

Citizens' Social Media Engagement in Times of Natural Disasters: Evidence from Greece

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Abstract. The aim of the present study is to examine how citizens in Greece engage in social media disaster communication during times of natural disasters with emphasis on Facebook. Moreover, through the lens of the social media engagement approach this study proposes a typology of users' disaster-related social media activities. Towards this end, an online quantitative survey was conducted through a self-administered questionnaire using the snowballing sampling method. In total, 1574 citizens responded to the questionnaire. Results indicate that citizens in Greece exhibited low levels of engagement in disaster related communication on Facebook. During times of natural disasters participants seem to perform mainly passive tasks such as receiving information about the event and reading the news from media sources and journalists. More active social media tasks such as creating disaster-related content were observed to an extremely low extent. Through an exploratory factor analysis, three main engagement forms were derived namely: consuming, sharing, and creating. Consuming refers to passive activities such as searching for information and reading posts of others about the disaster. Sharing is about forwarding information produced by other users while creating content reflects more active forms of social media engagement during disasters and is related to activities such as expressing emotions, proposing solutions, announcing, organizing relief efforts, praying for victims, discussing about responsibility, praising, etc. Results of the present study will be of value to disaster managers wishing to take advantage of social media.

Keywords: social media engagement; natural disasters; users; citizens; Greece.

1 Introduction

Social media can be regarded as important communication tools that can be used by citizens as well as authorities in times of emergencies and disasters. During disasters social media can provide to citizens relevant information in timely manner about the event by official and non-official channels but can also expose citizens to misinformation and false rumors (Simon et al., 2015). Due to the high levels of uncertainty that crises and disasters produce, oftentimes citizens turn to social media to seek as well as provide and spread information (Zander et al., 2022) regarding the event thus can act as "sensors" that identify information as well as journalists that analyze and report 'news' about the crisis (Palen and Hughes, 2018). Despite the various uses of social media by citizens, their actions on social media during emergencies might result in several advantages as well as challenges to emergency authorities (Albris, 2018). For example, emergency services can turn to user-generated content to formulate a clear picture of the crisis, the public sentiment, and public's knowledge about the disaster. This content can provide added value to the decision-making of authorities (Jurgens and Helsloot, 2018). However, citizens can use social media in a chaotic way by spreading false information or organizing rescue initiatives that might impede the work of emergency services (Kaufhold et al., 2019). Thus, it can be argued that understanding how citizens react and behave on social media (Reuter et al., 2019) might yield fruitful insights to disaster managers who try to communicate in an accurate and effective way to related publics as well as harness the user-generated crisis information on social media.

However, until now most research has tried to shed light on the ways authorities are utilizing social media to communicate with relevant public in all phases of a disaster cycle while fewer studies have examined how publics that evolve around a crisis or disaster use social media (Gasco et al., 2017) and engage in participatory behaviors (Guo et al., 2021). In addition, most studies on public's use of social media examine the content of social media posts that are collected about a specific type of crisis or disaster and less is known about users' self-reported social media activities when they encounter emergencies and disasters (e.g., Zander et al., 2022).

The present study contributes to the existing literature on social media engagement and disaster communication and sheds light on how citizens use social media during disasters. Specifically, the aim of the present study is three-fold. First, to identify the most frequent social media behaviors of users during natural disasters. Second to decipher the main dimensions that comprise users' social media engagement when they face emergencies and natural disasters. Third, to test whether social media usage frequency and their perceived reliability affects user social media engagement.

2 Related Work

The present study builds on the field of "crisis informatics" that deals with citizens use of communication technologies to react to disasters and to cope with the uncertainty inherited in such events (Palen and Anderson, 2016). Prior research has shown that users enact various roles in social media during times of disasters. According to Fraustino et al. (2017) three types of social media publics emerge during disasters: influential social media creators who engage in online discussions about the event and have more knowledge about the disaster than other publics; followers who receive information from influential creators and social media inactives that do not have social media accounts but are receivers of offline word-of-mouth communication by social media followers and creators. Regarding the content produced, Reuter et al. (2013) found that social media users can act as helpers that coordinate helping activities such as donations, rescue efforts, first aid and supplies provision, and psychological support. Moreover, social media users can become 'reporters' by analyzing, synthesizing, and providing information. Retweeters and repeaters are another type of users that share information and posts produced by others and readers are regarded as the most passive form of social media users that mainly consume disaster related content.

