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Understanding Fast Diffusion of Information in the Social Media Environment: A Comparison of two Cases

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Abstract

The purpose of this paper is to gain understanding of what factors cause rapid issue spread in social media, to help predict issue growth. The frequency graphics of two issues, Arctic Sunrise and U.S. capitol shooting, were compared to investigate rapidity of spread on Twitter. Next, a qualitative model was applied to explain the differences found. Furthermore, a first attempt was made to investigate issue transfer between social media and news media. The findings showed that news items and tweets were interrelated, with hardly any time-lag in between, although the tweets continued longer and included more emotion. The approach seems promising but needs further testing.
When in practice monitoring social media, attention should be given to issue characteristics that relate to drives to forward information. Emergencies with eye-witnesses present have considerable potential to engage users in social media interactions, while other issues require more organizational resources and engaging influentials to facilitate issue growth.

Key words: social media, issues management, information spread
Paper type: research.

Introduction

The continued development of social media brings high interactivity, resulting in the fast spread of issues on the web, also termed ‘issue contagion’ by Coombs (2002). This new phenomenon facilitates the creation of real-time news and hot topics. The purpose of this paper is to gain a better understanding of the attributes which make issues travel fast in social media. Statistical data on two real-world cases are utilized to observe the diffusion of information in Twitter and to compare the related frequency tables. In addition, the spread patterns

in Twitter and newspapers are compared. First, we discuss some insights from the literature on issues management and the diffusion of online information.

Issues Management

The emergence of social media presents a challenge for corporate communication, despite the continuance of some traditional media practices in the social media environment (Freberg, 2012). Organizations employ issues management to keep track of the development of issues that have potential importance for them, adjust to the social environment and/or seek to have it reflect organizational requirements (Heath & Nelson, 1986; Heath, 1998). Now that social media have become means for rapid information exchange and retrieval, reputation issues come to the forefront of communication (Hiltz, Diaz, & Mark, 2011). Unconfirmed information could be relayed faster in user-generated sources than organizational sources (Freberg, 2012). Blogs seem to be a leading indicator of upcoming issues (Fan, Geddes, & Flory, 2013), while, via user-generated content and self-reported information, micro-blog discourse is an emerging trend within networks of users (Keelan, Pavri, Balakrishnan, & Wilson, 2010). Action-oriented issues management is used to decrease persuasive unfavorable issue spread (Fan et al., 2013). Alternatively, organizations can aim at spreading information, for example for advocacy reasons. Or authorities may see social media as a way to identify public concerns and fulfill the information needs of citizens in the event of emergencies.

In mass media, including news media, audiences obtain specific gratifications from engaging in media selection (Anderson, 2011), whereas the willingness to communicate bilaterally is more strongly expressed stronger in social media, e.g. by forwarding or commenting on messages. Social media allow controversial topics, and direct dissemination of messages (Kumar & Mirchandani, 2012; Ledford & Anderson, 2013; Sanderson & Cheong, 2010). However, a potential risk of social media is that it offers pleasurable elements of intimacy and bonding, like a drama (Byron, Albury, & Evers, 2013). Consequently, when a message begins to spread, it can be enlarged or distorted. “Fads and rumors but also social unrest and riots travel fast and affect large fractions of the population participating in online social networks” (Borge-Holthoefer et al., 2012, p. 1), and diffusion is driven by emotional anxiety and informational ambiguity (Stieglitz & Dang-Xuan, 2013).

Diffusion of Information

The role of microblogs such as Twitter is especially strong in information diffusion, as they provide an open environment for collective discussion for users with a low access threshold, and gather large numbers of users in a short period of time. Information may cascade when it is retweeted to millions of users. Another feature of Twitter is that tweets can be reviewed and searched for publicly (Bosley et al., 2013). The geo-location and time of publication in Twitter can be monitored as actual tweets and metadata associated with the original feeds (Stefanidis et al., 2013).

A localized specific issue happening in real time can be identified by local users, then made publicly available through tweets on the internet, leading ultimately to, for example, a crisis or a political protest. Social media has commonly been utilized in political campaigns and has been successful in creating public attention (Bronstein, 2013). Besides political uses, Twitter is also considered capable of reflecting collective emotive trends. Compared to neutral messages, emotional ones are more likely to be retweeted, showing evidence of a powerful mechanism of information sharing (Stieglitz & Dang-Xuan, 2013). Utilizing the willingness to share information, content with links to, for example, video materials, is often provided to users (Denis, Klein, & Gueguen, 2014).

