Emergency service staff and social media – A comparative empirical study of the attitude by emergency services staff in Europe in 2014 and 2017

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ABSTRACT

Finding a way to ensure an effective use of social media has become increasingly important to emergency services over the past decade. Despite all efforts to determine the utility of social media for emergency organisations, it is necessary to benefit from such institutions' staffs' opinions to establish effective use. To provide empirical evidence we present a comparison of two surveys, conducted across Europe with emergency services in 2014 and 2017 respectively, with a total of 1169 answers. The analysis shows that personal experience has an effect on how organisational usage of social media is perceived and how emergency service staff view the future use of social media. Furthermore, the use has increased. This article not only shows emergency services what their staff think about their social media usage but also discusses challenges and future directions for the design of systems that can be useful for further development of optimized organisational social media usage.

1. Introduction

Over the last years, the usage of social media before, during and after emergencies has become an increasingly discussed topic among emergency services [1]. In particular, the question of whether or not internet-based platforms can constitute a reliable source of information retrieval and public information attracted much attention [2]. Social media are commonly referred to as the Web 2.0, which enables users to generate content either by creation, exchange or interaction with other users or the environment [3]. Today, the three biggest social media platforms (Facebook, YouTube and WhatsApp) have 5.7 billion active users per month across the globe [4]. Almost two decades ago, social media in their first variations were already employed in the field of crisis management: After the terrorist attacks of 9/11, wikis, created by ordinary citizens, were used to collect information about missing people [5,6]. However, the monitoring of and intervention in rapidly changing events is subject to a variety of different conditions which are not always fully recognized [5,7]. Also, the terms "disaster, crisis, catastrophe, and emergency management are sometimes used synonymously and sometimes with slight differences, by scholars and practitioners", as Hiltz

et al. [8] state. Therefore, measuring the influence of social media in such events is very difficult methodologically.

In recent years, the use of social media has increased and at the same time its nature has shifted towards a more collaborative mode. Recent examples of such collaborative coping can be discovered in the 2013 European floods [9], the 2013 Colorado floods [10] or the 2012 hurricane Sandy [11]. Across various studies of emergencies or disaster events, numerous positive and negative aspects of social media have been identified [11–14]. However, existing studies either focus only on citizens, the emergency services in the US [15,16] or on one particular emergency service. The question of general attitudes of various European emergency services' staff towards the use of social media in organisations has remained unanswered.

Thus, the research question reads as follows: ***What is the attitude of the staff of emergency services across Europe towards the organisational usage of social media platforms?*** This question aims for the very organisations and individuals which would work with the various social media platforms in the event of an emergency to inform the public or facilitate help among civilians. In order to gain a more detailed insight into their attitudes regarding organisational social media usage, we

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asked why and how they (would) interact with the public in a case of emergency, what types of information are important and what they would require from their organisation to ensure an effective use of social media. Assuming a correlation between private and organisational use, in our questionnaire we included questions regarding, e.g. own experiences with social media or the amount of time spent on social media platforms, as these potentially influence the attitudes of both current private and organisational use as well as views on future developments of organisational social media usage.

Our first survey from 2014 shows that at that point in time only 44% of the organisations' staff were saying that their organisation is giving advice for emergency prevention [17]. The staff also stated that skills and the organisational culture are in need of improvement in order to increase the effectiveness of social media usage. However, most of the participants only thought of sharing information rather than extracting it. But since 2014 the virtual landscape of social media has changed, as has the view of emergency organisations regarding their social media presence and interaction. In our second round of surveying in 2017 this questionnaire was used again, thus building a survey with two waves although it did not cover the same set of respondents. Nonetheless, the comparison of the respective results allows for a presentation of developments from 2014 to 2017. As a first step, the comparison's presentation will be operationalised with a basic descriptive comparison of the two datasets. Shifting the perspective towards a more causal analysis, this will be followed by combining the two sets to one big dataset with an ANOVA and a Mann-Whitney test for parametric and non-parametric correlations. The analysis concludes with a structural equation model to get a brief idea of how the given answers are depended on a knowledge-based structure.

By analysing the survey results, we want to generate a baseline of European emergency service staff usage of social media. Our survey results may prove valuable in terms of social media usage across various disaster or emergency scenarios and phases, focusing on emergency services' staff's general views on organisational use. This in turn will help us to develop ideas of how to increase the effectiveness of social media usage of emergency services in Europe during extreme events. The paper is structured as follows: After examining related works and the research gap (section 2), we describe the method of our survey including a dataset comparison, subgroup analysis and structural equation model (section 3) and present our results thereafter (section 4). As a last step, the findings are discussed within the scope of the emergency management cycle before concluding (section 5).

2. Background and related work

Today, we find a broad strand of literature on the use of social media in emergencies, including fundamental works (section 2.1), the examination of emergency services' labour practices and the investigation of potentials and barriers of social media use in emergencies (section 2.2). In giving an overview of the vast body of literature we also present results of surveys which have already been conducted, focusing specifically on social media use and related attitudes of emergency services (section 2.4) to clarify the research gap this study aims to fill (section 2.5).

2.1. Emergencies, social media and emergency services

In the past years, crisis informatics focused on the examination of social media in emergencies [18,19]. More specifically, Palen et al. [20]; pp. 3–4) posit that crisis informatics:

"views emergency response as an expanded social system where information is disseminated within and between official and public channels and entities. Crisis informatics [as a discipline] wrestles with methodological concerns as it strives to develop new theory and

support sociologically informed development of both ICT and policy."

More than a decade ago, Palen & Liu [5] observed that "the role held by members of the public in disasters […] is becoming more visible, active, and in possession of greater reach than ever seen before". Also, they asserted that "the availability of mobile, networked information communication technology (ICT) in the hands of ordinary people makes information exchange increasingly potent" [21]. The present-day's wide acceptance of social media has broadened the possibilities for various types of cooperation in crisis management. Classifying these, Reuter et al. [22] developed a communication matrix encompassing relationships from authorities to citizens (crisis communication, A2C), from citizen to authorities (integration of citizen-generated content, C2A), as well as from citizens to citizens (self-help and volunteer communities, C2C) and from authorities to authorities (interorganisational crisis management, A2A). Concerning volunteer communities, Reuter et al. [23] further suggested a distinction between real "emergent groups" [24], which usually act in the form of neighbourly help and on-site work and virtual volunteers [25], which are helping through digital contributions. These groups naturally can and often do overlap to some extent and both intersect with emergency services at various points.

Similar to ad-hoc self-help and volunteer communities, established emergency services increasingly integrate social media into their emergency response efforts [17]. Thus, scholars have also shed light on the role of authorities as producers or consumers of information. While a body of research examined the potential of citizen-generated content, e. g. eyewitness reports and multimedia files contributing to situational awareness [14], recent research puts an emphasis on actionable information, i.e. getting "right information to the right person at the right time" [26]. Furthermore, people increasingly expect agencies to use social media to meet their informational needs, according to Lindsay [27]. Authorities have already experimented with different tools. However, a 2015 interview study on the current and potential use of social media in emergency services in seven European countries [28] showed a lack of understanding of tools' advantages and disadvantages in specific situations. A more recent survey conducted in 2017 further points to "a limited use of social media analysis tools by research participants [i.e. emergency services staff]" [29]; p. 131). Based on interviews with representatives from large international disaster response organisations [30], found that "emergency responders already operate with less than reliable, or 'good enough', information in offline practice, and that social media data is useful to responders, but only in specific crisis situations". Moreover, a 2014 study examining online public communication during the 2012 hurricane Sandy indicates a high degree of variance in communication across different types of organisations and media [11].

