are part of it engaging with other participants without taking control of the course or direction of the discussion, emphasising and respecting the equality of experience of all participants in their own fields. No field is superior to any other.

Our workshop contained elements of: 1) *imprography* - as all workshops had structured presentations and “freewheeling” discussions; 2) *collaboration* - as it brought together academics and practitioners to work to co-create a focus on key issues from an agency perspective; and 3) *creativity* - as the imprographic nature of our approach allowed for workshop participants to put ideas and suggestions on the table for a research agenda without “fear of failure” (Tarr et al., 2018). Invited workshop participants were from public safety first-responder agencies including police, fire and ambulance, NGOs, online platforms owners, disaster technology organisations, humanitarian agencies and other government departments as well as academics working in the fields of information systems, disaster management, organisation studies, and accounting and finance. Participants worked with the workshop co-ordinators to craft the themes and outline of each workshop and all attendees actively participated either through short presentations and/or open discussion sessions. Presenters chose the topic of their talk and they attended the workshop in their capacity as professionals who had experience in disaster management, not as a representative of any single agency.

The IEERG research team consisted of three academics, two research assistants and one practitioner. Four members of the research team were assigned the task of taking notes during each workshop. At the conclusion of each presentation session, major points were discussed and aggregated in a document and then edited into a Powerpoint presentation. A resulting picture of emerging issues was thus continuously produced during the workshop and then presented back to the workshop participants. The results of each workshop were then shared among participants to further contribute to the emerging research agenda. This allowed different participants to engage, elaborate, amend or qualify the issues at each event. After all 3 workshops, all of the notes were analysed by four members of the research team (including three academics and one practitioner) for themes and topics of interest and were then compared for common patterns and issues between workshops to highlight emerging issues across jurisdictions. All workshops were open dialogue and highly participative, aiming at identifying the challenges and opportunities disaster and emergency management practitioners face from the use of social media as a communications mechanism.

By conducting these research workshops we sought to both develop our understanding of these issues as well as ensure collaboration with practitioners to work more immediately and effectively with the academic community and constructively formulate the research agenda (Martin, 2010; Van de Ven and Jing, 2012). The objective of these workshops was to identify areas of critical enquiry and to address and to understand the position, context and operations of public safety professionals in relation to social media use. One of the main threads that emerged in these workshops was centred around the impact of the increasing use of social media and Web 2.0 platforms by citizens on emergency management agencies, and that this increased activity is changing the expectations of those who are affected (and not affected) by the emergency or disaster. This finding has altered and broadened our initial view that was consistent with the literature and mainly based on emergency management agencies’ use of data and information arising from social media use by citizens and the challenges of analysing this data. Together with participants, we discovered that emergency managers are experiencing many other challenges arising from citizens’ use of social media including changes to emergency management processes, changes in the nature of emergency communication and changes in the emergency response process. Together, these changes are increasing the complexity of emergency responses and pose serious challenges to involved stakeholders. Following the first workshop, the other workshops focussed on how organisations that are involved in the emergency management domain embrace social media technologies while accounting for any negative impacts.

Our engagement scholarship approach of using workshops as a research method differs in important aspects from existing methods such as group interviews. Group interviews are “beneficial in generating data about the “why” behind behaviour” and are based on the assumption that people might need help in mining their knowledge and that group dynamics can enhance the recalling of existing knowledge (Lederman, 1990: , p. 118). A typical shortcoming is that there might be discrepancy between what people believe they do and their actual behaviour and that this is limited to surfacing existing knowledge. Our approach aims for the co-creation and reframing of problems and solutions. Hence, it is not limited to harvesting existing knowledge. Importantly, it brings about new thinking about the phenomenon that participants (academics and practitioners) develop through their participation. It should be noted that it also differs from performance ethnography (Saldaña, 1999; Denzin, 2003). Performance ethnography involves role playing and theatrical techniques that were not used in our live method. Our methods also differ from Delphi studies. In Delphi studies, the researcher assumes an independent objective role and hence acts as a collector of the “most reliable opinion consensus of a group of experts by subjecting them to series of questionnaires interspersed with controlled opinion feedback.” (Dalkey and Helmer, 1963: , p. 458). Our method did not apply questionnaires and contrary to the Delphi method assumed “a level playing field” for all participants including academics and researchers where all opinions were openly voiced. Unlike the Delphi method that “avoids direct confrontation of the experts with one another” (ibid, p.458), our live method encouraged “diffraction” of opinions and open discussions (Elbanna, 2018).

