Heinrich C. Mayr, Martin Pinzger (Hrsg.): INFORMATIK 2016,
Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn 2016 1805

Semi-Automatic Alerts and Notifications for Emergency Services based on Cross-Platform Social Media Data – Evaluation of a Prototype

Christian Reuter, Christoph Amelunxen, Matthias Moi[1]

Abstract: The convergence of social networking and mobile media technology is shifting the way how people communicate and gain or share information. People are using social media to a greater extent, also in emergency situations. During disasters throughout the world, such as the 2010 Haiti earthquake, the 2013 European floods, or the terror attacks 2015 in Paris and 2016 in Brussels, this has been illustrated again. Often information about disasters even finds its way faster to social media than it reaches regular news companies and emergency services. However, approaches for processing and analysing the vast quantities of data produced have even more potential. Yet many emergency services still have not found a way to put this potential to an effective use. Within our project EmerGent we are developing a system to process and analyse information from social media particularly tailored for the specific needs of emergency services. The aim is to transform the high volume of noisy data into a low volume of rich content that is useful to emergency personnel. In the first part of this paper we present our approach from a user interface perspective. The second part deals with the evaluation of the approach and the derivation of future potentials of the approach.

Keywords: social media, emergency management, evaluation

1 Introduction

Social media data might be of value for emergency services. However, many studies have identified barriers regarding the high amount of data emergency services need to deal with before, during and after emergencies. A study with 24 district officers in Virginia has demonstrated that the amount of data and the severity to detect or recognise relevant information is a main barrier [Ka11]. A survey with 241 emergency services in the US has shown that information overload is often the case [Pl15]. Another study in Thailand emphasized ensuing risks of wrong decisions and correction of mistakes [Ka12]. As a conclusion from this, there is a request for proper tools to deal with the high amount of social media data [Re15a], as identified in an interview study on current and potential use of social media in 7 European countries. Based on a survey with 761 emergency service staff across 32 European countries the "majority of emergency

[1] EU-Project EmerGent (www.fp7-emergent.eu)
Matthias Moi, M.Sc. (University of Paderborn; moi@cik.uni-paderborn.de)
Dipl.-Wirt.Ing. Christoph Amelunxen (University of Paderborn; amelunxen@cik.uni-paderborn.de)
Dr. Christian Reuter (University of Siegen; christian.reuter@uni-siegen.de)

services has positive attitudes towards social media", however it is "more used to share information (44%) than to receive messages (19%)", while a future increase is expected [Re16, S.3].

In our project the strategy is to process and analyse social media data streams before, during and after emergencies including the steps of (A) information gathering (incl. data preparation), (B) data enrichment, (C) semantic information modelling with ontologies and information mining, (E) information quality and (F) alert detection [Mo15]. The alert detection aims to observe on-going conversations and trying to identify arising alerts from the overall noise. It operates on mined and quality-rated information to detect emergency-related events such as "two injured persons detected" [Mo15]. Emergency services might want to know more upon request. E.g. if they receive an alert, they need the option to investigate the origin or the reason for it. Because of that it has to be possible to visualise the dependencies between alerts and single posts, which initiated an event (temporal representations, graph-based visualisations).

In this paper we present the evaluation of our concept, which has been implemented as a prototype for emergency services, including identified potentials.

2 Related Work

For the realisation of the need for information for decision-makers, the use of social media analytics has to meet specific requirements. As a basis for the comprehensive analysis of social media a sufficient number of platforms has to be connected. Especially in a crisis context, it is not sufficient only to look at microblogging services such as Twitter, emergency services should base their decisions on information from various media [Re15a, RV14]. Social media is also highly heterogeneous, so that the ways of distribution of different types of information varies greatly. An additional factor, which terminated the size of the available data base, is the type of connection. The different platforms offer only limited possibilities to detect an amount of data in a given period [RS14].

The number of different methods of analysis as well as the functional areas, which are covered by this, constitute a separate criterion in selecting appropriate practices for social media analysis. Thus, applications differ for market analysis from those of crisis management on things like focusing on reputation management, marketing and the customer relationship management [St14]. Other methods of analysis point to a general validity for the analysis of social media, such as sentiment analysis [Sh10]. Additionally, there are methods which are especially suitable for the context of crisis management so that an individual assessment of the provided functionality is required.

