

The Role of Social Media Network Participants in Extreme Events

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Abstract

How does the use of social media platforms like Twitter impact the network role of an emergency management agency (EMA) like the Berlin police and its relationships with other network roles in an extreme event such as the 1st of May Labour Day? How do properties of the social media communication network determine EMA and other network role relations and the overall network configuration? We argue that trust (-worthiness) is a central non-relational attribute of an EMA role which is based on perceptions of EMA integrity and which influences role relationships within the social network. As EMAs are also responsible for taking action to protect the community in times of such an extreme event, we also argue that “swift trust” is built within EMA roles. EMA roles are also reinforced by the non-relational role attribute of communication quality that reflects message authenticity, in this case “transparent and understandable” communications that are expected of an EMA.

Keywords

Social Media Analytics, Twitter, Extreme Events, Emergency Management Agencies, Social Network Analysis

INTRODUCTION

In a preliminary study (Mirbabaie et al. 2014), we analysed a Twitter data set about the 1st of May (Labour Day) event in Germany to obtain a better understanding of the roles that extreme event participants play via their use of social media. The analysis of this event revealed that the Twitter messages broadcasted by the Berlin Police account (emergency management agency role) belonged to the most shared messages in the overall emerging Twitter communication network relating to this event. Within this paper, we build on this previous analysis to explore in detail the role of the police in the Twitter communication network during the Labour Day event.

The 1st of May is Labour Day in Germany which is a public holiday. On this day there are Labour Day marches and rallies to raise awareness about work and social conditions. Although these marches are mostly peaceful events, some cities, such as Berlin and Hamburg, have a history of Labour Day marches turning into violent riots. Overall, in contrast to previous years, the 2014 Labour Day marches were mostly nonviolent events (Spiegel Online 2014). In Berlin, the two biggest events related to the 1st of May were a march with about 19,000 participants and a festival “myFest” with about 40,000 participants (Hasselmann 2014).

Within this study we have used the 1st of May as an example of a predictable public event, which has some of the characteristics of an extreme event, to better understand emergency management agency (EMA) communication behaviour and impact. This paper explores the type of information that was broadcast by the Berlin police during the 1st of May Labour Day event and how this information was shared through the Twitter communication network. The relationships between the EMA role and roles of network participants sharing the EMA communication were also identified and characterised.

Our paper is structured as follows: the next section gives an overview of social media usage in extreme event communication. We then describe our research design, which consists of an analysis of the Twitter communications for the 1st of May event, a detailed analysis of the Berlin police communication, as well as the social network analysis of the roles (participants) interacting with the EMA and each other during the event. Lastly, we discuss the implications and limitations of our study as they relate to the non-relational aspects of the police role that influenced the relationships between other network roles as well as the network's configuration.

SOCIAL MEDIA IN EXTREME EVENT COMMUNICATION

Social media services, especially publicly available social networks such as Facebook and microblogging services like Twitter, are often highly utilised to communicate during extreme events and crises by both individuals and organisations (Stieglitz and Krüger 2011).

Analysing the microblogging communication behaviour of EMA in extreme events is nothing entirely new. Previous studies about such organisations' crisis and extreme event communications indicate that EMA use their social media activities mainly as a "megaphone" to propagate information to the public rarely using microblogging channels for two-way interaction. Such behaviour is observed, for example, during the Queensland Floods in 2010/2011 (Bruns et al. 2012; Ehnis and Bunker 2012), in the information sharing behaviour of US police departments (Heverin and Zach 2010), during the London Riots in 2011 (Procter et al. 2013), and during the Boston Marathon Bombing of 2013 (Ehnis and Bunker 2013).

Another aspect of the communication behaviour of EMA is that in contrast to individuals, who tend to mostly share existing information (Fraustino et al. 2012), EMA use their social media channels mainly to broadcast internally sourced information (Sutton et al. 2012). This was revealed in a study about the online communication behaviour of different US state and federal organisations during the 2010 Deepwater Horizon oil spill disaster (Sutton et al. 2012).

It is insufficiently understood what the role of an organisation, such as an EMA, has on microblogging communication networks, and how they impact various role relationships present in these networks.

