The Role of Social Media in Emergency Management: An Exploration of the Perception and Usage of Social Media by Emergency Responders in the UK

Abstract

Emergency Management practices are being reshaped by social media. Emergency responders are embracing social media to enhance communications during an emergency. The integration of social media into UK emergency management is ambigious, and it is uncertain as to whether it is an effective tool. Using a mixed methods approach, this research investigates the UK emergency responders use of social media for emergency management, focusing in particular on the UK Winter Floods of 2013/14. Furthermore, the effectiveness of the UK emergency responders' social media activity is examined. This research shows that the responders perceive social media as a useful tool to effectively deliver information to the public, although they do not appear to fully exploit it in an emergency. While the responders appear to predominantly post caution and advice, the results suggest that information about structures and utilities affected by an incident is most likely to engage an audience.

1. Introduction

Technological advances are changing the way that information is accessed and exchanged, with new modes of delivery and speeds of exchange that were not possible even only a decade ago. In particular, social media has evolved from a place for posting and sharing general short messages, to a useful tool for broadcasting and dispersing breaking news and emergency communications (Vieweg et al.,2010). In times of emergency, people need information in order to make response decisions. Moreover, many citizens are keen to provide information as a means to assist in the general response efforts of the emergency responders (Hughes et al., 2008).

Over recent years, social media has increasingly been exploited as a tool to access and share information, express opinions and feelings, search for support and provide help to those in need, during disasters and emergencies (Terpstra et al., 2012). For example: during the Virginia Tech Shootings 2007, students used Facebook to identify who was safe and alive (Vieweg et al., 2008); Local individuals in the Red River Floods 2009 used Twitter to distribute information on flood-related matters including evacuation and sandbagging (Palen et al., 2010); and during the Japan Great Tohoku Earthquake and Tsunami 2011, individuals utilized Twitter to request assistance (Adam and Muraki, 2011).

The 2010 earthquake which struck Haiti led to a significant turning point in Emergency Management. The Emergency Responders realised the potential for using social media for information retrieval and emergency communications (Simon et al., 2015). Since then, Emergency Responders have been reportedly adopting social media for emergency management activities. During Hurricane Sandy 2012, Emergency Responders used social media to communicate with the public, predominantly distributing information about transportation services, safety instructions, and weather updates (Hughes et al., 2014). In 2013, an attack on Westgate Mall in Kenya took place. Social media became a crucial channel for communication between the Government, Emergency Responders and the public, primarily to provide situational awareness updates (Simon et al., 2014).

There are many limitations to using social media. For example, it cannot be assumed that all

users will see every message shared, power outages can be problematic (accessing social media relies on an internet connection and devices that have a battery), and generally, social media users are of a specific demographic. In spite of these limitations, Emergency Responders are now encouraged to have a social media presence for communicating and exchanging knowledge in an emergency (White, 2011). It is even recommended that social media is incorporated into emergency plans and training exercises (Wood and Glik., 2013). However, very little if any research has assessed the impact of the social media usage of Emergency Responders.

Audience engagement, which is often sought on social media, can help to increase the possible reach to a desired audience, and build relationships with them (Briones et al., 2011). Therefore, measuring engagement is a way of identifying the possible impact of social media use. It can indicate a level of interest in a user's social media activity and provide insights into its possible reach (Briones et al., 2011). A variety of social media metrics are believed to indicate the level of engagement. On Twitter, for example, the number of retweets and replies indicates a level of interaction with the audience (Zamparas et al., 2015). The number of likes and retweets received can suggest a level of impact on the audience (Zamparas et al., 2015), and the use of photos and videos is believed to capture the audience's attention and influence interaction (Yetim et al., 2011). Therefore, measuring the rate of engagement between the Responders and their audience on social media, could provide an initial insight into the success of the Responders use of social media for emergency management. However, it is important to emphasise that these metrics are only an indication of *possible* engagement. It is impossible to measure actual engagement, as some actions, such as the number of users that only read social media posts, cannot be measured (Phethean, 2014).

This paper will explore the UK Emergency Responders' (UK Responders) perception and use of social media. The overall goal of this research is to determine what role social media plays, and the impact it has in emergency management. While it is difficult to determine the actual impact of the Responders social media usage, this paper one of the first examples of an assessment towards this goal. Furthermore, before we can assess the impact of the Responders' social media activity, it is important to uncover their reasons for them using it, and how they use it.

Using a novel combination of methods involving a rigorous analysis of social media data with qualitative interviews, this paper aimed to answer the following research questions (RQ):

> RQ1: What role do the Responders believe social media fulfils in Emergency Management?
> RQ2: Do the Responders try to engage their audience on social media, and how do they engage them?
> RQ3: What aspects of the Responders' social media activity engages the audience?

The next section will introduce the important aspects of UK Emergency Management, followed by a brief description of social media. Section 4 provides a summary of the event of the UK Floods 2013/14, which is used to provide context for this research, and then an overview of the mixed methods approach used (Twitter analysis and qualitative interviews) follows. The final three sections use the findings from the studies, and the related literature, to answer the three research questions outlined above.