In addition to automated information review and selection, the possibility of individual weighting and validation by experts is an important point in the use of social media data [Ke10, Re15b]. Basically such systems should be able to adapt to changes in the setting

and to support emergent collaboration, such as ad hoc needed work in unforeseen events [Re14]. Especially in relation to the processing of unforeseen patterns it is necessary to activate this expertise and use. Some approaches try to combine virtual and real activities of volunteers [Re13]. Based on this approaches like XHelp focus on the citizens themselves and the support of their volunteer activities [Re15c], other approaches suggest to allow monitoring their activities [Lu15].

Market surveys reveal that the market for social media intelligence software is very heterogeneous and fast moving, which is also supported by related research [Po13, Tr15]. The reason is that a large number of designed systems often provide identical functionality in analysing social media. Existing approaches focus on the analysis of social media (e.g. Brand Watch, Public Sonar aka Twitcident, Signal Socialmention), provide functionality for organisational interaction and communication in social media (e.g. Coosto, Hootsuite, SproutSocial, TweetDeck) or provide specific functionalities or other approaches like crowdsourcing (e.g. AIDR: Artificial Intelligence for Disaster Response, SensePlace2, Tweedr, TwitInfo, Ushahidi). The transitions between the groups seem fluid and no clear-cut delineation is possible. Systems trying to generate alerts for emergency services have not been detected.

3 Alerts and Notifications: The EmerGent Semi-Automatic Concept for Emergency Services

Following the strategy [Mo15] to process social media data before, during and after emergencies, the visualisation of relevant information was defined as an important part for emergency services in order to handle the vast amount of social media data. In Reuter et al. [Re12] the data generating way of communication is defined as C2A (citizen to authorities), whereas citizens report information related to an incident or emergency. Considering social media this can be done directly or indirectly. For direct communication social apps or direct messaging can be used. For indirect C2A communication citizens do not address messages to concrete recipients (for instance the public timeline on Twitter). To analyse this information, API of different social media have to be used [RS14]. We also plan for A2C communication using a feedback channel allowing answering on posts from social media, e.g. with a warning.

In the requirement analysis, based on several empirical studies with emergency services [Re15a, Re16], we identified that it is not feasible for emergency services to deal with every single message that might be of interested or emergency related [Ak16]. During an emergency thousands of potentially relevant messages may come up and this would lead to an information overload [HP13] again. Information has to be transformed into meaningful and manageable parts.

To target this issue, we introduced the concept of *alerts* and *notifications* [Mo15] with the aim of "transferring high volume, but unclear information content into low volume and rich content suitable for emergency services" (Moi et al 2015., p. 47). An alert is a

set of classified messages sharing a similar context, which is of particular interest for emergency services. The context is defined by but not limited to attributes like date, time, location, full text, identified event types or language. The main aim of the interface is not to present hundreds of messages to the user, but to select relevant messages and to cluster them into alerts. Each notification consists of several messages from Twitter, Facebook, Google+, Instagram or YouTube, as long as they belong to the same setting. To do so, within the information mining process relevant data is filtered, classified and automatically categorised into these alerts and notifications. Furthermore, messages are evaluated for the information quality process to estimate different criteria's like timeliness, understandability, believability or completeness in order to support ES in the evaluation of information [Mo15]. Off course the user also has the possibility to adapt the process with specific key words. Therefore, we call it a semi-automatic progress.

The EmerGent ES-Interface is part of an IT-System (see Figure 1).