ROLES IN SOCIAL MEDIA COMMUNICATIONS NETWORKS

Barley (1990) discusses a role-based approach to the study of technology and work citing Nadel's (1957) study that distinguishes between the relational and non-relational attributes of roles. Relational roles must have a "specific other" e.g. a son must have a mother, while a non-relational role is characterised primarily by exhibiting behaviours that are indicative of that role, e.g. a professional class. Barley concludes, however, that it is difficult to exclusively classify roles into relational and non-relational types preferring to explain that all roles are "bundles of non-relational and relational elements" (Barley, 1990 – p. 68). He also sees that researchers studying the impact of technology such as social media platforms, on organisational networks and structures must focus on three elements, which are: 1) how technologies influence tasks, skills, and other non-relational aspects of roles; 2) how these changes influence the relationships between roles; 3) how properties of the social network determine role relations and the network's configuration.

In a preliminary investigation (Mirbabaie et al. 2014) about the impact of Twitter microblogging communication during the 1st of May Labour Day event in Germany, we identified a broad set of roles (participants) involved in the Twitter communication network. These roles consisted of *media organisations*, *emergency management agencies (EMAs)*, *commercial organisations*, *political groups*, *unions* and *individuals* (politically engaged and others).

From our analysis within this study, we see that the messages generated by the Police (EMA role) account "PolizeiBerlin_E" were amongst the most highly shared in the Twitter network. Within this study we have applied Barley's role approach to gain a better insight into the role, relationships, and social network of the Berlin police (EMA role) during the 1st May event. The detailed analysis of the police account is the focus of this paper.

RESEARCH DESIGN

The data was collected through a self-developed software tool, which identifies data by specific key words directly through the Twitter Search API. The tracking and collection phase took place for the period between the 28th of April and the 3rd of May 2014. A keyword portfolio (Mirbabaie et al. 2014) was created for the investigation containing terms that were attributable to the 1st of May event. The collected and prepared dataset consists of 13,511 entries. From these overall stock of messages 8,056 message were re-tweets and the remaining 5,455 messages were original tweets.

The analysis of the dataset is split into two parts. The aim of the first part is to provide a better understanding of the overall dataset. Therefore, the number of tweets over the time period of the event was examined. This revealed several phases in which the amount of re-tweets exceeded the number of original tweets. These peak phases of re-tweets were examined more closely to identify influential tweets.

In the second step of the analysis, we specifically looked at the behaviour and influence of the Berlin police role (“@PolizeiBerlin_E” Twitter account). This account is one of the two main accounts of the Berlin police force and is dedicated to extreme event police operations. The analysis of the behaviour and influence of this account was investigated in three phases. In the first phase, we explored the broadcasting behaviour of the police and the resulting re-tweet behaviour of other roles in the communications network over the duration of the event. In the second phase, we interpreted the specific social media communication of the police by applying a genre analysis (Westman and Freund 2010) to the data to understand the content of the messages broadcast by the police. Each message from “@PolizeiBerlin_E” was classified into different genres based on purpose and content. Some of the messages served multiple purposes and had multiple genre affiliations. As a background to the genre affiliations, we investigated which types of police messages were re-tweeted frequently and which types of messages were not. In the third phase, we investigated what types of network roles were interacting with the police role during the event by performing a social network analysis about the roles that re-tweeted the police tweets. This revealed the interacting roles and how frequently these roles shared information from the police (role).

ANALYSIS

The analysis is split into two sections. The first section reflects the overall analysis of the Twitter data and the second section describes the analysis of the network behaviour and perception of the police role during the 1st of May event.

Analysis Part 1 - Overall

The tweeting behaviour for the event is reflected in Figure 1. In this figure, a timeline analysis of the complete dataset is represented in a diagram where the number of messages is mapped against the timeframe of the event.