Our approach benefited participants in real time; as they start to reframe their challenges and continue to do so throughout the event. Later, this led some participants to initiate new projects within their organisations to create new protocols to address particular issues. For anonymity and confidentiality reasons, we cannot list these projects and resulting protocols despite their high level and wide reaching importance.

This paper thus provides a summary of the emerging themes from these workshops. These themes are classified based on the concerns of participants and focussed on a “consensus view.” Importantly, they outline major findings that were common to each workshop, highlighting inter-jurisdictional disaster management issues that may be of interest globally.

# Workshops Findings

The findings from the workshops highlight six different operational challenges that emergency responding organisations currently face in relation to social media use. This section presents the findings as expressed by the stakeholders who participated in our workshops.

## Dissemination of Information

The findings from the workshops reveal that practitioners are facing challenges regarding information quality, speed of dissemination and importantly contents and positioning of the message. They recognise the positive aspects of having informal channels for communities to exchange experience, ideas and provide emotional support. In this regard, they see social media and Web 2.0 platforms as important tools to support communities and enhance their resilience, innovation and recovery. For example in a flood, people may circulate information about safe routes thus preventing vehicle damage, injuries or the possibility of deaths. They may also post and respond to needs and requests from affected people on social media platforms.

These tools and platforms can also support the broadcasting of important messages and alerts, and can help locate vulnerable persons, and those at higher risk. For example, the UK environment agency use live flood alerts and live Web chat and their sites are visited by millions of people. Advances in geo-tagging and authentication support the use of these services and allow agencies to evaluate the service and its use. In Australia, the NSW Rural Fire Service (RFS) uses social media to alert the public about potential fire threats and also communicate actions the public need to take to ensure their safety. Their Facebook site and Twitter feed are used by thousands of people during a bushfire event, as an alternative source of trusted information.

However, practitioners also highlighted the fast spread of rumours, negative messages, seizing the opportunity of a disaster and channelling it towards a politically charged agenda, exploiting vulnerable people at time of need by spreading fabricated information, scams and false services that put the public at different types of risk including emotional, financial and health risk. For example, the high-jacking of social media channels by posts that are irrelevant to the response effort for the emergency at hand can also create confusion, divert attention, make the operating environment difficult as well as facilitating discontent from the public. When responding to a serious bushfire, posts about the inability of government to address global climate change could create a negative attitude and environment for responding agencies whose whole focus is centred on responding to the current emergency. While debates surrounding wider issues are useful, the creation of negative hype towards responding agencies could impact their morale, divert public attention from the emergency situation at hand to side issues as well as create unrealistic expectations from the public.

Against this tension, agencies pointed to the need of finding strategies and developing tools that could sift through large numbers of messages at an optimal rate while responding effectively to them by combating false messages, the spread of rumours and criminal activities. They highlighted the need to understand mechanisms for verifying messages, pushing effective combat methods and messages and to monitor public safety from new threats infused by negative use of social media. Participants wondered whether AI could be used and how to avoid unintentional side effects.

## Disaster Tourism

Participants of the workshop found that the use of social media to exchange photos of disasters during their peak opened the public appetite to experience dangerous situations first hand and hence encourage ‘disaster tourism’. Upon reading and seeing pictures of disasters, some people find it appealing to go to a disaster area to take pictures, experience the situation for themselves and to post pictures of themselves at the disaster to their friends and family on social media. This creates operational pressure on emergency responders who are trying to manage a disaster situation, evacuate an area and ensure public safety. During these times they may find themselves dealing with incoming traffic of enthusiastic disaster tourists who could resist any attempt from emergency agencies to stop them from entering the disaster zone.

Workshop participants found the need for research into this area and understanding of how and why Web 2.0 technology could be used to provide a balanced perspective on the disaster situation and the work agencies need to do to reduce public risk. They highlighted the interdisciplinary nature of this complex problem and that psychology, media studies and technology studies need to work together to develop effective messaging as well as technical solutions to allow the public to virtually experience the disaster without physically going to the area, putting themselves in danger and distracting rescue and relief efforts. Games, virtual reality tours and quizzes were offered during the workshops as potential technical solutions to these problems.