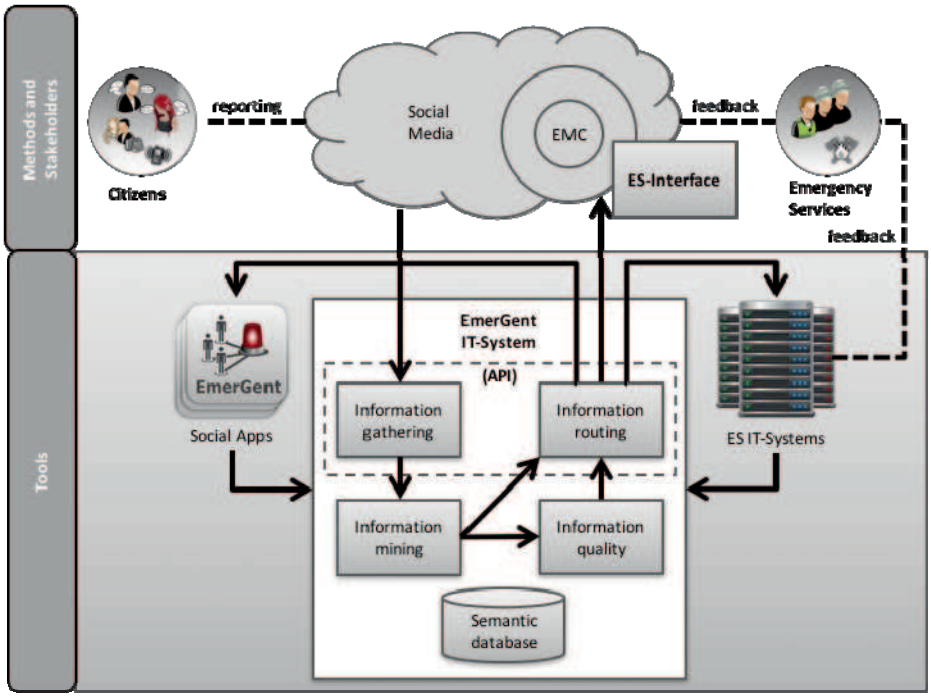
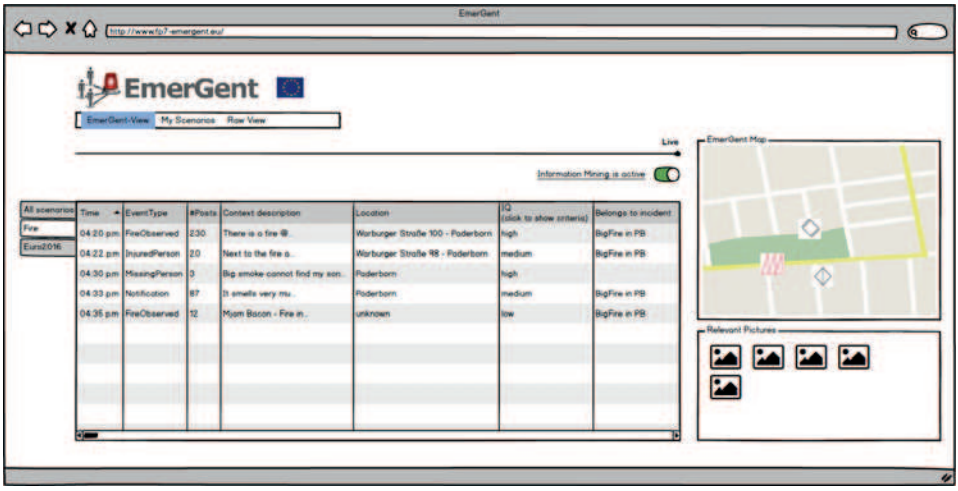


Figure 1 Overview of the EmerGent IT-System

The basic concept of the user interface (UI) is shown in Figure 2 where processed messages are aggregated into alerts and notifications.



Time	EventType	#Posts	Context description	Location	IQ (click to show criteria)	Belongs to incident
04:20 p.m.	FireObserved	230	There is a fire @...	Warburger Straße 100 - Paderborn	high	BigFire in PB
04:22 p.m	InjuredPerson	20	Next to the fire a...	Warburger Straße 98 - Paderborn	medium	BigFire in PB
04:30 p.m	MissingPerson	3	Big smoke cannot find my son...	Paderborn	high	
04:33 p.m	Notification	87	It smells very mu...	Paderborn	medium	BigFire in PB
04:35 p.m	FireObserved	12	Mjam Bacon - Fire in...	unknown	low	BigFire in PB

Figure 2 UI concept for visualising alerts & notifications (incl. zoom)

Followed by this concept a first prototype was developed to let emergency services interact with social media in a comfortable way. The relevant parts are summarised in Figure 3. The first functionality is *information gathering*, e.g. to edit your own search criteria based on location and keywords (Examples: you are a commander and need general information of all events (e.g. flood); or: you are a special unit (dike expert) and need special information (e.g. #broken, destroyed, damaged, #dikes, dam, hill, #sandbag)). Based on this, different alerts are displayed in a list (Figure 3, top) as well as on a map (Figure 3, bottom left). Using *filter criteria,* it is possible to filter the notifications/alerts to your specific requirements. The *information quality* is represented by different criteria like timeliness, understandability, believability or completeness (Figure 3, bottom right). A *post popup* includes detailed information and functionality such as sharing, replying and reporting.