2. UK Emergency Management

Emergencies in the UK are defined as:

> "an event or situation that threatens serious damage to human welfare in a place in the UK; serious damage to the environment in a place in the UK, or war, or terrorism, which threatens serious damage to the security of the UK." - *Civil Contingencies Act (2004),*

UK emergencies have taken several forms, including: natural disasters such as the Heatwave 2003 and Flooding 2007; epidemics, for example, the Swine Flu Pandemic 2009; and Terrorism, for example, the London Bombings 2005.

UK Responders responsible for undertaking UK Emergency Management are categorised as either Category 1 or Category 2 as follows.

Category 1 Responders are organisations at the core of emergency management. These include: The Emergency Services (Police, Fire and Ambulance), HM Coastguard, local authorities (District and County Councils), the Environment Agency, NHS bodies including Public Health England/Wales, and Port Health Authorities. Some of their roles in relation to information provision include creating and enforcing emergency plans, sharing information with other Responders to enhance co-ordination, and assessing the risk of emergencies occurring (Cabinet Office, 2013). This research will focus on Category 1 Responders only.

Category 2 Responders are private sector bodies, mostly utility companies and transport organisations, and are typically not involved in core multi-agency emergency response and recovery work. However, they can have an important role if their sector is affected during an emergency (HM Government, 2013). Category 2 Responders include Gas and Electricity distributors, water and sewer undertakers, telecommunications providers, Train, Airport, and Harbour operating companies, Network Rail, Transport for London and Highways England.

Recently, the UK Government's interest in Emergency preparedness, response and recovery has grown. A wide-scale review to improve UK Emergency Management was launched, and in 2013 the National Resilience Capabilities Programme (NRCP) was initiated (O'Brien, 2006). This involved the development of 46 Local Resilience Forums (LRFs), which are multi-agency partnerships, made up of Emergency Responder representatives. The LRFs serve communities defined by the boundaries of Police areas across the UK. They focus on identifying risks, planning, and preparing for a range of emergencies, with the goal of preventing or mitigating possible consequences to their local communities (Cabinet Office, 2014).

3. An Introduction to Social Media

The World Wide Web (Web) has evolved significantly since its "birth" in 1991. In the early years of the 21st Century, people began to play a role in shaping the Web, forming the 'Social Web.' This new era involved the emergence of social media (Phethean, 2014). Social media is a group of applications formed of user-generated content. It enables users, which may be individuals, companies or other organisations, to create and share various forms of content. Ultimately, it offers opportunities to communicate and collaborate on a local, national, and global scale, facilitating a place for discussion and sharing opinions.

Users can build profiles about themselves, establish connections with other users, post updates, share photos and videos, and distribute messages either publicly or privately. Some platforms are built to rely mostly on two-way reciprocation; two users must both accept one another before they can be classed as connected and are able to view each others content, whilst others only require a one-way follow where no reciprocation is required.

Twitter, a microblogging service launched in 2006, is deemed one of the most popular social media platforms (Alexa, 2016), with 313 Million monthly active users (Twitters, 2016). It is designed to enable users to post short updates, restricted to 140 characters, called 'tweets'. It offers users the opportunity to follow other users so that they can: view that user's tweets (no reciprocation is required); share each others posts, known as 'retweeting'; participate in conversations using the reply button; and express an opinion about a tweet – typically to show appreciation of a tweet - by 'liking' (rebranded from 'favourite' in 2015). Each user has a 'timeline' made up of tweets posted by other users that that particular user follows. The Twitter developers have realised that users exploit Twitter to distribute and collate emergency information. Thus, in 2013, 'Twitter Alerts' was introduced, to help users retrieve important and accurate information from credible organisations. Twitter Alerts are tweets published by official emergency organisations. If a user is signed up to receive a specific organisation's twitter alert, they will receive a notification directly to their mobile phone, and receive an SMS text. The tweet is also designed to stand out in the user's timeline (Twitter, 2013).

4. The UK Floods 2013/14

October 2013 felt like the beginning of an unforgettable event in the UK. St Jude's Storm was the first of many storms to hit the UK, causing devastation across different regions. Rivers burst their banks, trees were brought down by high winds, and sea defences were weakened, if not destroyed. Throughout December 2013 and January and February 2014, the UK experienced numerous bouts of stormy weather, affecting many people over the Christmas and New Year period (Julia et al., 2014). Hundreds of people were left without power, and thousands more were forced to evacuate their homes. Railways were destroyed and roads were flooded, causing chaos for commuters; this was the stormiest weather the UK had felt since 1969 (Rogers and Bryson, 2014).

During the UK Floods 2013/14 both the public and Emergency Responders used social media to deliver up-to-date warnings, provide weather-related information and share media (Parsons et al., 2015). However, despite this investment and effort the effectiveness of social media in this context remains uncertain (DEFRA, 2014).

