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Deliverable D6.3.1: First report on recommendations for future research

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1   INTRODUCTION

No longer in its infancy, understanding the contributions of social media in crisis management is a fundamental requirement in the digital era. Starting in April 2013, the COSMIC project, funded by the European Commission under the 7th Framework Programme[1], has focused on achieving four aims:

- To explore new and emerging communication technologies and applications, and provide insight into the most effective ways to use this media to promote the safety and security of citizens in crisis situations.
- To assist better communication and better information gathering for authorities and first responders.
- To examine the potential roles and ethics for citizen participation in emergency response.
- To produce guidelines that will assist authorities and first responders in deploying new and emerging communication technologies and applications to better protect citizens in crisis situations.

As time has passed, partners have focused their efforts on desk-based research, as well as opportunities to engage with stakeholders through the use of interactive workshops with those involved in using and researching these tools. The project will culminate in a set of two guidelines: 1) Guidelines for citizens for the use of new media in crisis management and 2) Guidelines for governments and corporate actors for the use of new media in crisis management. Stemming from our research and activities during the project is a need to continue investigative efforts within this domain to ensure that as technologies and individual interactions with those technologies develop, so too does our understanding and skills to use them to enhance crisis management.

Accordingly, this chapter contains recommendations for future research that will specifically focus on:

1. Considering how to further develop the COSMIC guidelines, particularly within future policy research
2. Understanding the public
3. Understanding public and private sector organisations
4. Understanding how crisis managers can further their use of social media to gain situational awareness
5. Further understanding the importance of the 'type' of crisis on how social media can best be utilised within crisis management
6. Enhancing our understanding and capabilities to respond to the ethical, legal and social issues associated with the use of social media in crisis management
7. Further research into emerging technologies and issues around interoperability, and their role and functionality within crisis management

The recommendations are followed by a concluding chapter.

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[1] Grant agreement number: 312737.

2   RECOMMENDATIONS FOR CONTINUING THE DEVELOPMENT OF THE COSMIC GUIDELINES & FURTHER RESEARCH ON THE USE OF NEW MEDIA IN CRISIS SITUATIONS

2.1   THE FUTURE OF THE COSMIC GUIDELINES

The general aim of the COSMIC guidelines is to establish and harness the working relationships between those involved in crisis management activities and the public. The basic principle to achieve this goal is transparency. When the actors involved have an overview of what is going on and what is being done, and by whom they can organize their own actions more effectively and enhance cooperation with these other actors.

To promote transparency and involve a broad scope of actors, not lastly the public, the aim is to publish the guidelines so than they become a freely available resource for all to see and maybe even something to build upon. The latter being an important feat since the guidelines are more of a start than an end; the field of Social Media is still so much in development. An ultimate aim would be that a further developed set of such guidelines is incorporated into the body of those of the EU Civil Protection Mechanism.

Since the subject of the guidelines is still rather new and undergoing rapid development, we recognise the need to improve upon them and (therefore) further the existing knowledge about Social Media in relation to crises and disasters. As such we will explore different themes relating to each guideline and address upcoming developments in the next and final version of this document.

2.2   UNDERSTANDING THE PUBLIC

Ongoing work by the partners in COSMIC examined the ways in which the public engage in use of new media technologies during crises and disasters.

Deliverable 4.1 outlined how new media can facilitate the public's engagement during a crisis. Namely, Deliverable 4.1 indicates that new communication technologies have made it possible for citizens to engage more efficiently as

1) potential or actual volunteers (first responders) who may aid emergency response and rescue;
2) as social activists who may utilize online networks to organize, coordinate, collaborate or mobilize during political crises; and
3) as journalists who report on emergencies and political crises.[2]

It is important to note that, despite the potential that new communication technologies may show in helping citizen engagement during crises and emergencies, research indicates that the

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[2] Lemi Baruh, Alex Papadimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Büşra Cıldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014, p.4

levels of digital media literacy and social media penetration, can present substantial variations across European countries.[3]

As such, further research is needed to not only understand in further detail the structural factors that may impede adoption of ICTs but also individual and social differences that may encourage or discourage adoption of ICTs during emergencies and crises. Via a more detailed analysis of structural, personal and social barriers to the use of ICTs, disaster awareness and emergency preparedness initiatives could be targeted to the needs of specific publics in a more effective way by determining a better media mix that can accommodate the needs of those who are "left behind" as a result of digital divide.