Although often unable to influence what people think of an issue, mass media attention to an issue underlines its importance (Niina Merilainen & Vos, 2011). Moreover, mass media can guide public preference by providing individuals with cues for interacting about issues (Fan et al., 2013). In the news, a voice may be given to actors other than those active in social media. Influential users in social media also have online opinion-making and agenda-setting power (Stieglitz & Dang-Xuan, 2013). In Twitter influentials with large numbers of followers, who in turn pass information on to their followers, can create cross-cutting connectivity between different social circles (Gruzd, Wellman, & Takhteyev, 2011). This may include activating weak ties, which act as "bridges which connect isolated communities and break through the trapping of information in local areas" (Zhao, Wu, & Xu, 2010: 016105-7).
Although issue transfer among different news media is generally expected and is facilitated by openness, for an issue to cross the boundary from one social medium to another may require a threshold (Rogers, Chapman, and Giotsas, 2012). Similarly, barriers may exist that impede transfer from social media to news media. Generally, issues that attract much interest in online discussions are considered of public interest, and consequently may be taken onto the media agenda by journalists (Uscinski, 2009). However, issue transfer cannot be taken for granted, and journalists and social media users may have various motives and drives for forwarding information.

Prediction of social media attention, e.g. by extrapolating statistical information gained in monitoring, may serve as an early warning, e.g. of rumors. Information diffusion is a collective transaction in large groups of people (Stieglitz & Dang-Xuan, 2013). In mass media, the public opinion can generally be predicted by unilateral communication (Fan et al., 2013), whereas in social media the neighboring nodes need to be taken into account, including internet use and user interaction (Zhao et al., 2010).

Methodology

This explorative study, aimed at contributing to the understanding of issue growth, both supports issues management and provides recommendations for future directions in social media research. The research questions are: (RQ1) What differences can be seen in how rapidly the two issues studied spread on Twitter? (RQ2) Is there a similarity or time-lag in the patterns that indicates issue transfer between microblogs and newspapers?

Two real-world cases were analyzed using database techniques. In each case, the same period of 9 days, September 30th to October 8th, 2013 was monitored. Case 1: The crew of the Arctic Sunrise, a vessel operated by Greenpeace, is arrested for piracy at a Russian oil rig. Case 2: In a U.S. capitol shooting, a woman rams security barricades in Washington and is being killed. Both events were widely discussed in news reports and social media.

The two cases were monitored in Twitter in real-time. Before the issues had expanded globally, key words were set in order to collect peak data for further analysis. The data were obtained from Twitter Streaming API (https://dev.twitter.com/docs/api/streaming), allowing for real-time collection of Twitter messages that contain up to 0.1% of the full Twitter stream. It functions by HTTP protocol, and returns data – in this case by a keyword filter – in real time to a requester in JSON format through persistent connection. The data collected was stored in a repository based on PostgreSQL DBMS (detailed architecture of the repository in Semenov 2013). For further analysis frequency graphics were made using social media monitoring software, and the results were exported to Excel format. Next, the timeline of each of the two events was interpreted from the graphics and compared for differences in rapidity of spread.

To compare the Twitter data with the news media reports, news items on the topic were collected on January 14th, 2014 from online news media for the same time period, using a keyword search in online news archives of a number of American well-known online media to construct similar frequency graphics. Included were the archives of the ABQ Journal, Bangor Daily, Boston Herald, Chicago Tribune, Clarion Ledger, Daily News, Detroit Free Press, Houston Chronicle, Las Vegas Review Journal, Las Vegas Sun, Los Angeles Times, National Politics, New York Post, NEWSOK, Boston Globe, Denver Post, New York Times, Washington Post, Washington Times, and USA Today. Attention was paid to similarities and time-lags that could indicate issue transfer between Twitter and the news media.

Findings

For each case, a brief chronological description is first provided, after which the spread pattern is discussed. Graphics are provided and commented on.

