# The Impact of Social Media for Emergency Services: A Case Study with the Fire Department Frankfurt

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## ABSTRACT

The use of social media is not only part of everyday life but also of crises and emergencies. Many studies focus on the concrete use of social media during a specific emergency, but the prevalence of social media, data access and published research studies allows the examination in a broader and more integrated manner. This work-in-progress paper presents the results of a case study with the Fire Department Frankfurt, which is one of the biggest and most modern fire departments in Germany. The findings relate to social media technologies, organizational structure and roles, information validation, staff skills and resources, and the importance of volunteer communities. In the next step, the results will be integrated into the frame of a comparative case study with the overall aim of examining the impact of social media on how emergency services respond and react in an emergency.

## Keywords

Social media, emergency services, facilitators and obstacles, comparative case studies.

## INTRODUCTION

For almost 15 years, social media has been part of everyday life, also appearing in critical situations (Reuter & Kaufhold, 2017). Already after the 9/11 attacks in 2001, citizens created wikis to collect information about missing people (Palen & Liu, 2007), and FEMA and the Red Cross used web-based technologies to inform the public and to provide status report internally and externally (Harrald et al., 2002). Many studies focus on the concrete use of social media during a specific emergency, such as the 2011 London riots (Denef et al., 2013), the 2012 hurricane Sandy (Hughes et al., 2014) or the 2013 European floods (Reuter et al., 2015). These studies demonstrate specific ways in which social media responded to various crises. However, the high prevalence of social media, data access via social media API's and published research studies allows the application of methods for examining social media during emergencies in a broader and more integrated manner. Amongst these methods are comparative case studies (Yin, 2013), representative surveys and systematic literature reviews (Brocke et al., 2015).

This work-in-progress paper presents the results of a case study with the Fire Department Frankfurt, which, in the next step, will be integrated into the frame of a comparative case study with the overall aim of examining the impact of social media on how emergency services respond and react in an emergency. After a concise literature review (section 2), the paper presents the key findings of a pre-study whose results informed the scoping of the comparative case study (section 3). Thereafter, the design and results of the case study with the Fire Department Frankfurt are presented (section 4). Finally, the conclusion outlines the key findings of the case study (section 5).

## FOUNDATIONS

Social media use in emergencies has become a very big research field, sometimes summarized under the term *crisis informatics*. Coined by Hagar (2007) and later elaborated by Palen et al. (2009), it "views emergency response as an expanded social system where information is disseminated within and between official and public channels and entities". Today, crisis informatics "is a multidisciplinary field combining computing and social science knowledge of disasters; its central tenet is that people use personal information and communication technology to respond to disaster in creative ways to cope with uncertainty" (Palen & Anderson, 2016).

In the last years, plenty of case studies on emergency services' perception, enablers, barriers and actual use of social media were published. On the one hand, there is a positive attitude towards the use of social media and, for instance, the majority of US authorities already use social media as they value its suitability for information dissemination (San et al., 2013). This includes warnings, advice and guidance on how to cope with or prevent emergencies or disasters, hints and advice on how to behave during an emergency, coordination of the help of volunteers, summary information after an emergency, and coordination of clean-up activities (Reuter et al., 2016). Furthermore, a study on 2012 hurricane Sandy reported that communication differed between fire and police departments and across media types (Hughes et al., 2014).

However, on the other hand, a study observed that authorities use social media comparably less to receive messages (Reuter et al., 2016). The perceived unreliability of such information (Mendoza et al., 2010), organizational prohibitions and a lack of formal policies to guide the use of social media (Plotnick et al., 2015) are significant obstacles in exploring opportunities of integrating citizen-generated content (Mendoza et al., 2010). Hughes and Palen (2014) complement the challenges of verification, liability, credibility, information overload, and allocation of resources. Thus, several applications and methods were developed and examined to integrate citizen-generated content and support authorities in processing social media content. For example, Moi et al. (2015) propose a system to process and analyze social media data, transforming the high volume of noisy data into a low volume of rich and high-quality content that is useful to emergency personnel. However, further research is required to foster good practice of social media use and related technology, and to overcome the barriers and challenges from the perspective of emergency services and across cultural boundaries.