In Deliverable 4.2 of the COSMIC project the analysis of relief efforts in the aftermath of disasters pointed out how new media technologies can offer three main benefits

1) Helping the coordination of volunteers who arrive at a disaster inflicted area before official response team arrive;
2) Helping to identify the whereabouts of victims affected by a disaster through the use of social media platforms such as Twitter; and
3) Helping the collection of donations and their delivery to victims of disasters on a global scale.[4]

Likewise, Deliverable 4.1 highlighted how citizens' involvement via social media can enhance the availability of data during an emergency and help organizations to make sense of emerging data through crowdsourced filtering.[5] However, it was also noted that there is not 'sufficient evidence to conclude that the use of social media has also changed the communicative approaches of agencies trying to reach citizens as volunteers'[6], with citizens themselves resorting to the creation of blogs or Facebook pages to support each other in the aftermath of a disaster.

This was the case for the example of the 2011 earthquake in Van, Turkey or the 2007 Virginia Tech shootings, where research by Vieweg et al. showed how social media helped individuals form an altruistic community online and support community resilience.[7] Moreover, research done in the aftermath of the 2010 Yasi cyclone in Australia also pointed out how the use of Facebook during the storm helped promote "safety, connectedness, self- and group-efficacy, and help, in terms of community resilience, directly supporting the adaptive capacities of information and communication, and help bolstering social capital and community

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[3] Bulger, Monica and Rafal Zaborowski, *Media literacy research and policy in Europe. A review of recent, current and planned activities*, Report of a meeting of the COST Action "Transforming Audiences, Transforming Societies", Brussels, 12 September 2013

[4] Baruh, Lemi, Hayley Watson, Kim Hagen, Kush Wadhwa, Zeynep Gṳnel, Haluk Mert Bal, Salvatore Scifo and Yusuf Salman (2014), "Report on citizen involvement and ethics", *Deliverable 4.2 of the COSMIC project*, March 2014, p.57

[5] Baruh, Lemi, Alex Papadimitriou, Zeynep Gṳnel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Bṳşra Cjldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014, p.4

[6] Ibid., p.4

[7] Vieweg, Sarah, Leysia Palen, Sophia B Liu, Amanda L Hughes, and Jeannette Sutton, "Collective Intelligence in Disaster: An Examination of the Phenomenon in the Aftermath of the 2007 Virginia Tech Shootings", *Proceedings of the 5th International ISCRAM Conference*, Washington, DC, USA, 2008

competence."[8] While these projects underline the potential that new media may play in building community resilience and provide psychological assistance, they also point to the need to "further understand the psychological opportunities that may stem from the use of social media in preparing for, responding to and recovering from a crisis."[9] Here, of particular importance will be understanding how different "usage types" (as for example, discussed by theoretical approaches like Uses and Gratifications with respect to use of media in general) and motivations may factor into the extent to which individuals benefit from presence of social media outlets.

At this point, it should also be noted that most of the data regarding how social media may help individuals and communities cope with the trauma created by disasters comes from surveys that focus on online users. However, understanding the implications of such online communities in the wake of crises or disasters for the wider public requires further research focusing on, not only those who are participating in such networks but also their offline connections.

The study of citizens as journalists in situations of crisis, carried out as part of Deliverable 4.1 of the COSMIC project, outlined the emergence of citizen journalists as a response to a perceived "democratic deficit" in mainstream media.[10] The report underlined citizen journalists' contributions to witness accounting and their role as a "fifth estate" to provide checks and balances against powerful institutions, including mainstream media. At the same time, COSMIC partners have observed how mainstream media newsrooms have pushed convergence one step further with the use of social media sources. An important problem that was discussed was the problem of the reliability of information. The report discussed approaches like the "tier 1.5 approach" to encourage cooperation between professional and citizen journalists for fact-checking and editing news stories. From an applied perspective, there still needs to be further research about how such cooperation between citizen reporters and professional journalists can be enhanced. Specifically, further understanding of the barriers against such cooperation, how power asymmetries may implicate journalistic freedom, and risks associated with the co-optation of citizen generated content by commercial media is needed.

When discussing the role of citizens as journalists, Deliverable 4.1 of the COSMIC project also investigated issues related to media framing and gatekeeping, and discussed how they may affect the possibilities of new voices to emerge. In our online interviews citizen journalists claimed editorial independence, however the reality showed that while they report emergencies

1) citizen journalists 'tend to adhere to news writing conventions that are often associated with mainstream media'; and

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[8] Taylor, Mel, Garrett Wells, Gwyneth Howell, and Beverley Raphael, "The Role of Social Media as Psychological First Aid as a Support to Community Resilience Building", *The Australian Journal of Emergency Management*, Vol. 27, No. 1, 2012, p. 20-26.