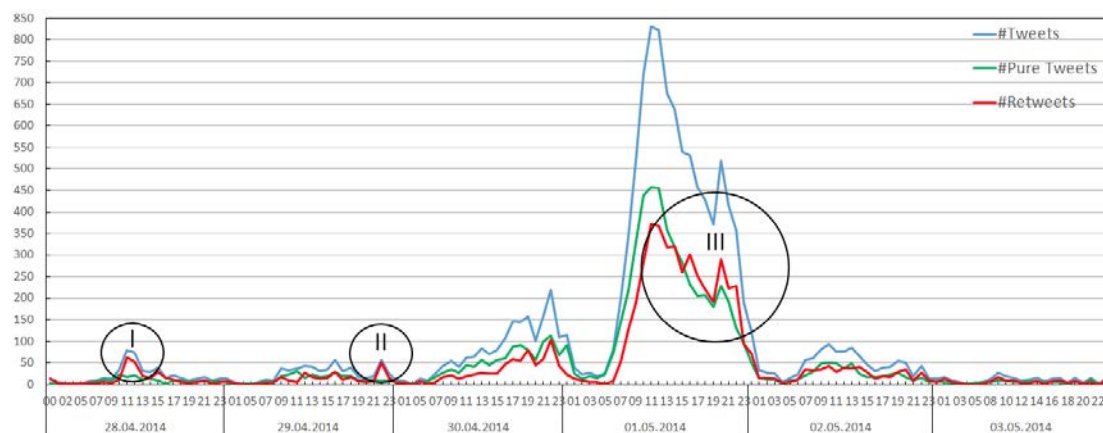


Figure 1: Overall communication timeline

The green line shows the number of original tweets and the red line indicates the number of re-tweets. The blue line reflects the combined number of original tweets and re-tweets. The main number of tweets about the 1st of May event occurred not surprisingly on the 1st of May. In the dataset, we could identify three peaks where the amount of re-tweets exceeded the number of original tweets. These peaks are highlighted and numbered in Figure 1. The first peak occurred at the 28th of April, the second at the 29th of April and the third during the late afternoon of the 1st of May.

Table 1. First Peak

Role of the Author	Tweet Content	Number of re-tweets	Time to first re-tweet
local media organisation	Die rechtsextreme #NPD hat ihre geplante Demonstration für den #1Mai in #Berlin-Neukölln bei der @polizeiberlin soeben abgesagt English: The right-wing NPD has just cancelled its planned demonstration for the 1 st of May in Berlin-Neukölln @polizeiBerlin.	51	2 min 6 sec
politically engaged individual	NPD hat Anmeldung für #1Mai zurückgezogen. 1 Aufmarsch gestoppt, 1 Aufmarsch komplett verhindert. Doppelerfolg für #BerlinNazifrei #einTraum English: NPD has withdrawn the registration for the 1 st of May. Stopped 1 st of May march. Double success for a Nazi-free Berlin, a dream.	38	52 sec

The messages from the first peak are shown in Table 1. The peak consisted of re-tweets of two tweets that were politically engaged messages about a cancelled demonstration march on the 1st of May. The tweet responsible for the second peak is shown in Table 2. The tweet is from a media organisation and is about a regulatory action by the city Rostock which forbade counter marches to a right wing march in order to prevent violent clashes between the two political groups. In comparison to the other re-tweeted messages in the peaks, with 19 minutes and 24 seconds, it was a relatively long period of time until the tweet was first retweeted, but after the initial re-tweet the following re-tweets occurred in a relatively fast period of time.

Table 2. Second Peak

Role of the Author	Tweet Content	Number of re-tweets	Time to first re-tweet
media organisation	Stadt #Rostock untersagt jeden Protest gegen Nazis http://t.co/4f6ZZTanIn #1MaiNazifrei #1mai #nazifrei #antifa #WTF English: City of Rostock prohibited any protest against Nazis.	48	19 min 24 sec

Three of the main retweeted messages from the third peak are shown in Table 3. The messages in this peak were about the day itself and most of them were of a political nature. The single tweet most often re-tweeted was from a commercial organisation, which used the extreme event for a humorous marketing message.

Table 3. Third Peak

Role of the Author	Tweet Content	Number of re-tweets	Time to first re-tweet
commercial organisation	Für alle, die am #1Mai eine Überdosis Pfeffer erwartet, wir haben auch Salz! English: For those who will have an overdose of pepper at the 1 st of May, we also have salt!	78	15 sec
politically engaged individual	Ein Gedanke zum Tag der Arbeit.... (link to political image) English: A thought regarding the labour day	48	4 min15 sec