5. A Mixed Methods Approach: Using Twitter Data and Qualitative Interviews

This research incorporates technical approaches with techniques from human geography research and the theoretical perspectives of the social sciences. To achieve the research aims, a combination of methods was used, known as 'Mixed Methods', which integrates quantitative and qualitative methods (Creswell and Plano, 2007). A quantitative analysis of Twitter data was deemed necessary to identify how the UK Responders have used a social media platform, in this case Twitter, during the UK Floods, and qualitative semi-structured interviews were carried out to gain a rich understanding of the UK Responders use and

perceptions of social media. Generally, the related literature has focused on using quantitative studies to analyse how social media is used during emergencies. However, these data do not explain the reasons for its use, rather merely showing how the users appear to exploit social media. Therefore, the benefit of a Mixed Methods approach is that it can support a level of understanding that each method could not accomplish alone (Bryman, 2012).

The Twitter analysis involved an examination of a variety of metrics, listed in Table 1, and a content analysis, categorising the tweets in accordance with a framework developed by Olteanu et al., (2015), which evolved from an extensive analysis of Twitter data of 26 different crises. As the analysis proceeded, it was deemed necessary to amend the category *Donations and Volunteer* to *Donations, Volunteer and Rescue,* and add an category; *Flood Related Information*. Table 2 lists the categories and provides a summary of their interpreted meaning as used in this research.

Table 1: Metrics and justifications used in the Twitter analysis.

Metric	**Reason for Analysis**
Total Number of Tweets Posted	According to Mei et al. (2015), this metric can be an indication of how proactive the user is in using Twitter, and provides an insight into their level of engagement within the Twitter community; a high number of tweets implies a high level of engagement.
Number of Tweets that are Retweets, Quote Retweets and Replies	Retweets are the reposting of another user's tweet; Quote Retweets are the reposting of another user's tweet whilst adding original content to it; and Replies are tweets that are in response to another user's tweet. These metrics can suggest how much a user engages in conversation with their audience (Zamparas et al., 2015; Phethean et al., 2012).
Number of Retweets and Favourites received	Retweets received is the number of times a tweet is reposted by another user, and Favourites received is the number of times a tweet is liked by another user. These can indicate engagement between a user and their audience (Kwak et al., 2010). They suggest a level of impact that tweet has had on the audience and signify a level of popularity (Zamparas et al., 2015).
Number of Hashtags and URL Links (URLs) included	Hashtags are keywords or topics marked in a tweet by using the # symbol. Hashtags and URLs tend to be used to help find and share information (Bruns and Stieglitz, 2013). They have been found to correlate with the retweetability of a tweet (Suh et al., 2010).
Number of Mentions included	Mentions are the action of tagging another Twitter in any part of the tweet by using the '@' symbol followed by their username. They are believed to have the potential to further the reach of a tweet. Researchers typically analyse mentions to uncover user influence (Zamparas et al., 2015). It is important to note that this does not include a count of all the usernames, as "@username" also represents Replies.

Use of Media (photos and videos)	Media is perceived as a method of influencing interaction (Yetim et al., 2011).

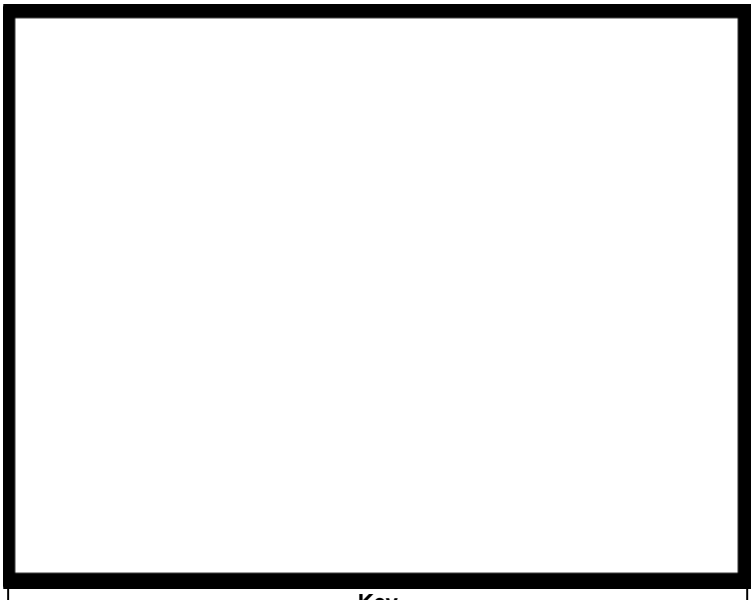
Table 2: Framework, adapted from Oltenau et al., 2015, used to categorise the Tweets content.

Information Type	**Summary**
Affected Individuals	Posts specifically about individuals that have been affected by the incident.
Infrastructure and Utilities	Posts about structures such as roads, buildings, and bridges, and utilities such as water and electricity supply, that have been affected by the incident.
Donations, Volunteer and Rescue	Posts related to donations of goods, services and money, and volunteer actions and information.
Caution and Advice	Posts providing warnings and informative information in advance of, during, and after an incident.
Sympathy and Support	Posts offering concerns and condolences
Flood Related Information	Information that is specifically about Flooding
Other Useful Information	Other information that is related to the incident

Semi-structured interviews were chosen for this research, as the method is suitable for supporting specific questions on how social media is used, whilst enabling the participants to openly express their opinions on it. It involved the use of an Interview Guide; a short list of questions on the specific topics to be covered in the interview. The primary aims of the interviews were to investigate:

1. The UK Responders' use of social media during an emergency.
2. The UK Responders' motivations for using social media in Emergency Management.
3. The UK Responders' perceptions of the use of social media for Emergency Management.
4. UK Responders' perceived impact of social media in Emergency Management

Both studies carried out in this research involve only UK Category 1 Emergency Responders involved in LRFs. As the UK Floods 2013/14 mostly affected the southern parts of the UK, this research concentrated on only six of the twelve regions of the UK, which are represented by 22 LRFs. Figure 1 provides an overview of the sample scope, illustrating that 15 of the 22 LRFs were involved in this research.