[9] Baruh, Lemi, Hayley Watson, Kim Hagen, Kush Wadhwa, Zeynep Günel, Haluk Mert Bal, Salvatore Scifo and Yusuf Salman (2014), "Report on citizen involvement and ethics", *Deliverable 4.2 of the COSMIC project*, March 2014, p.21

[10] Baruh, Lemi, Alex Papadimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Büşra Cıldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014, p.146

2) that the above 'is evident in the dominance of "episodic" frames, which are characterized by writing about an isolated event rather than providing information that can help readers understand the context of the event'.[11]

Indeed, content analysis performed in the context of that report seemed to contradict the claim that citizen journalists report perspectives that are different than those set by the mainstream media, therefore COSMIC partners believe that it might be important to pursue further research in the area of media framing during emergencies. This contradiction raises important questions regarding factors that prevent citizen generated content from challenging the boundaries created by the content and journalistic approaches of established journalism.

Deliverable 4.2 of COSMIC also discussed an issue that has become even more important with the increase of social media utilization during emergencies, given the potential of sharing misinformation and unverified information. Evidence emerging from previous research on the communicational dynamics in the aftermath of the 2011 Fukushima nuclear plant disaster and the 2013 Boston bombings pointed out how unverified information and/or information that misrepresents individuals or communities might result in

1) the misrepresentation of individuals
2) the polarization of communities
3) inciting hatred and prejudice.[12]

It is within this context that the COSMIC partners recommended that "good practices in the verification of information should be shared with digital volunteer communities who seek to contribute to the sharing and discussion of information in a crisis."[13]

Moreover, it was also recommended that "guidelines about information verification methods and approaches, such as information verification handbooks, should be widely disseminated by stakeholders to the public."[14] Therefore, COSMIC partners would suggest further research in this area to understand the level of public awareness regarding the available verification methods and how to reach out to the public (both in terms of types of communication media and communication strategies) to increase media literacy among the public to better equip them with critical information evaluation skills

2.3   UNDERSTANDING PUBLIC AND PRIVATE SECTOR ORGANISATIONS

Deliverable 4.1 of the COSMIC project described the ways in which public and private organizations, such as NGOs and response volunteer groups, engaged with members of the public for emergency preparedness and response. The deliverable particularly focused on how a sample of response organizations from Germany, Greece, Italy, Turkey, and the United

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[11] Baruh, Lemi, Alex Papadimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Büşra Cıldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014, p.147-8

[12] Baruh, Lemi, Hayley Watson, Kim Hagen, Kush Wadhwa, Zeynep Günel, Haluk Mert Bal, Salvatore Scifo and Yusuf Salman (2014), "Report on citizen involvement and ethics", *Deliverable 4.2 of the COSMIC project*, March 2014, p.42

[13] Ibid., p.42

[14] Ibid., p.61

Kingdom utilized various communication media, including social network sites, video sharing sites, television, books and webpages, to communicate with the public.

The analysis of this sample of organizations indicated that:

1) Community involvement is considered as an important goal across all countries that were analyzed (Germany, Greece, Italy, Turkey, the United Kingdom)
2) There are important cross-national differences in the extent to which new media technologies are utilized by response authorities to engage the public.[15]
3) More often than not, the type of involvement is typically an asymmetric one in the sense that social media is usually utilized by authorities for "one-to-many" communications. Interactivity is limited.
4) Part of the reason for this lack of interactivity is the tendency of public authorities, government agencies and response organizations to see citizens as stakeholders that need to be trained, whilst they simultaneously do not pay sufficient attention to soliciting intelligence from the public to improve emergency response.[16]
5) Discussions during the COSMIC Workshop on "Involving Citizens in Emergency Preparedness and Response" underlined the fact that large national and supranational organizations are, at least in some cases, the sources of resistance to utilization of social media to involve the public in emergency response.[17] Indeed, part of the problem it seems are the hierarchical structures of such organizations, which lends little leeway to social media managers to flexibly respond to citizens, and the existing legal frameworks as well as protocols that are in place at the moment when an emergency occurs.
6) The analysis suggest that although few and far between, there are some examples of more interactive uses of online media to solicit information and intelligence from the public.

Given these insights, it would surely be important for future research efforts to collect and analyse further information on the quantity and quality of the use of Social Media during crises, and build from the findings that the COSMIC project has brought together through its deliverables.

Generally, findings from COSMIC point to the need for more substantial working relationships between the public and those involved in crisis management activities, in order to help educate the public and crisis management personnel how to communicate and harness the benefits that can be gleaned from the use of social media. There is thus a need to further understand how to bring the two partners together in a collaborative manner.

