

## 1 **1. Introduction**

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3 Social media technologies have been touted to bring about unprecedented changes to  
4 how people produce and obtain information such as news. Owing to their open and  
5 interactive nature, people are able to actively create and share information with each  
6 other, rather than just being a passive information receiver. Indeed, they are deemed to  
7 be user-centric and able to facilitate communal activities, implying that users and their  
8 interactions are at the core of these technologies (van Dijck, 2013).

9

10 Being a typical form of social media technologies, Twitter has drawn substantial  
11 attention from both researchers and practitioners in recent years (e.g., Cha et al., 2010;  
12 Bakshy, et al., 2011; Hermida, 2010, 2014; Kwak, et al. 2010; Mocanu, et al. 2013).  
13 Twitter allows users to send short messages of less than 140 characters, or “micro-  
14 blogs”, in an instantaneous manner to other users. It has described itself as “a real-time  
15 information network that connects you to the latest information about what you find  
16 interesting”. Prior research notes that the technology enables users to “obtain immediate  
17 access to information held by all or at least most, and in which each person can instantly  
18 add to that knowledge” (Sunstein, 2006). Noting this characteristic, the extant research  
19 has argued that the technology (and social media alike) may enable new relational  
20 structures that disrupt the existing authoritative structures and established ways of  
21 information flow, one pertinent area being news dissemination (Hermida, et al. 2012;  
22 Boyd and Marwick, 2011).

23

24 Twitter is used extensively by individuals to read and share news with each other. For  
25 instance, it has emerged as a major platform to help report, organize and disseminate  
26 news information during major events such as the US presidential elections in 2008  
27 (Lenhart and Fox, 2009) and the Euromaidan revolution in 2013 (Ronzhyn, 2014).  
28 Indeed, Smith and Rainie (2010) found that news sharing on Twitter is very common,  
29 with 55 per cent of users posting links to news stories. A study by An et al. (2011) also  
30 found that news messages was forwarded 15.5 times on average, thereby substantially  
31 increasing the reach of their audience. Yet, at the same time, Twitter fosters the  
32 dissemination of short fragments of information from a diversity of news sources, both  
33 official and unofficial ones (Goodrum et al., 2010; Hermida, 2010). This is deemed to  
34 have challenged the conventional ways of news dissemination that are mainly  
35 controlled by official, authoritative news sources (e.g., CNN, New York Times), and  
36 undermined the gatekeeping function of journalists in determining the what and when  
37 of news content dissemination (Hermida, 2010).

38

39 Along the same vein, it has been argued that given the interactive nature of social media  
40 such as Twitter, conventional mass media may lose out in competing for news audience  
41 (Dimmick et al. 2011; Lee and Ma, 2012). This has led to the view that “news media

1 business managers and journalists face increasing uncertainty of what the future holds,  
2 and the institutions of journalism find themselves in crisis.” (Adcock 2016, p.2) In  
3 response, conventional mass media have attempted to involve by establishing their  
4 presence on Twitter and disseminating news on the platform themselves (Lasorsa et al.  
5 2011). On the flip side, it is worth noting that the open nature of Twitter makes it prone  
6 to disseminating rumors or fake news, and ordinary users play a big part in this  
7 dissemination (Vosoughi et al. 2018). This may potentially discount the role and  
8 importance of news dissemination on Twitter, especially when non-mass media users  
9 are concerned.

10  
11 In view of the mixed perspectives above, this study aims to conduct a comprehensive  
12 investigation on news dissemination on Twitter, in particular with respect to how  
13 different participants, including mass media and non-mass media/ordinary users,  
14 involve in the dissemination as well as their influence generated. Our formal research  
15 questions are: What types of participants are more active in disseminating news on  
16 Twitter? What are the relative influences they generate in the news dissemination? We  
17 seek answers to these research questions via two means: 1) examining both tweet and  
18 retweeting<sup>1</sup> behaviors of users, which respectively correspond to levels of their  
19 involvement and their influence generated (Cha et al. 2010); 2) based on a combination  
20 of machine analysis and human coding, identifying a comprehensive list of participants  
21 on Twitter including mass media (further differentiated into major news agencies, radio  
22 and TV stations, news aggregators, other news agencies), journalists (further  
23 differentiated into those affiliated to media and the independent journalists), bloggers  
24 (further differentiated into blogging associations and independent bloggers),  
25 organizations (further differentiated into commercial and non-commercial), and  
26 celebrities. These considerations allow us to obtain a clearer understanding on the  
27 involvement and influence of the different participants in news dissemination on Twitter.

28  
29 In the followings, we first present a review of the relevant literature on Twitter and news  
30 dissemination.

## 31 32 **2. Literature Review**

33  
34 A number of prior studies have investigated how Twitter is used for news dissemination.  
35 An early seminal study that notes such a usage of Twitter was Kwak et al. (2010); they  
36 showed that Twitter serves mainly as a news medium rather than a social network given  
37 its characteristics such as a low reciprocity among the participants. This was echoed by

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<sup>1</sup> Retweet refers to the reposting of a tweet content while referencing either the source of the content or the last person who shared it (Boyd et al., 2010).

1 several other studies. For instance, Goodrum et al. (2010) found that people prefer using  
2 social media such as Twitter to obtain news information due to its currency. In line with  
3 this, Hu et al. (2012) observed that Twitter broke the news on Osama Bin Laden's death  
4 before the mainstream media. In addition, Hermida (2010) noted that Twitter enables  
5 ambient journalism, defined as an awareness system that offers citizens with diverse  
6 means to collect, communicate, share and display a variety of news information. He  
7 and his co-authors (Hermida et al., 2012) further employed survey to show that users  
8 valued social media as a news source because it exposed and helped them to keep up  
9 with a wide range of news events.

10  
11 In view of this trend, conventional mass media have tried to establish their presence  
12 and disseminate news on Twitter (Armstrong and Gao 2010; Meyer and Tang 2015).  
13 For instance, it has been used by journalists to recommend news stories (Phelan et al.  
14 2009), and by newsroom to feed news headlines to their Twitter streams (Palser 2009).  
15 Research has also investigated strategies that can be used by conventional mass media  
16 and journalists to attract greater user attention to their news, such as enriching news  
17 tweets with hashtags and media contents, and engaging in personal interactions with  
18 other tweeters (Orellana-Rodriguez et al. 2017). In addition, journalists take advantage  
19 of Twitter as news sources, e.g., by observing breaking news information posted by  
20 users such as the first accounts, images or video of a news event (Hermida 2010).  
21 However, it should also be noted that some journalists are rather cautious and reluctant  
22 to use information from Twitter in their news coverage due to the invalidity of the  
23 information, and if they do, use it in an opportunistic way (Broersma and Graham 2013;  
24 Bruno 2011). Regardless, it can be seen that there is likely a mixture of participants on  
25 Twitter with regard to news dissemination.

26  
27 Indeed, Lotan et al. (2011) considered a wider range of participant types including  
28 bloggers and activists, and investigates how they participated in the disseminations of  
29 news during the Tunisian and Egyptian Revolutions. They concluded that such news on  
30 Twitter is being co-constructed by bloggers and activists alongside journalists. Hu et al.  
31 (2012) noted the involvement of three groups of influential participants or opinion  
32 leaders, i.e., mass media, individuals affiliated with media, and celebrities. Focusing on  
33 news related to the Arab Spring, Hermida et al. (2014) studied how a key information  
34 broker during the event, Andy Carvin, selected sources of news to cite in his tweets.  
35 They found that non-elite sources (e.g., bloggers, activists, non-media organizations)  
36 had a greater representation than elite sources in the content that Andy Carvin cited.  
37 However, Poell and Borra (2012) found that the use of social media including Twitter  
38 appears less of a success from the perspective of providing a more balanced  
39 participation and coverage of activist news reporting such as the G20 protests in  
40 Toronto. Hudoshnyk (2015), focusing on the Ukraine's Euromaidan news, also  
41 cautioned that social media including Twitter might be given too much credence for  
42 social uprisings such as the event they investigated.