Accordingly to St. Denis et al. [10]; Twitter tends to be used for real-time notification and Facebook for community engagement. Using the example of Twitter, a comparative study on the police's crisis communication during the 2011 London riots identified two different approaches to engage with the public: an 'instrumental', formal and depersonalised style of communication as well as an 'expressive', highly personalised one. Whereas the first emphasised the gap between the police and the public and thereby ensured effective support of primary policing functions, the latter allowed for direct interaction with individual followers, thus creating closer relations with the public. Reuter and Schröter [31] revealed pragmatic (linguistic) barriers to the understanding of information in crises. These are the result of irony, wordplay and ambiguity. Regarding the information quality of citizen-generated content, Ludwig, Reuter and Pipek [32] detect the challenges of context-dependency, subjectivity, quantity, trust, locations, aggregation and distribution. To sum up, it can be stated that the "landscape of the use of social media data in crisis response is varied, with pockets of use and acceptance among organisations" [30].

2.2. Emergency services' potentials and challenges of using social media

Based on qualitative data on emergency services' attitudes towards volunteer activities, studies by Ref. [23] claim that "additional information provided by volunteers can improve the work of emergency services". A contribution on the 2013 German centennial flood further confirms the potential of Twitter as a distributed 'social sensor' by analysing spatio-temporal clusters of tweets. Yet it also highlights some caveats in interpreting immediate results: As not every disaster is represented by a cluster, some clusters occur in places and times where no disaster happens and some clusters may not refer to disaster events but are consequences of these [33]. However, volunteer activism – also in social media – may have a negative impact. For instance, a case study on microblogging during the 2011 Norway attacks found that public rescue efforts and public opinion – both possibly influenced by microblogging activities – made disaster response more complex for professionals and increased the pressure on emergency services to act according to public discourse dynamics rather than outcome-oriented [34]. Therefore, in several past cases such as the 2011 Shadow Lake Fire, volunteers are actively deployed as "trusted volunteers" – a virtual team designed to manage and monitor social media communications in support of emergency incident response [35]; p. 1). A study of the 2011 Thailand flooding disaster highlights that authorities could have taken actions to correct mistakes caused by the "emerging risks of the chaotic use of social media" [36]. Regarding the advantages of social media, Rexiline Ragini et al. [37] emphasise that such platforms can be used for data mining to locate people who might be in danger.

Group interviews in Virginia with 25 county officials about their social media use and community involvement led to the identification of challenges, such as the overwhelming amount of data as well as recognising relevant information accurately and in a timely manner [38]. Hughes and Palen [39] underlined that the speed and reach of social communication results in new demands and expectations by the public, putting pressure on emergency responders to find ways to receive and filter a substantial amount of incoming information. Limited resources that hamper the collaboration of humanitarian aid organisations and Volunteer and Technical Communities (V&TCs), i.e. technically trained volunteers, via social media [40] have also been under examination. According to a study comprising eleven semi-structured interviews with US public sector emergency managers, the barriers to use social media are mainly organisational rather than technical [41]. The two most reported statements concern a lack of personnel or time to work with social media as well as a lack of policies and guidelines for its use. Further responses identify a lack of appropriate technology and training as well as issues of trustworthiness. Therefore, they stress that the information system designers need to provide structures and features for collecting, validating and transmitting citizen-generated information, in order to improve usability. Nonetheless, Hiltz et al. [41] report that interviewees were 'enthusiastic' about the potential usefulness of prototypes.

Social media offers potential across the whole emergency management cycle (EMC), which comprises the phases of mitigation, preparedness, response and recovery [42]. In an interview study with emergency service staff, Reuter et al. [28] outline potentials for bidirectional communication between authorities and citizens, including the identification of potential hot spots and informing the public about emergencies (prevention or mitigation), certain warnings or directions (preparedness), forthcoming evacuations (response) as well as medical aid and further behaviour (recovery). Furthermore, citizens' information needs differ in the EMC's phases [43], i.e. they require instructional information during the preparation phase as well as orientational information in the response phase [44–46]. Correspondingly, a survey with 761 emergency service staff found that emergency services disseminate preventive information on how to avoid incidents (44%) (preparedness), share information on how to behave during an incident (31%), monitor social media activities (23%), receive messages (19%)

(response), write reports enriched with media or coordinate clean-up activities (recovery) [17]. However, the type of disaster has implications for the potentials of social media use: In contrast to less predictable disasters such as wildfires, predictable disasters such as floods allow the timely distribution of preparatory information via social media [14]. Despite different information needs across the EMC, a comparison of fifteen social media guidelines for emergencies showed that only six guidelines differentiated their recommendations with regard to the EMC [47].

2.3. Related survey studies on social media use and attitudes of emergency services

As outlined above, qualitative studies on social media in emergencies provide an in-depth approach to the practices of various parties in relation to specific events. However, due to the eclectic nature of these events, generalising about overall attitudes towards social media use is difficult. Thus, quantitative studies complement the important qualitative work that has already been done so as to provide a more general understanding of attitudinal tendencies with respect to how much social media are used and for what purposes [48].

For instance, in 2013 the American National Emergency Management Association (NEMA) published a comparative study on the current degree of social media usage in crisis situations by emergency services and the organisations' perspectives on its future use. The web-based survey was sent to all 50 state emergency agencies and resulted in responses from 41 [49]. Considering the trustworthiness of citizen-generated information, 75% of the respondents mentioned that their agency would not take action on social media information unless it was verified by a trusted source. The main barriers to the agencies' use of social media were identified as a lack of personnel, experience and knowledge to take on additional responsibilities, although the "largely untapped resource" of digital volunteers could "help to alleviate some personnel issues" [49]. Moreover, the study revealed that all state emergency management agencies use social media in some capacity, as do 68% of county emergency management agencies and 85% of local response agencies.

A 2014 survey investigated the current status of 241 US county-level emergency managers' social media usage. About half (52%) of the respondents reported that staff of their agency use social media (SM) for job-related activities [50]. Only a few have formal policies and procedures guiding the use. Of those that do have formal policies, about one quarter implemented policies preventing social media use. A lack of staff, guidance and skills have been identified as the main barriers for A2C. The main barriers for C2A constitute a lack of staff, the trustworthiness of public generated content and information overload [51]. The authors conclude that "the agencies and their representatives are not yet ready to embrace SM [i.e. social media,] and use it to its fullest potential. For the most part, current SM use is for dissemination of information, not the collection of it" [50]. Furthermore, "in addition to technological advances, policy and management changes are needed as well, to remove the 'red tape' (lack of guidelines or even prohibitions against use) that impedes the effective use" of social media [50].

Since 2010, the International Association of Chiefs of Police (IACP) conducts an annual quantitative survey about law enforcement agencies' use of social media, addressing "the current state of practice and the issues agencies are facing in regard to social media" [52]. With more than 500 participating law enforcement agencies across the United States each year, the survey provides comparable results on how attitudes and adoption rates shifted in the last six years. Comparing the first [53] and last surveys, the agencies' use of social media increased from 81% (77% Facebook, 37% Twitter and 16% YouTube) to 96% (94% Facebook, 71% Twitter and 40% YouTube) and the share of agencies implementing social media policies has increased from 35% to 78%. The 2015 survey also highlights that 74% of responding agencies not using social media were considering its adoption; 86% reported that social

media had helped solving crimes and 84% stated that social media have improved police-community relations in their jurisdiction. However, agencies were "very concerned" about online radicalisation and violent extremism (26%), criminal use of social media (25%), fake accounts (25%), privacy (22%), employee safety (21%) and staying informed about technological changes (21%).

Flizikowski et al. [54] conducted the only recent survey among European citizens (317 respondents) and emergency services (130 respondents plus 33 interviews from Finland, France, Portugal, Norway, Ireland, Great Britain and Poland). The study identifies preliminary end-user requirements concerning crisis management in online and mobile communication. Generally, a high share of respondents claimed that they use social media, expressing a positive attitude towards its use for crisis management purposes and considering it a good way for distributing and receiving information. Accordingly, emergency services acknowledge the potential of citizens contributing to disaster response by providing "photos of the situation, video and audio messages, and information about location of events" [54]. Both citizens and emergency services identified similar challenges. These include a lack of knowledge, guidelines on how to use social media and trained personnel, the reliability of citizen-generated content, concerns about security and personal data protection as well as accessibility for older generations. Finally, the authors highlight that the type of emergency service had no significant influence on the respondents' opinions.

