

CIVILIANS HEROES: A SOCIAL NETWORK ANALYSIS OF INFORMATION STRUCTURE ON SOCIAL MEDIA DURING DISASTER

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ABSTRACT. Online social activists through social media play an important role in disseminating information during disaster. However the nature and scale of the typical activist's involvement with social media have remained unexplored topic. This study applies Social Network Analysis to identify the key information brokers, their roles and the type and flow of information exchanges between the online activists in the network structure. The analysis was performed on a dataset consisting of 139 posts from a volunteer social media group. The findings demonstrate that civilians play crucial role during disaster as information broker and information boundary spanner, bridging different clusters of network. There were 5 important clusters discovered, each orchestrated around different type of supports. The different types of information posted also reflected the integrative supports covering physical, mental and supports offered for the victims. The evolution of clusters during and post period demonstrates the transitions of social media use by the civilians in coping and managing disasters. This finding can serves as a foundation for integrating public and formal efforts during disaster which ideally increase the efficiency of disaster management.

Keywords: disaster, social network analysis, social media, information dissemination

INTRODUCTION

In recent years the rate at which disasters occurs is alarming. According to Kreps (as cited in Yandong, 2010) a disaster is an event that is observable in both time and space where societies incur damages and interruption of their routine functioning and affects hundreds of thousands globally. Malaysia recently, has experienced the worst disaster in decades with twelve states being hit which led to a damage that is worth over \$560 million (Post Magazine, 2015).

In managing disasters, online social activists play an important role in disseminating information and organizing mission aid. They rely primarily on social media due to its ability for information exchange via conversation (Yates & Paquette, 2011). This is visible in the case of Japan tsunami, Haiti earthquake, Los Angeles wildfire where it was used to disseminate real-time information like warnings, live updates, and relief coordination (Hjorth & Kim, 2011; Yates & Paquette, 2011). It has proved to provide new avenues for connected, affective and civic responses (Belblidia, 2010). The bigger the network structure that they

have, the better the support they offer to victims in terms of psychological support (Yandong, 2010).

As the social activist information structure is important in disseminating critical information, there is an urgent need to analyse the network structure of their information exchanges during the recent Malaysia's flood. The nature and scale of the typical activist's involvement with social media have remained important but unexplored topic. Through this study, we can refine our understandings on the key information brokers, their roles and the type and flow of information exchanges between the online activists in the network structure. This finding serves as a foundation for integrating public and formal efforts during disaster which ideally increase the efficiency of disaster management.

LITERATURE REVIEW

Information dissemination research during disaster has been active an field of study in recent years (Hjorth & Kim, 2011). Previous research proved that social media is important in information dissemination among the civilians which supports better integration with official disaster response (Sutton, Palen, & Shklovski, 2008). In recent years, emergency workers are adopting the use of social media for prompt information dissemination so as to reach their target audience (Denef, Augustin, Bayerl, & Kaptein, 2013). Belblidia, (2010), added that information dissemination using social media is a vital addition to the traditional means of exchanging information during critical times in emergency by giving an avenue for collaboration that enhances the community resilience, it also offers a more direct channel for information dissemination to the public (Denef et al., 2013). These studies have suggested the importance of social media for information dissemination during disaster. However, a more refine description of the information dissemination structure, the key information brokers' roles and type of postings will be useful to enhance our understandings. To achieve this, Social Network Analysis (SNA) will be applied.

SNA can be seen as a set of methods to study the social structure. Here the actors are the nodes while the relationship is the edges or ties where the nodes and ties connects together to form a network like structure (Yandong, 2010). It creates links between relationships to understand factors that affect knowledge flows and equally what knowledge is being shared. It highlights the important people in the network, individuals that has the strongest influence in the communities and those who channels vital information, this enable it to show who are the most influencer, most prominent, the brokers and the outliers with the subgroups or clusters that exist within the network and how the network structure changes with events and time (Hansen, Shneiderman, & Smith, 2011).

METHODOLOGY

In identifying the key information brokers/influencers and the type of network structure formed, SNA technique was applied involving four stages. In the first stage, the data was collected from a non-profit organization fan page on Facebook using NodeXL. The data was collated between 18th of December 2014 to 24th of January 2015 and were grouped into during and post-flood group. The during-flood period spanned over a period of 18 days with a total of 97 posts while the post-flood group spanned over a period of 20 days with a total of 42 posts. The whole dataset consists of 139 posts. In the next stage, the collated data was pre-processed by filtering duplicate vertices and tweets followed by merging of repeated edges for improving the accuracy of the analysis (Hansen et al., 2011). In the third stage, the graphs were generated and analyzed using graph such as betweenness centrality, in-degree, out-degree and clustering co-efficient to identify important people in the network; the information disseminators, bridge spanners and outliers (Hansen et al., 2011). The clustered network based

on Wakita-Tsurumi algorithm was used in identifying active posts and identify cliques within the network (Wakita & Tsurumi, 2007). Lastly, for content analysis, the posts and tweets on the fan page were analyzed in to identify emerging themes. This was done using KH Coder (Higuchi, 2001).