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Furthermore, research has discussed the pros and cons of Twitter in news dissemination. On one hand, the open and interactive nature of Twitter makes it conducive for anyone to participate in news dissemination. Users are able to easily share their first-hand news accounts and witnesses on Twitter, and previous research shows that people have high willingness to provide relevant and updated information to others (Abdullah et al. 2017). Such information shared by fellow users may be deemed more trustworthy than those provided by mass media, which may be biased and deemed farther away from ordinary users' everyday life (Skoler 2009). On the other hand, the very same nature of Twitter also makes it prone to issues such as the dissemination of rumors or fake news (e.g., Tanaka et al. 2012; Gupta et al. 2013; Vosoughi et al. 2018). For instance, a recent study by Vosoughi et al. (2018) shows that fake news spread more than truth on Twitter. Taken together, with the variety of participants on Twitter and the different nature of news information they provide (editorial vs. user-generated), it remains unclear who would involve more in news dissemination on Twitter, and who are more influential in the process.

With reference to the above discussions, our study aims to contribute to the extant literature in three ways. First, in contrast to previous studies that employed a limited set of sampled data, our study employs more extensive data comprising 95,986 tweets extracted during the Ukraine's conflict in Kyiv from November 21, 2013 until Crimean Tartars supporting the new Kiev administration clashed with pro-Russia protesters in the region on February 26, 2014. Second, we comprehensively coded the categories of participants, including mass media, journalists, bloggers, organizations, and celebrities (refer to the Research Method section for details). Third, while previous research mainly relied on human coding to perform the categorizations, we employed a combination of machine analysis and human coding to achieve the purpose in view of the large dataset. Collectively, these measures allow us to more accurately and comprehensively examine how the various participants were involved in the Ukraine's conflict tweeting activities, and which among them were more influential than others in the related news dissemination.

**3 Research Method**

We embarked on a series of efforts to categorize the different types of participants on Twitter, first via machine analysis and then through human coding. We extracted tweets posted during the Ukraine's conflict in Kyiv from November 21, 2013 until Crimean Tartars supporting the new Kiev administration clashed with pro-Russia protesters in the region on February 26, 2014. Table 1 below depicts the key events that occurred during the whole episode.

Key event	Date
Protests gathered pace, as 100,000 people attended a demonstration in Kiev.	Late November 2013
Protesters occupied Kiev city hall and Independence Square in dramatic style. Some 800,000 people rallied in Kiev.	Early December 2013
Vladimir Putin threw President Yanukovich an economic lifeline, agreeing to buy \$15bn of Ukrainian debt and reduce the price of Russian gas supplies by about a third	17 December
Parliament passed restrictive anti-protest laws as clashes turn deadly. Protesters began storming regional government offices in Western Ukraine.	16-23 January
Prime Minister Mykola Azarov resigned and parliament annulled the anti-protest law. Parliament passed amnesty bill but opposition rejected conditions.	28-29 January
All 234 protesters arrested since December were released. Kiev city hall, occupied since 1 December, was abandoned by demonstrators, along with other public buildings in regions.	14-16 February
Clashes erupted, with reasons unclear: 18 dead.	18 February
Kiev saw its worst day of violence for almost 70 years. At least 88 people were killed in 48 hours. Video showed uniformed snipers firing at protesters holding makeshift shields.	20 February
President Yanukovich signed compromise deal with opposition leaders.	21 February
<ul style="list-style-type: none"> <li>• President Yanukovich disappeared</li> <li>• Protesters took control of presidential administration buildings</li> <li>• Parliament voted to remove president from power with elections set for 25 May</li> <li>• Mr Yanukovich appeared on TV to denounce ‘coup’</li> <li>• His arch-rival Yulia Tymoshenko was freed from jail</li> </ul>	22 February
Ukraine's parliament assigned presidential powers to its new speaker, Oleksandr Turchinov, an ally of Tymoshenko. Pro-Russian protesters rallied in Crimea against the new Kiev administration	23 February
Ukraine's interim government drew up a warrant for Yanukovich's arrest.	24 February
Pro-Russian Aleksey Chaly was appointed Sevastopol's de facto mayor as rallies in Crimea continue.	25 February
Crimean Tartars supporting the new Kiev administration clashed with pro-Russia protesters in the region.	26 February

1 *Table 1 Key Events during the Ukraine Conflict*

2 The data was extracted by crawling Twitter for tweets that contain the word “Ukraine”  
3 or “Russia” at every 15-minute interval, covering most of the related tweets posted  
4 during the time period. The tweets irrelevant to the Ukraine’s conflict, such as weather

1 in Ukraine tweets, were removed. Altogether 95,986 tweets were obtained in total. In  
 2 analyzing the data, we considered two types of tweets: event-based and people-related  
 3 tweets. For event-related tweets, we further extracted the tweets based on the following  
 4 two sets of keywords: 1) “protest” and “square”, and 2) “Russia” and “troops”. These  
 5 keywords were selected because they were related to two key events that occurred  
 6 during the conflict that attracted most attention, and resulted in respectively 7,429 and  
 7 12,333 tweets extracted. For people-related tweets, we further extracted the tweets  
 8 based on the following two sets of keywords: 1) “Obama”, and 2) “Putin”, as they are  
 9 the key political figures who made decisions that affected how the conflict evolved  
 10 during the whole episode. This resulted in respectively 27,973 and 48,251 tweets  
 11 extracted. These tweets were subsequently used as the inputs for our data analyses.

12  
 13 As mentioned, we comprehensively coded the categories of participants in the  
 14 dissemination of the focal news event, including mass media (further differentiated into  
 15 major news agencies, radio and TV stations, news aggregators, other news agencies),  
 16 journalists (further differentiated into those affiliated to media and those independent  
 17 journalists), bloggers (further differentiated into blogging associations and independent  
 18 bloggers), and organizations (further differentiated into commercial and non-  
 19 commercial), and celebrities. Table 2 below presents descriptions of the different  
 20 categories of participants.

21

Type	Description	Examples
<i>Mass media</i>		
Major news agencies	Mainstream news producers that are directly linked to corporate conglomerates	@CNN, @BBCNews
Radio and TV stations	Mainstream news producers that are linked to radio and TV stations	@PressTV (a TV broadcaster)
Other news agencies	Various non mainstream news producers, such as non-commercial or regional news agencies	@ria_novosti, @IndyWorld
News aggregators	Aggregate news from other news producers, but do not produce news themselves	@MSN
<i>Journalists</i>		
Affiliated	Individual journalists who are affiliated to a news agency	@patrickjackson (affiliated to BBC)
Independent	Individual journalists who produce first-hand news materials, e.g., interviews, photos, etc., but are not affiliated to a news agency	@AHernandezDj (journalist and DJ)
<i>Bloggers</i>		
Blogging associations	Blogging platforms that host blogs on news from different sources	@mashable
Independent bloggers	Independent bloggers who are not affiliated to any news media and do not produce news by themselves; they highlight or forward news information	@ArminaLaManna (self-described as storyteller, director, and writer)

	from other sources	
<i>Organizations</i>		
Commercial	Commercial organizations	@JECComposites (an organization dedicated to promote composite materials internationally)
Non-commercial	Non-profit, grassroots organizations	@100prayingwomen
<i>Celebrities</i>	Individuals who are famous for reasons unrelated to politics or activism.	@KirkWhalum (Grammy-winning jazz saxophonist / recording artist)

1 *Table 1 Descriptions of the Participant Categories*

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3 To implement the categorizations based on machine analysis, we first extracted a set of  
4 Boolean features based on the “user\_screen\_name” and “user\_description”. These  
5 features were derived by observations in the dataset and the known list of some specific  
6 media names (refer to Table A1 in the Appendix). Based on the values of the features,  
7 we employed heuristic rules to categorize the participants based on the values of the  
8 features (refer to Table A2 in the Appendix). We conducted the clustering for several  
9 rounds to increase accuracy. For example, categories ‘Journalists Affiliated to News  
10 Agency’ and ‘Independent Journalists’ were originally clustered into one ‘Journalists’  
11 category. Upon closer inspection of randomly selected users from the ‘Journalists’  
12 category, we added two features, i.e., ‘affiliated’ and ‘independent’ to differentiate  
13 between the ‘Journalists Affiliated to News Agency’ and ‘Independent Journalists’. We  
14 also manually coded the participants in the ‘Others’ category who were not identified  
15 by the feature rules, but who owns a website or a webpage either as non-commercial  
16 participants, commercial organizations, or celebrities.