Work on user generated content during natural disasters has revealed several functions that social media serve in emergencies. As Fraustino et al. (2017) note citizens' social media activities span from passive behaviors such as reading, searching, and filtering disaster related information to more active forms of social media usage such as sharing disaster content, organizing volunteer activities, responding to urgent needs, providing emotional support to others as well as expressing opinions and engaging in discussions with other users.

Qu et al. (2011) analyzed the social media posts of citizens in the 2010 Yushu earthquake and found that users tend to publish informational messages about disaster updates and relief efforts; action-related messages that requested help, and coordinated relief efforts and proposed relief actions; opinion-related messages that criticized the government response, evaluated and commented on the situation; and emotion-related messages through which users expressed their personal feelings and provided emotional and social support to the affected citizens. Imran et al. (2013) and Li et al. (2018) argued that during natural disasters such as the 2011 Joplin tornado and the Yiliang earthquake users on social media post mainly informational messages, caution and advice posts, messages about the casualties and extent of damages, as well as messages seeking for help, donations, etc.

Takahashi et al. (2015) examining citizens social media behavior during the Haiyan Typhoon classified users' posts into the following categories: reporting posts where users reported their personal information or shared information from other sources such as news outlets, requesting help, coordinating relief efforts, providing mental counseling and health support, criticizing the government, expressing well wishes and memorializing victims, discussing causes, and reconnecting community members. Al-Saggaf and Simmons (2015) analyzed through a qualitative thematic analysis users social media activity during two natural disasters in Saudi Arabia. Based on the results users through their posts tried to help users communicate the extent of the crisis, engage in discussions about the causes of the disaster, assign responsibility, criticize the government, request help, express emotion and sadness. Albris (2018) investigated the posts published by Facebook groups during the 2013 floods in Dresden, Germany. These posts aimed to enhance the profile's network, to report on the situation, to offer help, to request help as well as to bolster the morale of volunteers, authorities, emergency personnel.

In a recent literature review, Li et al. (2021) social media disasters posts by citizens were classified in two broad categories: (a) situational information messages and (b) non-situational messages. Situational messages were further divided into social-support related posts through which citizens published warnings, advice, calls for help and donations; and non-social support messages that included more disaster-related information about damages. Non-social messages also contained and personal comments about the event. In addition, non-situational posts were messages that were of interest only to the sender.

Based on the preceding analysis it can be argued that most of the studies on disaster-related communication on social media by citizens analyze the content of social media posts for specific types of disasters and do not take into account the perceptions and importance that citizens assign to each type of post. Moreover, the proposed typologies until now do not classify messages based on the intensity of users' engagement. Towards this end, the present study will shed light on the (a) importance assigned by social media users to several types of social media posts that are published during natural disasters and (b) classify users' social media actions based on the intensity of their engagement with disaster related communication. Social media engagement activities can span along a spectrum from passive to active based on the commitment of users (Molina et al., 2023). Passive forms of engagement are related to consuming activities (searching for and reading posts) while more active forms of engagement are sharing (forwarding information) and creating content (expressing opinion, organizing relief activities). Another objective of the study is to test whether social media usage frequency and perceived social media reliability influences the different forms of social media engagement with disaster communication.

3 Methodology

To achieve the study's objectives a quantitative online survey was conducted from November 2019 until July 2020. The initial "seed" sampling units comprised of students of a Communication Department at a University in a northwestern city in Greece. The seed students were asked (in class) to forward the online questionnaire to at least 20 Facebook peers, in exchange for extra credit. To ensure that the students had done as asked (i.e., to receive the extra credit), in the online questionnaire, their peers were asked to note the registry number of the student by whom they had been asked to complete the survey. Only if a student registry number appeared in 20 questionnaires would the student receive the extra credit. In total, 1574 questionnaires were completed only with no missing values. The questionnaire was in Greek and was developed in Google Forms.