union	<p>RT @_verdi: Ob auf dem #Taksim, in #Berlin oder #Madrid. 36 Wir wünschen euch einen tollen & kämpferischen #1Mai. #MayDay is ours.</p> <p>English: No matter where you are, Taksim Square, Berlin, Madrid. We wish you a great & struggling '1st May'.</p>	38 sec
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One of the findings of this analysis highlights is that most of the re-tweets which lead to peaks are re-tweets from the following roles: media organisations; organisations and individuals with political content; and a major union. Another remarkable finding lies in the reactions of the re-tweeters. Almost every tweet in the peaks was re-tweeted very quickly (within a few seconds or a few minutes). The speed of information flow for this event within the Twitter network could be classified as fast. It is also noticeable that individual tweets of the police (“@PolizeiBerlin_E” account) do not belong to the most frequently re-tweeted tweets in the peaks. But the police only reported about the local events in Berlin and the overall analysed dataset was about events occurring all over Germany. The messages from the police account, however, are still the second most shared messages in our dataset. The most frequently shared messages were posted by a media organisation.

Analysis Part 2 – Police

A very influential role in the Twitter communication network of the 1st of May event was the Berlin police force. This EMA started their Twitter activity in March 2014 (Rickmann 2014). Their Twitter strategy was to use two main communication channels. The account “@polizeiberlin” which is used for general interaction with their listening community and “@polizeiBerlin_E” which is a more specific account, only actively used and monitored during extreme events and major police operations. In our analysis we focused only on the communication generated from “@polizeiBerlin_E”.

During the data collection period, the “@polizeiBerlin_E” account broadcasted 70 messages over 2 distinct operational phases. The first operational phase was around the eve of the 1st of May, when festivities and some demonstrations were already taking place. The second operation was focussed on the 1st of May demonstrations in Berlin.

Figure 2 shows the tweeting-behaviour of “@polizeiBerlin_E”. The blue line reflects the number of tweets and the red line displays the number of re-tweets from other accounts as a reaction to the police communication. Because of our data collection method, we did not capture the re-tweets for the eve of the 1st of May, since these messages consisted of different keywords. Furthermore, it is possible that a few of the re-tweets on the 1st of May itself were not tracked (caused by limitations of the data collection method). On the 1st of May, 30 of the 48 tweets in our dataset were at least re-tweeted once. Overall, “@polizeiBerlin_E” was re-tweeted at least 244 times in the dataset. The re-tweet time was often within seconds, which is an indicator that groups and individuals actively monitored this account.

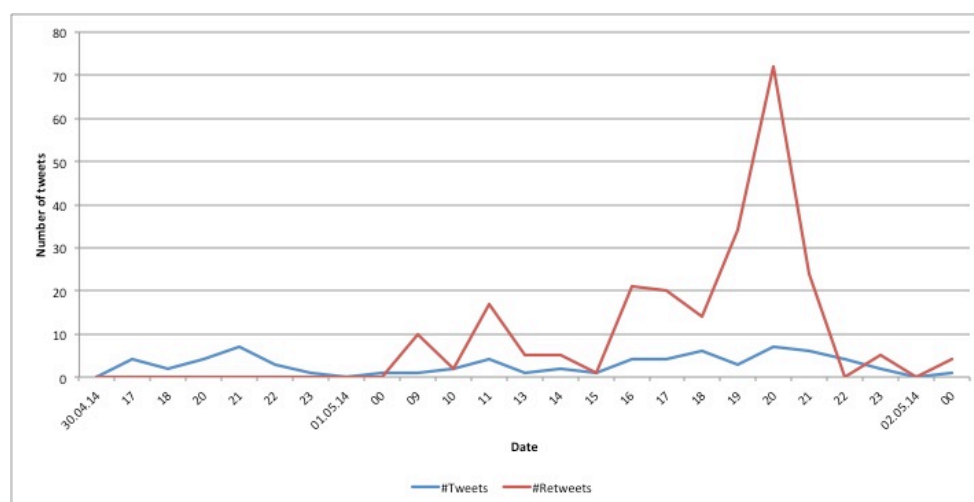


Figure 2: Police communication timeline

In the next part of the analysis we classified each message from “@polizeiBerlin_E” based on their content in different genres. The messages could be divided into 14 genres. These individual genres could be clustered into three top level genres: broadcast of information, broadcast of warning, and influencing behaviour. The genre descriptions are shown in table 4.