17

## 18 **4 Analysis Results**

19

20 With all the eligible<sup>2</sup> tweets coded, we analyzed the spread of involvement and  
21 influence of the different participants. We present the analysis results first regarding the  
22 levels of involvement followed by the levels of influence of the different participants.

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### 24 **4.1 Analysis of levels of involvement**

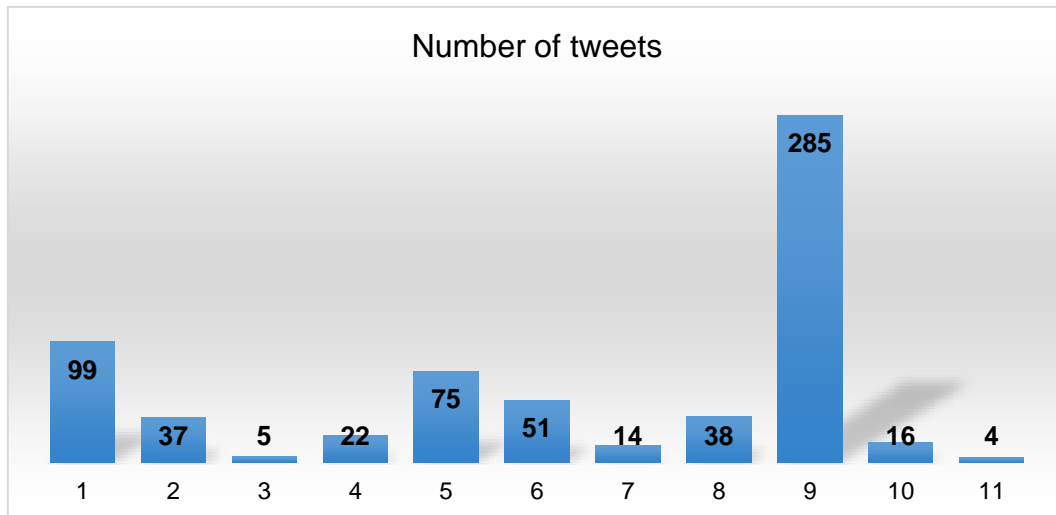
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26 We first present the results of analyzing the levels of involvement of the different  
27 participants. Figure 1 and Figure 2 present the results respectively for the analyses  
28 based on the event-related keyword sets of 1) “protest” and “square”; and 2) “Russia”  
29 and “troops”.

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<sup>2</sup> Some were removed because of an absence of URL to reliably categorize the participants.

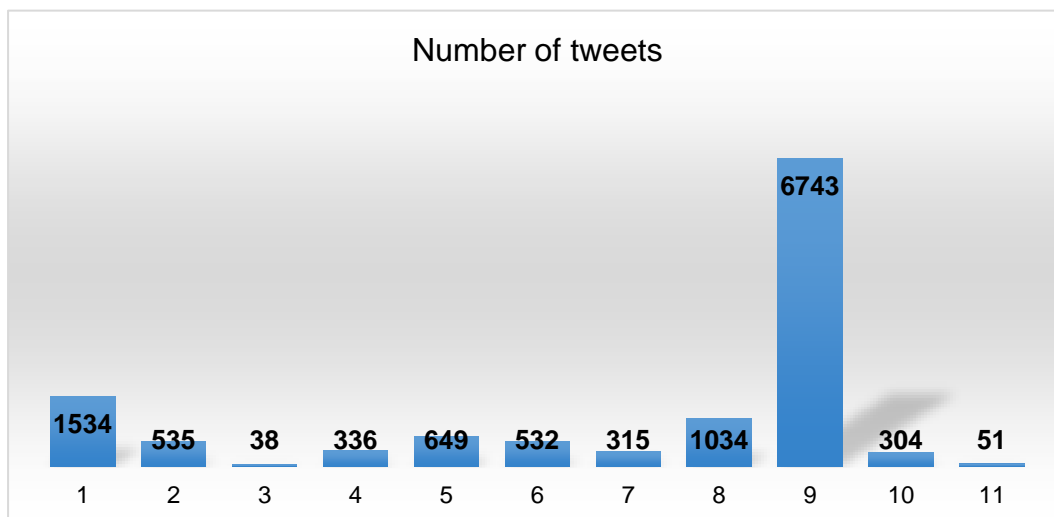


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**Fig. 1** Levels of Involvement of the Different Participants for Tweets related to “Protest” and “Square”

Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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**Fig. 2** Levels of Involvement of the Different Participants for Tweets related to “Russia” and “Troops”

6 From Figure 1 and Figure 2, the levels of involvement of the different participants  
7 appear quite consistent. Specifically, non-commercial participants were notably the  
8 most active in posting tweets related to the two events. This seems consistent with the  
9 general view that grassroots and lay people dominate and take a central stage on the  
10 social media. It is also to note that major news agencies participated quite actively in  
11 positing the related tweets (second most active in both the events), although to a much  
12 lesser extent.

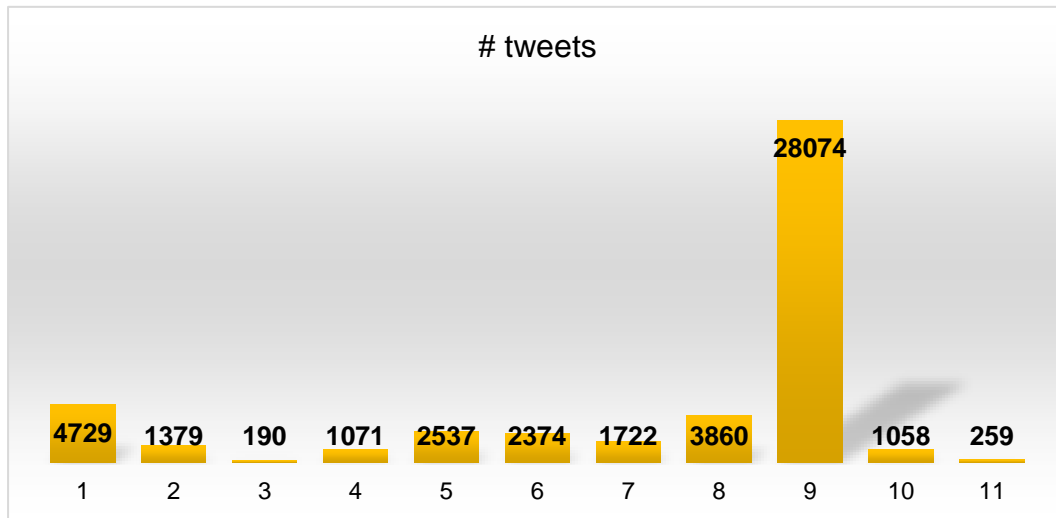
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14 Next we analyze the levels of involvement of the different participants when tweets  
15 related to the key political figures (“Putin”, “Obama”) were concerned (Figure 3 and



1 Figure 4 below).

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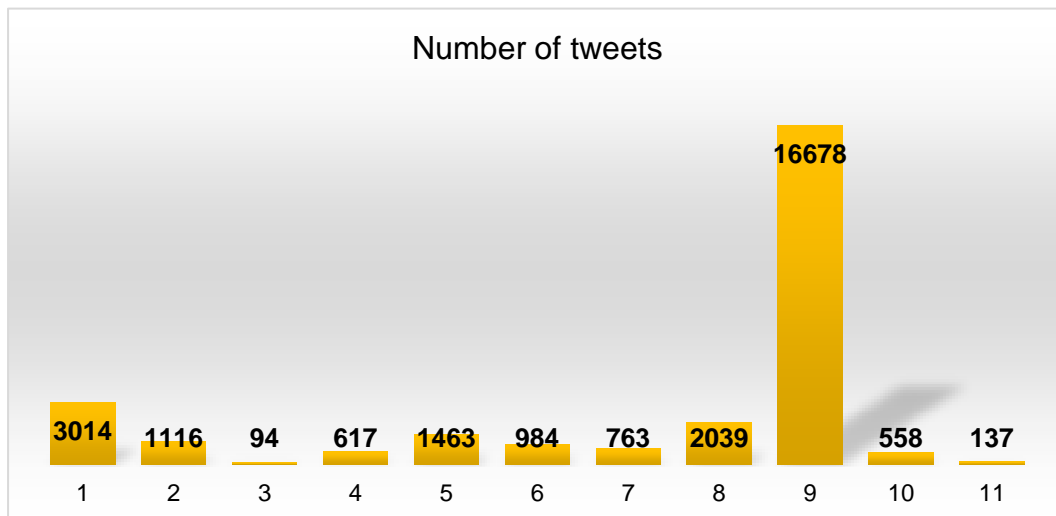