## Communities Expectations

Participants find that the high speed of social media communication and the fast exchange of ideas it creates to be infusing false expectations within communities of how they might be assisted and the speed of resource delivery. Responding with the swiftness that it takes to send and receive social media messages, posting notes, initiating debates and inflaming feelings on social media is significantly challenging for responders who need to deal with hazards on the ground, conducting careful risk assessment and interference strategy while coordinating with different parties to minimise unwanted impacts. Interestingly, practitioners find that the public expectation is that “things should happen in a blink” and that these expectations have become a “moving target” which is difficult for agencies to address. Practitioners were questioning whether there is a way to understand temporality and how people could differentiate between virtual activities that happen “on the press of a button” and others that are happening on the ground when “dealing with real people and real situations”.

##  Flash Volunteering

Practitioners agreed that volunteering has always been part of disaster response and that there are established frameworks for training, approving and involving volunteers. However, they found that social media is creating a new form of volunteering that is not only spontaneous but more importantly enables people to assemble and surprisingly appear at the scene of a disaster in large numbers without previous permission from an emergency authority or notification to offer assistance. This ‘flash’ or ‘mob’ volunteering was identified during the workshops as a positive impact that could also have negative consequences and hence needs to be significantly moderated to ensure the management of any negative side effects. In this regard, participants mentioned side effects such as criminals blending into the crowd, accumulation of unwanted donations or inappropriate emergency provision, untrained flash volunteers putting themselves in immediate danger, or individuals crowding the disaster scene when evacuation is the strategy agencies are deciding to pursue. For example, one of the participants told the story of having volunteers suddenly gathering in a disaster situation and one of them “has just jumped into deep water, may be he assumed it was shallow, he did not know the area well, it was a hilly area and the bottom of the hill was very flooded. So here he was, he was sinking, he couldn’t swim and we had to get a boat and rescue him.” They commented that attending to flash volunteers could take away important resources from the main disaster response effort and that to divert attention from rescuing affected people to rescuing and attending to flash volunteers is a major problem.

Flash volunteering presents a major operational shift for emergency management agencies compared to the traditional highly structured process of volunteering. Traditional volunteering with NGOs working in emergency and disaster relief is based on a rigorous scanning, approval, training and accreditation process which is comprised of: 1) a potentially interested individual filling in an application; 2) the application is carefully screened by the NGO including conducting background and security checks on each applicant; 3) accepted applicants are registered as volunteers and are issued with a formal ID card; and 4) these volunteers receive applicable training (Fahey et al., 2002; Alexander et al., 2009).

Practitioners also highlighted the various sensitivities surrounding flash volunteering including logistical, political, social, and economic concerns. These concerns can create tensions on the emergency scene regarding how to tactfully deal with good intentioned people who suddenly appear on a difficult and demanding scene wanting to help or bringing in large amounts of un-needed material donations. Participants questioned how to find suitable storage for these out of context donations and how to use ICT to either redistribute those donations or swiftly advertise what is required and how to integrate this in their response protocol.

##  PPRR Protocol Review

Participants also found that social media is not only changing community expectations in terms of speed of response, communication of available information and speed of recovery but also challenging their response models and protocols. For example, Prevention, Preparedness, Response and Recovery (PPRR) is the principal protocol used to frame disaster management policy in Australia (Smith and Bunker, 2007). Figure 2 provides an overview of this approach and its importance in the various phases of community warnings and crisis communications. PPRR has provided the principles and foundations for Australian disaster management since it was adopted and disseminated by the Commonwealth in the 1970s. Currently, disasters are more frequent, more complex; and communities have higher expectations. The delineation between response and recovery is blurred.

Following the PPRR model with its implication on budget, resource allocation and information flow, provides a slower response to a disaster than a social media facilitated response, which the public now expects. It is recognized that “people do not expect agencies to solve everything at once but they want agencies to be upfront and tell them unmixed messages and clear information” at Internet speed.