## PRE-STUDY: COMPARATIVE CASE STUDY ON FLOOD SCENARIOS

### Methodology

The overall aims of the pre-study, which focused on the theme of 'flooding', were researching a) the impact of social media on how emergency services (ES) respond and react in an emergency and b) how citizens use social media in an emergency, how they use it to interact with each other and others, including ES, and what impact this has on them (Spielhofer et al., 1016). The pre-study is based on a 'multiple case study' approach which allows for exploration of the impact of social media in emergency situations through the use of a 'replication strategy', in which successive case examples are selected to explore and confirm or disprove the patterns identified in the initial case examples (Yin, 2013).

In a preliminary analysis (Junge et al., 2014), five themes were identified, which formed the specific research questions and study objectives, which are a) patterns of social media usage, b) social media roles, c) quality of information, d) scale of social media information and e) organizational and professional factors. The case study methodology was based on the three interconnected stages of scoping, data collection, analysis and integration. The findings from the different flood case studies (2013 Elbe in Germany, 2015 Tbilisi in Georgia, 2014 Ljubljana in Slovenia, 2010 Wroclaw in Poland, 2014 Western Norway floods, and 2013/14 Wiltshire in UK) were summarized in standardized case study reports and finally analyzed comparatively using an item analysis procedure. The results serve as foundation of the methodology and topics of this case study.

### Key Findings

#### *Use of social media in flooding emergencies*

The level and purposes of social media use and the roles of different actors involved varied considerably from case to case (Hughes et al., 2014). In the German case (Kaufhold & Reuter, 2016), Twitter was used as a platform for status updates and Facebook pages were mostly used by volunteer communities to provide an overview of the situation, to coordinate response efforts and to filter the vast information supply. In Tbilisi, social media was used during and after the flood to post pictures and videos, to inform other people on the scale of the disaster, to contact friends, to find information on the safety of specific areas and road access, to trace needs, and to offer help. In Ljubljana, the emergency services used social media to send out warnings and information during the flood, mainly through Facebook and Twitter.

#### *Information quality and the impact of 'rumors'*

In the Tbilisi case, initially, social media provided an immediate picture of what was happening, in contrast to conventional media, which were much slower to respond. However, inaccurate information was a major problem; the rapid and wide distribution of rumors caused greater panic and fear. Yet, a 'self-correcting' mechanism was

identified, where other citizens used social media mainly to highlight false and misleading information. In the Wroclaw case, the evidence suggests that citizens were motivated by a desire to provide specific and useful information regarding the flood situation and the information disseminated through social media was generally of high quality. However, from the perspective of the emergency services, issues were still raised regarding the veracity and credibility of the information circulated through citizen to citizen communication.

*Scale and impact of social media data for emergency management*

The key impacts of the use of social media during and after the analyzed flooding emergencies can be summarized as (1) more efficient and effective coordination of information by volunteers, often in real-time, on events related to the flooding; (2) more effective and fast dissemination/broadcasting of timely information on what was happening more widely by emergency services and volunteers; (3) providing emotional support and solidarity, particularly among citizens and (4) demonstrating the potential of social media in improving the effectiveness of emergency services' responses, and, in some cases, promoting changes in organizational systems and processes.

*Obstacles to the use of social media*

The case study analysis highlighted four main sets of obstacles to the use of social media in emergencies: (1) lack of organizational structures and procedures in place – on the whole the structures and networks already developed in emergency services to support the use of social media were limited; (2) lack of resources, staff and skills – for example respondents in Western Norway emergency services reported that they had virtually no personnel trained in using social media, and a corresponding lack of tools and expertise; (3) lack of systems and procedures to deal with information overload; and (4) verification of information – services were often not confident about the veracity of the information circulated through social media.

## CASE STUDY: SOCIAL MEDIA TECHNOLOGIES OF THE FIRE DEPARTMENT FRANKFURT

### Background and Methodology

Since 1874, Frankfurt am Main has a professional fire department, the Fire Department Frankfurt (FDF), that is one of the biggest and most modern professional fire departments in Germany. Employing approximately 1,000 people, this fire department is also one of the biggest public offices in the city administration of Frankfurt am Main (W1). With a population of 732,000, Frankfurt is both the biggest city in the German federal state of Hessen and the fifth-largest city in Germany (W2). Twelve fire and rescue stations, organized in four groups, are spread throughout the urban area. Additionally, further 900 active members work in 28 volunteer fire departments to supplement with the tasks of fire protection, rescue service and technical danger prevention. In Frankfurt, the fire department coordinates every non-police hazard prevention unit.