Summarising the current studies on citizens' attitudes, it has been shown that there is a positive attitude towards the use of social media in general [49] with regard to both personal and organisational use [17]. Most US authorities already use social media, valuing its usefulness for information dissemination [49]. This includes warnings and advice as well as guidance on how to cope with and prevent emergencies. For example, emergency services can offer advice on how to behave during an emergency, coordinate the help of volunteers, summarise information or coordinate the clean-up activities [17]. Therefore, a further increase of social media usage can be expected, as 74% of agencies currently not using social media are considering its adoption [17].

On the other hand, there are some restrictions regarding the use of social media: First, despite the overall positive attitude towards social media for obtaining an overview of the situation in emergencies, only a few agencies have in fact often or sometimes used social media sites for this purpose. Thus, there is a huge gap between rhetoric and reality [17]. This can be attributed to social media being predominantly used to share [17,49], rather than receive, information [17]. Furthermore, only a modest use of social media was observed; ground-breaking, crowd-sourcing and crisis-mapping activities are neglected [49]. In addition, about 20% of the local and about 30% of the county agencies surveyed by NEMA "had not identified a goal for social media operations" at all [49]. Also, the study of Plotnick et al. [50] found that about half of the county-level emergency agencies observed had not used social media at all. Identified barriers to usage included a lack of dedicated personnel [49], doubts about credibility and reliability [17,49], concerns about privacy issues [17] and a lack of formal policies to guide it [50]. As the NEMA survey indicates, the constrained usage of social media in the field of emergency management could be based on limited reach and insufficient resources for the collection and analysis of data [49]. However, organisational culture and skills, which can also be the key to the verification of citizen-generated content [49], were identified as enabling conditions for the organisational use of social media [17].

2.4. Research gap

Research suggests that citizens share information across multiple platforms during crises [55], indicating that both crisis communication and monitoring are required to encompass cross-platform interactions despite the observed lack of skills and staff by emergency services [56]. Therefore, it is important to not only analyse attitudes of organisations in Europe but to focus especially on staff attitudes regarding organisational social media usage. This is necessary because they will implement, evolve and work with instruments concerning the usage of social media in emergency service organisations. Hence, is it our goal – and the research gap we aspire to fill – to provide a better understanding of the emergency services' staff attitudes concerning the organisational use of social media platforms.

We acknowledge that, as mentioned above, studies on this issue have already been conducted. Yet we offer novel insights into European developments with regards to personal and organisational social media use, key factors of effective utilisation as well as opinions on future use before, during and after emergencies. Comparing the two surveys' results and observing trends is important to align organisational and technological developments with staff needs, perceptions and their practice [57]. At the same time, we suggest building our analysis on plausible assumptions regarding individual processes of knowledge and reality formation. Particularly due to experiences in the staff's personal lives and their increasing use of social media platforms, they are more willing to use social media in organisational contexts. Thus, our perspective offers a first examination of the hypothesised causal relationship between private and organisational social media usage.

3. Method

Based on our goal to produce a comparative analysis of emergency services' staff attitudes towards social media across several European countries in the years 2014 and 2017, this section presents the method of our study. First, we will present the survey design (section 3.1). This is followed by a characterisation of our participants (section 3.2) and a description of the design of our quantitative analysis (section 3.3).

3.1. Survey design

Our survey aimed to identify the attitudes of emergency service staff towards their own and their organisation's current and future use of social media. The survey was designed with the aim to collect a mixture of quantitative and qualitative evidence. It consisted of four parts, as described below (also see Appendix: Survey Description and Questions):

- Part I: Demographic details of survey participants (age, gender, country of origin, role and type of organisation) to explore any differences in responses depending on the characteristics of participants.
- Part II: Attitudes towards social media – a combination of closed questions (five-point Likert scale [58] asking participants to rate on a scale of 1–5 how much they agree with a series of statements) and open-ended questions.
- Part III: Use of social media by one's own organisation – three sets of closed questions to gauge current usage, what information is considered useful and the main factors to ensure the use of social media by the organisation. This was supplemented by two open-ended questions to provide further details.
- Part IV: A series of closed questions and one open-ended question to explore expected changes in the future use of social media.

We designed the survey based on a strategy aimed at triangulation of micro- (referring to individual attitudes) and macro-level (referring to the responses to (perceived) organisational behaviour) attitudes. This so-called methodological triangulation involved a combination of questions focusing on more qualitative aspects of the emergency services' intentions towards social media and their usage before, during and after an emergency at a micro-level, as well as more quantitative aspects to obtain a comprehensive picture of emergency services' attitudes towards social media within emergencies at a macro-level.

The survey was created using the open-source survey application LimeSurvey (https://www.limesurvey.org) in 2014 and SurveyMonkey (https://www.surveymonkey.com/) in 2017. The change of the tool was

due to organisational reasons and didn't influence the questions and the outcome. In both September 2014 and in October 2017 we sent out the link to the online survey to different networks of emergency services as well as to different national and international mailing lists. These included the Federation of the European Union Fire Officer Associations (FEU), European Emergency Number Association (EENA), Emergency Services Staff Network (ESSN), various fire and rescue units (e.g. Fire Brigade Dortmund and Ljubljana), Norwegian regional authorities and others.

3.2. Characteristics of survey participants

In 2014, about 696 of the emergency services staff responded to the survey. In 2017, we had a participation of 473 respondents. Although we didn't focus on a particular group of agencies in 2014, most of the respondents came from fire departments, volunteer fire brigades and volunteer support agencies. In 2017, roughly seven times as many police staff responded compared to 2014. In terms of the participants' period of service and their positioning within the organisation, not too many differences were found between the datasets – they were almost equally distributed. Similar distributions were also observed concerning the participants' age. However, the proportional distribution of gender moved towards a higher number of female respondents, from 7.8% to 18%. Due to reasons of anonymity we are not able to reconstruct if individuals participated in both surveys.

3.3. Analytical instruments

3.3.1. Comparison of the 2014 and 2017 datasets

In a first attempt to analyse the field of attitudes of emergency service staff in Europe, we start with comparing our dataset from 2014 with the new dataset from 2017. To do that, we weigh the two datasets in order to account for the discrepancies in the number of respondents. As weighting variables, we use the organisational background, age, gender and years of service, as these are possible dimensions in which the groups may show a base-line-bias. For the comparison we use the non-parametric Mann-Whitney test and treat the scale as ordinal. In addition, we conduct a *t*-test for the question sets "general attitude towards social media", "the current social media usage in the participant's organisation" and "the assessment of the future social media use of the organisation" (see Appendix: Survey Description and Questions) to verify the significance of the model.

3.3.2. Subgroup analysis

Having completed the comparison, we analyse the relation between the given response and the demographic characteristics in order to pin down groups that are of interest for answering the research question.

Therefore, we perform a Spearman correlation for each item and an analysis of variances (ANOVAs) with the general social media attitudes of the participants as well as their opinions on current and future usage in the organisation. Thereby, the question sets are compared to the obtained demographic data, such as age, years of service, gender and the personal attitude. As gender is not measured in a metric or ordinal scale, we switched to a Mann-Whitney test for each individual item and a *t*-test for attitude-combined scores. Regarding the variable 'personal attitude towards social media', we could not perform an ANOVA. Instead, we used a Spearman correlation for each individual item and a Spearman correlation for a use-combined score to compare it to the current and future organisational use of social media. Although we need to weigh the variables due to the differences and therefore risk a decrease in the variance of the analysis, we are still able to extract a lot of significant outcomes. Another point for the interpretation is that the characteristics of the variables are reversed so that higher values are negative and low values are positive.