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4 **Fig. 3** Levels of Involvement of the Different Participants in Tweets related to “Putin”

Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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7 **Fig. 4** Levels of Involvement of the Different Participants in Tweets related to “Obama”

8 From Figure 3 and Figure 4, the levels of involvement of the different participants are  
9 highly consistent with those depicted in Figure 1 and Figure 2. That is, non-commercial  
10 participants are the most active in generating tweets about the key political figures  
11 “Putin” and “Obama”. In addition, major news agencies remain the next most active,  
12 although again to a much lesser extent.

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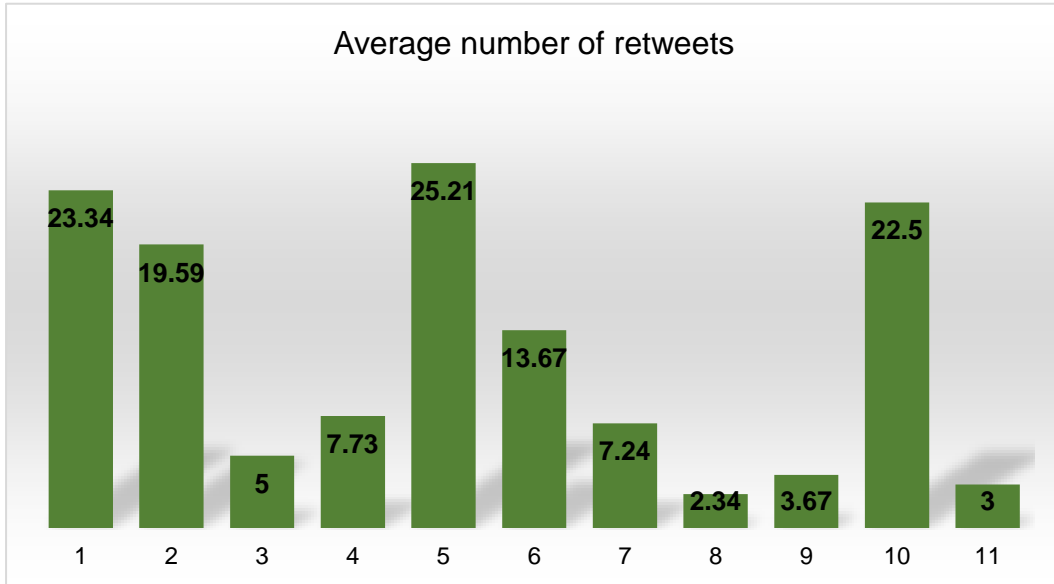
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1 **4.2 Analysis of levels of influence**

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3 As with the analysis of the levels of involvement, we first present the results of  
4 analyzing the levels of influence of the different participants for event-related tweets  
5 (see Figure 5 and Figure 6). We employed average number of retweets to indicate the  
6 levels of influence of the different participants.

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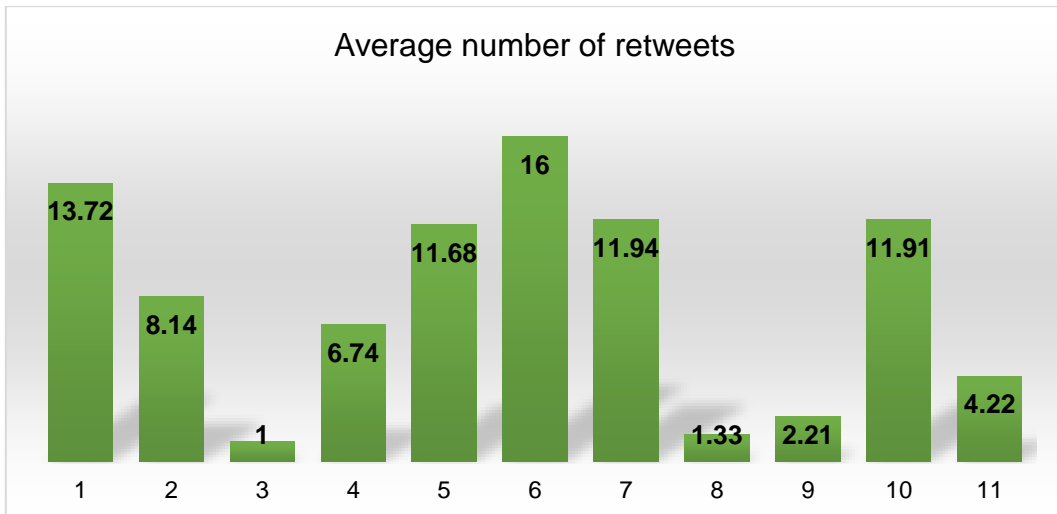


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9 **Fig. 5** Levels of Influence of the Different Participants for Tweets related to “Protest” and “Square”

Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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12 **Fig. 6** Levels of Influence of the Different Participants for Tweets related to “Russia” and “Troops”

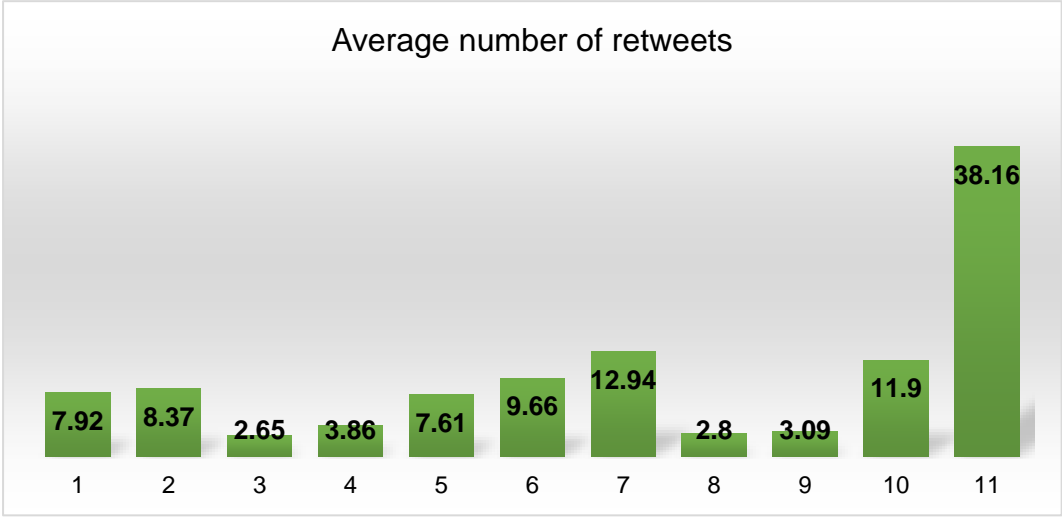
13 From Figure 5 and Figure 6, a strikingly different pattern emerges when the number of

1 retweets garnered by the different participants was examined. Five types of participants  
2 consistently attracted the most retweets in both cases, i.e., major news agencies, radio  
3 and TV stations, affiliated journalists, independent journalists, and commercial  
4 organizations. In the tweets related to the keyword set “Russia” and “troops”, the  
5 number of retweets garnered by the blogging associations was also notably high. It  
6 seems that while non-commercial participants were the most active in generating tweets  
7 on Twitter for the news event, it was the mainstream media, journalists, and commercial  
8 organizations that were more influential in terms of garnering retweets.