Table 4. Genre descriptons

Top-level genre	Genre:	Description:
Information	Operation end	Police tweeting about police operation ended
Information	Operation start	Police tweeting about police operation started
Information	Demonstration end	Demonstration march was declared finished
Information	Demonstration start	Demonstration march started
Information	Demonstration location	Location of the demonstration march
Information	Demonstration route	Information about the planned route of the demonstration march
Information	Changed event	Information that the event changed
Information	Event information	General event information
Information	Traffic information	Information about traffic and blocked roads
Information	Information police behaviour	Explanation why the police acts in a specific way
Information	Number of participants	Information about how many people participate in the event / Sub-event
Information	Number of active police officers	Information about number of the active police officers in the event
Encourage behaviour	Encourage behaviour	Active approach to influence behaviour of the participants and others
Warning	General warning	Warning of potential hazards

Table 5 shows the genre affiliations of the tweets and the number of re-tweets in the different genre affiliations. The dataset for this part of the analysis consisted of 70 tweets from the account “@PolizeiBerlin_E”. When a tweet served multiple purposes we assigned up to two genre affiliations to that tweet.

Factual information like the number of participants in the 1st of May event created the most re-tweets followed by the police declaration when a protest march ended. Tweets classified under demonstration location also created several re-tweets. Tweets with the genre affiliation influencing behaviour were barely shared through the communication network and messages about the demonstration route or a changed sub-event were not shared at all.

Table 5. Genre affiliations

Genre:	Genre	2nd Genre	Re-Tweets	Re-Tweets 2nd Genre
Operation end	4	0	4	0
Operation start	3	0	10	0
Demonstration end	6	0	20	0
Demonstration start	6	0	8	0
Demonstration location	19	6	21	60
Demonstration route	5	0	0	0
Changed event	1	2	0	0
Event information	11	1	13	5
Traffic information	13	3	39	6

Information police behaviour	6	1	10	0
Warning	4	3	20	0
Number of participants	12	0	73	0
Number of active police officers	4	0	16	0
Influencing behaviour	5	2	0	6

As a further step, a network analysis was performed to highlight roles that were directly involved in the process of information diffusion during the 1st of May event. The results of this analysis are represented in Figure 3. In order to preserve account anonymity we have disguised the account names by using the role (name) that they play in the network. In total 149 accounts re-tweeted the police account. In order to produce a relevant overview of the communications activity, only those roles were considered for closer examination that had re-tweeted at least three messages from “@PolizeiBerlin_E”. The following figure shows the roles including both their account type and their number of followers. The roles of individuals were indicated with a (p) when it was felt that they were politically engaged. In this subnetwork all of the individual roles were politically engaged and tweeted political positions. When there were multiple accounts with the same role we indicated the different accounts with a character (a, b... etc).

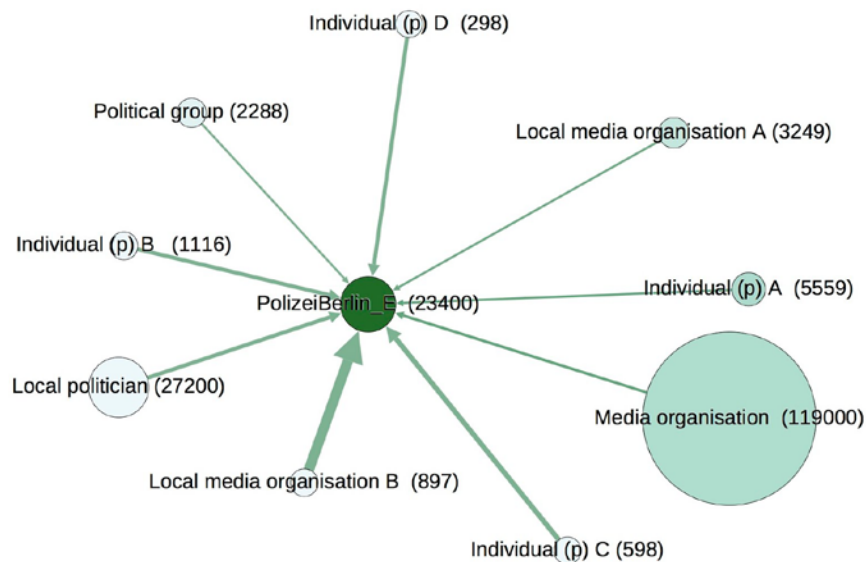


Figure 3: Police Retweet Network

The colour of the edges and circles implies the number of re-tweets, i.e. the darker the colour the more the account was re-tweeted by other actors in the network. This in turn indicates that this account has a high *visibility* in the network. The size of the circles derives from the number of *followers* of an account.