More specifically, further analysis of organizational and individual factors that may impede or support authorities' utilization of new communication technologies to communicate with the public rather than communicate to them will help develop methods to improve the level

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[15] Baruh, Lemi, Alex Papadimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Büşra Cjldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014.

[16] Baruh, Lemi, Alex Papadimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo and Büşra Cjldaş (2014), "Report on citizens' involvement in emergency communication", *Deliverable 4.1 of the COSMIC project*, January 2014, p.157

[17] Baruh, Lemi, Marie Christine Bonnamour and Robert Miskuf (2014), "Workshop Report", *Deliverable 4.3 of the COSMIC project*, September 2014, p.13

involvement of citizens. This question is also related to the resources, such as human resources, that authorities have to cope with the influx of data that they receive from the public during emergencies. For example, Deliverable 4.1 has outlined, how, in the case of Italy, the Civil Protection Department is refraining to use social media at the national level due to the supposed lack of resources to be destined to such efforts at the national level.

While examining the use of new media during emergencies, it is important also to consider the wider context of an emergency and the possibility to interact more effectively with other stakeholders other than citizens and responding authorities such as, for example, critical infrastructure providers dealing with matters as health, food/water, transport, housing and energy. The possibilities of harnessing the possibilities offered by new media, and the aggregation and analysis of information through 'big data' should be considered in order to provide tools or information to improve the capacity to respond to emergencies. As such, further research is needed to identify best practices in the use of big data opportunities and to consider the possibilities for response authorities to utilize crowd sourced data for gathering intelligence.

2.4   SOCIAL MEDIA FOR SITUATIONAL AWARENESS

The need for reliable information is high in complex, dynamic situations, such as crises and disaster management, in order to make good decisions, while such situations are often characterized by a high degree of uncertainty.[18] In trying to reduce uncertainty the concept of 'situational awareness' has received much attention in the last decennia. As Endsley defines it, situational awareness involves "the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future".[19]

In line with the above we can conclude that situational awareness is a key performance indicator for first responders acting in the field. To garner proper situational awareness information and the spread thereof is crucial, information (like big data)[20] is abundantly present but spread out over many actors that are mainly present in the affected areas. Therefore such information has to be spread, bundled, interpreted and arrive at the relevant parties. The opportunities to gain a proper situational awareness have vastly expanded with the emergence of Social Media. For example, by means of the mapping tool Ushahidi a near real time map of the affected areas was created during the Haitian earthquake from messages from disaster-struck areas, leading to an increased situational awareness in first responders and thereby enabling them to allocate their resources better.[21] Incidents like this showcase the potential of Social Media to provide civilians and other actors with a platform to distribute

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[18] Vieweg, Sarah, Amanda L. Hughes, Kate Starbird, and Leysia Palen, "Microblogging during two natural hazards events: what twitter may contribute to Situational Awareness", *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Atlanta, GA, USA, 2010.

[19] Endsley, M.R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors 37*(1), p. 32–64.

[20] Baruh, Lemi, Alex Papdimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo, Büşra Çildaş, "Final report on citizens' involvement in emergency communication", *Deliverable 4.1.2 of the COSMIC project*, 2014.

[21] Baruh, Lemi, Alex Papdimitriou, Zeynep Günel, Haluk Mert Bal, Yusuf Salman, Salvatore Scifo, Büşra Çildaş, "Final report on citizens' involvement in emergency communication", *Deliverable 4.1.2 of the COSMIC project*, 2014.

and obtain timely, relevant (area-specific) information, where this is very difficult through mass-media.

However, much is still unclear about the current usage of Social Media with regard to crises, thereby also limiting a realistic estimation and realistic ideas for the potential usage of Social Media. As such it is not yet clear what, in general, the impact of new media during crises and disasters is. There is only limited knowledge about, for example, the actual population that utilizes new media during times of crises, what its demographic characteristics are and what they use Social Media for. Similar knowledge gaps apply to the usage of Social Media by emergency services. Concrete questions are: to what extend as well as why and when (response phase or aftermath) do emergency service employees use Social Media and what is their background (first responder or tactical/ strategic level). Only when questions such as those are answered it is possible to start thinking about how to adequately make use of all the possibilities offered by Social Media as well as what its limits are.

Following the endnote of the former paragraph a second line of further research are questions regarding if and when it is useful and efficient to act upon the possibilities offered by Social Media for creating an enhanced situational awareness. The opportunities presented by, for example, Big Data, as shown in Deliverable 3, are tremendous as are the obstacles. This necessitates looking into matters as whether or not it is effective for public authorities, such as the police and fire services, to monitor new media during actual crises and disasters. Other aspects concern whether or not it is useful for emergency services to question Social Media users during an actual crisis or disaster to obtain the information needed. In addition thought should be given to how other key organizations, such as critical infrastructure providers, can and should engage with Social Media in relation to crises in order to operate effectively and efficiently.