Case 1: Arctic Sunrise

On September 18th, 2013, a Greenpeace ship approached Gazprom's Prirazlomnaya drilling platform. Activists attempted to board the platform to protest against drilling in the Arctic. On September 19th, the Russian government took control of the ship Arctic Sunrise and captured its crew of 30. On October 2nd and 3rd Leninsky District Court issued an arrest warrant for piracy. Starting on November 5th, demonstrations were held in various locations worldwide. With the possibility of a 15-year jail sentence, the case attracted much social media attention. Some of the activists were held in custody for two months pending an investigation.

Starting on November 19th the crew members awaiting trial were gradually granted bail. On December 18th, along with other suspects, they were granted amnesty. By December 29th all of the foreign activists had received exit visas and left the country. The observation period focused on the main peak of attention around the arrests.

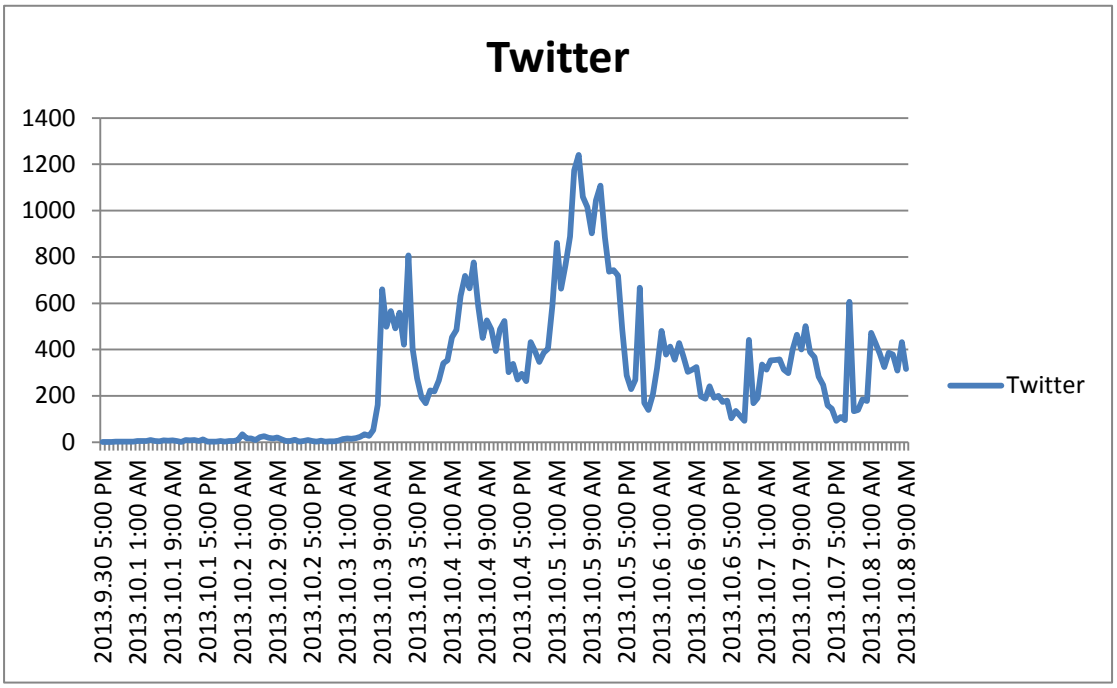

Figure 1. Frequency graphic of Twitter messages on case 1.

Figure 1 shows that the data collection started on September 30th, 2013, using the hashtags #freethearctic, freethearctic30, #arctic30, arctic30, and savethearctic. On October 3rd, the sum total of messages was 770, thereafter peaking at 6:00 New York time on October 5th at 1 241 messages. From October 6-8th, The number of messages then dropped to 300 and leveled off (interval 1 hour). Owing to the huge amount of data on Twitter, it should be noted that this study examined key words only, focussing on the issue itself without regard to the attitude – positive, neutral or negative – of the messages. No restrictions were imposed on language, and hence the selected tweets are in various languages. The Twitter account "freethearctic30" was also monitored. This was not a formal Greenpeace account, but a private initiative of 28 Greenpeace crew and 2 freelance journalists in September 2013, and gained many followers, also using a Facebook page. Its aim was to support the Arctic cause, and during the 9-day data collection period 1 248 messages were sent. In this period of 9 days, a total of 51691 messages concerning this case were exchanged on Twitter.