Surprisingly, participants argue that currently the PPRR model provides financial, organisational, and technical obstacles to the advancement of on-going efforts to building community resilience and the social capital that underpins it. Time and effort are consumed in debating what activities fall into which phases, who is responsible and what are the boundaries and hand-off procedures. Considering recovery as a pre-emergency and on-going effort throughout the cycle of an emergency requires significant changes to the PPRR protocol and all its supporting mechanisms such as legislation, policies and procedures.



**Figure 2:** Mapping of the PPRR approach to community warning and crisis communications – diagram reproduced from (Smith and Bunker, 2007)

## Crisis communication and community relations

During the workshops, practitioners warned us not to lose sight of the fact that older communication systems continue to be valid and useful in crisis communication. Landline telephony and door knocking are particularly helpful in remote areas with weak Internet coverage and with low-income or older population demographics where residents may not have access to mobile or computing technology. However, social media is considered a valuable new form of communication that is appealing not only to younger people but to the large percentage of the population who frequently use mobile telephony.

So far, social media use by government and public sector agencies has been largely associated with broadcasting to and alerting the population (Ehnis & Bunker 2012). However, the workshops reveal that public safety agencies are experimenting with social media for two-way communication and as an important means for eliciting information from the public. For example, The NSW Rural Fire Service is trialling two-way communication and information gathering from the public in a number of on-going pilot cases. These pilots are showing positive results in obtaining information more quickly from the public who are reporting on an emergency they are experiencing or witnessing.

Another example that occurred during the Blue Mountain fires in Australia in 2013, was where social media channels were used for agencies to receive messages from the public and to respond to public enquiries and concerns. This mode of use alerted agencies to the possibility of a fire spreading into areas that agencies could not examine through satellite imageries due to poor weather conditions; smoke density or thick interlocking trees. Thus, participants find that social media could provide eyewitness information that is precious for decision-making.

Agencies are recognising the need to improve their capacity to gather, analyse and share information in real time. This real-time view of information allows for a faster and more proactive response to risks. Social media could also allow for predictive views of risks in emergencies. It is recognised, however, that creating multi-layered real-time data gathering and analysis requires the development of advanced visualisation techniques and dashboards alongside developing the human capacity to interpret these new and complex layered data.

Practitioners also find that emergency call lines such as 999 in the UK and 000 in Australia might consider including social media as another communications channel. People in danger (for instance experiencing a terrorist attack or a crime taking place) might find social media to be a “quiet” mode of communication to convey a message to agencies, without drawing attention to themselves. Also, vulnerable people in emergency situations might find social media’s discreetness particularly appealing in order to come forward and contact agencies. For a major change in emergency reporting like this to occur, many aspects including legislative, operational and technical prerequisites have to be re-considered and adapted.

# Interpretation of the findings and discovering a future agenda for research and practice

The previous section summarised the themes that have emerged and were discussed during the series of workshops that we conducted with a wide range of stakeholders. Six main challenging areas were highlighted which include the dissemination of information, disaster tourism, communities’ expectations, flash volunteering, PPRR, crisis communication and community relations.

This section presents our analysis of the emergent themes. In framing the research agenda with stakeholders, it became clear to us that stakeholders are facing contradictory demands not only related to social media use and how to embed it into existing practices, but importantly about how to manage its side effect within a highly structured, political and regulated environment. Research in management and organisation studies has paid attention to the competing demands organisations could face and their need to be ambidextrous, excelling in meeting these contradictory and paradoxical demands (Andriopoulos and Lewis, 2009; Smith and Lewis, 2011). Analytically, we have identified a set of tensions related to the highlighted themes and have framed our research agenda accordingly.

## Tension of information

As the *use of social media tools and platforms* are proliferating, government and agencies find themselves in a situation where they need to rethink how to “manage the message” i.e. who owns the message and which communications channel is appropriate for the message (Ehnis and Bunker, 2012a). Experimenting with Web 2.0 social media intelligence using advanced authentication represents an opportunity to be explored by multi-disciplinary teams comprising of both agency personnel and academics from different academic disciplines. Social media integration into current agencies’ communications and information flows is of vital importance and while various governmental jurisdictions are addressing this problem, there remains a lot of critical work to be done around consistent approaches to communications channel management and integration with agency operational systems.