The questionnaire was comprised of two main sections. The first section contained 28 questions that were derived from an extended literature review of studies related to social media posts of users in natural disasters. Specifically, a group of questions asked the frequency users engaged in searching for information about the crisis event, government response, media reports, instructions on how to handle the crisis, emergency spots and locations (e.g., evacuation shelters, hospitals), relief initiatives, personal stories and testimonials, lost people and victims. Another group of questions collected information about sharing-related activities of users such as sharing information about the disaster event, relief initiatives, missing people and victims, calls for help, guidelines of authorities, critique of the government and response of authorities. In addition, a set of questions asked participants to rate how frequently during a natural disaster did they engage in activities such as expressing negative emotions about a disaster, describing their personal experience, criticizing the government, proposing solutions for future crisis avoidance, suggesting solutions for quick recovery, offering instructions and personal advice, offering support to victims, discussing about the crisis responsibility, praying for victims, praising rescuers, firefighters, volunteers, organizing relief initiatives, report about their safety, offering psychological support, and requesting help. The questionnaire also included a question about the usage frequency of Facebook in general. All the above questions were answered on five-point likert-scales ranging from 1: never to 5: very frequent. Moreover, respondents rated their perceptions about the reliability of Facebook as a communication channel during natural disasters through a five-point scale ranging from (1) strongly disagree to (5) strongly agree. The second section of the questionnaire included questions about the gender and age of the participants.

4 Results

The sample consisted of 42.7% males and 57.3% females. 45.4% of participants were aged between 18 to 25 years old; 18.6% between 26 to 35 years old; 18.8% between 36 to 45 years old; 13.3% between 46 to 55 years old; and only 3.9% were above 56 years old.

To examine the dimensionality of users' social media engagement with disaster communication an exploratory factor analysis was performed using principal components and varimax rotation via SPSS 21.0. The 28 questions were initially factor analyzed. However, three items were dropped from further analysis (e.g., request for help, receive information about missing people, share criticism) due to high cross loading between two factors. The remaining 25 questions were again factor analyzed. The analysis revealed three factors with eigenvalues greater than 1.0 that explained the 67.31% of the variance. Moreover, all items had factor loadings that were above 0.50 and the three factors exhibited high internal reliability as Cronbach's alpha values exceeded the 0.70 threshold. Table 1 shows the factor loadings and the descriptive statistics of each item.

Table 1. Results of factor analysis

Factor/Items	Factor Loadings	Mean Scores (Standard Deviation)
<i>Consuming (Cronbach's alpha: 0.907, 19.54% of variance)</i>		
Receive information about the authorities' response	0.777	2.44 (1.10)
Receive information about the disaster event	0.775	2.76 (1.08)
Receive information about the news and media reports	0.757	2.72 (1.11)
Learn about emergency spots and locations (e.g., hospitals)	0.747	2.71 (1.12)
Receive information about instructions on how to respond	0.735	2.39 (1.07)
Receive information on how to help	0.724	2.65 (1.06)
Read personal stories and experiences from affected citizens	0.682	2.63 (1.11)
<i>Sharing (Cronbach's alpha: 0.931, 17.48% of variance)</i>		
Share support and relief initiatives	0.827	2.47 (1.15)
Share calls for help	0.793	2.41 (1.15)
Share information about missing people	0.768	2.58 (1.24)
Share information and instructions of authorities	0.766	2.41 (1.18)
Share information about the disaster event	0.724	2.31 (1.14)
<i>Creating Content (Cronbach's alpha: 0.952, 30.29% of variance)</i>		
Express negative emotions (e.g., worry)	0.764	2.11 (1.08)
Describe personal experiences about the disaster	0.758	1.85 (0.98)
Propose solutions for future crises and disasters	0.747	2.06 (1.14)
Criticize authorities	0.742	1.94 (1.02)
Suggest solutions for recovery	0.736	2.05 (1.10)
Offer instructions and personal advice	0.724	2.01 (1.02)
Offer support to victims	0.714	2.31 (1.14)
Pray for victims	0.691	2.12 (1.15)
Discuss about responsibility	0.690	1.99 (0.98)
Praise rescuers, firefighters, volunteers, etc	0.685	2.31 (1.13)
Organize relief initiatives	0.681	2.12 (1.10)
Report their safety	0.653	2.08 (1.16)
Offer psychological and mental health support	0.636	2.11 (1.09)