The aim of this case study focuses on researching the impact of social media on how emergency services respond and react in an emergency. Based on the results of the pre-study, the objectives of this study comprise emergency services' a) tools, platforms or technologies, b) organizational structures and facilitators, c) social media users and uses, d) information validation, e) staff skills and resources, and f) moderation of volunteer communities. It is intended to contribute to another 'multiple case study' round of successive case examples to explore and confirm or disprove the patterns identified in the initial case examples (Yin, 2013) and, if all or most of the cases provide similar results, to develop a preliminary theory that describes the phenomena (Eisenhardt, 1989).

By recommendation of a consortium member of the EmerGent project (http://fp7-emergent.eu/), we approached the FDF by performing a short key informant interview (K1) with the head of the press and public relations department to get a general overview of the organization, their social media use and available documents of interest. Thereafter, we conducted two in-depth interviews (I1, I2) with one of their press spokesmen who is responsible for social media use. For each of the study's objectives, 2-4 related questions were integrated into the interviews (see appendix). Furthermore, source material of social media presences (Facebook, Instagram, YouTube, Twitter), their website (W1), Wikipedia for basic information about Frankfurt (W2) and FDF (W3), and a video presentation (V1, https://www.youtube.com/watch?v=ieU6TVCjAcU), which addresses the social media strategy of FDF including a Q&A session, were analyzed. Interviews were audio-recorded and transcribed for further analysis. In our subsequent analysis we employed "open" coding (Strauss & Corbin, 1998), i.e. gathering data into approximate categories to reflect the issues raised by respondents based on repeated readings of the data and its organization into "similar" statements. The identified themes were then processed according to the structure of the following results section to enable comparability with upcoming case studies. While the analysis was conducted in German, the quotes selected for this article were translated into English by the authors.

**Findings**

*Social Media Tools, Platforms or Technologies: Usage, Strengths and Weaknesses*

The opening of the European Central Bank (ECB) in 2015 in Frankfurt was a significant event that made the FDF realize the need to take the use of social media for communicating with citizens more seriously (I1, 14:05). During that event, multicultural protesters not only attacked police but also relief forces such as the fire services and with the help of social media communication, the FDF could reduce the attacks on relief forces. They now see *s*ocial media as a central part of their daily routine: "We consider the use of social media to be essential." Therefore, they differentiate between the real and the virtual situation of an operation. The real situation includes, for example, actions undertaken by emergency personnel in the context of an emergency. The virtual situation depends on context and public interest. For operational communication, *Twitter* is used as a central key tool, not only to provide current information about ongoing operations, but also to warn citizens in dangerous contexts such as fire (K1). In March 2015 and a few days after the ECB riots, its use was promoted with a 24-hour campaign using the hashtag *#24h112* where FDF posted tweets about their daily routine: everyday life, operations and training units (V1, 12:10).
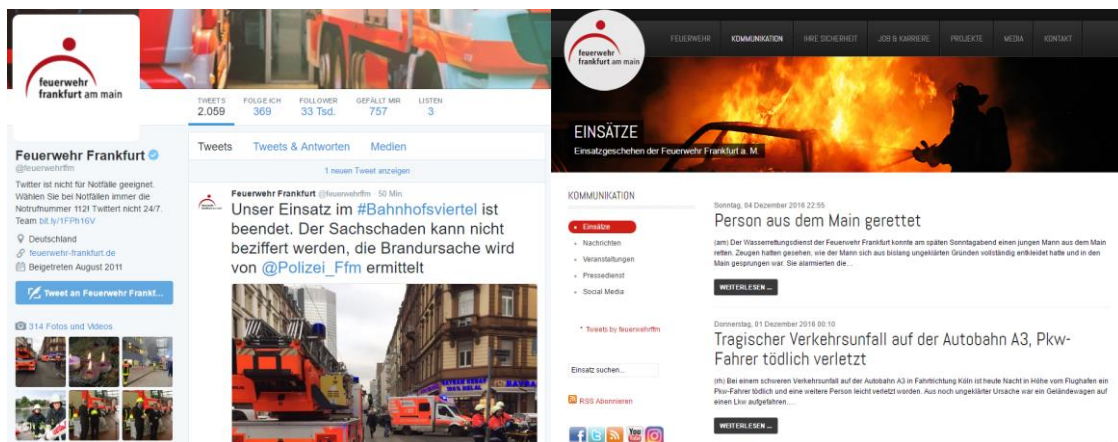