Key	
	Settings of UK Regions affected by UK Floods 2013/14

Figure 1: Map of Sample Scope

The sample of UK Responders' Twitter activity during the UK Floods 2013/14 was retrieved using Twitter's Advanced Search; a feature that enables users, once logged into Twitter, to search through Twitter's archive of all the tweets that have been published. Users can tailor their searches by selecting filters including specific date ranges, users, location, words in the tweet content, language, and hashtags. To obtain a manageable sample size for the analysis, only the tweets of the emergency services' involved in the 10 LRFs within the South West (SW) and South East (SE) Regions, were examined. The sample was constrained to only include tweets and retweets containing the word `flood' in the content, and posted between the dates 1st December 2013 and 28th February 2014 inclusive. This was to ensure that the data collected were relevant to the case study, and covered the main period of the UK Floods.

To acquire interview participants, an online survey was distributed using the Snowball Technique. This involves "gathering research subjects through the identification of an initial subject who is used to provide the names of other actors. These actors may themselves open possibilities for an expanding web of contact and inquiry" (Lewis-Beck et al., 2004). 14 interviews took place, either Online, Face-to-Face, or by Telephone, representing 12 LRFs. The organisations are kept anonymous. For analysis purposes, each interview was manually transcribed, using the 'Intelligent Verbatim' technique; omitting mumbles, half sentences and irrelevant words such as ``ums'' and ``like'' without losing the meaning of the content (Salonga, S. NoDate; SPEECHPAD, 2016). Furthermore, each transcript was returned to the participant for review. The credibility of qualitative research is heavily debated due to its subjectivity. However, arranging for transcripts to be examined by the participants can improve validity. By confirming the transcripts, it helps to ensure that it reflects what the participants intended, and can help to reduce any misunderstandings (Burnard, 2008).

The methodology 'Thematic Analysis' (TA) was used to analyse the transcripts.
TA is a method for "identifying, analysing, and reporting patterns (themes) within data" (Braun and Clarke, 2006). It is seen as a means to organise and describe data in rich detail, which can be achieved through a range of techniques; from word counts to line-by-line analyses (Ryan and Bernard, 2003). Generally, TA involves six steps: (1) familiarising with the data, (2) devising initial codes (essentially labels or tags), (3) creating themes by grouping the initial codes, (4) reviewing the themes, (5) defining and naming themes, generally to form 'codebooks', and (6) drawing upon the themes to form an analysis. However, TA is not necessarily a step-by-step process; often steps are repeated and reviewed until the researcher is content.

6. Social Media Enhances Emergency Communications: The UK Responders Perspective

"we knew there was a gap, we knew we needed to communicate better" - ***Interviewee 1***

Before an assessment of the Responders use of social media can take place, it is firstly important to uncover why the Responders are using it. A theme that emerged from the interviews is that a key underlying motivation for integrating social media into UK Emergency Management is the Responders' perception that social media will help to enhance emergency communications. Communications is a major challenge for UK Emergency Responders, as was explained by an interviewee:

> ***"****To give you a little bit of background: we have recently gone through what is a peer challenge, and that is, essentially, it is like an audit from a mixture of stakeholders, they come in and they assess your service on various aspects. One of those elements is communication, and that was seen as less…as an area for development, lets put it like that […] so one of the ways that I identified to improve it…is we use social media" –* ***interviewee 1***

Communication is of paramount importance in Emergency Management. Yet, it has been a common cause of failure relating to interoperability from emergencies in the UK (Pollock, 2013). A review of the Foot and Mouth Outbreak in 2001 highlighted that "information was not fully co-ordinated on a national and local scale; updates became more of a burden than a benefit; and operators of the helpline were overstretched and did not have enough up-to-date knowledge" (Anderson, 2002). Following the UK Floods 2007, the need for providing better advice and help for people to protect their families and homes, was emphasised (Pitt, 2008), and it was reported that during the London Bombings 2007, one of the biggest problems was how to communicate with the victims and their families (Strom and Eyerman, 2008). These evaluations highlight that, in terms of emergency communications, one of the most common challenges that the UK Responders face is the ability to effectively communicate with general citizens in a timely manner.