The “@PolizeiBerlin_E” with 23,400 followers is expected to accomplish much lower direct information diffusion than the “media organisation” with 119,000 followers. According to the colour of the circles it can be seen that the police were the most re-tweeted in this network. This indicates that the police account accomplished high indirect information diffusion. Thus, the police have an important and central role in the network. Analysing the thickness of the arrows we see that “local media organisation B” re-tweeted “@PolizeiBerlin_E” the most, but was hardly noticed or re-tweeted by other accounts.

To gain better insights about the re-tweet behaviour of the network we investigated the three roles that re-tweeted some tweets from “@PolizeiBerlin_E” and were also re-tweeted several times themselves in the network. These roles were expected to amplify information more than roles that received no re-tweets. These roles are: “media organisation”, “individual (p) A”, and the “local media organisation”. Further, we looked deeper into the four accounts which re-tweeted “@PolizeiBerlin_E” the most. These four accounts were not re-tweeted in the overall network and were therefore expected to not create much impact in the 1st of May

communication network. These four accounts are: “local media organisation B”, “individual (p) B”, “individual (p) C”, and a “local politician”.

“Media organisation” is a major newspaper in Berlin with a readership as well outside of Germany. They have 119,000 followers on Twitter and re-tweeted “@PolizeiBerlin_E” five times. The messages this account shared were classified as event information, traffic information, warning demonstration start, and information about police behaviour.

“Local media organisation A” is an online branch of a local media organisation. This account has 3,249 followers and they re-tweeted “@PolizeiBerlin_E” four times. The re-tweeted tweets were about the location of the demonstration, the number of participants, and traffic information. Similar to tweets of the account “media organisation, tweets of “local media organisation A” were shared through the network.

The last account that was frequently re-tweeted through the overall communication network, was “individual (p) A”. This account is very politically active and operated by an individual person. The follower count for this account is 5,559. “Individual (p) A” re-tweeted “@PolizeiBerlin_E” four times. The content of the re-tweets was about the end of a demonstration march, the location of a demonstration, number of participants, and information about the police behaviour.

In the following section we describe the four roles, that re-tweeted “@PolizeiBerlin_E” most often, but were not re-tweeted in the overall communication network. One of these actors is a “local politician”. This account retweeted seven messages of “@PolizeiBerlin_E” and has 27,200 followers. The messages shared by this role were about the number of active police officers, event information, traffic information the location of the demonstration marches, and the end of marches.

“Individual (p) B” has 1,116 followers and is very politically engaged. This role re-tweeted seven tweets from “@PolizeiBerlin_E” and was not re-tweeted itself. The content of the re-tweets were about traffic information, influencing behaviour, the location of a demonstration march, the end of marches, the number of participants, and information about the police behaviour.

“Individual (p) C” has 598 followers and re-tweeted “@PolizeiBerlin_E” nine times but was not re-tweeted through the network. The content of the re-tweeted police messages was about number of participants, the location of demonstrations, the end of a demonstration march, warnings about specific incidents, traffic information, and general event information.

“Local media organisation B” is a local newspaper with 897 followers. Its main focus was new information about emergency management agency operations, such as police, fire departments or ambulance. They re-tweeted 18 messages from “@PolizeiBerlin_E”. “Local media organisation B” was not re-tweeted in the 1st of May network. The messages they shared from “@PolizeiBerlin_E” were about, the start of demonstration marches, the end of a demonstration march, the location of the demonstration marches, number of active police officers, the number of demonstration participants, information about the police behaviour, warnings, influencing crowd behaviour, traffic information, general event information, and the start of the overall police operation.

DISCUSSION & IMPLICATIONS

This Twitter analysis of the 1st of May event provides evidence that while the Berlin police did not broadcast many tweets overall, they did have a lot of influence and visibility in the social media communications network. The data that was collected came from all over Germany while “@PolizeiBerlin_E” broadcast only about events in Berlin. It is not a surprise that the messages of this account, therefore did not have a great impact on or influence over the communication peaks of the overall communication network. Nevertheless, the behaviour of various roles within the network indicates the central focus that “@PolizeiBerlin_E” provided within the network.