**Figure 1. Twitter account and website of the Fire Department Frankfurt**

However, for traditional organizational communication (I1, 03:15), for instance, to recruit talented young employees, FDF uses *Facebook*, *Instagram* and *YouTube*. Especially Facebook was intended to represent FDF as an employer and in 2015, for instance, Markus Röck reported the receipt of about 800 applications for 40 open positions (V1, 08:00). Contrary to the Feuerwehr München (Fire Service Munich), they deliberately decided to not put operation reports to Facebook, because they saw conflict potential between the reports, which may contain information about deaths, and the like button mechanism, and therefore anticipated a high effort of moderation. Instead, FDF directs all communication to their lead channel Twitter (I2, 09:20). Instagram and YouTube, then again, depict the different units of the fire department, their areas of responsibility, interviews and practical exercises. The same applies to Facebook, where additional pictures provide insight into different exercises. The FDF maintains a **website** with the goal to inform people and to facilitate communication. In Twitter, links to operation reports and in Facebook, security advices of the website are often embedded into messages.

**Table 1.  Social Platforms of Feuerwehr Frankfurt (4th of January 2017)**

|              | Facebook               | Instagram              | Twitter                    | YouTube                | Website                                    |
| ------------ | ---------------------- | ---------------------- | -------------------------- | ---------------------- | ------------------------------------------ |
| Start        | February 2013          | October 2016           | August 2011                | August 2012            | December 2011                              |
| Reach        | 61808 sub.             | 3238 sub.              | 39979 followers            | 2169 sub.              | 442482 visitors                            |
| Publication  | 542 posts              | 39 pictures            | 2106 tweets                | 26 videos              | 215 news                                   |
| Purposes     | Publicity, recruitment | Publicity, recruitment | Operational communication  | Publicity, recruitment | Publicity, recruitment, safety information |

For both monitoring and analysis of social media content, FDF uses *TweetDeck*, a dashboard application for the management of Twitter accounts, due to its real-time capability in terms of monitoring keywords and hashtags and free access. However, it is not used 24/7 because emergency calls are assumed as staring points for monitoring in relevant situations. Since the volume of social media data does not allow monitoring of unfiltered data, FDF

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uses different search strategies to find essential and relevant information with TweetDeck, e.g. reducing the number of sources (e.g. monitoring important media agencies only), filtering for tweets with a certain propagation (e.g. tweets that were retweeted at least 10-20 times) or using keywords with query operators if the user is familiar with it and the emergency allows to spend time on refining the search term (I2, 03:40). Finally, for internal direct communication, the FDF uses messengers such as *Telegram* that are encrypted and meet the industry standards in terms of messenger communication (I1, 26:36).

Several events such as the opening of the ECB in Frankfurt in March 2015 highlighted the main strengths of social media (I1, 14:05): "These networks provide the possibility to influence and control real-life behavior." Another positive effect was shown in the context of refugee aid in September 2015 when social media calls were used to mobilize spontaneous volunteers and delegate many suitable tasks accordingly (I1, 14:05). Moreover, communication and coordination of the public via social media is often much faster than traditional channels, supporting rapid information delivery and response. However, this also means that people that are dissatisfied with the work of FDF or disappointed can also react faster and distribute their opinion on the internet. Hence, it can be said that the increased speed of communication puts the FDF under pressure. Furthermore, the FDF does not have sufficient personnel resources and thus has problems to invest the time needed (I1, 20:39).