A trend emerged from the interviews that showed that UK Responders are turning to the use of social media as a means to improve emergency communications, considering it as an option to effectively communicate with the public during emergencies. This is supported by the analysis of the Responders Twitter use during the UK Floods. The results show that they made efforts to post relevant content for members of the public affected by the floods, including situation updates and advice on how to handle the event; see examples below:

> **@kentfirerescue:** NEWS: Flood warnings issued in Kent ow.ly/rtR4s #floodaware
>
> **@ThamesVP:** Severe flood warning in Datchet village, especially for properties in Slough Road. Please take care and do not drive through flood water.
>
> **@SECAmbulance:** If you have any health questions related to #flooding, why not check out advice provided by the Health Protection Agency? bit.ly/NGdvmW

It is clear from the interview responses that the Responders consider social media as an efficient course of action for dispersing emergency information compared with other traditional methods:

> *"that's just the quickest way to get it out there […] it doesn't get filtered by the journalists"* - ***Interviewee 2***
>
> *"It's faster than what ever we can put out on the radio"* - ***Interviewee 5***
>
> *"Rather than waiting for people to have a teleconference […] if you just have the links to the information website, and just tweet them out, or Facebook them out, then that cuts down on time"*- ***Interviewee 8***
> *"everyone else didn't have to make a single phone call, when normally you're on the phone all the time."* – ***Interviewee 14***

Although the UK Responders may perceive social media as a useful tool for communicating directly with the public, the concern is that they may be too optimistic about who, and how many people, they can reach. It emerged from the interviews that the majority of the Responders do not know who their social media audience actually is. When prompted to describe their followers, some participants guessed, whilst others openly admitted they did not know:

> "*Although quite difficult – maybe I need to give this some more thought – but we need to know who our audience are, or probably more important, who they are not."* - ***Interviewee 1***
>
> *"I've never looked to check who follows [Organisation] or the [Organisation's] account"* – ***Interviewee 3***
>
> *"well, generally it's, who are our followers, it's anyone who takes an interest…I* ***think*** *the local communities and local responders we're pally with"* - ***Interviewee 9***
>
> "*we do have a number of individuals who we are not aware of or where they are from etc. Without going into too much detail in finding that out, so I* ***think*** *it's members of the public"* - ***Interviewee 12***

Considering the online nature of social media, understanding who the audience is, and identifying who is actually listening, is imperative before the impact of using social media for emergency communications can be realised. Social media does not involve the entire population. In 2013, based upon the number of users in the UK on Twitter in 2013 (Curtis, 2013), and the Population of the UK in 2013 (Office for National Statistics, 2016), only 23% of the UK's population had a Twitter account, and not all accounts would have actually been active. Also, many social media users are found to be of a particular demographic. According to the Office for National Statistics (2013), it was observed that 16-24 year olds are the most likely demographic to use social media in the UK, and 65-74 years are the least likely.

A significant number of social media users are not who they seem. Bots are common on social media sites (Chu et al., 2010). They deceive the public by appearing to be a real user, but are actually algorithms running automated tasks. For example, spammers use bots to push spam to numerous accounts (Chu et al., 2010). Thus, understanding who the Responders

followers are would provide a picture of who - if anybody – the Responders are possibly reaching.

7. Intentions to Engage vs. Actions of Engagement

"it is a great way to form a relationship with people" – ***Interviewee 13***

Generally, social media users will choose to follow others that post relevant content to their interests. This could be a result of anything from friendships to a shared interest for breaking news or celebrity gossip (Cha et al., 2010). However, the nature of social media means that a user is not likely to see all of their followers' posts. Twitter, for example, applies a sorting algorithm to organise a users' timeline; the tweets believed to be most desirable to a user will be displayed first. This is determined using a variety of machine learning computing techniques that calculate the number of interactions a user has had with a particular follower. In other words, the more often a user likes, retweets or replies to, a follower's posts, the more likely they are to see that followers' Twitter activity. Therefore, audience engagement is often sought on social media (Briones et al., 2011).

It emerged from the interview responses that the Responders do try to engage with their audience to achieve their main objective for using social media:

> *"You've got to start at the bottom level and get people engaged"* – ***Interviewee 9***
> "*I think its more about the engagement, you want people to be engaging with you*" - ***Interviewee 11***
>
> "*We'd like to tailor the messages we put out there in order for the public to feel that they can engage with us*" – ***Interviewee 12***

A variety of mechanisms for increasing audience engagement can be used on social media. Posting regular, up-to-date, and relevant content that is interesting to the public is key (Kaplan and Haenlien, 2010). Furthermore, participating in conversations, for example using Twitter's replies and mentions (Phethean, 2014); interacting with other users' messages, for example, by retweeting or liking a message on Twitter (Boyd et al., 2010); and, making use of URLs, hashtags, photos and videos, which are likely to attract other users' attention (Suh et al., 2010; Yetim et al., 2011), are also considered as useful techniques to engage an audience.

In the interviews, the Responders claim to frequently post on various social media platforms, although Facebook and Twitter were the most popular, providing coverage of incidents happening in their local areas. They believe this to be the primary type of information that their audience - assumed to be the public - desire from them.