2.5   ACKNOWLEDGING AND PREDICTING THE TYPE OF CRISIS

There is a vast scope of crises and disasters, since they differ in magnitude and severity, but also in causes, consequences and courses. As a result responses can differ widely as might the way Social Media are used and the sort of messages that are spread. If such differences exist, they should be paid attention to when developing ways to efficiently use and incorporate Social Media in crises and disaster management. This leads to the need for analysing the way Social Media are used and the specific messages that are spread in different kinds of crises and disasters, like technological and natural disasters or slow-onset and flash crises. Additionally, could be differentiated between citizens, first responders, authorities and other actors.

Currently, the guidelines not only pay no attention to differences between crises and disasters they also provide no guidance in the way civilians can effectively monitor different types of crises and disasters. Without ways to effectively judge what they are dealing with precisely, it will be difficult for civilians to tailor their response adequately and the most effectively, highlighting the added value of incorporating the use of such monitoring tools in the guidelines.

Additionally, a tool, much like Tweetdeck, should come into being to monitor crises and social media impact. For authorities and governments such tools already start coming into being, such as for example the Dutch developed and risk and incident focussed Twitcident.[22]

As Deliverable 3 showed, with regard to epidemics for example[23], at this point much effort is being invested in trying to develop predictive instruments based on Social Media regarding crises and disasters. If this is really a viable option is still unsure and if so, needs to be researched regarding which crises and disasters can be predicted as some crises and disasters undoubtedly have a low predictive value; slow-onset crises and disasters would seem to qualify.

Concluding, it is also paramount to observe what the effect is of promoting such guidelines and the usage of social media. Are there any negative side-effects, such as the development of social disorder? An example in this case is Shell's oil storage and tanker loading buoy, the Brent Spar, where massive media attention forced the company to reconsider its decision to sink this platform, at a cost of millions of dollars.[24]

2.6   ETHICAL, LEGAL AND SOCIAL ISSUES

As technologies develop, so too do the ways in which organisations and citizens interact with them. As a result, there are a number of ethical, legal and social issues that must be considered. Within the COSMIC project, particular emphasis was placed on:

1. Understanding any potential ethical concerns that may have cropped up in our analysis of case studies. For instance, the analysis of the use of social media within the 2013 Boston attacks presented a number of ethical concerns relating to (online) vigilante activity.[25]
2. Identifying political, social and industrial extensions of the use of existing and emerging technologies in crisis management. For instance, we identified a number of privacy, security and surveillance related considerations associated with the use of social media within crisis management, including (for instance): data protection, dataveillance, counter-surveillance and the protection of information from theft.[26]
3. Examining the ethical dimensions of communicative opportunities that new media bring, and providing recommendations for how these issues can be adequately addressed. For instance, attention was placed on the consideration of the threat of

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[22] Teun Terpstra, Arnout de Vries, Richard Stronkman and Geerte L. Paradies, "Towards a realtime Twitter analysis during crises for operational crisis management", in L. Rothkrantz, J. Ristvei and Z. Franco (eds), Proceedings of the 9th International ISCRAM Conference. Vancouver, Canada, April 2012; www.twitcident.com

[23] Kotsiopoulos, Ioannis, Angelos Yannopoulos, Michiel In 't Veld and David de Vries, "Final report on the use of emerging technologies in crisis situations", *Deliverable 3.1.2 of the COSMIC project*, 2014.

[24] EC newsdesk (2010, May 5). *Brent Spar: battle that launched modern activism*. Recovered 25-11-2014 at www.ethicalcorp.com/communications-reporting/brent-spar-battle-launched-modern-activism

[25] Papadimitriou, Alex, Angelos Yannopoulos, Ioannis Kotsiopoulos, Rachel L. Finn, Hayley Watson, Kush Wadhwa and Lemi Baruh, "Case Studies of Communication Media and Their Use in Crisis Situations", *Deliverable 2.2 of the COSMIC project*, 2013.