Case 2: U.S. Capitol Shooting

In the case of the U.S. capitol shooting on October 3rd, 2013 a 32-year-old African American woman was shot dead by police officers after a police chase initiated when she attempted to drive through a White House

security checkpoint. After the shooting incident, negative emotions were vented in the social media. The local police confirmed that the shooting was an isolated incident, and not terrorism. It subsequently emerged that the woman suffered from depression and a one-year-old baby, who was uninjured, was also in the car.

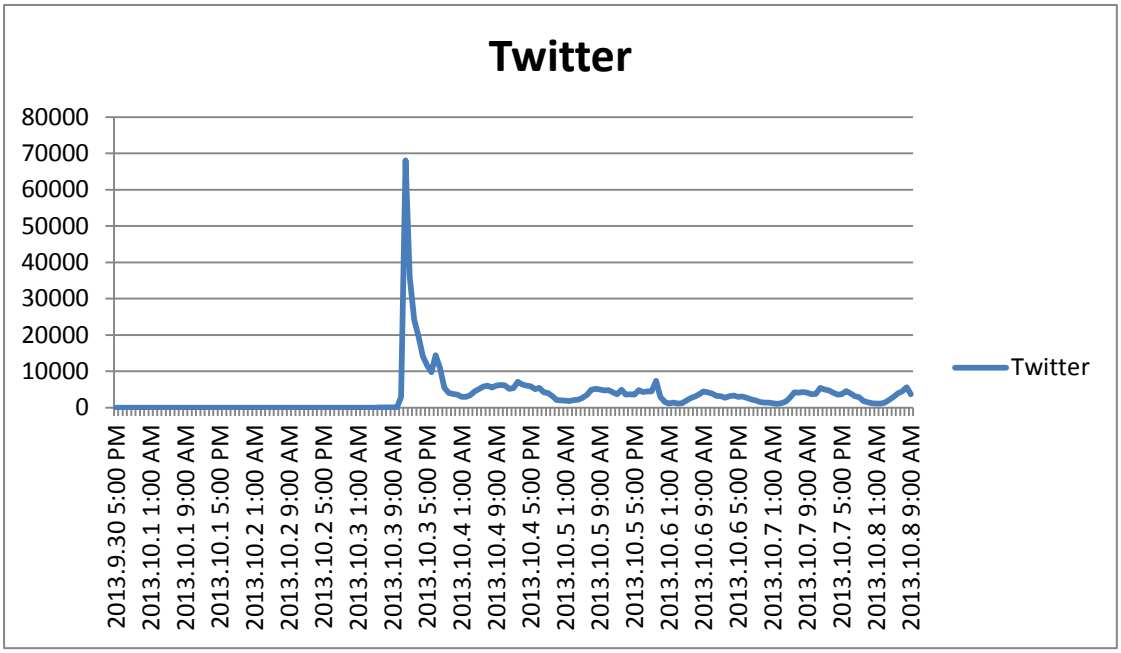

Figure 2. Frequency graphic of Twitter messages on case 2.

Figure 2 shows that the data collection in Twitter started on October 2nd, 2013 and continued for 9 days. On October 3rd, 225,893 Twitter messages for the keyword 'shooting' were retrieved. The numbers began to rise from 2 876 messages at 11:00 AM, and had sharply increased to 68,061 by 12:00 AM. According to police reports, this fits the time when the shooting occurred. Several users reported this real-time case on Twitter, for example, @LukeRussert tweeted: "Gun shots in front of Capitol, Cops scrambling, Not a joke" at 11:19 AM local time, and @AzmatZahra tweets "Capitol shooting witness saw bleeding little girl". In fact, the baby was not injured. After the peak around 12:00 AM, the number of messages drops steadily.

Differences in the Diffusion of Tweets between the Two Cases

The frequency graphic for the first case shows more peaks during the observation period, while the second case shows one clear peak followed by a substantially lower level of messaging. The first case graphic includes the main peak of a longer issue, while the second case was an incident that initially was intensively shared, especially by the exchange of eye-witness accounts, but that after the situation had been clarified its peculiarities were discussed by far fewer people.

When the total numbers of tweets were compared between the cases, the second case generated around four times more tweets than the first. We should note that, by using hashtags that clearly referred to the issue, the keywords in the first case were very precise. In the second case, the keyword 'shooting', although filtered, also produced unrelated hits. However, the fact that the number of Tweets found on the day before this

particular shooting was only 313, suggests that the number of unrelated hits was probably not high. Therefore, we can conclude that in the second case more tweets were produced over the 9-day observation period than in the first case. On the other hand, in the first case several related events occurred over a three-month period, and only the main events were included in the measurement.