Based on the rotated factor matrix, the first factor was named "consuming" and included seven items that were related to passive forms of social media engagement such as searching for information and reading posts of others about the disaster. The second factor was named "sharing" and was comprised of five items. This factor represented moderate levels of user engagement and included items that were about sharing posts and forwarding information produced by other users. The third item was labeled "creating content" and contained thirteen items that referred to activities such as expressing emotions, proposing solutions, announcing and organizing relief efforts, praying for victims, discussing about responsibility, praising, etc. "Creating content" reflected more active forms of users' disaster-related social media engagement.

Looking at the descriptive statistics of the items it should be noted that respondents do not engage to a high extent in disaster related communication on social media. In fact, we found low levels of engagement with social media during times of disaster and emergencies. Of the 25 social media activities, participants indicated that they mainly utilize social media for passive forms of engagement (consuming activities) such as to learn about the event, reports from media sources, emergency locations, information on how to help, experiences of others, missing people, and government's response. Moreover, they engage in sharing activities such as forwarding

information about missing people, instructions of authorities, and calls for help. To a much lesser extent, respondents reported that they engage in active form of disaster communication.

Next three summative scales were developed for each factor by adding the items of each factor and dividing them with the number of items. Then, we calculated the Pearson's r correlation coefficient to examine whether each summative scale was correlated with Facebook usage frequency and Facebook's perceived reliability. Results indicate that Facebook usage frequency is significantly ($p < 0.05$) and positively correlated with consuming ($r = 0.224$, $\text{sig} = 0.000$), sharing ($r = 0.144$, $\text{sig} = 0.000$), and creating ($r = 0.167$, $\text{sig} = 0.000$) activities on social media during disasters. In a similar vein, Facebook's perceived reliability was significantly ($p < 0.05$) and positively related to consuming ($r = 0.347$, $\text{sig} = 0.000$), sharing ($r = 0.173$, $\text{sig} = 0.000$), and creating ($r = 0.241$, $\text{sig} = 0.000$) forms of disaster-related social media engagement. Based on the findings consuming activities are influenced the most by Facebook usage frequency and reliability perceptions compared to the other two dimensions (creating and sharing).

5 Conclusions

The present study examines how citizens in Greece utilize social media and specifically Facebook during times of natural disasters. Results indicate that respondents exhibited low levels of engagement in disaster related communication on Facebook. During times of emergencies participants seem to perform mainly consuming tasks such as receiving information about the event and reading the news from media sources and journalists. More active forms of engagement such as creating disaster related content were observed to an extremely low extent. Another important contribution of the present study is that it develops a unique typology of users' disaster-related social media activities through the lens of social media engagement approach. The typology classifies social media activities into three dimensions, namely: consuming, sharing, and creating. Each dimension represents different forms of users' engagement with disaster-related information on Facebook. In addition, the present study shed light on the antecedents of the three derived disaster-related social media engagement forms and found that respondents' Facebook usage frequency and Facebook's perceived reliability were positively correlated with all three engagement forms.

Findings of the present study could be of value to disaster managers wishing to harness the power of social media and communicate effectively with citizens during natural disasters and emergencies based on their needs. Future research could validate the dimensionality of the proposed typology based on another sample as well as test other antecedents of users' social media engagement with disaster-related information.

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