[26] Kotsiopoulos, Ioannis, Angelos Yannopoulos, Hayley Watson, Rachel L. Finn, Kush Wadhwa, Rowena Rodrigues and Alex Papadimitriou, "Final Report on Political, Social and Industrial Opportunities Arising from the Use of Emerging Technologies", *Deliverable 3.22 of the COSMIC project,* 2014.

being recorded, as well as ethical issues such as the abuse of power, misinformation, misrepresentation and the ethics of news production.[27]

By doing so, COSMIC partners have sought to show how it is necessary to tackle these issues in order to manage and positively respond to these challenges. Confronting these issues can help those involved in crisis management activities to build effective partnerships between the different actors involved in a crisis thereby gaining maximum value from the use of social media when preparing for, responding to and recovering from a crisis.[28] In order to progress and remain cognisant of these on-going challenges, further research in this area needs to be conducted. Furthermore, stakeholders involved in responding to these challenges should be encouraged to share best practices with each other in order to support the efforts of others.

2.6.1 Considerations for further research:

Presently, whilst it is acknowledged that there are indeed a number of ethical, legal and social issues relating to the use of social media among the public, as well as public and private sectors, it is not necessarily clear how these challenges are being understood and, accordingly, managed. As such, we are left with the following research questions that are in need of further enquiry:

- What measures does the public take to manage the ethical, legal and social challenges surrounding the use of social media in a crisis?
- What kind of tools and guidelines can be developed to protect the confidentiality of victims, protestors and bystanders in the wake of enhanced ability of the public to record incidents?
- What policies do public and private organisations have in place in order to manage the ethical, legal and social complexities surrounding the use of social media in a crisis?
  - o Do they have policies in place?
  - o What good practices can be gleaned from existing policies?
- How is the research and development community tied with developing solutions for crisis management negotiate and respond to ethical, legal and social challenges?

The responsibility for initiating research in this area should ideally fall with applicable research councils (at both an EU and national level) and furthermore through the encouragement of different types of stakeholders to be brought together to respond to these challenges.

2.7 ADVANCES IN TECHNOLOGY

Our findings in Deliverable 3.3.2 and Deliverable 3.3.2 on interoperability and openness in social media show that they, somehow, are a victim of their own success. Large private platforms have realised the value of controlling information and restricting the once open

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[27] Baruh, Lemi, Hayley Watson, Kim Hagen, Kush Wadhwa, Zeynep Günel, Haluk Mert Bal, Salvatore Scifo and Yusuf Salman, "Final Report on Citizen Involvement and Ethics", *Deliverable 4.2.2 of the COSMIC project,* 2014.

[28] Kotsiopoulos, Ioannis, Angelos Yannopoulos, Hayley Watson, Kush Wadhwa, Susan Anson and Alex Papadimitriou, "Final Report on the Strategic Use of Emerging Communication Technologies for Crisis Stakeholders", *Deliverable 3.3.2 of the COSMIC project,* 2014.

flow of the Internet. These so called "walled garden" situations have profound effects in limiting acceptance of open standards and, in turn, limiting interoperability among the various platforms. The result is that proposed open standards such as OpenSocial and Activity Streams have not yet gained widespread acceptance and true technical interoperability (in the sense of being able to address everybody within the social fabric, share social metadata and have a controlled way to accommodate protocol extensions and updates) is still absent. Instead, the social media landscape is characterised by a complex interplay between market leaders and their competitors, and correspondingly between proprietary and open standards. Similarly, semantic interoperability, an even more difficult issue, is at an even less developed state.

Any advance in interoperability would be good news for crisis management. Addressing everybody, even unknown networks, and retrieving information from any platform is a valuable asset during a crisis. We have no complete solutions today; instead, a variety of partial "ways out" has shown promise both in technical as well as semantic interoperability.

On the technical front, interaction – but not full interoperability – among the services offered by social media platforms is served via the Application Programming Interfaces (APIs) of those platforms. Although they differ from network to network, they offer content and user-related functionality and also microapplications (widgets). These features can prove useful during a crisis; for example noting increased numbers of re-tweets with a similar theme can provide insight on the development and the severity of a situation long before official announcements. Another by-product of the platforms' APIs is social media aggregation, a process of collecting content from multiple services into a unified presentation. An extensive number of network aggregator applications exist today, and a role for them in crisis management has already been established, as verified by the experience with the floods in Brisbane (2013): aggregation platforms offer various ways of collecting content from a large selection of social networks, and can function as a central destination for social media updates originating from all sorts of rescue organisations.

Ongoing standardisation efforts, aiming at interoperability, are taking place at two international organisations, with differing missions. These are the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and the World Wide Web Consortium, otherwise known as W3C. The former is a crisis response organisation, while the latter is a standardisation organisation structured as a community. Their common point, with regard to social networks is that they both, through the need to serve their purpose, recognise the necessity for standardisation in social media and work actively towards its achievement.