Comparing Tweets and News Items in Case 1

To compare the data from Twitter with reporting in the news media, news items on the topic from American online news media were investigated. In the case of Arctic Sunrise, for the month of October 2013, a total of 28 news items were retrieved, with a peak of 7 news items on October 2nd. To enable a comparison, Figure 3 shows the relative distribution of news items and Twitter messages as a percentage of the total number of messages over the of 9-day period.

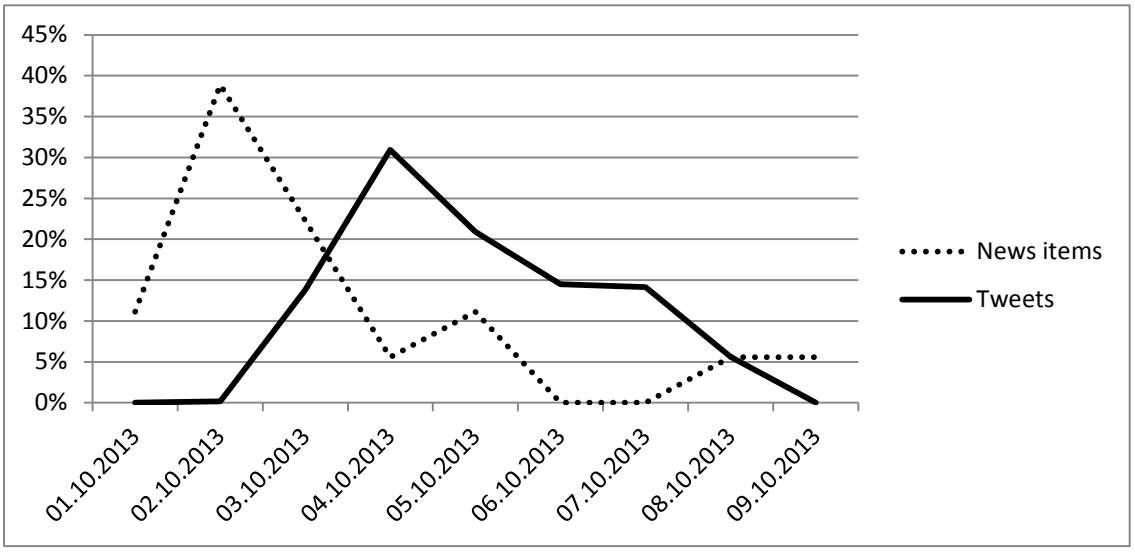

Figure 3. Distribution of news items and social media messages concerning case 1 (per day as a percentage of their total number).

The graphic shows that the peak in the online newspapers occurred about two days earlier than the peak on Twitter. The news mainly concerns the Greenpeace activists charged with piracy in Russia and mentions the possibility of a 15-year jail sentence. In many news items dated October 2nd, 2013, the word "charged" is used in the title, and in one case the word "accuse". Gazprom is hardly mentioned. Thereafter, the discussion on Twitter develops, with demonstrations organized worldwide from November 5th onwards.

Comparing Tweets and News Items for Case 2

On the case of the U.S. Capitol Shooting, 22 news items were retrieved from American online newspaper archives on October 3rd, 2013. These form 58% of the total number or news items retrieved for this case. For

example, one of the early items in the Las Vegas Review-Journal, "Police shoot, kill driver after chase near U.S. Capitol", was posted at 11:32 AM on October 3rd, 2013.