RESULTS AND ANALYSIS

The social network structure generated was a community cluster structure in which different topics attracts distinct audience, influencers and information source (Smith, 2014). The bigger the node the more active they are on the fan page and the colored nodes are much more important than the others regardless of its size. The metrics used for categorizing the importance of nodes are based on betweenness centrality and social tie strength (Hansen et al., 2011). The importance of the nodes stretches from the colour yellow (most important) to the blue colour. In the overall network structure, only 5% of the overall users are important and serves as an important communication bridge with 45% active users. There were more active female participants than the male in the overall network structure.

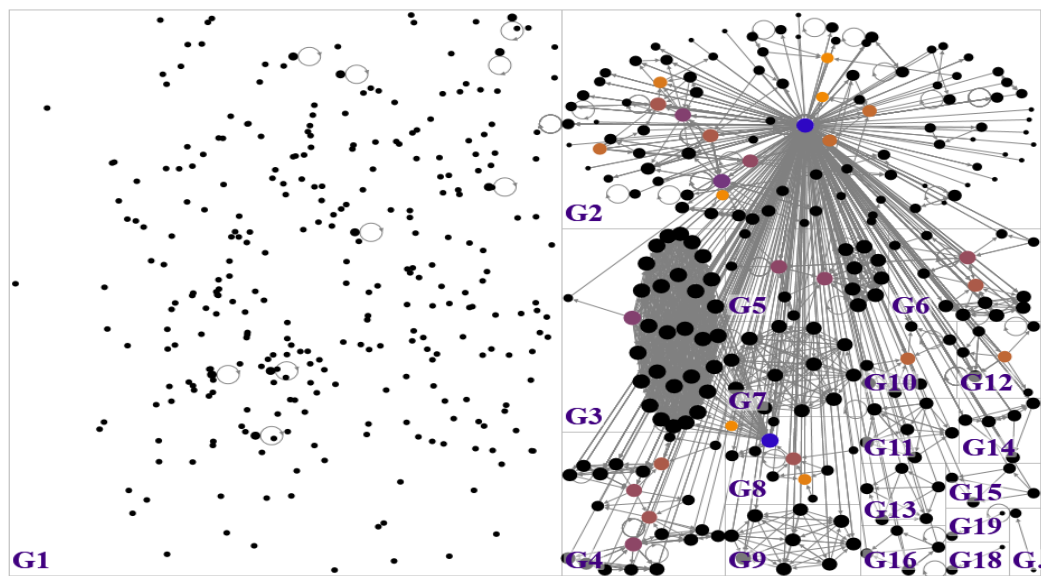


Figure 1. Social network structure of MSRK fan page

Table 1. Cluster analysis

Clusters	Type of posts	Influencer's Clustering coefficient	Graph density	Key Player	Vertices
Cluster 1 (G3)	Rise in water level that threatens a 50,000 population settlement (during)	0.478	0.476	Influencer 5	31
Cluster 2 (G4)	Sorting and good dispersion (post)	0.282	0.143	Influencer 6	22
Cluster 3 (G7)	Volunteering activities	0.518	0.515	Not much influential	12
Cluster 4 (G6)	Post flood cleaning (post)	0.214,0.431	0.205	Two Influential but are not listed	13
Cluster 5 (G5)	Talked about Volunteering (during)	0.439,.181	0.286	Influencer 7 and 8	14

Referring to Table 1, there were 5 important clusters discovered, each orchestrated around different type of supports. Most dense clusters were formed during the flood period. They serve as a primary source of information dissemination, situation awareness and social support which is crucial during the early stages of the flood. The post flood clusters were sparser due to the containing occasional updates about volunteering actions with few contributions. Other clusters such as G2 with a graph density of 0.024 had a lot of influencers but the graph density was very low due to the sparse connections. The overall graph density which is 0.004 shows that the graph is a very sparse graph with little action among the participants.

Table 2. Influencers table

Key player	Betweenness Centrality	Sum Degree	Clustering Co-efficient	Gender
Influencer 1	52254.000	301	0.016	Organization
Influencer 2	261.000	40	0.331	Male
Influencer 3	47.000	19	0.224	Male
Influencer 4	32.000	13	0.282	Male
Influencer 5	30.000	32	0.478	Female
Influencer 6	25.000	18	0.282	Male
Influencer 7	24.000	14	0.181	Male
Influencer 8	24.000	13	0.439	Female

In terms of the key information brokers or influencers, they were determined basically by their betweenness centrality. Meanwhile the active people were determined by their social tie strength, (sum of in and out degrees). A lot of the information disseminators had a relatively low sum degree which means they posted or commented less on the overall network structure, but it is evident that their contribution was genuine and effective. Example is the influencer 4 with a sum degree of 13 and yet had a high betweenness centrality due to the quality of his post and he serves as a bridge to other information disseminator in the overall network structure. The clustering co-efficient of the influencers also showed their participation level and how much they interacted with other people to form relationships. Influencer 5 which is a civilian was key in the during flood phase and had a strong relationship with other participant serving as an important influencer and information bridge. In contrary to the first and second influencers that served primarily as information source but had little relationship with the overall network structure. In conclusion mostly civilians (14 females and 12 males) were influential on the overall network. The network structure had 45% of its vertices with a social tie strength (sum degree) greater than 1.