On the semantic front, we note that crises have a relatively limited vocabulary, therefore concepts and their inter-relations can be formalised as crisis ontologies and then utilised by possibly specific social media applications. In this respect, we have a variety of crisis specific ontologies already in use, including the DiRes ontology by the European project Disaster 2.0. Despite considerable activity in the field, fragmentation manifests itself with a shortage of formal ontologies, missing terminologies and interoperability gaps. The concept has been shown to work in practice: during the Haiti earthquake, crowdsourced linked open data[29] was

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[29] Jens Ortmann, Minu Limbu, Dong Wang, and Tomi Kauppinen, "Crowdsourcing Linked Open Data for Disaster Management", in Rolf Grütter, Dave Kolas, Manolis Koubarakis, Dieter Pfoser (eds), Proceedings of Terra Cognita 2011, Workshop at the 10th International Semantic Web Conference, (ISWC2011), volume 798 of CEUR Workshop Proceedings, Bonn, Germany, October 2011.

collected on the Ushahidi platform, organised and made available online via the Management Of A Crisis (MOAC) vocabulary developed for this purpose.

What appears to be of interest is that we have two different streams of evolution in the wider field of semantic interoperability and the corresponding open standardisation: social media and crisis management. We have shown throughout COSMIC that the former plays an important role in the success of the latter, but we are aware of no research effort to address the common ground of both streams (i.e. semantic interoperability for social media in crisis management), with the notable exception of the application to the Haiti crisis described in the previous paragraph. This is an area of further research, which can result in useful applications with life-saving potential.

Finally, one should not overlook the policy issues related to opening up social media data: personal data may be involved and the relevant legislation – which also differs among countries – may place its own limitations, despite the existence of cases where there are obvious benefits to crisis management.

2.7.1 Research questions to be addressed

As a result of the above findings within COSMIC, a number of research directions is proposed with the aim to further the role of social networks during crises.

2.7.1.1   Automatic (machine processable) recognition of distress and crisis messages transmitted via the discourse of social media

There has already been considerable research in this area, with varying results, but no concrete applications or systems have emerged. The subject has inherent difficulties. As remarked in D3.2.2 social media data is inter-referenced and relations among virtual entities communicating are mapped to corresponding relations among humans. Information is at best semi-structured both syntactically (representation) and semantically (no semantic web concepts used). A combination of standard-based structure (technical interoperability) and semantic identification (possibly based on a crisis ontology) can be a most effective approach, provided open "social standards" are in place. The need is both for direct research on the subject, as well as evaluation and assessment of the numerous existing research results which partially address the domain, such as those under European framework programmes.

What appears to be of interest is that we have two different streams of evolution in the wider field of semantic interoperability and the corresponding open standardisation: social media and crisis management. We have shown throughout COSMIC that the former plays an important role in the success of the latter, but we are aware of no research effort to address the common ground of both streams (i.e. semantic interoperability for social media in crisis management), with the notable exception of the application to the Haiti crisis referred to in the previous section. This is an area of further research, which can result in useful applications with life-saving potential.

2.7.1.2   Assessment of the possibilities of partial solutions for addressing inter-operability among social media during crises, also using pilot cases for demonstration.

This is a more application-oriented direction, which aims to bring together the two concepts of social media and crisis management and which relies on existing technology and standards by combining:

- Social media standards such as OpenSocial and ActivitiyStreams and their extensions to close gaps and serve social business use-cases, according to the recommendations of the W3C Jam Results,[30] and in possible collaboration with the W3C Community and Social Business Group[31]
- Social media related ontologies describing relations of people and communities such as FOAF[32] and SIOC[33]
- Crisis ontologies of which a variety of examples, already at pre-production level, exist, such as MOAC[34] and the UN OCHA[35] developed HXL[36]
- Synergies among different efforts to use Semantic Web technologies in crises, as discussed in the Emergency Information Community Group of W3C[37]

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[30] W3C Social Business Jam event, November 8-10, 2011, www.w3.org/2011/socialbusiness-jam/report.html

[31] W3C Community and Social Business Group, www.w3.org/community/socbizcg

[32] Friend Of A Friend (FOAF) ontology, FOAF project, www.foaf-project.org

[33] Diego Berrueta *et al*, "SIOC Core Ontology Specification", Uldis Bojārs, John G. Breslin (eds.), March 25, 2010, available at: http://rdfs.org/sioc/spec/, http://sioc-project.org

[34] Management Of A Crisis (MOAC) vocabulary, 2012 specification, http://observedchange.com/moac/ns