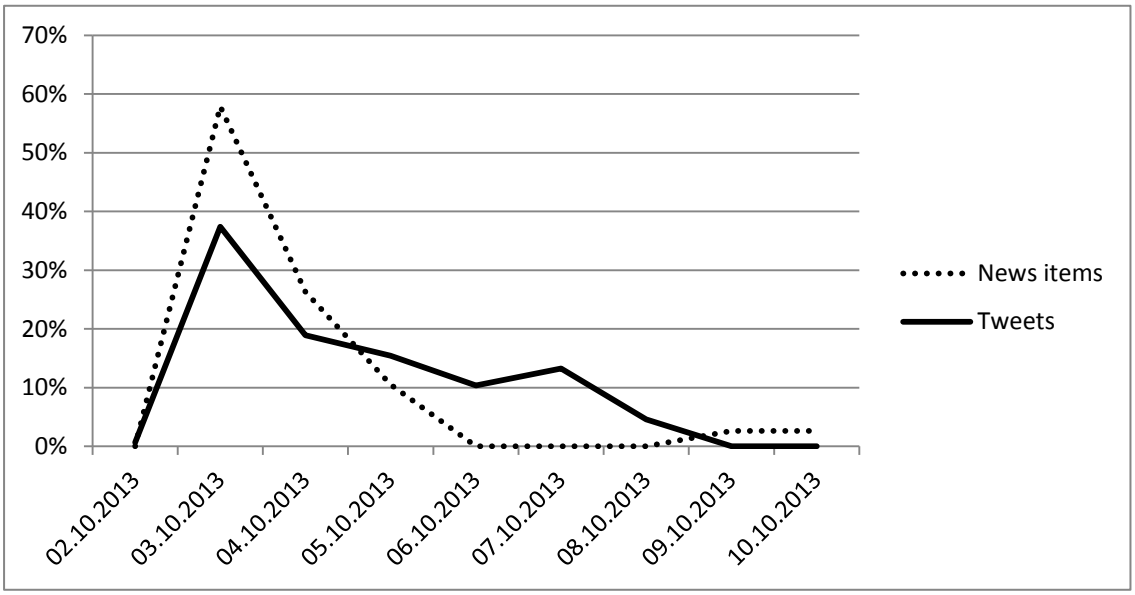

Figure 4. Distribution of news items and social media messages concerning case 2 (per day as a percentage of their total number).

Most of the news items reported the incident at approximately the same time and some referred to tweets. The discussion went on somewhat longer in the social media, possibly because people were trying to make sense of what had happened, for example, wondering about the presence of the child in the car.

Discussion and Conclusion

We will first discuss the different outcomes measured in social media and then look at the comparison of the numbers of online news items and social media posts.

Differences between the cases in information spread in social media

This study illustrated the fast information spread in a micro blog, Twitter. The patterns in the frequency graphics, however, differ between the two cases studied. In the first case there were more peaks, while in the second case there was only one high peak, after which the level of exchange of messages became much lower. When we compare the events over the observation period, more people were tweeting about the US Capitol Shooting than about Arctic Sunrise.

Predicting the spread of issues with more accuracy then just can be gained simply by extrapolating initial observations, is only possible when we better understand such differences as those pointed out above. Zhang

and Vos (in review) suggest a qualitative approach and mention various factors that may explain what issues are likely to spread fast on the web: (1) factors relating to what makes an issue more or less attractive for users to pass the information on; (2) factors related to the medium the topic originate from and in which it is discussed; (3) factors related to actor resources, including the preparedness of the organization, cooperation of partners and involvement of influentials; and general factors including societal factors and the reputation of the organization involved.

Can the factors mentioned in the model explain the differences in the spread patterns observed? As only two cases were investigated, any conclusions can only be tentative. Table 1 shows that both issues were deemed worthwhile to pass on, comprising emotions and news value, while the first case also exhibited a drive to support the Arctic cause by passing it on. In both cases, to initiate information exchange Twitter was mainly used, but in the first case this received more reinforcement from other social media channels. General factors, in particular attention for climate change resp. terrorism risk awareness, may have facilitated information dissemination in both cases. However, organizational resources and aims may explain some of the difference observed in the spread patters. In the first case, an organization had created the event, engaged influentials and strongly supported the spreading of the issue. In the second case, emergency management was the goal, informing citizens rather than letting the issue needlessly grow.