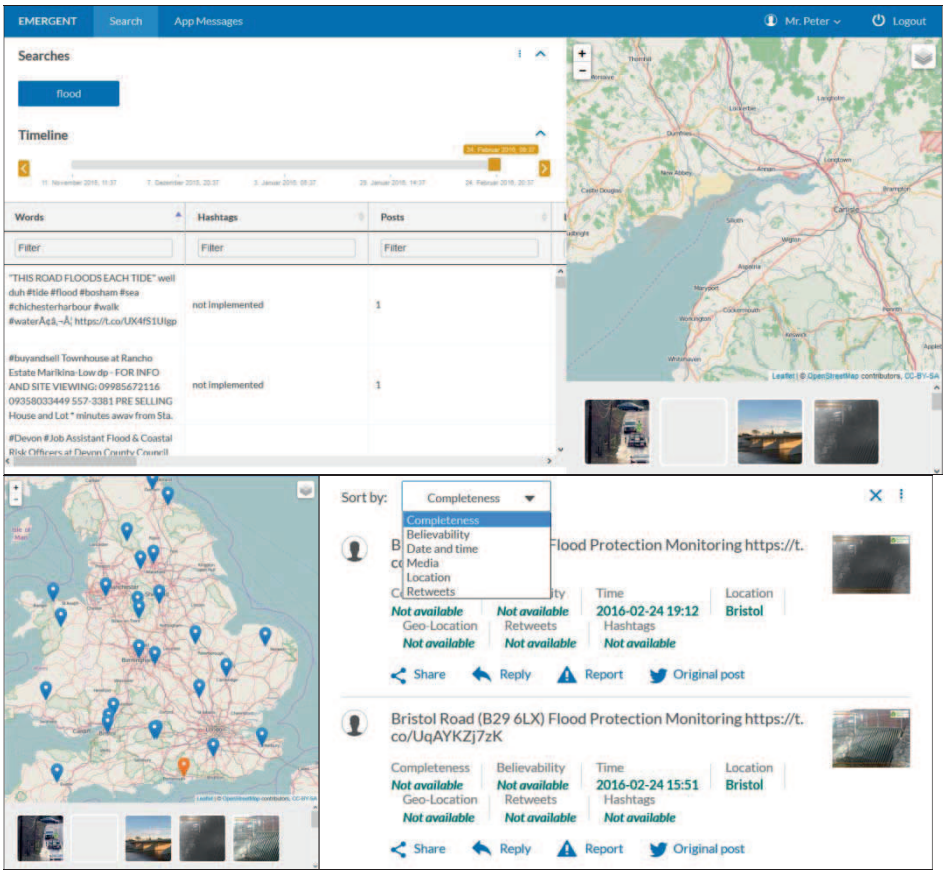


Figure 3: The EmerGent Emergency Service Interface

4 Qualitative Evaluation with Emergency Services

In order to evaluate the concept, we conducted an end user oriented evaluation with the aim to receive feedback from practitioners/emergency services. It followed the structure of a situated evaluation [Tw94] and was carried out in different countries. It is important that we do not focus on feedback such as the change of colour or the size of the system. We mainly wanted to receive feedback on the functionality of the intended system and how it would be of value for their work. The questions were split in two parts: personal details and 10 questions about the system.

4.1 Methodology

Scenarios are recognised as an important strategy towards understanding the interface between the environment and the system as well as a means to elicit and specify software behaviour [Le97]. Broadly, a scenario is an evolving description of situations in the environment. This scenario approach is a part of the evaluation strategy of EmerGent in two different ways. The first one happens in the form of a story about a flood in Germany. The story shows under which real life circumstances social media might provide added value to emergency services and to citizens in distress. The story connects a series of events resulting from the flood regarding the possible uses of social media [Ak16]. The story is a tool to support the interviewer. It helps to introduce the user to the overall situation where the interviewee could use this kind of system. Depending on the individual interviewee, the interviewer decides whether to use the story or not. The second one happens in form of precise examples for every ES-Interface function. It demonstrates a concrete situation in which way this function could be useful. This method builds the system context, which is defined by the context and system boundary [Po09].