Content Analysis

The data set consisted of 139 posts. Upon analysis of the types of information shared, six categories emerged (refer to Figure 2):

Category 1: Volunteering activities were present throughout the duration of the flood and outnumbered other themes. Example of posts in this section is:

“Pagi ini Team Sukarelawan MeSRA ke Hospital Raja Perempuan Zainab , II Kota Bharu”

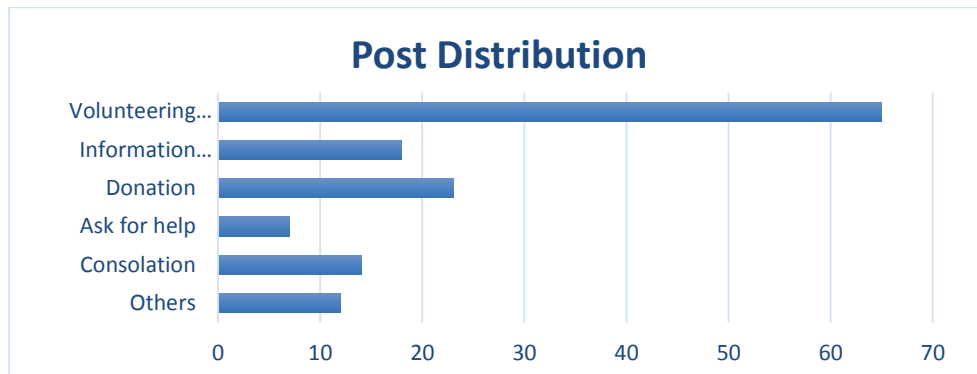


Figure 2. Posts theme frequency of MSRK posts during the period of the study

Category 2: The information update posts were used to pass important news across, it includes the provision of service portal for urgent detail. Example of a post in this section is:

“Dikhabarkan air naik di beberapa tempat Doakan semoga semuanya baik-baik sahaja”

Category 3: In the donation and contribution post, the list of required items were issued and details on how to contribute or to distribute donated materials were highlighted. Example:

“masih memerlukan WATER JET dll peralatan bagi membantu kerja mencuci pasca banjir.”

Category 4: The asking for help was pronounced during the flood period where information about stranded people were posted, supporting rescue coordination and awareness. Example:

“Minta pertolongan juga di sekolah kebangsaan bunut payong, sehingga kini mereka belum mendapat sebarang bantuan”

Category 5: The consolation theme for mental support of the victims was pronounced in the third week basically and surfaces sparingly in other weeks. Example includes:

“Doa Ketika Ditimpa Musibah.Ujian datang untuk menguji keimanan. Semoga semua mangsa banjir terus tabah dan sabar menghadapi kehidupan mendatang. Ameen”

DISCUSSION

The network structure coupled with the content analysis shows the rate and type of supports on the page. The page was highly busy during the flood period with decrease in activity as time passes by. During the flood period there were more of urgent information dissemination, rescue and relief coordination which is an important thing that the media was being created for initially. The first and second week of the flood concentrated on seeking for help (category 4) about area that was distraught. There was more of resources needs (donations) posts for the victims as more information about the condition centers continued to stream in. However, there were sparing condolence messages and few calls for volunteerism. During the third week, the number of condolences message increased, which are mostly Quranic verses. This could be said as a way of uplifting the victim’s morale and consoling the victims. In this study, the social media page was used as an avenue to offer psychological supports to the victims through heartfelt condolences and religious text similar to previous literature (Yandong, 2010).

The page was also used extensively in coordinating aid. This is especially evident during the fourth week where a sharp increase of volunteerism was noticed. There was increase in

their activities specifically related to the cleaning of the environment. The fifth week was characterized by an increase in donation for victims and volunteerism from states, organization, families, schools and internationals. The sixth week comprises of information for sorting of relief materials for the victims, coordination of volunteers for more post-flood cleaning. There was still active cleaning on going in the region. However the activities were relatively lower in comparison to during flood period which probably was because of the criticality of disaster updates is not a concern anymore. As for the sparse networks, these comprises of the public that visits the page for information updates.

CONCLUSION

In conclusion, this study shows that organization fan page serves as an important tool in information dissemination during disaster, and equally serves as a source for support to the victims. There were 5 important clusters discovered, each orchestrated around different type of supports. The different types of information posted reflected the integrative supports covering physical, mental and supports offered for the victims. This study also highlight how normal civilians can play important role as information brokers and volunteerism coordinators. The continuous updates and activities during post-disaster gives a sense of belonging to the affected victims. This finding can also serves as a foundation for integrating public and formal efforts during disaster which ideally increase the efficiency of disaster management.

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