> "*they [Joint Emergency Control Centre] can say 'this type of incident has happened' because its just of interest to the public*" – ***Interviewee 1***

> *"People want to know what is going on in their local area"* – ***Interviewee 4***

> *"We'll post several times a day to each account"* – ***Interviewee 11***

The Responders also discussed using social media features to engage their audience, deeming the use of media (photos and videos) as the most important method to engage their audience:

> *"we do a lot using photographs and graphics"* - ***Interviewee 2***

> *"So imaging is good, it has got to be there."* – ***Interviewee 7***

> *"so what we've decided to do is go down the picture sharing route, as we realise this is quite a big thing at the moment"* - ***Interviewee 9***

However, the results from the Twitter analysis contradict the Responders' interview responses. The 30 organisations included in the analysis only posted 799 tweets across the three months of the flooding incident; that is an average of 8/9 tweets per organisation per month (although some organisations did post more than others). The Responders rarely retweeted (12%), or replied to (3%), other users' tweets, 48% of the tweets contained at least one hashtag, 34% of tweets contained at least one mention, and just under half of the tweets included a URL link. Furthermore, their use of media was minimal. Only 9% of the tweets included a photo or video.

In Wukich and Steinberg (2014), the authors concluded that Emergency Responders knowledge of best practice and how to integrate social media appears to be limited, as they found that the Responders used irrelevant hashtags in their tweets. The findings from this research suggests that the Responders do appear to have an understanding of how to exploit social media features to engage their audience, but they do not appear to implement this knowledge during an emergency. It could be inferred from the results of the Twitter analysis that the UK Responders use of Twitter to deliver information to the public during the UK Floods 2013/14 was limited. Although, a limitation of this study is that the Twitter data from the UK Floods occurred before the interviews took place. Therefore, the Responders strategy and usage could have changed between the data collection periods.

8. Examining the Level of Engagement during the UK Floods 2013/14

> *"how do we define success?"* – ***Interviewee 7***

The final part of this paper investigates if the Responders' use of social media does actually play a role in Emergency Management. The online nature of social media means that it is difficult, if not impossible, to determine whether the actions on social media attribute to the

real actions offline. It emerged from the interviews that the Responders struggle to measure the effectiveness of their social media activity, and rely on monitoring the number of followers as an indication.

> *"As indicated by the number of followers the [service] have got, it's not really huge…so you really need a greater number of followers"* – ***Interviewee 6***
> *"In terms of numbers, it's a drop in the ocean really…but we've just got to keep plugging away to try and get more people to follow us"* – ***Interviewee 9***
> *"There's no point tweeting to a few followers, you need thousands"* – ***Interviewee 10***

Whilst the number of followers is objective, it does not actually explain much about social media success. Merely counting the number of followers can be misleading about the actual rates of engagement, as it provides an insight only into how many users will *potentially* see a message. It cannot be assumed that every follower will actually see every post (Phethean et al., 2012). However, metrics representing the possible reach and level of engagement can help to discover the potential impact of a user's social media activity (Phethean et al., 2012). Constraints of the Twitter data available to access, meant that the number of followers for each Responder - included in the data sample – during the UK Floods 2013/14 could not be obtained. However, the number of favourites and retweets received, which were acquired, can indicate a level of engagement (Zamparas et al., 2015).

To favourite a tweet (i.e., the action of liking a tweet) indicates that a user wishes to show appreciation for that post (Kwak et al., 2010). It should be noted that in November 2015, Twitter rebranded the "*Favourite*" button, represented by a star, to be "*Like*", now represented as a heart. As this data sample dates before November 2015, to avoid any confusion, the term "*Favourites*" is still used (Twitter, 2015). Retweeting (i.e., reposting another user's tweet) suggests that a user deems that message worthy. Henceforth, the term *level of engagement* will denote the number of favourites and retweets received.

To determine if, and how, the Responders' engage their audience on social media, the level of engagement during the UK Floods 2013/14 is examined here. The findings from the Twitter analysis show that the level of engagement varied significantly by LRF, see Figure 2.