The stakeholders are a very important knowledge source to evaluate the system. If important stakeholders are unconsidered, it could have negative effects on the results [Po09]. The above mentioned evaluation was end user oriented, which provides strong basic conditions for the identification of relevant stakeholders. The following stakeholder identification approach is based on an emergency services process analysis. To cover the different ES processes of the countries it is necessary to abstract them. In this case they were related to time- and local-aspects and the rank of the end user. Local-related aspects regard the place and environment where stakeholders work, existing infrastructure and working conditions. This lead to the identification of three working areas: emergency services in the field (e.g. incident commander), an incident support back office (e.g. public-safety answering point (PSAP), incident commander staff) and a general back office or other authorities (e.g. press and public relations). Regarding alerts and notifications two timestamps are relevant: before and after an official emergency call. Before an emergency call one cannot search for a certain event or place. After an emergency call a concrete event in a determined place or area is existent. The rank reflects, in combination with the work years, the experience, education and the perspective to situations. Regarding all these conditions, five relevant roles are identified (Table 1).

These five roles serve as target roles for the selection of the interviewees. In the first evaluation twelve interviews have been conducted within a period of four weeks. All target roles were represented, what was the highest priority in order to get a brought feedback. As the availability of gold level officers is much more limited than silver and bronze, we decided to have them represented in the final evaluation. An overview about the distribution of participants is given in Table2. In total, twelve emergency service staffs (E1-E12) from three countries (Germany, Poland and Slovenia) participated in the

evaluation.

Table 1: identified relevant end-user roles

Role	Command-level			Time-related (emergency-call)		Location-related		
	Gold(strategical)	Silver (tactical)	Bronze (Operational)	Before	After	In the field	Incident support back office	General back office
Emergency service social media manager/team				x	x		x	x
Dispatcher	x	x	x	x	x	x		
Incident commander	x	x	x		x	x		
Incident command staff (special media and press)	x	x	x		x	x	x	
Press and public relations				x	x		x	x

Table 1: Participants

ID	Main role	Command level	Work experience in years	Age
E1	Incident Commander	Silver	Under 5	30-39
E2	Section Leader, Incident Commander	Silver	15+	50-59
E3	Incident Commander, Communication Officer	Silver	15+	40-49
E4	Member of the crew	Silver, Bronze	5-9	20-29
E5	Member of the crew	Silver, Bronze	10-14	40-49
E6	Head/supervisor of organisation	Bronze	15+	50-59
E7	Incident commander	Bronze	5-9	20-29
E8	Head/supervisor of organisation	Bronze	15+	40-49
E9	Member of the crew	Bronze	5-9	30-39
E10	Section leader	Bronze	15+	40-49
E11	Section leader	Bronze	15+	40-49
E12	Member of the crew, PSAP Operator	Silver, Bronze	5-9	30-39

4.2 Results I: Potentials of Alerts and Notifications

First Impression (Q1): Nine of the 12 interviewees liked the presented interface or thought it would be helpful, however three could not see a possible use for it or were not interested. E1 and E3 saw its potential especially for the control centre or the high command, E3 also mentioned the possibility to forward information as very useful. E1

and E8 said that additional information would always be positive. However, the interface still seems to need some improvements as mentioned by E4 and confirmed by E5 with his addition *"when it's finished"*. This is based on the limitations of the current development. E12 was already satisfied with the current state and thought it was *"simple to understand"*. E1 mentioned *"each additional source of information is helpful, but it has to be considered as a tool for a larger scale operation"*.

Potentials (Q2): Almost all participants were able to identify useful potential uses of the ES-interface. This included forwarding information to the head of operations or the officer-in-charge as well as informing the citizens which was mentioned multiple times by the interviewees. Most of them saw its potential mostly for big scale incidents and in getting information directly from the scene. E1, E10 and E12 also saw potential for identifying risks or emergencies beforehand. "*It could be used to define the development of some event via timeline and geo-location. Therefore, it could be useful to predict the future development of some event – so we can plan ahead with the RSue units' deployment, logistics"* (E12). The filtering function and location map were also perceived as helpful by E1 and E12. Just one participant could not see any potential – this was the same user (E9) who thought that the interface would not be useful for them overall.