	Arctic Sunrise	**U.S. Capitol Shooting**
1 Issue Characteristics		
1.1 Considered worthwhile	+ Important event, stretched over time, international context	+ Important emergency, soon clarified, eye witnesses
1.2 Expresses needs or emotions	+ Similar to earlier actions but now in Russian waters	+ Initial uncertainty followed by sensemaking
1.3 Entertainment value or positive sentiment	-	-
1.4 News value	+ Headline news, longer	+ Headline news, short
1.5 People want to be identified with it	+ People who share interest in the issue	-
2 Media Characteristics		
2.1 Ease of sharing information	+ Twitter mainly used, along with other social media; easy to share links and retweet	+ Twitter mainly used, initiated also by citizen eye-witnesses; easy to share links and retweet
2.2 Ease of finding information	+ In Titter hashtags are used	+ In Twitter hashtags are used
2.3 Ease of connecting	+ In Twitter it is easy to follow an account	+ In Twitter it is easy to follow an account
3 Organizational resources and aims		
3.1 Preparedness for monitoring and social media activity	+ Greenpeace makes active use of internet to enlarge issue spread	+ Police use social media for crisis management
3.1 Cooperation with partners	+ International structure	+ Other authorities
3.2 Engaging influentials	+ Motivating supporters	-
4 General factors		
4.1 Societal and situational factors	+ Increasing attention to climate change	+ High risk awareness but the event turned out to be an incident
4.2 Organizational reputation	+ Well-known organization	+ Authority

Table 1. Qualitative comparison of the two cases

At first sight, issue characteristics, in particular, seem to make a difference. The case of the U.S. Capital Shooting, confirms that emergencies involving citizen eye-witnesses have particularly large potential to engage users in social media interactions. In the case of Arctic Sunrise, many tweets were also generated, indicating that issue-related events, using organizational resources and social capital in the form of supporting influentials, may attract large scale attention over a longer period of time. However, as only two cases were compared, and the measurement and model need to be further developed, the data do not support strong conclusions here.

Comparison of the numbers of news items and social media

Most news media actively monitor Twitter for breaking news and include it, if confirmed, in their reporting (Terdiman, 2014). Such 'Twitter Journalism' seems to offer the public the stamp of approval (Tam, 2012); however, the order of events can also be the other way around. Social media add to reports in the news media by providing platforms for users to express their own feelings and attitudes. In the cases observed, social media attention seemed to extend over a longer period than news media attention, but which came first differed.

In the first case, the news reports showed an earlier peak than social media. The news about piracy charges by the Russian court, including the possibility of a jail sentence, as emphasized in press releases by Greenpeace, was first broadcasted by the mass media. The news media seemed to take a lead in reporting the news from Russia, but when demonstrations began to be organized in various places Twitter showed a peak. Thus, following the demonstrations rather than the initial news, the biggest volume of Twitter messages started later in time, expressed more emotion and continued longer. The latter was also facilitated by influentials who continued the discussion, in particular the account of FreeTheArctic30.

In the second case, news reports and tweets were clearly intertwined. Many news items referred to tweets by eye-witnesses, for example, NYDailyNews.com stated that "U.S. Capitol shooting: Witnesses, Capitol Hill workers, lawmakers capture shooting drama in real-time on Twitter".
The opposite also happened, for example, a tweet by @cnnbrk, "Source: The female driver of car in chase ending at Capitol Hill apparently hit by gunfire. A child was in the car. http://t.co/1LNz0jWdlR". The link connects the message to a CNN news item.
Due to the availability of many eye-witnesses in the Washington area social media messages appeared fast. As the tweets also had high news value, no time-lag was visible between tweets and news reports, though the initial reporting seems to have taken place in social media by eye-witnesses. In addition, tweets and news reports referred to each other.

This study examined two events that both occurred in early October 2013. A first attempt was made to utilize frequency graphics to investigate the spread patterns of different issues, paying attention to transfer effects

between news items and Tweets. Only Twitter and a number of American news media were investigated. The approach seems promising but needs to be tested on a wider scale.

Although information may cascade relatively easily in Twitter, for diffusion in other social media such as Facebook or WhatsApp, there may be a threshold before information travels beyond the micro-community (Rogers, Chapman, and Giotsas, 2012). A stricter selection may be needed in future studies to reduce big data problems, e.g. the sampling procedure did not take languages into account. Despite its preliminary character, this study clearly indicates that the approach of comparing cases and media, using a quantitative as well as qualitative approach, has value for future research.

The study also has some practical implications. The results underline that, when considering the issue spread in social media, attention should be given to issue characteristics that relate to drives to forward information. Moreover, the results confirm that crises involving citizen eye-witnesses have considerable potential to engage users in social media interaction. In the case of issues, organizational resources and engaging influentials may attract attention over a longer period of time.

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