**Table 2. Pros and Cons of Social Media Use**

| Pros | Cons |
|---|---|
| Influence and control real-life behavior | Limited personnel and time resources |
| Rapid delivery of and response to information | Pressure due to fast information response |
| Reach, e.g. providing information for journalists and press | |
| Personnel recruitment | |
| Public image maintenance | |
| Operational communication (esp. Twitter) | |

In terms of the social media tools, FDF values the real-time capabilities for monitoring keywords and hashtags, the integrated filtering options and the free access of TweetDeck. They also analyzed commercial solutions such as Brandwatch, a social media monitoring tool, which are too expensive and whose target groups are not organizations such as fire departments (I1, 06:50). However, TweetDeck only supports Twitter, and citizens may publish relevant information, including media such as pictures or videos, on different social media. The "optimal" social media tool should provide a good overall usability, capabilities to pre-structure actions and content, the flexibility to adapt it to the current emergency, support for all relevant social media, and possibilities to capture the mood of citizens. He concludes that current systems are too expensive, not operational enough and more suited for medium- or long-term observations but not for emergencies (I2, 06:28).

*Organizational Structure and Facilitators: Integration, Enablers, Barriers and Resistance towards Social Media*

Social Media is a central part of FDF's organizational structure and integrated into their everyday practice and operational plans. Three departments are subordinated to the head of office: 1) Press and public relations, 2) staff council and equal opportunities officer, 3) hazard prevention and 4) infrastructure. The access to and the use of organizational social media accounts are restricted to **press spokesmen** working for the press and public relations department (I1, 12:49). The respective staff is trained appropriately to use social media as a standard procedure in emergencies. As press spokesmen are connected technically 24/7 via laptops, mobile phones and tablets, they can immediately react to emergencies, regardless of whether the person is at home or at the deployment site (I1, 06:50). Another factor is that almost everybody within the organization uses social media privately and thus the whole workforce of 1900 people operates as a "search algorithm" and contributes to monitoring activities (I1, 11:16). A further factor is that, although the fire department is a strongly hierarchical organization, they established an organizational structure which enables press spokesmen to disseminate tweets quickly without administrative barriers that could hinder the timely dissemination of relevant information (V1, 30:50). Thus, a progressive organizational culture is required to enable a successful integration of social media.

However, the limited budget and personnel resources do not allow to communicate over and monitor social media full-time, because press spokesmen also must fulfill regular fire department duties and interact with traditional media (V1, 26:00). A press spokesman indicated that some employees may not like social media or feel overrun by the technology (I1, 20:39). However, due to the organization's hierarchical structure this is not an issue because the employees follow instructions from the top management, which demands the use of social media (I1, 33:42). Therefore, the employees comply with the requirements. It is worthwhile to mention that FDF is a big fire

department with a focus on communication. They hired a former Twitter employee to teach the employees in using social media for their communication. Furthermore, a press spokesman indicates that they are creating documents to formalize existing problems, strategies to overcome them, and related tasks, measures and tools (I1, 35:10). However, these documents are more like a comprehensive checklist currently, but an integrated concept, which allows to implement an effective and quick use of social media, is still missing. Some remaining questions are: What is operatively relevant information in social media? How can we aggregate and integrate the information to improve the picture of the emergency and to influence decisions? What are the potentials of social media in (daily) medium and large-scale emergencies?

### Social Media Users and Uses: Types of Staff, Information and Roles

Only press spokesman have access to organizational social media accounts and therefore can use social media over official channels. However, employees, especially from the voluntary fire departments, contribute using their private social media accounts by actively sending potentially relevant information or passively being monitored (I1, 11:16). FDF explicitly publishes operational information on Twitter not only to provide reliable information for the general population, journalists and the press, but also to increase the reach with the presence of the channel in traditional media. Moreover, volunteers may perform basic tasks during emergencies, but due to insufficient personnel resources, it is not appropriate to use social media „to keep the citizens onboard" and to organize groups of volunteers: "Spontaneous volunteers are employed spontaneously and otherwise they should become part of a volunteer fire department."

FDF is especially interested in the public mood of citizens (I2, 06:28) and potential rumors or misinformation (I1, 03:15) to prevent negative influence from the virtual realm on the real emergency. Furthermore, it is important to identify misinterpretations of the situation to counter a potential loss of trust (I2, 11:26). From the analysis of the November 2015 Paris attacks and 2016 Munich shooting, FDF sees the necessity to establish a *lead communication* which means adopting the moderating role in the current emergency and providing information to citizens in sufficient quantity and speed. To establish the lead in such situations, the population's trust is required, but it is perceived as an opportunity to control and counter rumors or misinformation (I1, 14:05).