3.3.3. Structural equation model (SEM)

For a more in-depth analysis, we performed a structural equation model (SEM) (see Ref. [59] in order to visualise more complex correlations between the question-sets. We operationalised this in-depth analysis by performing two models with increasing complexity. The reason for using a SEM is that we thereby can display not only the simple item-based correlations with the data set but shed light on the depending structures within the dataset. Regarding its construction, a SEM is essentially a combination of a factor analysis[1] and a pathway analysis displaying causal relations between – in our case – opinions. In other terms, it shows how factor A causes the outcome of factor B. Furthermore, the model is able to show us moderating and mediating effects. Moderating effects are thereby factors that are able to further explain a dependency, meaning that including another factor (C) in the dependency form A and B, so that the interaction now goes from A to C to B. For example, you pay your taxes and if you want your tax returns, firstly you need to fill out the form requesting these taxes in order to get refunded. In this case the moderating effect (C) is the filled-out form that improves the explanation of why you are getting the tax returns. The mediating effect is a factor that is just taking influence on the dependency from A to B: For example, sending a letter instead of an e-mail to the treasury department containing questions about your tax return, because you know that any other form of interaction with the department will fail. In this case we try to get a brief idea of how the factor 'private experience' causes the outcome of the attitudes to the social media usage of the staffs' organisation.

Hence, the SEM is inspired by the theory of the sociology of knowledge by Berger/Luckmann [60] and Knoblauch [61]. The main interest of this theory is how an individual processes and aggregates knowledge. Therefore, the theory focuses on the subject's surrounding environment and the subject's interactions with this self-constructed reality. More precisely, we focused on the theory of phenomenological knowledge sociology by Knoblauch [61]; which combines the concepts of Berger/Luckmann [60] and Alfred Schuetz [62,63]. It states that individuals construct a reality – based on their experience, knowledge and subjective interpretations of situations – which is altered and generated by every action. Following this theoretical concept, it is possible to make out four levels: (1) Experiences, of which every individual has its very own set depending on age, gender, years of service, status in the service, type of organisation (e.g. police, fire brigade, technical relieve organisations, etc.) and cultural background (e.g. the individual's country of origin). (2) Meaning, where the individual combines the experience-based knowledge with the situational context of structures of meaning. The individual is enabled to recognise and typecast the environment as well as to assign a certain relevance to the various parts. If those two levels are passed, the individual enters into level (3): the action level. Actions have to be planned for a future reality [61], a reality that will be changed by the actions of the individual once again. Thus, individuals find themselves in a dynamic and subjective (4) reality in which they need to constantly alter their actions in accordance with the changing conditions.

To map the theory onto the survey and its structure we use the already defined sections of the questionnaire leaving out Part I, i.e. the demographic details, because they were not compoundable into one or more factors. Furthermore, we do not work with level 4 of the theory, reality, mainly because our core interest is emergency services' staff' perception of reality. We transform the other Parts (II-IV) and theory levels (1–3) into factors, which did not require their alteration. In the

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[1] The factor analysis, in this case the confirmatory analysis (CFA), is used to visualise latent variables in the dataset, such as norms and opinions. It is used for all of those variables that can't be measured directly in the field due to social acceptancy or unaware opinions. For performing such an analysis, you need at least two variables that are loading with at least 0.5 to the factor (possible range −1 to +1) (see Ref. [59]; p. 74–85).

end, the following 6 factors were aggregated:

- Individual member side (Theory: Experience (1)) (Survey part II)

This factor describes the individual experiences of the staff in their daily lives.

- Meaning-structuring factors (Theory: Meaning (2)) (Survey part III)

The factors reconstruct staffs' latent structures of meaning on what information they would wish emergency service organisations to share (Factor 3) and how the organisations could improve their social media presence. The question-sets underlying the factors ask staff to draw from their experiences and apply these to think of possible improvements for their organisation's information sharing policy and workflow.

- Individual organisational attitude (Theory: Action (3)) (Survey part III-IV)

These factors describe the opinion towards the actions taken by the organisations to use social media in the past and anticipated actions in the future.

Using this structure, we try to visualise the influence of both private usage and private experiences of the staff with respect to the other factors (i.e. factors 3–6). After the basic construction of this model we analyse the correlation of private usage and private experiences with other factors in order to shed light on their direct influence. Moreover, we extend our model so that it fits the theoretical framework more precisely. Therefore, the meaning-structuring factors (factors 3–4) are treated as moderating effects in the model. This reflects our assumption, drawn from the sociology of knowledge by Knoblauch [61]; that private experiences do not necessarily influence opinions on the usage of social media in emergency organisations directly but are moderated by the meaning-structuring factors. In the models run to account for this, the private-use factor shows no significant influence on the other factors. Thus, the factor of how often someone uses social media applications appears to be unimportant. We therefore exclude the factor from the model to reduce complexity and improve the model fit. We trace the relative redundancy of this factor back to the question's composition, namely asking how often they use social media and how often their friends and relatives use such platforms. While in the absence of an emergency the general frequency of using social media alone does not seem to shape people's opinions, experiences on social media platforms certainly shape their opinions in an emergency. Also, when performing the model with moderating effects on the factor of "opinion on an effective organisational social media usage", the numbers show that the factor has no significant influence on other factors, especially not with regard to the question of how the organisations will use social media in the future. Hence, the model was excluded from this analysis.

It needs to be noticed that the SEM is not performed for each year separately but for the merged dataset of 2014 and 2017. This was done due to the fact that in non-merged datasets the number of samples would have been too small to converge. Noticeable attention also needs to be drawn to the model fits and the general outcomes which are not strong overall but meet the criteria in order to be seen as a tendency to how the answer depend on private experiences.

4. Results

In the following section we will present the findings of our analysis, starting with a description of the developments over the four years, a subgroup analysis and the structural equation model.

4.1. Trends between 2014 and 2017

4.1.1. Attitudes towards the use of social media for private and organisational purposes (Q7)

Most of the emergency service staff used social media for private and/or organisational purposes. Overall, usage for both purposes increased from 2014 to 2017. Most emergency service staff used social media for private purposes. As can be seen in Fig. 1, the proportions of staff agreeing with the statements slightly changed from 2014 to 2017. In 2014, 66% were using social media in their private life. In 2017, 71% were doing so. The share of emergency service staff who agreed with the statement that most of their friends were using social media to keep in touch increased significantly from 76% in 2014 to 83% in 2017.

However, a greater number of survey respondents (see Fig. 1) thought that information provided on social media is not reliable (48%) in 2017 than in 2014 (17%). At the same time, a majority agreed with the statement that social media could be useful for keeping in touch with the public during emergencies (73%, 2017). In 2014, the share of survey respondents who agreed with this statement was significantly smaller (68%). The majority of emergency service staff further agreed that social media platforms are an important tool for emergency services. The approval rating thus changed significantly from 59% in 2014 to 70% in 2017. The survey participants also agreed that social media could be useful for gaining situational awareness (78%, 2017), which is also an increase similar to the statement on keeping in touch with the public (68%, 2014). In 2017, nearly nine out of ten surveyed staff agreed that social media are useful for sharing information with citizens. The approval rating thus increased significantly from 83% in 2014 to 88% in 2017. Even though the majority of respondents agreed that social media could be useful for emergency services, 33% in 2017 and 27% in 2014 agreed that emergency services are too busy to use social media. This points to the gap between potential and reality discussed above: Although the potential usefulness is acknowledged and praised by staff, problems regarding the unreliability of citizen-generated content and the additional workload for agencies impede its realisation.