Most Useful Functionality (Q5): Forwarding information was once again mentioned as one of the favourite functionalities by the interviewees (E1, E2, E3, E7). E8 and E10 found the connection of location and incidents also very useful. E6 and E12 mentioned the option to filter the information through own criteria and therefore extracting useful *"information out of thousands of posts"* (E12).

4.3 Results II: Challenges of Social Media in Emergencies

Weaknesses and Risks (Q3): The main concern expressed in nearly every answer was false information and its impact on operations or the people causing panic. E1 and E12 said that the system cannot be accurate a 100%, ether missing important information due to language barriers or overreaction due to the used wording. E3 thought the main barrier of using the application would include the needed skills in social media and the pure manpower needed to handle the amount of information. Also E1, E2 and E10 mentioned concerns in terms of privacy and data protection: *"Authorities keep citizens and their social media platforms under surveillance. Citizens could feel monitored"* (E1).

Additional Functionality Needed (Q7): Only four participants provided an answer to this question. E2 said that a better connection is needed to other involved actors such as the police or other emergency services, while E3 suggested that the interface needs to distinguish between private and official accounts. Official ones should be treated as more trustworthy and the interface should also allow the user to identify particular accounts as more trustworthy than others.

Challenges of Social Media in Emergencies (Q8): The interviewees saw false information and possible negative consequences on acting on such false information as the main challenges. This is followed by a need to be able to filter out unimportant and unhelpful information, as well as lacking skills in the handling of social media.

4.4 Results III: Impact on the Work

Work Improvement (Q4): The majority of the participants thought that the application could help them, especially in the use case of information and communication. As the additional text answers also showed, it was particularly seen as potentially helpful for big and mass events. Generally, the opinion seems to be positive towards the interface and its capability of supporting the interviewees' jobs. However, the answers differ in which use case it would help but, with the exception of only one, they all got at least six approvals. **(Q9)** The majority of the participants would use the application for the reasons already mentioned in the previous questions; the main reason for not using it was lack of time or not using social media at all. A suggestion mentions: *"keep it simple on the UI and complex in the backend"* **(Q12)**.

5 Discussion and Conclusion

Social media plays a role in emergency management, however the amount of information sometimes exceeds the ability to work with them. Some tools exist to deal with this amount, although fewer systems were tailored for emergency services who do not have time to work with this system in full time (section 2). Therefore – based on related work – our approach comprises alerts, notifications and grouping of messages from social media with a possible relevance for emergency services. These are generated in a semi-automatic way, which means that the generation progress is adjustable to the individual needs of the officer in charge (section 3). As a contribution of this article, a system, including this functionality, has been evaluated (section 4), detecting the following findings (table 1):

Table 2: Summary of the findings

Aspect	Summary
Potentials	forwarding information to the head of operations, identifying risks, filtering using own criteria – precise information (notifications) are needed (Q2, Q5), especially in mass events (Q4), semi-automatic approaches can help
Weaknesses	false information (Q3) and negative consequences (Q8)
Final remarks	"keep it simple on the UI and complex in the backend" (Q10)

The majority of the participants expressed a positive attitude towards the ES-interface and they see potential for supporting them in their work. Only a few did not think it would be helpful, mostly because they do not have the time to use it or are not familiar with social media at all. Interviewees thought that being able to forward social media information to others is one of the most useful features and they wanted the interface to allow them to communicate with other services and organisations involved in crisis situations. Another positively perceived feature is filtering: it helps ES to deal with the massive amount of posts and therefore allows focusing on the helpful information only. On the other hand, participants thought that this might also be problematic, as an automatic system cannot replace the human expertise and might therefore lead to missing important information. In this context, E1 and E2 recommend to check the EmerGent information in the back office (e.g. public-safety answering point) by using humans and to share relevant information with the incident commander. However, EmerGent notifications are meant to do this in a semi-automatic way. Unfortunately, most participants were not able to answer the question about the EmerGent notification as it was impossible to demonstrate this in the current version of the interface.