### Information Validation: Credibility of Information, Procedures of Validation and Technological Support

Although TweetDeck is used for monitoring social media, FDF does not use a special tool with information validation components (K1). In a research project, they furthermore examine an information quality approach for filtering social media content based on the 1) geolocation of the user, 2) credibility of the source, 3) relevance of the source, 4) credibility of information and 5) relevance of information (I2, 15:36). Using this approach, each component is assessed with a score and the person responsible for emergency communication can define a threshold to filter information: "At the beginning of an emergency, I just want to see information with a relatively high score in terms of credibility and relevance. With an increasing number of staff involved, however, the threshold could be reduced to get a more comprehensive picture of the incoming information" (I2, 15:36). Furthermore, tools must support the fast identification of low quality posts, misinformation and rumors to implement a fast information policy, which allows to counter these (I1, 14:05) and to establish a lead communication.

### Staff Skills and Resources

A general rule of FDF requires that personnel must perform communication tasks in the daily routine to be prepared for communication during emergencies (I2, 28:06). Some of the relevant skills identified by FDF to find, interpret and use social media are a) an understanding of different social media networks, corresponding tools and their characteristics, b) skills to keep up with the development of technology, its new variations and fields of deployment, and c) socio-psychological strategies on how to counter irrational behavior in social networks. From the perspective of resources, multiple positions are required that explicitly deal with the topic of social media communication to ensure a good social media performance continuously as well as to develop and improve best practices and guidelines (I1, 20:39).

Although a former employee of Twitter is currently responsible for increasing the employees' skills, it is very difficult to expand the employees' expertise due to the rapid development of technology, new variations and fields of deployment over the recent years, making it hard to exploit the maximum potential of social media yet (I1, 20:39). Furthermore, the necessary personnel resources are limited. Although there is a motivated team dealing with social media, administrating daily work is very time-consuming so that "it is very difficult to invest the time necessary to deal with social media conceptually" (I1, 20:39). According to a press spokesman, the inertia and the salary structure of the public service prevents an effective and efficient competence development. Therefore, FDF

also considers the deployment of Virtual Operation Support Teams (VOST) and, furthermore, guidelines for the use of social media in emergencies that are valid across organizations would help the (inter-)organizational overcoming of emergencies. A press spokesman proposes the establishment of a central institution which "analyzes emergencies, reveals problems, develops solution strategies and recommends tactical measures in terms of a catalogue of measures which is available for all federal states, municipalities and districts" (I1, 20:39).

*Moderating Communities: Importance, Engagement, Support and Cooperation*

During the 2013 European floods and even more during the September 2015 refugee aid, FDF realized the value of spontaneous volunteers in performing a variety of required "non-hazardous" tasks. In the latter case, volunteers performed some special tasks (e.g. interpreting/translation), but in tendency more general tasks that require no specialization (e.g., supervision) (I2, 31:16). A press spokesman emphasizes that social technologies enable volunteers to organize much faster than previously, which constitutes a novelty (I1, 23:50). Furthermore, the engagement with communities depends on the scale of the emergency, which can be an isolated event or affect a large area. In the latter case, the federalism of Germany constitutes an issue to create comprehensive interaction concepts: Because fire departments are municipal organizations and, in this case, as soon as the emergency exceeds the borders of Frankfurt, the handling of outside areas comes under the responsibility of other organizations which may implement other interaction concepts (I1, 20:39).

Social media communities are handled as autonomous units. During refugee aid, for example, FDF established a tentative operations center together with the federal police, the German Railways and selected contact persons of volunteer communities. For improved engagement, FDF considers the deployment of VOST: "Because we have volunteer fire departments all over the town with honorary employees that work in different environments of their regular jobs, we just need to search those with basic skills in communication and the respective technology to build up displaced teams" (I1, 26:36). These displaced teams then could be activated as VOST and provided with self-coordination tasks via the internet during large-scale emergencies (I2, 31:16). Moreover, social media, traditional media and press can provide guidance, increase the public perception of volunteer communities and therefore help maintaining their motivation over an extended period (I2, 33:06). The presented VOST approach could be applied to create stronger connections and trust with citizens and citizen communities through mutual support in overcoming the emergency (I1, 26:36).