4.1.2. Opinion on the current organisational usage of social media (Q9, Q11)

From the perspective of the emergency service staff, the organisations managed to increase their presence in social media. Yet it is important to note that information gathered cannot be used to extrapolate real changes in organisational behaviour. However, research made on actual organisational behaviour points into the same direction: Regarding the publishing and sharing of preventive information in 2014, only 16% of emergency service staff stated that relevant information was often publicised, whereas in 2017 almost 39% agreed with the statement. Furthermore, the emergency service staff perceive an increase in organisations' social media work not only before but also during emergencies. In 2014, only 10% in the five-point answer scale said that their organisation was often providing citizens with information on how to behave during an emergency, while over 37% indicated that their organisation did not pass information to the public. As for 2017, 24% reported that informing citizens is a frequently used tool for their organisations and slightly more than 19% claimed that it is never used.

When it comes to the communication between organisation and public, the percentage of people stating that two-way communication with the public is often used nearly doubled from 11% in 2014 to 21% in 2017. According to the organisations' staff, more organisations try to receive messages from the public during emergencies. In 2014, only 5% indicated that receiving messages is a frequently used method and 17% said that it is used occasionally. In contrast, 14% of staff in 2017 said that their organisations "are receiving messages during an emergency" and 20% said that their organisation is "receiving messages at least sometimes".

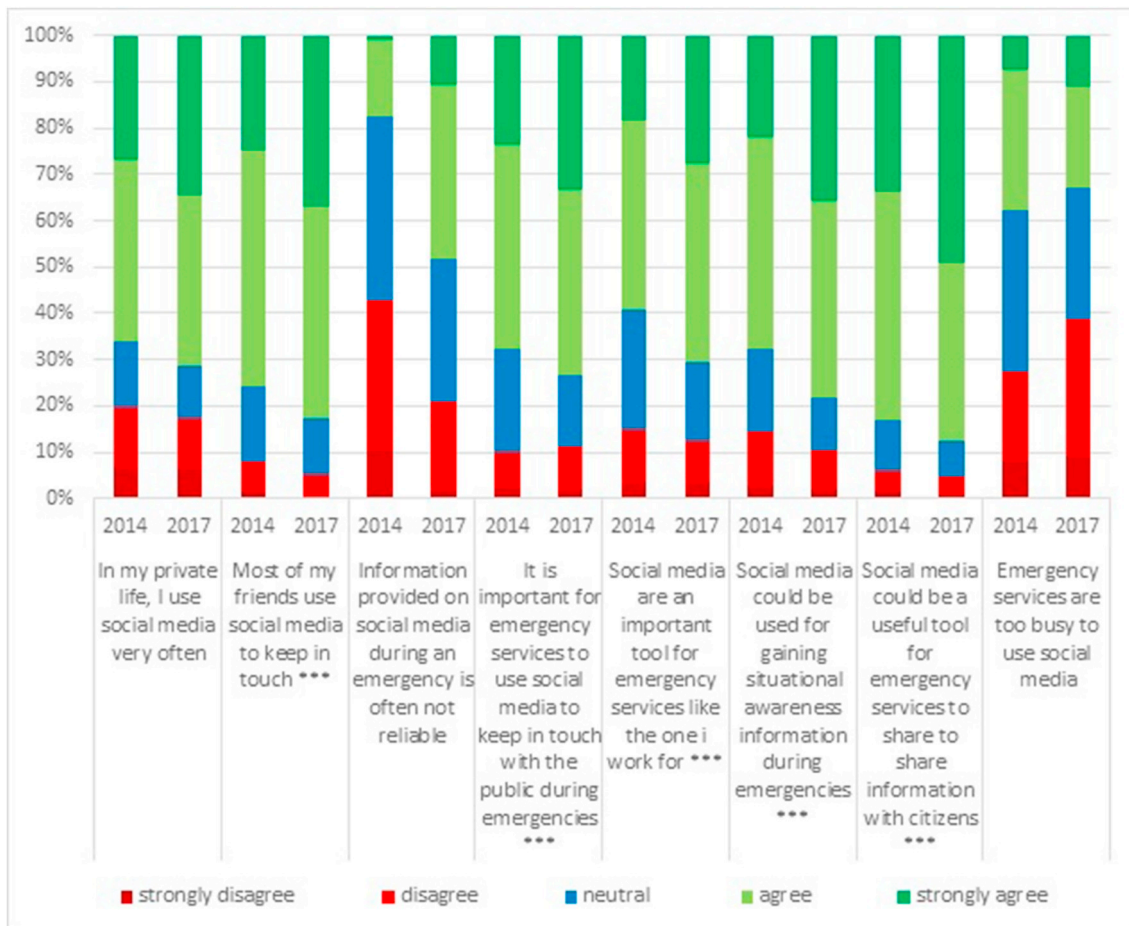If we now focus on the use of social media contents to raise

Fig. 1. Attitudes toward social media for private and organisational purposes (Note. *** indicates p < .001, **p < .01 and * p < .05 for further information see appendix table 2).

situational awareness, we see that 8% of the emergency service staff in 2014 stated that it is used regularly and 18% that it is used sometimes. In 2017, 17% reported that their organisation is using it often, while 25% stated that their organisation is using it sometimes. Therefore, 16% of the emergency service staff in 2014 indicated that specific information, such as injuries and damages to property, would be very useful to their organisation, when asked which information is perceived to be useful to the organisation. In 2017, the percentage of emergency service staff stating that this specific information would be very useful to their organisation rose to 23% (p < .05). To summarise the development, we can identify a similar tendency to the set of questions in Section 4.1.1: Staff have the impression that not only would it be helpful for the organisations to use social media but that the organisations are already increasing the social media usage.

4.1.3. Key factors for more effective use of social media by the emergency service organisations (Q12)

Next, we examined the question of how to ensure a better use of social media contents for the organisations. In 2014, 33% argued that it would be essential to have skilled emergency service staff working with social media. In 2017, 42% agreed with this statement. Furthermore, in 2014 28% indicated that it would be more important to change or develop the organisational culture towards enhanced use of social media. In 2017, 44% agreed with this statement. The staff also indicated that an expansion of equipment purchases for the departments dealing with social media is needed. Whereas 24% reported in 2014 that an expansion of such purchases is very important, 30% did so in 2017 (p < .05). Part of this expansion of purchases are better and more efficient

software solutions to access social media. 23% stated in 2014 and 34% in 2017 that it would be very important to improve the software solutions. Hence, staff see the need to be educated better in using social media and demand proper technical solutions when working with social media.

4.1.4. Opinion on the future use of social media in the emergency service staff' organisation (Q14)

As for the future, 37% of emergency service staff in 2014 and nearly 50% in 2017 believe that their respective emergency service organisation will continue to publish and share preventive information on how to avoid accidents. The staff increasingly believe that sharing information in social media during an emergency is a concept that needs to be continued or will become an important part of the organisation in the future (32% in 2014 and 42% in 2017). Equal rates of growth can be observed when evaluating the questions regarding communication. In 2014, 17% answered the question of whether the organisation will have two-way communication with the public with 'very likely'; in 2017 24% did. Concerning the question of if the organisation will receive and process messages from the public in an emergency, in 2014 16% responded with 'very likely' whereas 23% did so in 2017. If such messages from the public or from social media in general will be utilised to gain situational awareness is therefore questionable. In 2014, 27% did not know if this was going to be implemented and only 17% indicated that using social media for gaining situational awareness is 'very likely'. In 2017, however, 23% thought that usage of social media to gain situational awareness is likely to occur, while only 18% remained neutral to the question.

This shows that the staff of the emergency service organisations believe in the usefulness of social media and are under the impression that more and more is done in their organisation and will be done in the near and distant future. Yet it is immanent that without an increase of more efficient technical solutions and a more sufficient education this expansion is not manageable.

4.2. Merged data results

In terms of the data, we decided to merge the datasets from 2014 to 2017 to fit the size criteria for our subgroup analysis and gain, due to larger variance, a deeper understanding of the emergency service staff' attitudes. Albeit the fact that there is a time span of three years between data points, we could not detect much difference with respect to demographic factors, which would have made the merge unjustifiable.