The main challenge and problem of social media use in general, in emergency services and in crisis situations at all, is the possibility of false information and how this could lead to wrong decisions during a crisis. Interviewees were worried that false information or rumours shared via social media could cause panic – this was one of the main reasons why many were reluctant to rely on social media during emergencies. In future work we aim to improve our system in order to detect alerts even more appropriate and to address the weaknesses.

Acknowledgements

The research project EmerGent was funded by a grant of the European Union (FP7 No. 608352). This article is based on Deliverable 3.7 “Potentials of Social Media Usage by EMS and citizens’ involvement in the EMC enabled by EmerGent”.

References

[Ak16] Akerkar, Rajendra; Friberg, Therese; Amelunxen, Christoph: EmerGent Deliverable 3.5: User Requirements, Version 2. Paderborn, 2016

[HP13] Hiltz, SR; Plotnick, Linda: Dealing with Information Overload When Using Social Media for Emergency Management: Emerging Solutions. In: Proceedings of the Information Systems for Crisis Response and Management (ISCRAM). Baden-Baden, Germany, 2013, S. 823–827

[Ka12] Kaewkitipong, Laddawan; Chen, Charlie; Ractham, Peter: Lessons Learned from the Use of Social Media in Combating a Crisis: A Case Study of 2011 Thailand Flooding Disaster. In: Proceedings of the International Conference on Information Systems (ICIS).

Orlando, USA, 2012, S. 1–17

[Ka11] Kavanaugh, Andrea; Fox, Edward A; Sheetz, Steven; Yang, Seungwon; Li, Lin Tzy; Whalen, Travis F.; Shoemaker, Donald; Natsev, Paul; u. a.: Social Media Use by Government: From the Routine to the Critical. In: Proceedings of the International Digital Government Research Conference. Maryland, USA, 2011.

[Ke10] Keim, Daniel; Mansmann, Florian; Thomas, Jim; Keim, Daniel: Visual Analytics : How Much Visualization and How Much Analytics ? In: ACM SIGKDD Explorations Newsletter Bd. 11 (2010), Nr. 2, S. 5–8 — ISBN 1931-0145

[Le97] Leite, J C S P; Rossi, G; Balaguer, F; Maiorana, V; Kaplan, G; Hadad, G; Oliveros, A: Enhancing a requirements baseline with scenarios. In: Requirements Engineering, 1997., Proceedings of the Third IEEE International Symposium on, 1997, S. 44–53

[Lu15] Ludwig, Thomas; Reuter, Christian; Siebigteroth, Tim; Pipek, Volkmar: CrowdMonitor: Mobile Crowd Sensing for Assessing Physical and Digital Activities of Citizens during Emergencies. In: CHI '15: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. Seoul, Korea : ACM Press, 2015, S. 4083–4092

[Mo15] Moi, Matthias; Friberg, Therese; Marterer, Robin; Reuter, Christian; Ludwig, Thomas; Markham, Deborah; Hewlett, Mike; Muddiman, Andrew: Strategy for Processing and Analyzing Social Media Data Streams in Emergencies. In: Proceedings of the International Conference on Information and Communication Technologies for Disaster Management (ICT-DM). Brest, France, 2015

[Pl15] Plotnick, Linda; Hiltz, Starr Roxanne; Kushma, Jane a; Tapia, Andrea: Red Tape : Attitudes and Issues Related to Use of Social Media by U . S . County- Level Emergency Managers. In: Proceedings of the Information Systems for Crisis Response and Management (ISCRAM). Kristiansand, Norway, 2015

[Po09] Po, Klaus: Basiswissen requirements engineering. Aus- und Weiterbildung zum Certified Professional for Requirements Engineering : dpunkt, 2009

[Po13] Po, Daniela: Social Media Analysis for Crisis Management: A Brief Survey. URL http://stcsn.ieee.net/e-letter/vol-2-no-1/social-media-analysis-for-crisis-management-a-brief-survey.