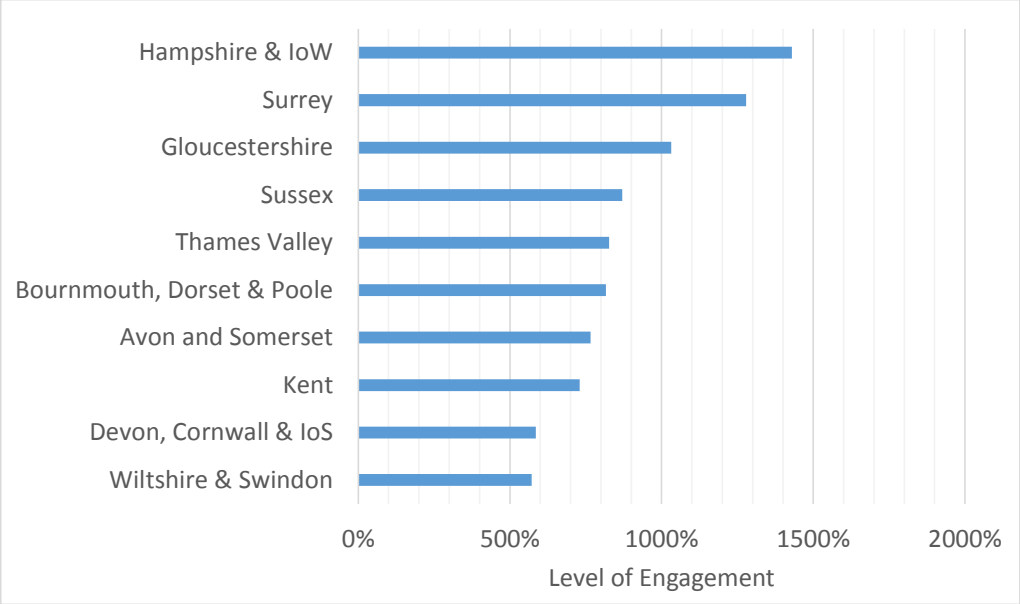


Figure 2: Level of Engagement from Audience across LRFs

Many reasons could explain this variability across LRFs, such as: the population size covered by each LRF may vary; the number of followers for each LRF may differ significantly; and, some Responders may have been using Twitter longer than others. However, this paper concentrates on identifying what aspects of the Responders' Twitter activity may have had an impact on the level of engagement.
Using IBM's tool SPSS, two multiple regression analyses were conducted to investigate what variables explain the variance in the level of engagement. The first test examined the content categories of the tweets: Caution and Advice, Infrastructure and Utilities, Donation and Volunteer, Rescue, Sympathy and Support, Affected Individuals, Flood Related, and Other Information. Interestingly, the test revealed that albeit *Caution and Advice* related tweets were the most popular type of content to be posted by the Responders, only the *Infrastructure and Utilities* category explained a proportion of the variance statistically (63%; $p<0.05$). The other categories did not have any association statistically.

Examples of tweets in the *Infrastructures and Utilities* category (i.e., involving posts about structures, such as buildings and bridges, and utilities such as water and electricity supply, that have been affected by the incident) that were posted during the UK Floods are shown below:

> **@wiltshirepolice:** Queens Drive, Swindon near to Windsor Road, reports of flooding on carriage way. Swindon Council informed.
>
> **@sussex_police:** TRAVEL NEWS: Flooding at Balcombe has closed the rail line between Haywards Heath and Gatwick Airport. sussex.police.uk/whats-happenin ...
>
> **@RBFRSofficial:** Flooding is now affecting the Bath Road Reading in the vicinity of the old reservoir please avoid the area as traffic is building up.

The Pearson's product-moment correlation coefficient (0.795; $p<0.05$) indicates a large positive association between the level of engagement and the *Infrastructures and Utilities* category. The plot in Figure 3 shows that the LRFs that posted a large number of tweets categorised as *Infrastructures and Utilities*, achieved a higher level of engagement. Therefore, these findings suggest that the Responders are more likely to increase audience engagement on social media in future emergencies, if they focus on providing information about *Infrastructures and Utilities*.

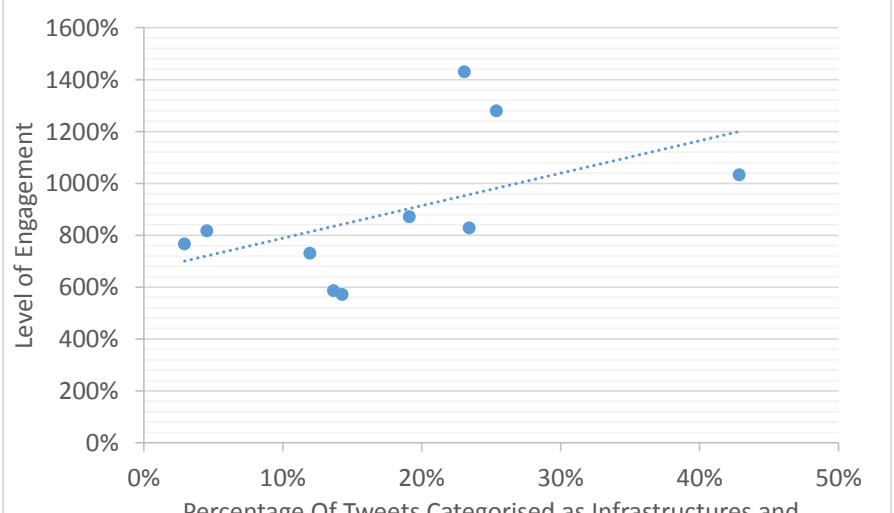


Figure 3: Correlation between Level of Engagement from Audience and Percentage of Tweets categorised as Infrastructure and Utilities.

A second multiple regression model was fitted to investigate if any of the following variables: the number of tweets, level of interaction responders attempted (number of retweets, quote retweets and replies), number of tweets containing at least one hashtag, number of tweets containing at least one mention, number of tweets containing a URL, and number of tweets containing media (photos and videos), also explained the variance in the level of engagement. In accordance with the Responders' beliefs about the most effective methods for engaging the audience on social media, the results showed that the use of photos and videos explained 85% of the variation in the level of engagement (p<0.01). The other variables do not explain the variance statistically. Furthermore, a large positive correlation was found between the variables (0.920; p<0.01). Thus, the LRFs that posted the highest proportion of photos and videos also obtained a higher level of engagement (Figure 4). Although this may be less surprising, during the UK Floods, only 9% of the tweets included a photo and video. Therefore, if the Responders also focus on using more photos and videos in their social media posts, it might help to maximise the level of engagement.