“@PolizeiBerlin_E” was used to inform the general public about the 1st of May event and their police operations. We could not find evidence that the account was used to actively source information from witnesses through social media. We also could not find any indication that the police used this account to respond to messages from their listening community. In this context the impact on the network of these tweets could be seen as that of a “megaphone” by which a larger audience could be reached. This is supported by the number of re-tweets of “@PolizeiBerlin_E” by “local media organisation B” (a news broadcaster), which also highlights that various role relationships within the network (i.e. those that had re-tweeted messages) are also very important to the overall function, behaviour, and structure of the network to underpin this “megaphone” effect.

The relatively short re-tweet times of “@PolizeiBerlin_E” messages, which were often within seconds, also indicated that their messages were propagated throughout the network very quickly, underpinning the importance and central role of the Berlin police within this network.

Why is the role of the Berlin police i.e. so important to this network? What are the non-relational attributes of this EMA role that influence the relationships between roles in this network and determine the overall role relations and the network’s configuration? We argue that trust (-worthiness) is a central non-relational attribute of this role. Trust as defined within this study is “an expectancy held by an individual or group that a word, promise, verbal or written statement of another individual or group can be relied on” (Rotter, 1967, Anderson and Narus, 1984 – as cited by Zeffane et al. 2011).

Jarvenpaa et al. (1998), in their study on antecedents of trust in global virtual teams, highlight that trust in team members is more strongly predicted by perceptions of other team members’ *integrity* i.e. “the adherence to a set of principles making the trustee dependable and reliable”. We argue that a key non-relational attribute of an EMA role (such as the Berlin police) would be that of integrity, which would be influential on role relationships within the network due to the inherent trust placed in this role. As an EMA role such as Berlin police is also responsible for taking action to protect the community in times of such an extreme event, we would also argue that “swift trust” is built in the role that relates to this action.

This EMA role is also reinforced by the non-relational role attribute of quality of communication (Massey and Kyriazis, 2007, Kottila and Ronni, 2008) that reflects message authenticity (Ellonen et al., 2008) in this case “transparent and understandable” communications that are expected of an EMA. For instance, the police tweeted relatively low volumes of factual information about the event and these tweets were highly re-tweeted by other members of the network, illustrating the belief in their authenticity.

Jarvenpaa et al. (1998) maintain that trust is forged and maintained through effective communication and that “Increases in trust, decrease transaction costs of relationships because individuals have to engage less in self protective actions in preparation for the possibility of others behaviour (pp. 30-31)”.

CONCLUSION

Not surprisingly, the communication about the 1st of May was mainly political communication, since this day is celebrated in Germany as Labour Day. Even though the account “@PolizeiBerlin_E” was used for local communication about the unfolding event of the police operation in Berlin, it had high prominence in the overall unfolding communication network.

The “@PolizeiBerlin_E” role used Twitter mainly as a “megaphone”. This role had high visibility indicating a high level of trust (-worthiness) with a relatively low number of tweets but a high number of re-tweets i.e. high level of communications authenticity. Our analysis also revealed that the most influential roles in the network were those that created information that was perceived as trustworthy, such as police, and the roles that spread the created information throughout the network, such as media organisations and influential and politically engaged individuals and organisations.

In the case of the 1st of May event, the most recognized and communicated information from the “@PolizeiBerlin_E” role included: the number of participants; the location of demonstration marches and traffic information. The time to re-tweets was mostly seconds or a few minutes indicating a high speed of information flow and a belief in the communications’ authenticity.

As with any study, there are limitations. In our analysis some of the re-tweets of “@PolizeiBerlin_E” were missing because of our selection of keywords for our data collection. Our selection of this type of event with more predictable characteristics than those found in a truly extreme event, makes it also difficult to compare to other extreme events. We would recommend that future studies must include an analysis of more diverse and extreme events to strengthen any resulting conclusions.

As a follow up to this study, we intend to further investigate the motivations of the police in order to understand their reasons and perceptions behind their Twitter use in the 1st May event as well as in other extreme event operations. We also feel it would be desirable to examine “media organisation B” much more closely to better understand the motivation behind their re-tweets of “@PolizeiBerlin_E” and whether these actions can be correlated with our assumption that this was based on Police communications authenticity.

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