## CONCLUSION AND OUTLOOK

This paper presented, based on a literature review and pre-study, the results of a case study with the Fire Department Frankfurt (FDF). The FDF uses Twitter as lead channel for operational communication while complete operation reports are available at (and linked via Twitter to) the official website. Facebook, Instagram and YouTube are primarily used for public image maintenance and employee recruitment, but occasionally for the dissemination of safety advices by linking the respective content from their website. Besides the above-mentioned purposes, the possible influence and control of real-life behavior, the reach (e.g. in combination with journalists, press and traditional media) and the integration of spontaneous volunteers are recognized as strengths of social media. Contrary, the limited personnel and time resources and the pressure to act due to fast information response were mentioned as weaknesses of social media. TweetDeck is not used for social media monitoring 24/7 but on demand during emergencies. Commercial solutions such as Brandwatch were analyzed by FDF but are too expensive and, as they are not optimized for emergency services, do not fulfill the requirements of FDF. However, the need for an information quality application tailored for emergency services became apparent and they are already putting research effort into this issue.

This case study provides insights for practitioners on the successful organizational integration of social media and still existing challenges. The most important aspect is that social media is an integrated part of the organizational culture and structure of FDF. Press spokesmen exclusively manage social media communication, using the lead channel of Twitter, directly without administrative barriers that could hinder the timely dissemination of relevant information. The basic guidelines on social media use, the coaching of a former Twitter employee and the hierarchical structure ensure the adaption of social media. The FDF proposes the establishment of a central institution, which "analyzes emergencies, reveals problems, develops solution strategies and recommends tactical measures in terms of a catalogue of measures which is available for all federal states, municipalities and districts". These could help overcome inter-organizational work, especially if an emergency overlaps different areas of responsibility, and improve the integration of spontaneous volunteers. Spontaneous volunteers and social media communities are valued as important stakeholders in overcoming emergencies or large-scale disasters, but due to limited resources, it is impossible to moderate them all. However, the FDF thinks about implementing VOST teams based especially on the (personal) networks of honorary employees of the volunteer fire departments, but additional research is required concerning the optimal implementation and evaluation of VOST.

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The study has some limitations. Firstly, besides the analyzed documents, interviews with one press spokesmen constitute the primary source of information. However, social media use at the FDF is restricted to press spokesmen who are a small group following the same social media guidelines, and the interviews with managerial staff provided insight into the underlying decision-making processes. Secondly, the study only provides limited insight into an ongoing comparative case study; the need for additional information and interviews, including other organizational roles, with the FDF may become apparent during preliminary analysis of the other planned case studies. After conducting the individual cases, similar to the pre-study, the case of FDF will be integrated and further analyzed in the frame of the comparative case study to confirm or disprove the patterns identified in the initial case examples (Yin, 2013).

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## APPENDIX: INTERVIEW GUIDELINE

Theme 1: Social media tools, platforms and technologies

1. How does your organisation access/analyse social media currently?
2. What specific tools do you use?
3. When are they used?
4. Who uses them?
5. For what purposes are they used?

Theme 2: Organisational structures and facilitators

1. In what ways and to what extent is the use and analysis of social media integrated into your organizational structures and systems?
2. To what extent does this facilitate or hinder the use of information gained from social media?
3. What would you say are the main barriers to the widespread and systematic use of social media in your organisation?
4. How do you think these barriers could be eliminated or reduced?
5. What specific things would you say could facilitate the use of social media by your organisation in general?

Theme 3: Social media users and uses

1. Which types of staff in your emergency services are most likely to look for information on social media?
2. What types of information are you most interested in finding out from social media?
3. What roles have citizens played in emergencies in your area in the past?
4. What kinds of social media citizen roles would be most useful for your organisation?

Theme 4: Information validation

1. Have you experienced any problems with the level and quality of social media data generated in emergencies in the past?
2. What procedures and tools did you use to validate information efficiently and effectively?

Theme 5: Emergency service staff skills and resources

1. What skills are required to help emergency services such as yours to find, interpret and make use of social media data?

2. Would you say that staff in your organisation in general have these skills and resources?
3. What guidance or training do you think would be most useful to help emergencies services like your own to use social information efficiently and effectively?

Theme 6: Moderating citizen communities

1. Do you use citizen communities in any way to help you access or analyse social media data before, during or after an emergency?
2. In what ways and to what extent do you engage with these communities?
3. What else could be done to support social media volunteer communities in emergencies to help them become more efficient and effective?
4. What else could you do before an emergency to make stronger links with such communities?