[35] United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

[36] Carsten Keßler, Chad Hendrix, "The Humanitarian eXchange Language: Coordinating Disaster Response with Semantic Web Technologies", Semantic Web Journal 1 (2009) 1–5, IOS Press, 2013, www.semantic-web-journal.net/system/files/swj537_0.pdf

[37] Souripriya Das, Seema Sundara, Richard Cyganiak, "R2RML: RDB to RDF Mapping Language", W3C recommendation available from www.w3.org/TR/r2rml, 27 September 2012

3   CONCLUSION

Our findings in COSMIC, described in this document, suggest that the role of social networks in crisis management is promising, important and complementary to the response effort. We expect that this role will be further enhanced by the release of our guidelines for citizens and organisations, and also by widening our understanding on six related areas and directions, identified as being in need of further research. These refer to:

- **Understanding the public**
- **Understanding public and private sector organisations**
- **Using social media for situational awareness**
- **Acknowledging and predicting the type of crisis**
- **Ethical, legal and social issues**
- **Advances in technology**

Regarding the first area, **"Understanding the public"**, our initially identified research need is to comprehend further the structural factors that may impede adoption of ICTs and the associated individual and social differences that may encourage or discourage this adoption during emergencies and crises. On another note, we draw attention to the need to understand how online communities can help in the wake of crises and disasters, by looking not only at those who are online participants of such networks but also at their offline connections.

We have identified that during crises citizens become reporters via social media, often alongside professional reporters. We propose further research on how this cooperation can be enhanced, especially when considering the barriers, conflicts and risks associated and the power asymmetries that may affect journalistic freedom. In the interests of accuracy of critical information transmitted, studies into methods to increase media literacy and evaluation skills among the public are also required.

The involvement of the public is also affected by the way **public and private sector organisations** utilise new communication technologies such as social media. We found that these are frequently used to communicate *to* the public rather than *with* the public. Further analysis of those organisational and individual factors which affect this communication will help develop methods to improve the level of involvement of citizens and also to guide organisations regarding the allocation of resources (such as human resources), especially when large influxes of data emanate from the public during an emergency.

These large influxes of social media data can, in principle, aid **situational awareness**. We need to know more about the possibilities and limitations of such a practice and this, in turn, is related to answering questions of the type: *to what extent, as well as why and when (response phase or aftermath) do emergency service employees use social media and what is their background (first responder or tactical/ strategic level)?*

On the other hand, the opportunities presented by, for example, big data techniques utilising crowd-sourced data for intelligence gathering are tremendous as are the obstacles. This necessitates looking into whether or not it is effective for responding public authorities (police, fire services, etc) to monitor new media during crises and disasters or to appeal to social media users for the supply of information. This also leads to the more general question

of how other key organisations, such as critical infrastructure providers, can and should engage with social media in order to operate effectively and efficiently during a crisis.

Crises and disasters range from technological to natural ones, from slow-onset to flash ones. Analysing the way social media and the associated messages behave in **differing types of crises** and the way citizens, first responders, authorities and other actors are involved remains an open question. Equally open is the question of whether **predictive instruments** based on social media have any value, in relation to the type of crisis; in other words: *which types of crises exhibit a high social media predictive potential?*

Presently, whilst it is acknowledged that there are indeed a number of **ethical, legal and social issues** relating to the use of social media among the public, as well as public and private sectors, it is not necessarily clear how these challenges are being understood and, accordingly, managed. As such, we are left with the following research questions that are in need of further enquiry:

- What measures does the public take to manage the ethical, legal and social challenges surrounding the use of social media in a crisis?
- What kind of tools and guidelines can be developed to protect the confidentiality of victims, protestors and bystanders in the wake of enhanced ability of the public to record incidents?
- What policies do public and private organisations have in place in order to manage the ethical, legal and social complexities surrounding the use of social media in a crisis?
  - Do they have policies in place?
  - What good practices can be gleaned from existing policies?
- How is the research and development community tied with developing solutions for crisis management negotiate and respond to ethical, legal and social challenges?

The responsibility for initiating research in this area should ideally fall with applicable research councils (at both an EU and national level) and furthermore through the encouragement of different types of stakeholders to be brought together to respond to these challenges.

Finally, from the **technology** point of view, we note that open standards for social media have so far met with limited acceptance and this, in turn, prevents true interoperability among all social media platforms. We advocate that further research is needed in this area and in particular in:

- Automatic (machine processable) recognition of distress and crisis messages transmitted via the discourse of social media, also associated with an in-depth survey of the rich body of existing efforts, especially under European framework programmes
- Assessment of the possibilities of partial solutions for addressing interoperability among social media during crises, also using pilot cases for demonstration