[Re12] Reuter, Christian; Marx, Alexandra; Pipek, Volkmar: Crisis Management 2.0: Towards a Systematization of Social Software Use in Crisis Situations. In: International Journal of Information Systems for Crisis Response and Management (IJISCRAM) Bd. 4 (2012), Nr. 1, S. 1–16

[RS14] Reuter, Christian; Scholl, Simon: Technical Limitations for Designing Applications for Social Media. In: Koch, M.; Butz, A.; Schlichter, J. (Hrsg.): Mensch & Computer 2014: Workshopband. München, Germany : Oldenbourg-Verlag, 2014, S. 131–140

[Re13] Reuter, Christian; Heger, Oliver; Pipek, Volkmar: Combining Real and Virtual Volunteers through Social Media. In: Comes, T.; Fiedrich, F.; Fortier, S.; Geldermann, J.; Müller, T. (Hrsg.): Proceedings of the Information Systems for Crisis Response and Management (ISCRAM). Baden-Baden, Germany, 2013, S. 1–10

[Re14] Reuter, Christian: Emergent Collaboration Infrastructures: Technology Design for Inter-Organizational Crisis Management (Ph.D. Thesis). Siegen, Germany : Springer Gabler,

2014 — ISBN 978-3-658-08585-8

[Re15a] Reuter, Christian; Ludwig, Thomas; Friberg, Therese; Pratzler-Wanczura, Sylvia; Gizikis, Alexis: Social Media and Emergency Services? Interview Study on Current and Potential Use in 7 European Countries. In: International Journal of Information Systems for Crisis Response and Management (IJISCRAM) Bd. 7 (2015), Nr. 2

[Re15b] Reuter, Christian; Ludwig, Thomas; Ritzkatis, Michael; Pipek, Volkmar: Social-QAS: Tailorable Quality Assessment Service for Social Media Content. In: Proceedings of the International Symposium on End-User Development (IS-EUD). Lecture Notes in Computer Science, 2015

[Re15c] Reuter, Christian; Ludwig, Thomas; Kaufhold, Marc-André; Pipek, Volkmar: XHELP: Design of a Cross-Platform Social-Media Application to Support Volunteer Moderators in Disasters. In: Proceedings of the Conference on Human Factors in Computing Systems (CHI). Seoul, Korea : ACM Press, 2015

[Re16] Reuter, Christian; Ludwig, Thomas; Kaufhold, Marc-André; Spielhofer, Thomas: Emergency Services Attitudes towards Social Media: A Quantitative and Qualitative Survey across Europe. In: International Journal on Human-Computer Studies (IJHCS) (2016)

[RV14] Ruggiero, Aino; Vos, Marita: Social Media Monitoring for Crisis Communication: Process, Methods and Trends in the Scientific Literature. In: Online Journal of Communication and Media Technologies Bd. 4 (2014), Nr. 1, S. 105–130

[St14] Stieglitz, Stefan; Dang-Xuan, Linh; Bruns, Axel; Neuberger, Christoph: Socialmedia analytics. In: Business and Information Systems Engineering Bd. 6 (2014), Nr. 2, S. 89–96

[Sh10] Sheth, Amit; Purohit, H; Jadhav, A; Kapanipathi, P; Chen, L: Understanding events through analysis of social media. In: The Ohio Center of Excellence in Knowledge-Enabled Computing (Kno.e.sis) (2010), S. 1–4

[Tr15] Trateral Research & Consulting: Comparative Review of Social Media Analysis Tools for Preparedness. URL http://Trateralresearch.com/wp-content/uploads/2015/08/GDPC_SMAT_Short-Report-for-GDPC_Final.pdf

[Tw94] Twidale, Michael; Randall, David; Bentley, Richard: Situated evaluation for cooperative systems Situated evaluation for cooperative systems. Lancester, UK, 1994

Appendix: Evaluation Questions

Part I: Personal Details

1. What type of organisation do you work for?
2. What is your main role (the role you spend most time on) in this organisation?
3. What is your command level?
4. How many years have you been working for Emergency Services?
5. What is your age?

6. What is your gender?
7. What country do you live in?

Part II: 10 Questions on the Application

1. What is your first impression?
2. What potentials does the application involve?
3. What weaknesses and risks does the application have? How could they be improved?
4. Would a final version of the application help you doing your job better? In which use cases (not)?
5. What functionality of the application do you find most useful?
6. What is your evaluation of the "EmerGent Notifications" (summary of social media posts) and of the "Information Quality"?
7. Is there any additional functionality you would like the application to have?
8. What are the greatest challenges of using social media in emergencies?
9. If the application was operationally available, would you use it? Why (not)?
10. Do you have final remarks?