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10 Next we analyze the levels of influence of the different participants when tweets related  
11 to the key political figures (“Putin”, “Obama”) were concerned (Figure 7 and Figure 8  
12 below).

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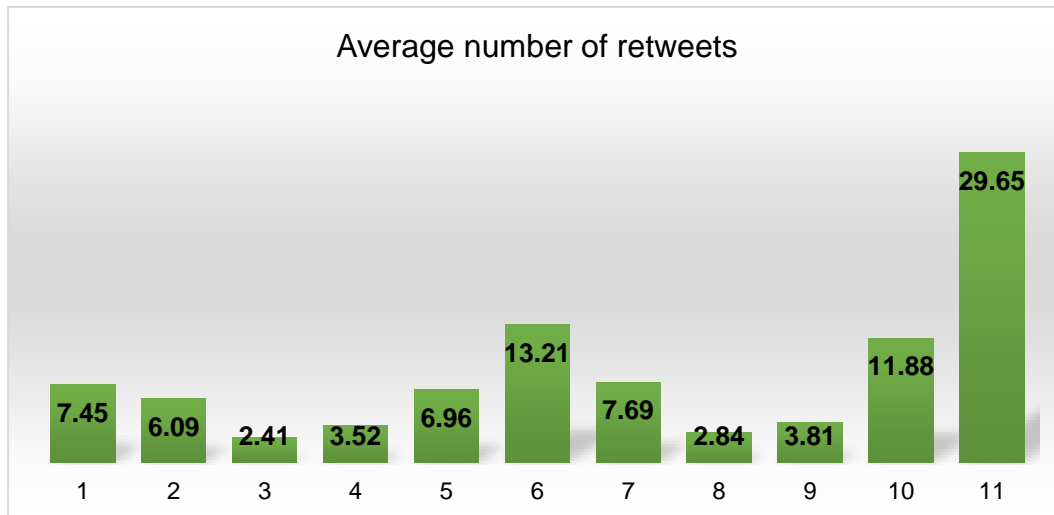


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15 **Fig. 7** Levels of Influence of the Different Participants in Tweets related to “Putin”

Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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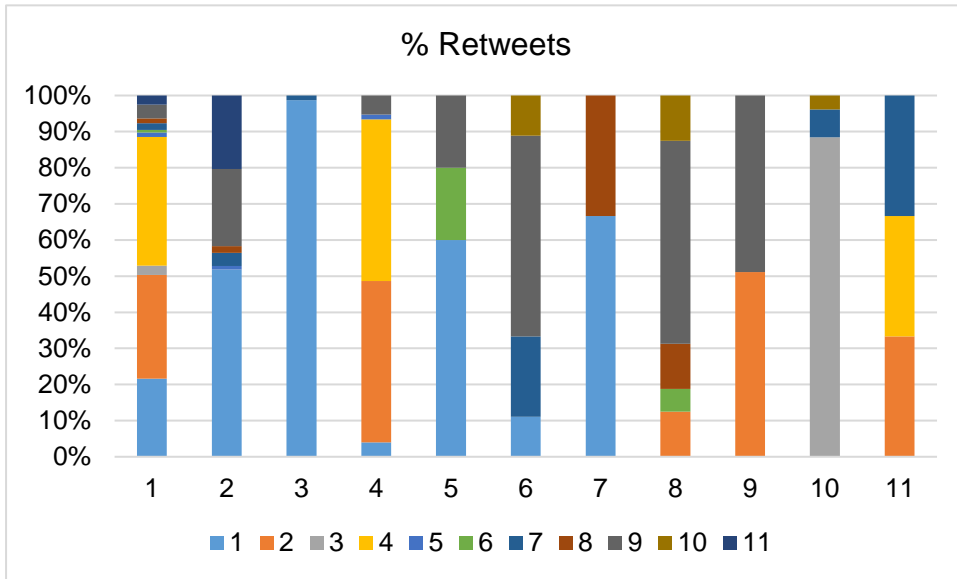
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**Fig. 8** Levels of Influence of the Different Participants in Tweets related to “Obama”

It is, however, interesting to see that when people-related tweets are of focus (refer to Figure 7 and Figure 8), the results present a very different picture. Mainstream media, journalists, and commercial organizations no longer garnered the most retweets, but celebrities emerged to be the one (and clearly many more than the other types of participants). This unveils the content-dependent (event vs. people) influence of the different participants in the news dissemination on Twitter. Another point worth noting is that regardless of whether the event-related or people-related tweets were concerned, the retweets garnered by the non-commercial participants remained low.

**4.3 Analysis of retweet distribution**

To gain further insights, we also examined the types of users/participants who retweeted the tweets posted by the different users/participants. Figures 9-12 below show the analysis results.



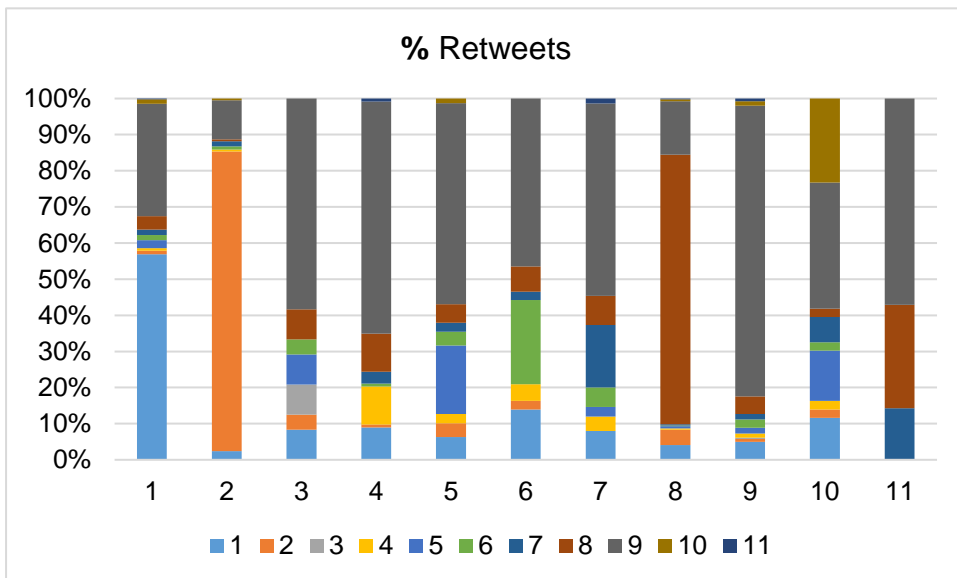
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2 **Fig. 9** “Protest” and “Square” – Types of Users Who Retweeted in Each Category

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Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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6 **Fig. 10** “Russia” and “Troops” – Types of Users Who Retweeted in Each Category

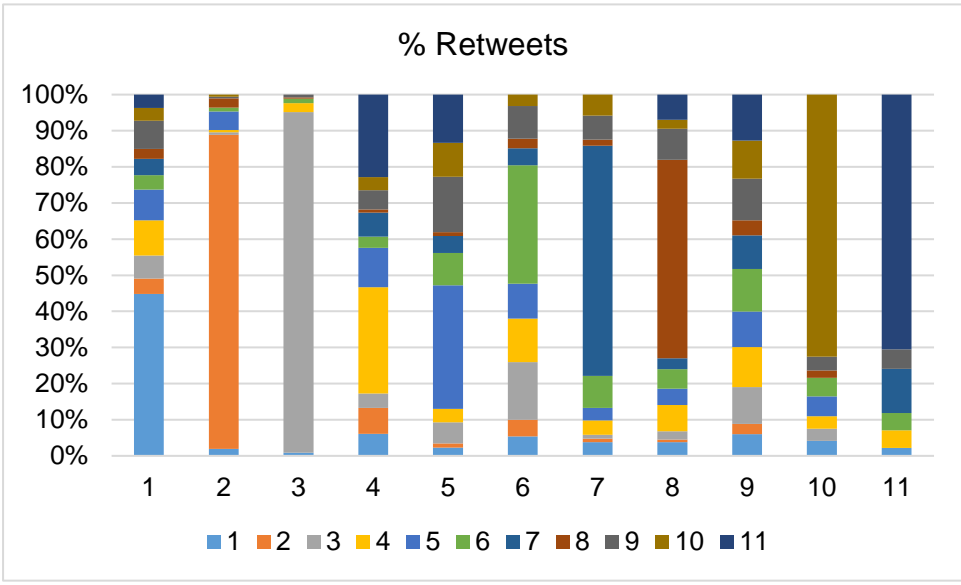
7 Previously, it was found that five types of participants consistently attracted the most  
 8 retweets in the keyword set “Protest” and “square”, and the keyword set “Russia” and  
 9 “troops”, i.e., major news agencies, radio and TV stations, affiliated journalists,  
 10 independent journalists, and commercial organizations. From Figures 9-10, more than  
 11 half of the tweets regarding “Protest” and “square”, and “Russia” and “troops” by