However agencies are also aware of their need to combat the spread of false messages and rumours in social media during disasters. They find this to be important in terms of public safety and attitude to emergency services. In commenting on the negative effect of rumours and false message, a participant commented that “I was sitting in the van dealing with [serious matter regarding public safety] and we found a spread of a message saying we destroyed a building, it went viral and people were posting angry comments about how useless we are, this is not good for my team, it is demoralising, they are risking their lives and they see that [these negative messages]. Also they could aggravate an already difficult situation. We had to respond quickly to this message, I asked my team to take a time-stamped picture of that building and post it online and we said here is the building that some claim it is gone. It worked but it meant I had to allocate and reallocate resources for this.”

Future research should examine how emergency responders could handle the ambidexterity of using and combating social media and managing its message.

##  Tension of volunteering

The *‘flash volunteer’* is here to stay (AG, 2015). The generosity of individuals, groups and communities is clearly facilitated through the use of social media (Shahid and Elbanna, 2015). The challenge here is for governments, their agencies and other stakeholder organisations to identify, create and manage approaches to more effectively combine digital and physical volunteer resources in times of emergency and disaster (Shahid and Elbanna, 2016). It emerged during the workshops that stakeholders value the voluntary work people do to help out but that this work has been traditionally regulated and well organised through agencies, NGOs and humanitarian organisations. While they appreciate volunteering, the challenge for emergency managers is to incorporate the sudden appearance of volunteers and donations on the disaster scene into their response effort. Hence emergency agencies find themselves managing the competing demands of welcoming volunteers including flash volunteers while ensuring the safety of the public and the volunteers and finding solutions for unwanted donations. Turning away flash volunteers could have dramatic social and political implications and hence agencies need to manage this “delicate” matter.

##  Tension of Tourism

While agencies find disaster tourism to be disrupting to operations particularly if it involves the evacuation of a disaster zone, they find deterring the public from entering the disaster area to be a sensitive issue. First, they are concerned that stopping the public from entering could send a negative message that prevents the re-generation of the area in the future or is seen to be limiting legitimate access to an area (say impacted residents) in times of crisis. Second, they see deterring the public as a strong interference with free will and human experience and curiosity. Hence they find this issue of particular tension as they fear for public safety but at the same time do not favour interfering with public choices.

##  Tension of community expectation

Communities and individuals expect ‘Internet-speed’ communication and response on the ground during a disaster or emergency regardless of the complexity of the situation (Baskerville et al., 2003). Agencies find that this puts specific pressure on their operations as public confidence in an agency is closely connected to their ability to continuously inform the general public of the situation. During the age of social media, agencies find that they need to gather and communicate well-structured, accurate and timely information while also attending to the public expectations of hyper or very high-speed information provision and response.

All this must happen against a background of formal and structured emergency response processes, which may also have limits on how information must be provided to other agencies as well as to the general public, within a local legislative framework.

##  Tension of PPRR

The advent of Web 2.0 and social media as an increasingly preferred individual and community communications, collaboration and co-ordination platform is creating a tension regarding the emergency management agencies’ ability to develop a “common operating picture” (COP) by harvesting and analysing social media information and communications for disaster situational awareness (Bunker et al., 2015). It became clear to participants that the *PPRR protocol* needs to be reviewed in light of the developments in social media and ‘flash’ volunteering. PPRR in its current form provides little flexibility to accommodate the new developments in Web 2.0 technologies such as information sharing, developing a common operating picture (COP) for disaster recovery and the need for building community resilience. It does not adequately accommodate the perspectives of the individual or affected community and so social and psychological viewpoints on disaster management are lacking. However PPRR has proved to be beneficial in providing a structured approach to emergency management that has been embedded into agencies practices. The transformation to a new approach is difficult for agencies that need to attend to legislative frameworks and a highly structured and audited approach. Therefore, agencies are facing a tension of following their operational processes and methods in response to an emergency, while individuals and communities are now increasingly engaged in an event through their use of social media which fuels their self-organisation in response and which cannot be pre-planned and is subject to surprises.

##  Tension of Crisis Communication

Finally, we see that *crisis communications* have been changed by the development and large-scale adoption of social media technologies. Accordingly, agencies have to embed the new communications practices of the general public in the less risky communications practices of disaster and emergency management organisations. Further research into how social media supplements and complements other crisis communications channels is of critical importance. By more effectively linking social media platforms and their use as well as GIS and visualisation techniques we can add to the value of these Web 2.0 technologies and platforms in general.