4.2.1. Subgroup analysis

If we take a closer look at the age of survey participants, the data implies that the older the emergency service staff are, the less the participants and their friend(s) (r = .251; r= .280 (p < .001)) are likely to use social media in their daily lives. The older the participants are, however, the more they tend to perceive social media as useful for gaining situational awareness in an emergency situation (r = -.091 (p < .005)). As for the current state of social media usage in the organisation, the correlations show that the older the participants are, the higher the likelihood that they believe that their organisation uses social media to raise situational awareness (r = -.104 (p < .005)) and actively communicates with the public (r = -.073 (p < .05)).

This tendency is reflected in the evaluation of questions asking which information could be useful to the emergency service staff' organisation. The older the staff are, the more they find specific information (such as injuries and damages to properties) to be useful to the organisation (r = -.085 (p < .01)). They further believe that visual information such as videos of the emergency situation can be helpful (r = -.075 (p < .05)). However, the older participants indicated that processing such data streams, leading to a more effective social media usage, would require an increased amount of time in order to train the general use of social media (r = -.180 (p < .001)) as well as a proper software (r = -.085 (p < .01)). The older participants further believe that emergency service staff need to be trained to extend their skills in terms of using social media (r = -.067p < .05). When asked about the future use of social media in the organisation, the younger respondents assumed that the organisations will shift towards both preventive publishing (e.g. to avoid accidents (r= .081 (p < .01)) and active two-way communication (r= .074 (p < .05)). By contrast, the older emergency service staff assumed that the organisations will focus on emergency operations in terms of how to behave (r = -.110 (p < .001)) and how to receive information (r = -.109 (p < .001)).

Examining these findings, one is left with the impression that older survey participants have a more positive attitude towards social media in general. However, that does not mean that the younger generations in the emergency organisations are less convinced of social media usage.

4.2.2. Structural equation model (SEM)

For performing a SEM, an initial factor analysis is needed. The results of this analysis show that in every factor at least four variable loads are over 0.60 and can therefore be considered as a valuable influence on the factor. However, as already mentioned, factor 1 does not fit the criteria but is also not in use for the further analysis and thus can be neglected (Table 1).

The rudimentary SEM shows that private experiences tend to have a positive influence on all other factors and that the model fit is satisfying (Fig. 2). Not surprisingly, the model indicates that the factors measuring how frequently social media are used have an influence on the experiences made with social media platforms. Also, the private experiences of staff have a strong influence on the expectations of and opinions on

Table 1
Structural equation model.

Factor	Load in the Factor	Variable
Individual member side (Theory: Experience (1)) (Survey part II)		
Factor 1:	.9	Q7.1
"Private use of social media"	.57	Q7.2
Factor 2:	.8	Q7.4
Private experience	.73	Q7.5
	.72	Q7.6
	.71	Q7.7
Meaning-structuring factors (Theory: Meaning (2)) (Survey part III)		
Factor 3:	.67	Q11.1
"information expectations from social media	.69	Q11.2
platforms in case of an emergency"	.57	Q11.3
	.62	Q11.4
	.61	Q11.5
Factor 4:	.77	Q12.1
"Opinion on an effective organisational social media	.79	Q12.2
usage"	.61	Q12.3
	.57	Q12.4
	.66	Q12.5
Individual organisational attitude (Theory: Action (3)) (Survey part III-IV)		
Factor 5:	.69	Q9.1
"Opinion on the current organisational social media	.74	Q9.2
usage"	.76	Q9.3
	.7	Q9.4
	.68	Q9.5
Factor 6:	.55	Q14.1
"Opinion on future social media usage in the	.67	Q14.2
organisation"	.68	Q14.3
	.69	Q14.4
	.73	Q14.5

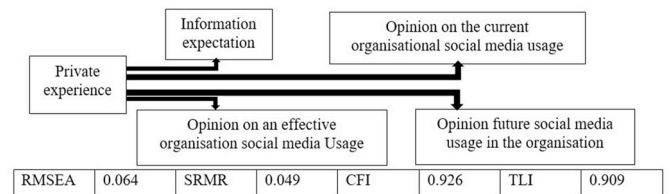| RMSEA | 0.064 | SRMR | 0.049 | CFI | 0.926 | TLI | 0.909 |

Fig. 2. Simple SEM on private experience toward the attitudes (description of the fit values in appendix).

information distribution in social media as well as the organisations' operational handling of social media presence.

The strongest influences on private experience are found in the expectations of how the public should be informed, followed by the opinion on future use of social media in the organisation. The more positive experiences the participants have made with social media, the more likely they are to agree with or even demand greater use of social media in emergency service organisations. The opinion on the current organisational usage of social media, however, shows a relatively weak influence regarding private experiences of the emergency service staff.

In a next step (Fig. 3), we use the information expectation factor as a moderating effect towards the factor of current usage of social media in the organisation, the factor of how to ensure a more effective use of
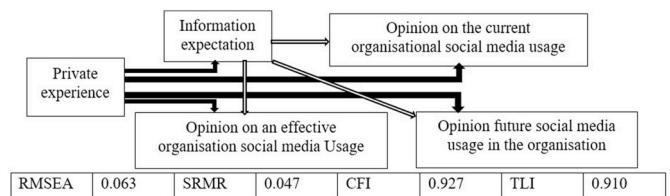

| RMSEA | 0.063 | SRMR | 0.047 | CFI | 0.927 | TLI | 0.910 |

Fig. 3. SEM with the moderator "Information expectations" (description of the fit values in appendix).

social media and the factor of future developments in organisational social media usage.

The moderating effects of private expectations towards information publishing tend to have a rather weak influence on the other factors. The moderating effects, however, do have an influence on the factor "opinion on an effective organisational social media usage". This means that the experiences the staff make in their private lives shape their expectations towards being informed of social media channels. This again influences their thoughts on how to develop an adequate and sufficient social media usage strategy.

5. Discussion and conclusion

In our comparative survey, we conducted two opinion-based surveys in 2014 and 2017, asking emergency service staff about their opinion towards social media in private life and in relation to their organisation. In total, we received 1169 answers: In 2014, 696 persons responded to the survey and in 2017, 473 persons participated. The resulting discrepancies were balanced by applying weights to the datasets. The respondents came from a variety of European countries and different types of emergency service organisations.

5.1. Main results

We began this analysis by performing a descriptive comparison of results from 2014 to 2017. The comparison revealed an **increasingly positive attitude** towards social media. Furthermore, a growing number of participants indicated that they themselves and their friends are using social media. They also confirmed that social media are of increasing importance to them and their organisations. Moreover, the emergency service staff in 2017 believed more strongly in the advantages of communicating with the public via social media. At the same time, more emergency service staff nonetheless question the reliability of information gained from social media platforms, as compared to 2014. Arguing that citizen-generated content needs to be treated with caution, they further point to the fact that emergency service organisations are too busy to properly manage a social media presence.

Despite the personal point of view of emergency service staff towards the reliability of information gleaned from social media, a growing number of staff opine that the organisation in fact uses social media before, during and after an emergency more frequently – not only to inform the public but also to receive messages from citizens. To further support the usage of social media, the participants think that training staff and a reorientation of the organisation are essential. A growing percentage of emergency service staff believe that the use of social media platforms can be increased if those key factors can be integrated into the organisations' culture.

Furthermore, when taking a closer look at the correlations, we discovered that **especially the older and more experienced staff are a driving force for an increased use of social media** albeit the fact that they do not use social media in their private lives on a daily basis (also see Feldman et al. [64]. Here, age corresponds with service time and rank, meaning that the older emergency service staff are the more time they have spent in the organisation and hence are likely to occupy higher positions in the organisation's hierarchy. Those two correlation variables, i.e. 'age' and 'time working in the service', show quite exact the same correlation coefficient when they are put in relation to questions concerning the current and future use of social media in the organisation. Even though the younger participants seem to use social media on a more frequent basis, they are not as related to the topic of using social media in emergency situations.