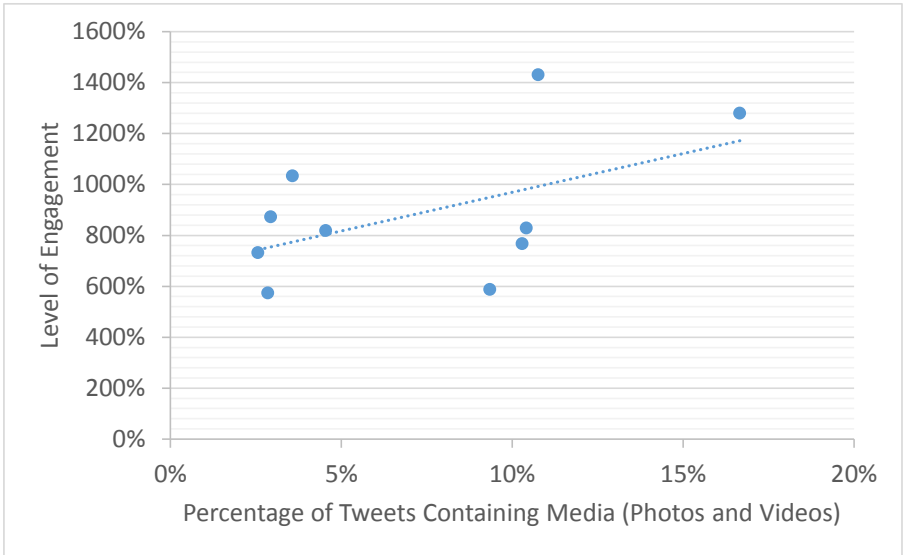


Figure 4: Correlation between Tweets containing Media and Level of Engagement from Audience.

The obtained correlations, taken together, suggest that the Responders can achieve a level of engagement on social media during an emergency, although, if they focus more on posting content related to the *infrastructure and utilities* category, and include more photos and videos, they are likely to achieve a much higher level of engagement. However, measuring the number of retweets and favourites to represent the level of engagement does not imply absolute impact, it is only an indication. Although users may favourite a post to show appreciation, or retweet a post they deem to be worthy to forward on to their followers, it does not mean that they are following the Responders every message, or listening to, and retaining, the information provided by the Responders. Further research would be required, involving the Responders' followers, to determine how effective the Responders use of Twitter actually is during an emergency.

Whilst the use of social media as a tool to communicate with the public seems promising, it should not be the only tool used, and should not replace other traditional methods, for distributing emergency information. It should only be seen as a mechanism to supplement the Responders' communications toolkit. Here, only the number of favourites and retweets was analysed to represent the level of engagement. This provides only an indication of engagement, as currently there is little evidence to show who they are *actually* reaching and engaging. Furthermore, constraints of social media, including the design of the platforms, and the demography of the social media population, are but a few of the many factors that may hinder the success of reaching the desired audience during an emergency.

9. Conclusion

This research investigated the perception and use of social media amongst UK Emergency Responders for emergency management, providing one of the first analyses of the role that social media now plays, and its potential impact, in emergency management in the UK.

It is clear from this research that UK Emergency Responders believe that social media does play a role in emergency management. UK Emergency Responders are turning to social media as a means to improve emergency communications, which has been one of the main causes of failures in past emergencies. They perceive it as a tool that will enable them to quickly and effectively deliver emergency information to the public, which has previously been one of the biggest challenges for the Responders. During the UK Floods 2013/14, UK Emergency Responders used Twitter as a mechanism to distribute information related to the event, although some were more active than others.

The results highlighted a difference between how the Responders believe they are using social media, and how they appear to use social media. While they wished to use an engagement approach to increase the likeliness of reaching their audience, the Twitter analysis suggested otherwise; very few tweets were posted by each responder, they rarely participated in conversations with the Twitter community, and they hardly used features such as hashtags, URLs and photos and videos, all of which are believed to be effective methods for engaging an audience on Twitter.

The evidence did show that a level of engagement was achieved, although it varied significantly by LRF. Using statistical tests to further investigate this variability, it was discovered that the Responders could possibly increase the level of engagement on social media in future emergencies, if they post more information about structures, such as bridges and roads, and utilities, such as water and electricity supply, that are affected by the emergency (the Infrastructures and Utilities category), and include more photos and videos in their posts.

During the UK Floods, the Responders appeared to predominantly post Caution and Advice related tweets, and hardly posted any media (only 9% of tweets contained a photo or video). Only the content category *Infrastructures and Utilities* explained a significant amount of the variance in the level of engagement. Furthermore, the variables: number of tweets, use of URLs and Hashtags, and use of mentions, were not found to have an effect. Only the use of media had a large significant correlation with the level of engagement. Therefore, if Emergency Responders are going to continue pursuing the use of social media, and integrate it into emergency management practice in an attempt to improve emergency communications, they should consider increasing the number of posts related to *Infrastructure and Utilities* content, as this appears to be of more interest to the audience, and increase the use of media.

Before it can be determined if social media is an effective tool for emergency management, and fulfils the role that Emergency Responders believe it can play in emergency management, further research is required to answer the questions that currently remain unanswered, such as: Who are the Responders followers on social media? Are the Responders actually reaching the public in emergency situations? Do the public find the Responders social media activity useful in an emergency?

Acknowledgements

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