# Discussion and Concluding remarks

There have been many technological developments in information systems and crisis communications in a very short period of time. The proliferation of social media and mobile phones and devices has changed the way that individuals use their personal mobile devices to obtain and communicate information. This study aimed to explore areas of critical enquiry arising from agencies’ use of social media. We adopted an engaged scholarship approach to understand and frame the problem with participants. Therefore, we used workshops as data collection and co-creation method with participants where researchers do not hold any advantage over practitioners and there is an equal ground for co-creation.

Surprisingly, one of the main ideas that emerged in these workshops was centred around the impact of the increasing use of social media and Web 2.0 platforms by citizens on emergency management agencies, and that this increased activity is changing the expectations of those who are affected (and not affected) by the emergency or disaster. This finding has altered and broadened our initial view that was consistent with the literature and mainly based on emergency management agencies’ use of data and information arising from social media use by citizens and the challenges of analysing this data. Together with participants, we discovered that emergency managers are experiencing many other challenges arising from citizens’ use of social media regarding the dissemination of information, disaster tourism, communities expectations, flash volunteering, emergency management protocol and crisis communication and community relations. These challenges present tensions for organisations where they need to attend to competing demands.

Previous research focused on the data and information aspects of social media and how agencies can make use of this information (Alexander, 2014; Keim and Noji, 2011; Velev and Zlateva, 2012; Houston et al., 2015; Xiao et al., 2015; Middleton et al., 2014; Stieglitz et al., 2018b); how they can communicate with the public through social media (Hughes and Palen, 2012); the analysis of social media data to infer aspects of users behaviour (Mirbabaie et al., 2018; Stieglitz et al., 2018a; Stieglitz et al., 2018c) and also the examination of the role of social media and Web 2.0 on community empowerment during disasters (Gao et al., 2011; Dufty, 2012; Latonero and Shklovski, 2013; Leong et al., 2015). The participatory and engaging method we employed allowed us to unravel other aspects within the problem space that have been less considered within the literature. We find that the increasing public embrace of social media is challenging organisations to find strategies to attend to competing demands. Organisations need to recognise and embrace public communication through social media but at the same time protect the public from the unintended consequences of rumours and criminal activities. Organisations also need to embrace social media activism and volunteering and hence accommodate ‘flash’ volunteers while at the same time considering and making arrangements for public safety and attending to volunteering protocols. Agencies also need to consider embracing tourism to disaster areas to encourage regeneration but at the same time deter the public from entering dangerous zones and evacuation areas. They need to ensure that they communicate accurate information of a developing situation and formulate well-constructed messages while attending to the public increasing expectation of internet-speed communication and information. They must also attend to a well rehearsed top down emergency management protocol while responding to the accommodation of the new developments in Web 2.0 technologies such as information sharing, developing a common operating picture (COP) for disaster recovery and the need for building community resilience. These findings extend Potter’s (2016) research that highlighted the need for agencies to balance conflicting operational and communications priorities through identifying many other conflicting demands agencies face from the specific use of social media (Potter, 2016).

Regarding engaged scholarship, our experience from the workshops confirms the importance of engaging stakeholders from the start of the research process. Indeed, practitioners can provide a wealth of information regarding areas of concern, contradictions, confusion and unresolved arguments. During the workshops, participants highlighted novel areas for research ranging from the use of AI to the legal issues involved in using social media as a way of emergency reporting. They also highlighted the need for interdisciplinary research in complex areas such as volunteer engagement, communicating with the public, and AI development. This provides insight for new areas of research and examination. Practitioners also benefited from the workshops as they reframed their challenges and many of them initiated internal projects to develop protocols and solutions to these challenges as a consequence of their workshop participation.

Our research was limited to collaborative identification of challenges building on the approach of engaged scholarship. Future research could adopt action research approaches and methods to comprehensively work with practitioners to find viable solutions to these challenges. Researchers and practitioners who are working in the disaster management domain now have the challenge before them of identifying and developing effective uses for social media and Web 2.0 technologies to enhance community engagement and improve communication, collaboration and co-ordination of people and resources during a disaster.

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