It is also important to note that overall, correlations are not very strong or highly valid, but in sum show a tendency towards the older and more experienced staff being more positive about their organisation's information sharing practices. This is probably due to the likelihood of them occupying higher positions where questions of organisational

social media usage are more important than in daily work.

Another important note is that those results are staff attitudes and do not reflect the actual organisational use of social media. By performing a structural equation model, we showed that particularly their private experiences with social media are a driving factor for their answers to the question of how the organisation uses social media in the present and how it will utilise social media platforms in the future.

To summarise:

1. Emergency service personnel in Europe have the opinion that social media in emergency service organisations is of increasing importance in terms of preventive and situational communication.
2. More experienced staff believe more strongly in the usefulness of social media in the context of an emergency service organisation.
3. The private usage of social media is a driving force in shaping the opinion on organisational use.

5.2. Relationship with related work

In distinction to most existing qualitative surveys on social media use by emergency services [49,50,54], our study centres on a descriptive comparison of results from 2014 to 2017. Thus, we were able to confirm the positive attitude towards social media shown in existing studies and identify an increase of perceived importance, e.g. for citizen interaction, information sharing and situational awareness. Similar to Flizikowski et al. [54]; however, the reliability of citizen-generated content was perceived to be an issue for social media use. Although the recurring IACP studies allow annual comparisons of results [52,53] as well, they examine American police departments in contrast to our European multi-organisational focus. Still, in both cases an increase of social media use was observed. While the ICAP studies examined the use of specific social media (e.g. Facebook, Twitter or YouTube), our study focused on use cases of social media (Q9) and the expected future increase (Q14). Therefore, our study is contributing to a wider perspective within the discussion of social media usage in emergency organisations in general, while opening up this field to a European viewpoint.

5.3. Limitations

Nevertheless, there are limitations to this analysis, mainly the large size difference between the two surveys. To address this issue, the authors needed to weight the 2017 dataset to make it comparable to the dataset of 2014. We also examined a particularly European point of view. Hence, individual perspectives of organisations and countries (such as environmental details and locational specifics) are not taken into account. However, the focus of this survey and the article lies in finding common ground regarding the social media presence of emergency service organisations in the European Union in general. Choosing a theoretical perspective based on Berger and Luckmann [60] as well as Knoblauch [61] allowed us to design a structural equation model incorporating assumptions of individual usage and particularly experiences influencing views on organisational use, mediated by individuals' information expectations. Still, in future research it may prove plausible to include other potential factors, such as experience with local policies or type of area (countryside vs. city), in order to comprehend emergency staff's reasoning more accurately.

5.4. Future directions

This paper shows emergency organisations how staff perceive their social media presence as well as what they expect from them in the future. Based on this information, the organisations are able to tackle the challenges described by Hiltz et al. (Starr Roxanne [41], develop guidelines and system solutions with their operators 'on the ground' and ensure an effective utilisation of social media before, during and after emergency events [36]. Although we did not analyse samples that are

representative in terms of age, gender, country of origin, role and type of organisation, it is noteworthy that the perceived unreliability of social media increased from 43% (2014) to 48% (2017). Thus, there is a need to further investigate the decrease in perceived reliability of social media qualitatively and quantitatively, such as the potential impact of the recent discussion of fake news [65]. In addition, research suggests that social media guidelines may avoid chaotic use of social media during emergency events by both authorities and citizens as consumers or producers [47]. Furthermore, artificial intelligence algorithms may assist in overcoming issues of information credibility, reliability or overload by the classification, clustering, summarisation and quality assessment of information [66,67].

However, as emergency mangers need to make sense of algorithmically computed data, usable interfaces are required that support the actionability of information, i.e. provide the right information at the right time in the right form to the right audience [26]. One promising approach is the application of visual analytics to deliver solutions that are tailorable with regard to role-specific interests [68]. We envision that the combination of tailorable and usable algorithms and interfaces will help to counter the increasing perception of emergency services being too busy to monitor social media (33% in 2017 vs. 27% in 2014). Furthermore, despite the perceived usefulness of photos and videos by emergency services, the vast majority of studies focus on textual content

[69]. Thus, the design of systems supporting multimodal content analysis (integrating text, video and photo processing) both on algorithm and interface level is a direction for future research. In a long-term perspective, improved crisis information management, including asocial media presence and information extracted from social media [70] and processed by emergency staff, can lead to a more prepared and better-informed civil population in emergency situations. Of course, this survey can only be a first framework for implementing a social media presence as pointed out. Further research needs to be done to meet the preferences of various countries and emergency service organisations across Europe.

Acknowledgements

Appendix I: Survey Description and Questions

The survey aims to find out the attitudes of emergency service staff towards their own and their organisation's current and future use of social media. Social media, such as Facebook, Twitter or YouTube, allow people to create, share or exchange information in virtual communities and networks. Such information could be useful to emergency services during emergencies.

I agree to complete this questionnaire for the EmerGent project, asking me about my opinions on social media and that my participation is voluntary. The results of this survey will be used for the purpose of research and not for profit; all information gathered in this survey will be retained, accessed and analysed by the project researchers for the purpose of this project only. My anonymity is guaranteed and I will not be identified in publications or otherwise without my express written consent.

Welcome, the following questions will take only about 5–10 min to answer. We thank you in advance for your participation. For the completion of the questionnaire it is mandatory to answer all questions, unless the question specifies otherwise.

Part I: Personal Details

- Q1: *What type of organisation do you work for? (Fire Department; Volunteer Fire Brigade; Emergency Medical Service; Police PSAP (Public Safety Answering Point); Other type of organization
- Q2: *What is your main role in this organisation – the role you spend most time on each day? (Head/supervisor of organisation; Incident commander; Section leader; Communication Officer (incl. press); PSAP Supervisor (public-safety answering point); PSAP Operator (public-safety answering point); Member of the crew; Other)
- Q3: *How many years have you been working for Emergency Services? (under 5, 5–9, 10–14, 15 +)
- Q4: *What is your age? (under 20; 20–29; 30–39; 40–49; 50–59; 60 +)
- Q5: *What is your gender? (Female; Male)
- Q6: *What country do you live in?

Part II: Your own attitudes towards social media

- Q7: *Please indicate how strongly you agree or disagree with the following statements. (Strongly Agree; Agree; Neutral; Disagree; Strongly Disagree)
  - In my private life, I use social media very often.
  - Most of my friends use social media to keep in touch.
  - Information provided on social media during an emergency is often not reliable.
  - It is important for Emergency Services to use social media to keep in touch with the public during emergencies.
  - Social media are an important tool for Emergency Services like the one I work for.
  - Social media could be useful for gaining situational awareness information during emergencies.
  - Social media could be a useful tool for Emergency Services to share information with citizens.
  - Emergency Services are too busy to use social media.
- Q8: Add any other comments about your attitude towards social media

Part III: Use of social media by your own organisation

- Q9: *Does your organisation use social media? (Often; Sometimes; Occasionally; Never; Don't know)
  - To share information with the public about how to avoid accidents or emergencies?
  - To share information with the public during emergencies about how to behave?
  - For two-way communication with the public?
  - To receive messages from the public during emergencies? - To search social media sites to gain situational awareness during emergencies?
- Q10: Please give an example of the way(s) in which your organisation used social media recently before, during or after an emergency or incident?
- Q11: *Which of the following types of information shared on social media by the public would you find useful to receive during an emergency? (Very useful; Useful; Neutral; Not useful; Not at all useful)
  - General situational updates (relating to the emergency)
  - Specific information (injuries, damage to property etc.) - Information about the public mood (panic or calm) - Photos of the emergency situation
  - Videos of the emergency situation
- Q12: *How important do you think are the following factors to ensure that social media is widely used by Emergency Services like yours? (Very important; Important; Neutral; Not important; Not at all important)
  - Staff skills to use social media
  - Organisational culture - Funding for staff time to use social media - Equipment - Software to access social media
- Q13: Are there any other factors that are important?