1 independent journalists were retweeted by non-commercial participants. Non-  
 2 commercial participants were also the most active participant in retweeting the tweets  
 3 about “Russia” and “troops” by affiliated journalists. However, they were secondary to  
 4 major news agencies in retweeting the tweets regarding “Protest” and “square” by  
 5 affiliated journalists. Nevertheless, these findings show the overall importance of non-  
 6 commercial participants in retweeting the event-related tweets by individual journalists,  
 7 again demonstrating their high involvement in the news dissemination.

8  
 9 As aforementioned, most of the tweets regarding “Protest” and “square” by affiliated  
 10 journalists were retweeted by major news agencies. Major news agencies are also  
 11 important participants in retweeting the tweets regarding “Protest” and “square” by  
 12 other major news agencies (third place after news aggregator and radio and TV stations),  
 13 radio and TV stations, and commercial organizations. Overall, these findings show the  
 14 importance of major news agencies in retweeting the tweets regarding “Protest” and  
 15 “square” by organization-based participants, depicting a “reinforcing” influence build-  
 16 up among the “elite” participants.

17  
 18 Finally, while most of the tweets regarding “Russia” and “troops” by major news  
 19 agencies were retweeted by other major news agencies, most of the tweets regarding  
 20 “Russia” and “troops” by radio and TV stations were retweeted by other radio and TV  
 21 stations, and most of the tweets regarding “Russia” and “troops” by commercial  
 22 organizations were retweeted by non-commercial participants and other commercial  
 23 organizations. These findings signal the importance of the same types organization-  
 24 based participants in retweeting the tweets regarding “Russia” and “troops”.

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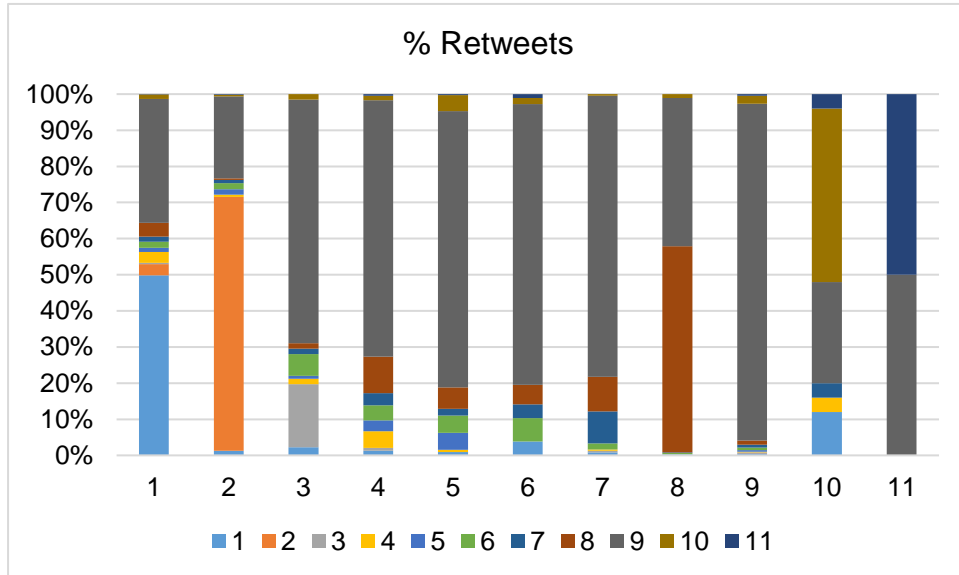
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27 **Fig. 11** “Putin” – Types of Users Who Retweeted in Each Category

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Legends: 1- Major news agencies; 2- Radio and TV stations; 3- Other news agencies; 4-News aggregator; 5- Journalists (affiliated); 6- Journalists (independent); 7- Blogging associations; 8- Independent bloggers; 9- Non-commercial participants; 10- Commercial organizations; 11- Celebrities

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**Fig. 12** “Obama” – Types of Users Who Retweeted in Each Category

4

It was also previously found that the participants who consistently attracted the most retweets regarding the keywords “Putin” or “Obama” were the celebrities. From Figures 11-12, we could see that while most the celebrities’ tweets about Putin was retweeted by the celebrities themselves, the celebrities’ tweets about Obama was partly retweeted by the celebrities themselves and partly retweeted by non-commercial participants. Hence, while it is interesting to see the reinforcement effect of people-related tweets by the celebrities, the involvements of non-commercial participants in propagating the celebrities’ people-related tweets remains notably salient.

12

13

## 5. Discussion and Conclusion

14

15

The open and interactive nature of social media has led to a belief that their use for news dissemination may challenge the role of conventional news media (Hermida, 2010). This seems a reasonable expectation. However, our study highlights that whether this holds depends on whether it is the “involvement” or the “influence” that is of concern.

19

20

21

By analyzing tweet data during the Ukraine’s conflict, our analyses unveil the following insights: 1) indeed non-commercial participants (e.g., religious networks, charities, volunteers) dominated the news tweeting landscape by being the most active and posting the most tweets; 2) yet, the retweets they attracted, which is a commonly used

22

23

24

1 measure of influence (Cha et al., 2010), was among the lowest. In contrast, “elite”  
2 participants including journalists, professional associations and commercial  
3 organizations, while generated lesser tweets, took the crown in attracting retweets; 3)  
4 we further found an exception to this pattern - when the tweets focused on popular  
5 political figures (Obama, Putin) related to the event, celebrities’ influence in terms of  
6 retweet count became salient.

7  
8 As a whole, our findings suggest that the role of mainstream media remain dominant  
9 on Twitter. This is despite the fact that Twitter as a social media now enables a full  
10 spectrum of communications from personal and private to ‘mass-personal’ (e.g.,  
11 celebrities) and traditional mass media (Walther et al., 2010). As this finding is less  
12 consistent with the common expectation that social media are dominated by ordinary  
13 non-commercial users (which should include the dissemination of news), below we try  
14 to offer explanations for why “elite” participants (major news agencies, radio and TV  
15 stations, affiliated journalists, independent journalists, and commercial organizations)  
16 are the ones who garnered greater retweets by building on the relevant literature.

17  
18 **5.1 Plausible reasons for the dominance of mainstream media in garnering**  
19 **retweets**

20  
21 Our further analysis shows that part of the retweets garnered by mainstream media can  
22 be explained by a reinforcing tendency of the “elite” participants in retweeting the  
23 tweets posted by their same kinds to some extents. However, we do see an active  
24 involvement of non-commercial participants in retweeting the posts of mainstream  
25 media, leading to the greater influence of the latter. That is, people seem to self-select  
26 news information from mainstream media to share with others (i.e., retweeting),  
27 causing the dominance of mainstream media in news dissemination to persist on Twitter.  
28 What may explain this tendency?

29  
30 We believe an examination of people’s motivations to retweet may offer some insights  
31 into this. We conducted a review of the literature that investigates motivations of  
32 retweeting (refer to Table A3 for a literature review). As can be seen from Table A3,  
33 there are various factors that may influence people’s tendency to retweet a post. Among  
34 the literature, Boyd et al. (2010) is among the earliest studies that explore what may  
35 lead to people’s retweeting behavior. Their exploratory study did not test the relative  
36 significance of the different factors identified, but noted, “[b]reaking news tends to be  
37 retweeted in the form of links to articles in media sources.” (p.6) Subsequent studies  
38 have indicated similar factors, in addition to general factors such as information sharing,  
39 self-expression, and social interaction or social capital building (Abdullah et al. 2017;  
40 Lee et al. 2012; Park and Jeong 2011; Recuero et al. 2011). For instance, Abdullah et  
41 al. (2015) found that people retweeted a post because they believe the post is important,



1 an indication being that it is from official account or trusted sources. Lee et al. (2014)  
2 also found that people tended to retweet a post that contained a link to a significant  
3 report from a reputable media news source, as they believe such a post is more  
4 trustworthy. Indeed, credibility or trustworthiness of a news source is a common factor  
5 influencing retweeting that is identified in the literature (Abdullah et al. 2017; Boehmer  
6 and Tandor 2015; Metaxas et al. 2015).

7  
8 From these studies, it can be seen that when news dissemination is concerned, news  
9 information from authoritative mainstream media may be perceived as more credible.  
10 Academic journals and trade press have indicated that the majority of news consumers  
11 still prefer mainstream news sources (83.8 per cent, see Fletcher and Park 2017), and  
12 that people's trust in social media as a news source is falling (Scott 2017). This may  
13 also have to do with the widespread occurrences of rumors on Twitter nowadays  
14 (Tanaka et al. 2012; Gupta et al. 2013; Mendoza et al. 2010; Vosoughi et al. 2018). Thus,  
15 users may be more careful to retweet information from other ordinary users (vis-à-vis  
16 information from mainstream media), especially if they do not possess first-hand  
17 understanding about a crisis event. Our findings with regard to the retweeting of  
18 information related to political figures may provide an opposite example that further  
19 supports this notion. We find that tweets by celebrities on political figures attracted the  
20 highest retweets. This may be due to the nature of such information that is more feeling-  
21 or perspective-based (e.g., whether a political figure makes a right or wrong decision),  
22 and so the credibility of news sources may matter less here.

23  
24 Nonetheless, we should not ignore the observation that people's trust in mainstream  
25 media is decreasing as well (Fletcher and Park 2017). People may be concerned that  
26 news information reported on mainstream media are biased and not as objective as those  
27 shared by ordinary, non-commercial users. Still, people's motivations to retweet may  
28 provide an explanation of why people tend to retweet news information from  
29 mainstream media if this is the case. A recent research by Majmundar et al. (2018)  
30 highlights that people may retweet for the purpose of arguing against a tweet that they  
31 disagree with. Thus, when people see a news tweet that they feel is biased and disagree  
32 with, they may retweet it with their comments and views inserted. This expression of  
33 disagreement may also help the users achieve the purpose of building social interaction  
34 and social capital with other users (Lee et al. 2012; Park and Jeong 2011; Recuero et al.  
35 2011), and they may find support of their views from mainstream media in other users.

36  
37 Collectively, the preceding may explain why news information from mainstream c  
38 media tended to be retweeted more on Twitter.

## 1 **5.2 Implications for research and practice**

2  
3 By affording the insights above, this research helps deepen our understanding of the  
4 nature and role of social media, in particular Twitter in news dissemination. First, we  
5 highlight the stark differences in the levels of involvement and influence among the  
6 various participants in news dissemination on Twitter. Second, by considering not only  
7 event-related tweets but also people-related tweets (popular political figures), we show  
8 the content-dependent influence of the different participants. Together these offer a  
9 more fine-grained and accurate understanding of the involvement and influence of the  
10 various participants on Twitter in news dissemination during conflicts such as the  
11 Ukraine episode.

12  
13 In particular, the potential impact of Twitter in changing the established authority  
14 structures of news dissemination may be less than what is being expected. Although the  
15 state of involvements of the different participants is true to the conceived nature of  
16 social media (i.e., grassroots and non-commercial participants take the central stage),  
17 the elite participants such as mainstream media and journalists garnered the highest  
18 retweets and thus were the more influential in news dissemination.

19  
20 To conventional media organizations, our results suggest that they should leverage  
21 Twitter for generating traffics to their websites by tweeting event-related snippets with  
22 links to specific news pages. As previously mentioned, such tweets from conventional  
23 media organizations garnered the highest retweets. This may be partly because they are  
24 perceived as validated news information, which are relatively safe to be retweeted. Due  
25 to the limited characters of a tweet, Twitter users may not be able to satisfy their  
26 curiosity of the news by simply reading the tweet. Instead, they will click on the  
27 accompanying links that will bring them to the news publisher's site. The widespread  
28 tweets are hence beneficial in bringing traffics to the websites of the conventional media  
29 organizations.

## 30 **5.3 Limitations, future research directions, and conclusion**

31  
32  
33 There are two limitations in this research that need to be recognized. First, we only  
34 focused on an important news event, i.e., Ukraine conflict. Future research may  
35 examine other events to assess the generalizability of our findings. Second, we only  
36 examined one area whereby the influence of the different types of participants could  
37 potentially vary, i.e., by considering tweets related to key political figures in contrast to  
38 those related to the event itself. Future research may try to identify other plausible areas  
39 wherein the levels of involvement and influence of the participants also differ.

40  
41 Notwithstanding these limitations, our research contributes towards the extant research  
42 on the use of social media in news dissemination by providing a clearer understanding

1 on this issue. The user/participant types and the associated heuristic categorization rules  
2 we developed may also be employed in relevant future research. We hope our research  
3 can serve as a foundation for subsequent work in this area.

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13

14 **Appendix – Supplementary Materials**

15

Features	If any &str in “user_screen_name”→(ind1= 0 or 1)	If any &str in “user_description” ”→(ind2(3)= 0 or 1)	
Magazine		{"magazine"}	ind2
Newspaper		{"newspaper"}	
Othermedia	{'Mississauga','BBC','CN N','NYTimes','nytimes','LATimes','usatoday','AJE','sfchronicle','washingtonpost','AJAM','CBS','ABC','Bloomberg','Reuter','DailyMirror'}	{'@bbc','cnn','cnn.' 'cnn','@cnn','@latimes','@ajam','aljazeera','ny times','new york times','aljazeera','breaking news','huffington','washington post','wall street journal','york times','bloomberg','difficult stories','telegraph','usatoday','usatoday','daily mirror','reuter'} <b>or</b> {'world news','news service','news network','news media','news agency','bringing latest news','latest news','source news','local news','covering latest','covering news','providing latest','provide latest','daily news','daily updates','leading source','leading provider','announce latest','announce news','stay connected','stay tuned','stay updated','stay informed','international news','global news','news provide','news features','news analysis','news feats'}	ind1*ind2
Tv_radio	{'Mississauga','BBC','CN N','NYTimes','nytimes','LATimes','usatoday','AJE','sfchronicle','washingtonpost','AJAM','CBS','ABC','Bloomberg','Reuter','DailyMirror'}	{'world news','news service','news network','news media','news agency','bringing latest news','latest news','source news','local news','covering latest','covering news','providing latest','provide latest','daily news','daily updates','leading source','leading provider','announce latest','announce news','stay	(ind1*ind2 ) or (ind2*ind3 )