Part IV: Future use of social media by your own organisation

- Q14: *Please indicate the extent to which you expect your organisation to increase its use of social media in future (Very likely; Likely; Neutral; Not likely; Not at all likely)
  - To share information with the public about how to avoid accidents or emergencies?
  - To share information with the public during emergencies about how to behave?
  - For two-way communication with the public?
  - To receive messages from the public during emergencies?
  - To search social media sites to gain situational awareness during emergencies?
- Q15: What role do you think social media could play for your organisation in 5–10 years' time?
- Q16: *Are you willing to receive the results of the survey and to take part in a follow-up survey later on in the project? (if yes: e-mail address)
  - It is very likely that the emergency service will not know about this request.
  - I would expect to get a response from them within an hour.
  - Emergency services are too busy to monitor social media during an emergency.
- Q23: *To what extent are you aware or have you heard of the following services provided via social media? (Very aware, Moderately aware, Somewhat aware, Slightly aware, Not at all aware)
  - Twitter Alerts - used by key organisations to send alerts during emergencies
  - Facebook Safety Checks - allows you during an emergency to let friends and family know you and friends are safe
- Q24: *Is there anything else you want to mention with regard to the use of social media before, during or after an emergency?
- Q25: *Thank you very much for your help in completing this survey! The findings will be made available on our project website (click here to access the website). Please provide an email address if you would like to receive a link to the summary findings from this research when they are available.
- Q26: *Would you be willing to take part in a similar survey in future? (Yes, No)

Appendix II: SEM Fit Indices

Table 2
SEM indicies and thresholds [71]

Root Mean Square Error of Approximation (RMSEA)	Values less than 0.07	Has a known distribution. Favours parsimony. Values less than 0.03 represent excellent fit.
Standardized Root Mean Square Residual (SRMR)	SRMR less than 0.08	Standardised. Residual based. The average squared differences between the residuals of the sample covariances and the residuals of the estimated covariances.
Tucker Lewis Index or Non-normed Fit Index (TLI/NNFI)	Values greater than 0.95	.9 is the minimum to meet the interpretation criteria. Non-normed, values can fall outside the 0–1 range.
Comparative Fit Index (CFI)	Values greater than 0.95	.9 is the minimum to meet the interpretation criteria. Normed, 0–1 range.

Appendix III. : Confidence Intervals of Q7

Table 3
95% Confidence Intervals to Q7

95% Confidence Intervals							
Attitudes (Q7)							
			Percent	N	SE	Lower limit	Upper limit
In my private life	2014	Strongly Agree	0,269	696	0,017	0236	0,302
		Agree	0,392	696	0,019	0356	0,428
		Neutral	0,142	696	0,013	0116	0,168
		Disagree	0,128	696	0,013	0103	0,153
		Strongly Disagree	0,069	696	0,010	0050	0,088
	2017	Strongly Agree	0,344	473	0,022	0301	0,387
		Agree	0,371	473	0,022	0327	0,415
		Neutral	0,114	473	0,015	0085	0,143
		Disagree	0,106	473	0,014	0078	0,134
		Strongly Disagree	0,066	473	0,011	0044	0,088
Most of my friends	2014	Strongly Agree	0,249	696	0,016	0217	0,281
use social media		Agree	0,51	696	0,019	0473	0,547
to keep in touch.		Neutral	0,159	696	0,014	0132	0,186
		Disagree	0,068	696	0,010	0049	0,087
		Strongly Disagree	0,014	696	0,004	0005	0,023
	2017	Strongly Agree	0,369	473	0,022	0326	0,412
		Agree	0,46	473	0,023	0415	0,505
		Neutral	0,12	473	0,015	0091	0,149
		Disagree	0,048	473	0,010	0029	0,067
		Strongly Disagree	0,003	473	0,003	−0,002	0008
Information provided	2014	Strongly Agree	0,106	696	0,012	0083	0,129
on social media during		Agree	0,322	696	0,018	0287	0,357
an emergency is often		Neutral	0,398	696	0,019	0362	0,434
not reliable.		Disagree	0,164	696	0,014	0136	0,192
		Strongly Disagree	0,01	696	0,004	0003	0,017
	2017	Strongly Agree	0,106	473	0,014	0078	0,134
		Agree	0,377	473	0,022	0333	0,421
		Neutral	0,308	473	0,021	0266	0,350
		Disagree	0,191	473	0,018	0156	0,226
		Strongly Disagree	0,018	473	0,006	0006	0,030
It is important for	2014	Strongly Agree	0,234	696	0,016	0203	0,265
emergency services		Agree	0,443	696	0,019	0406	0,480
to use social		Neutral	0,223	696	0,016	0192	0,254
media to keep in touch with		Disagree	0,076	696	0,010	0056	0,096
the public during emergencies.		Strongly Disagree	0,024	696	0,006	0013	0,035
	2017	Strongly Agree	0,335	473	0,022	0292	0,378
		Agree	0,397	473	0,022	0353	0,441
		Neutral	0,154	473	0,017	0121	0,187
		Disagree	0,093	473	0,013	0067	0,119
		Strongly Disagree	0,021	473	0,007	0008	0,034
Social media are	2014	Strongly Agree	0,185	696	0,015	0156	0,214
an important tool		Agree	0,408	696	0,019	0371	0,445
for emergency		Neutral	0,256	696	0,017	0224	0,288
services like the		Disagree	0,115	696	0,012	0091	0,139
one I work for.		Strongly Disagree	0,036	696	0,007	0022	0,050
	2017	Strongly Agree	0,275	473	0,021	0235	0,315
		Agree	0,429	473	0,023	0384	0,474
		Neutral	0,172	473	0,017	0138	0,206
		Disagree	0,089	473	0,013	0063	0,115
		Strongly Disagree	0,035	473	0,008	0018	0,052
Social media could	2014	Strongly Agree	0,218	696	0,016	0187	0,249
be useful for gaining		Agree	0,458	696	0,019	0421	0,495
situational awareness		Neutral	0,177	696	0,014	0149	0,205
information during		Disagree	0,118	696	0,012	0094	0,142
emergencies.		Strongly Disagree	0,029	696	0,006	0017	0,041
	2017	Strongly Agree	0,355	473	0,022	0312	0,398
		Agree	0,426	473	0,023	0381	0,471
		Neutral	0,116	473	0,015	0087	0,145
		Disagree	0,082	473	0,013	0057	0,107
		Strongly Disagree	0,022	473	0,007	0009	0,035
Social media could	2014	Strongly Agree	0,336	696	0,018	0301	0,371
be a useful tool for		Agree	0,496	696	0,019	0459	0,533
emergency services to		Neutral	0,106	696	0,012	0083	0,129
share information with citizens.		Disagree	0,046	696	0,008	0030	0,062
		Strongly Disagree	0,016	696	0,005	0007	0,025
	2017	Strongly Agree	0,493	473	0,023	0448	0,538
		Agree	0,385	473	0,022	0341	0,429
		Neutral	0,076	473	0,012	0052	0,100
		Disagree	0,039	473	0,009	0022	0,056

Table 3 (*continued*)

95% Confidence Intervals							
Attitudes (Q7)							
			Percent	N	SE	Lower limit	Upper limit
Emergency services are too busy to use social media.	2014	Strongly Disagree	0,008	473	0,004	0000	0,016
		Strongly Agree	0,08	696	0,010	0060	0,100
		Agree	0,193	696	0,015	0164	0,222
		Neutral	0,349	696	0,018	0314	0,384
		Disagree	0,305	696	0,017	0271	0,339
		Strongly Disagree	0,073	696	0,010	0054	0,092
	2017	Strongly Agree	0,109	473	0,014	0081	0,137
		Agree	0,221	473	0,019	0184	0,258
		Neutral	0,281	473	0,021	0240	0,322
		Disagree	0,297	473	0,021	0256	0,338
		Strongly Disagree	0,093	473	0,013	0067	0,119

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