		connected', 'stay tuned', 'stay updated', 'stay informed', 'international news', 'global news', 'news provide', 'news features', 'news analysis', 'news feats'} →ind2 { 'tv', 'radio', 'tv program', 'podcast', 'television program', 'tune in' } →ind3	
Media_people		{ 'writer', 'anchor', 'host', 'editor', 'producer', 'correspondent', 'reporter', 'columnist', 'commentator', 'journalist', 'newsroom', 'photographer', 'presenter', 'curator', 'trustee', 'publisher', 'analyst', 'investigat', 'meteorologist', 'media specialist', 'media expert', 'illustrator', 'staff', 'writing' }	ind2
Affiliated		{ "contributing", "contribute to", "contributor", "journalist for", "journalist @", "journalist at", "journalist with", "journalist of", "associate", "affiliate", "staff", "edit or for", "affiliation", "reporter at", "reporter @", "correspondent for", "correspondent at", "correspondent @", "correspondent", "based", "present", "i cover", "head of", "writing in", "writing at", "write for", "writing @", "writing for", "presenter of", "work at" } AND NOT { "not affiliate", "freelance", "unaffiliate", "non affiliate", "self employed", "self-employed" }	ind2
Independent		{ "independence", "independent", "autonomous", "autonom", "uncontrolled", "freelance", "free lance", "free-lance", "non profit", "nonprofit", "non-profit", "free" }	ind2
Blog	{ "mashable", "lifehack", "blog" }	{ "blog", "trend", "blogger", "social media", "blogging", "enthusiast", "website", "vlog" }	ind1 or ind2
Fan_site		{ "fan", "fanpage", "lover", "promoter", "fansite", "fan site", "fan page", "fanclub", "fan club", "fandom", "fanatic", "fanboy" }	ind2
Official_Site		{ "official twitter account", "official account" }	ind2
Organized_effort		{ "organization", "organisation", "foundation", "platform", "community", "fundrais", "campaign", "association", "venture", 'press release', '.org' }	ind2
Former		{ "former", "ex-", "retired", "departed", "prior", "latter" }	ind2
Aggregate	{ "feed", "RSS", "Feed", "FEED" }	{ "translat", "dispense", "repost", "repost", "rssfeed", "rss feed", "rss-	ind1 or ind2



		feed", "rss", "review news", "review interviews", "sharing", "retweeter", \ "retweet endorsement", "news reader", "newsreader", "aggregat", "related news", 'news site', 'news website', 'news review', 'news insight', 'news gossip', 'news comment'}	
--	--	--	--

1 *Table A1 Features of the Participants*

Class	Rule (for each user i)
1. Major News Agencies	if (features['magazine'][i]==1 and features['media_people'][i]==0 and \ features['tv_radio'][i]==0 and (features['blog'][i] == 0) \ OR if (features['magazine'][i]==1 and features['media_people'][i]==0 and \ features['tv_radio'][i]==0 and (features['blog'][i] == 0)) \ OR if (features['othermedia'][i]==1 and features['media_people'][i]==0 and features['tv_radio'][i]==0 and (features['blog'][i] == 0)\ and if (features['independent'][i] == 0)and features['organized_effort'][i] == 0\ and features['fan_site'][i] == 0 and features['former'][i] == 0)
2. Radio and TV Stations	if (features['media_people'][i]==0 and features['tv_radio'][i]==1 and (features['blog'][i] == 0) and (features['independent'][i] == 0)and features['organized_effort'][i] == 0\ and features['fan_site'][i] == 0 and features['former'][i] == 0)
3. Other News Agencies	if ((features['magazine'][i] + \ features['newspaper'][i] + features['othermedia'][i] > 0) and features['media_people'][i]==0 and features['tv_radio'][i]==0 and (features['blog'][i] == 0) and (features['independent'][i] == 0)and features['organized_effort'][i] == 1\ and features['fan_site'][i] == 0 and features['former'][i] == 0)
4. News Aggregators	if (features['aggregate'][i]==1 and features['media_people'][i]==0 and features['tv_radio'][i]==0 and (features['blog'][i] == 0) and (features['independent'][i] == 0)and features['organized_effort'][i] == 1\ and features['former'][i] == 0)
5. Journalists Affiliated to News Agency	if (features['media_people'][i]==1 and (features['magazine'][i] + \ features['newspaper'][i] + features['othermedia'][i] > 0) and (features['affiliated'][i] == 1)\ and (features['independent'][i] == 0))
6. Independent Journalists	if (features['media_people'][i]==1 and (features['magazine'][i] + \ features['newspaper'][i] + features['othermedia'][i] > 0) and (features['affiliated'][i] == 0)\ and (features['independent'][i] == 1))
7. Blogging Associations	if ((features['blog'][i] == 1)\ and (features['independent'][i] == 0) and features['organized_effort'][i] == 1\ and features['former'][i] == 0)
8. Independent Bloggers	if ((features['blog'][i] == 1)\ and (features['independent'][i] == 1))
9. Others	Else

2 *Table A2 Heuristic Rules to Categorize the Participants based on the Values of the Features*

3

4

Author (year)	Context investigated	Research method	Findings about factors that influence retweeting
Boyd et al. (2010)	General	Secondary data analysis	<ul style="list-style-type: none"> <li>- To amplify or spread tweets to new audiences</li> <li>- To entertain or inform a specific audience</li> <li>- To comment on someone's tweet</li> <li>- To make one's presence as a listener visible</li> <li>- To publicly agree with someone</li> <li>- To validate others' thoughts</li> <li>- As an act of friendship, loyalty, or homage by drawing attention, sometimes via a retweet request</li> <li>- To recognize less visible content</li> <li>- For self-gain, either to gain followers or reciprocity from more visible participants</li> <li>- To save tweets for future personal access</li> </ul>
Suh et al. (2010)	General	Secondary data analysis	<p>Characteristics of tweets that are more likely to be retweeted:</p> <ul style="list-style-type: none"> <li>- Tweets which contained URLs and hashtags</li> <li>- Tweets written by a user with a greater number of followers and followees, and a longer history of using Twitter</li> </ul>
Park and Jeong (2011)	General	Survey	<ul style="list-style-type: none"> <li>- More social interactions and more intimacy with people on their network, and for more influence on their followers</li> <li>- Information sharing (let other users know important information)</li> <li>- Responsiveness (be able to have immediate feedback)</li> <li>- Emotional propagation (share public indignation)</li> </ul>
Recuero et al. (2011)	General	Survey	People retweet to build social capital
Lee et al. (2012)	General	Survey	<ul style="list-style-type: none"> <li>- Information sharing</li> <li>- Social interaction building</li> <li>- Self-expression</li> </ul>
Lee et al. (2014)	Health news (bird flu)	Secondary data analysis, experiment	<p>Factors affecting retweeting (when requested):</p> <ul style="list-style-type: none"> <li>- Trustworthiness of the content to be spread (e.g., because it contained a link to a significant report from a reputable media news source)</li> <li>- Content relevance (e.g., because it happened in the retweeter's neighborhood)</li> <li>- Message contained valuable information and was helpful to society (e.g., the retweeter think the information is valuable)</li> </ul>

Abdullah et al. (2015)	Disaster information	Survey	<ul style="list-style-type: none"> <li>- Need to retweet (people believe it is important to spread the information, that the tweet is related to one's situation, and is from official account or trusted sources)</li> <li>- Interesting tweet content</li> <li>- Tweet user (e.g., which followers have retweeted)</li> </ul>
Boehmer and Tandor (2015)	Sport news	Survey	<ul style="list-style-type: none"> <li>- User characteristics: level of interest in a tweet topic, perceived relevance of the tweet, how similarity of the tweet information with personal opinion, and perception of how a tweet would affect followers</li> <li>- Content-related characteristics: tweet's style, informativeness, and originality</li> <li>- Source characteristics: perceived source credibility and likeability</li> </ul>
Lee et al. (2015)	General	Survey	Altruistic motivation (other-oriented benefits) and reciprocity motivation (mutual exchange of favors) are related to behavioral intention of retweeting
Metaxas et al. (2015)	General	Survey	<ul style="list-style-type: none"> <li>- Interest in a message</li> <li>- Trust in the message and the originator</li> <li>- Agreement with the message contents</li> </ul>
Shen et al. (2015)	General	Modeling and experiment	Retweeting behavior is an outcome of the influence from the post (e.g., a post with rich information) and the influential users.
Abdullah et al. (2017)	Disaster information	Survey	<ul style="list-style-type: none"> <li>- To provide relevant and updated information because the information is believable</li> <li>- Want people to know the information they perceive as important</li> <li>- The information capture retweeters' interest and they felt excited to share about the unusual situation</li> <li>- Want to get feedback and alert other people</li> </ul>
Majmundar et al. (2018)	Health information	Survey	<ul style="list-style-type: none"> <li>- To show approval (e.g., to show support to the tweeter)</li> <li>- To argue (e.g., to argue against a tweet that one disagrees with)</li> <li>- To gain attention, e.g., to increase followers</li> <li>- To entertain, e.g., humor/amusement</li> </ul>

1 *Table A3 Factors Influencing People to Retweet (articles presented in chronological order)*

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