Sep 14th, 2:30 PM - 3:00 PM

When Social Media Fails: Exploring Alternative Technologies for Effective Communication in Disasters

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Research Paper

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ABSTRACT

Effective communication plays a critical role in disaster management, encompassing both data gathering and information dissemination. This study examines the utilization of alternative technologies for communication during disasters, aiming to address the vulnerabilities of relying solely on social media platforms. To answer the research questions, a qualitative methodology employing an inductive approach was used to gather and analyze data from literature and officers working in disaster management organizations. The research findings reveal the efficacy of employing SMS, emails, phone calls, and other supporting technologies as viable alternatives for disaster communication. These approaches have demonstrated their reliability to overcome challenges posed by social media disruptions. The study emphasizes the importance of diversifying communication channels to ensure inclusive and resilient communication strategies within disaster management organizations. Overall, this study contributes to enhancing the effectiveness of disaster communication strategies by incorporating alternative technologies and addressing the limitations of social media platforms.

Keywords

Social Media, Alternative Technologies, Social Media Disruptions, Social Media Challenges, Social Media limitations, Disaster Communication Strategies, Crisis Communication, Disaster Management, Disaster Management Organizations, Inductive Coding.

1. INTRODUCTION

Effective communication plays a critical role in disaster management and response. In recent years, social media platforms have emerged as powerful tools for disseminating and gathering information, coordinating relief efforts, and connecting affected individuals during disasters. However, the increasing reliance on social media for disaster communication raises concerns about its limitations and vulnerabilities. When social media fails due to network disruptions, overload, or intentional

misinformation, alternative technologies become essential for ensuring continuous and reliable communication. This paper aims to explore alternative technologies as a means of overcoming the shortcomings of social media in disaster situations. By examining the challenges associated with relying solely on social media and investigating alternative communication technologies, this research seeks to enhance the resilience and effectiveness of disaster communication strategies. Social media platforms, such as Twitter, Facebook, and Instagram, have proven invaluable in their ability to provide real-time updates, share vital information, and mobilize communities during crises. They allow disaster management organization (DMOs) and the public to communicate with one another, disseminate emergency alerts, and coordinate relief efforts. However, social media also faces inherent limitations. Infrastructure damage, network disruptions, or power outages can render social media platforms inaccessible during disasters, impeding critical communication channels. Furthermore, the rapid spread of misinformation and rumors on social media can complicate the gathering and dissemination of accurate information, jeopardizing public safety and hindering response efforts.

To address these limitations, it is essential to explore alternative technologies that can serve as reliable communication channels when social media fails. By diversifying the communication landscape, alternative technologies provide accessibility and enhance information gathering and sharing capabilities, ensuring that vital messages reach those in need even in challenging circumstances. To explore these alternative technologies the following questions were examined.

1. What are the limitations and vulnerabilities of relying solely on social media for disaster communication?
2. What alternative technologies are available for effective communication during disasters?

To address the research questions, a qualitative methodology was employed, utilizing an inductive approach to collect and analyze data from literature and professionals working in disaster management organizations (DMOs). This approach facilitated the identification of significant themes and patterns that emerged during data analysis. Through detailed examination, the findings were derived, providing valuable insights in answering the research questions.

The outcomes of this research will contribute to developing guidelines and recommendations for DMOs and other stakeholders involved in disaster response. By incorporating alternative technologies into their strategies, they can enhance preparedness, response coordination, and public safety in the face of communication disruptions.

2. USE OF SOCIAL MEDIA FOR DISASTER MANAGEMENT

A disaster is “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (UNISDR, 2009. p.9). Disasters, both natural and man-made, pose significant challenges to societies worldwide. Within the context of disaster management, effective communication plays a pivotal role in providing timely warnings, coordinating response efforts, and disseminating vital information to affected populations.

Many organizations, including DMOs, have embraced social media as a communication tool due to its affordability and its ability to enhance management functions (Artman et al. 2011). The reason behind this adoption is the advantage of reaching a wide audience directly through these platforms (Ehnis, 2017). DMOs are regarded as dependable sources of information during disaster situations because they have the ability to regulate and disseminate accurate information about ongoing disaster events (Ehnis, 2017). Therefore, DMOs have the crucial task of keeping the public informed during these events, and

social media provides an ideal platform for delivering these essential services. To ensure effectiveness in disaster events, DMOs must adapt their communication strategies on social media. According to Artman et al (2011), there are two concepts proposed for achieving effective communication in such situations. The first concept is "dialogical disaster management," which involves actively monitoring social media posts to adjust the communication strategy based on the content and feedback received. The second concept is "strategic awareness," which emphasizes the public's comprehension of both the disaster information and the disaster itself. Hence, DMOs should view the general public as active participants in co-creating disaster information, rather than solely passive consumers of information.

Several researchers have examined the utilization of social media by DMOs, specifically focusing on their communication strategies during disasters (Bruns et al., 2012; Ehnis & Bunker, 2012; Mirbabaie et al., 2021; Procter et al., 2013; Teresa, 2012). In general, DMOs employ social media platforms for various purposes such as sharing information, issuing warnings, soliciting specific information from the public, combating misinformation and rumors (Ehnis & Bunker, 2012; Ehnis, 2017) and influencing the behavior of both the public and the media during disaster events (Bruns et al., 2012; Teresa, 2012). Ehnis and Bunker (2012) as well as Potter (2016) conducted studies on the use of social media by DMOs and discovered that they predominantly rely on social media during the response phase of disaster management. Even in such instances, they primarily utilize social media for disseminating information only (Ehnis, 2017; Subba & Bui, 2017) despite the potential for social media to be utilized for both disseminating and gathering disaster information (Kankanamge et al., 2020; Power, 2017). Thus, social media platforms have revolutionized the way DMOs communicate and share information. During disasters, the platforms emerged as crucial tools for disseminating real-time updates and coordinating relief efforts. However, the dependence on social media alone can pose challenges when disasters disrupt or overload the existing infrastructure (Pfefferbaum et al., 2018; Tal & Tali, 2023). When disasters strike, such as earthquakes and floods, the impact on telecommunication infrastructure can be severe. Disaster impact such as power outages, network failures, and limited internet access can hinder people's ability to use social media platforms effectively for communication and information sharing (Sutton et al., 2008; Tal & Tali, 2023). It is therefore important to take a multi-faceted approach to disaster communication by exploring alternative technologies that can supplement social media and ensure effective communication in disaster scenarios.

3. METHODOLOGY

To accomplish the objectives of our research, we utilized a qualitative methodology with an inductive perspective. Inductive research is commonly employed in qualitative studies with the intention of formulating theories and concepts that arise directly from collected data (Charmaz, 2007; Strauss & Corbin, 1998). This approach to research provides flexibility and adaptability, allowing researchers to remain receptive to fresh ideas and viewpoints that may emerge from the data (Eisenhardt, 1989). Inductive research proves particularly valuable in exploratory studies such as ours, where limited existing knowledge or theory exists regarding the subject under investigation, and the goal is to generate novel knowledge and understanding (Braun & Clarke, 2006).

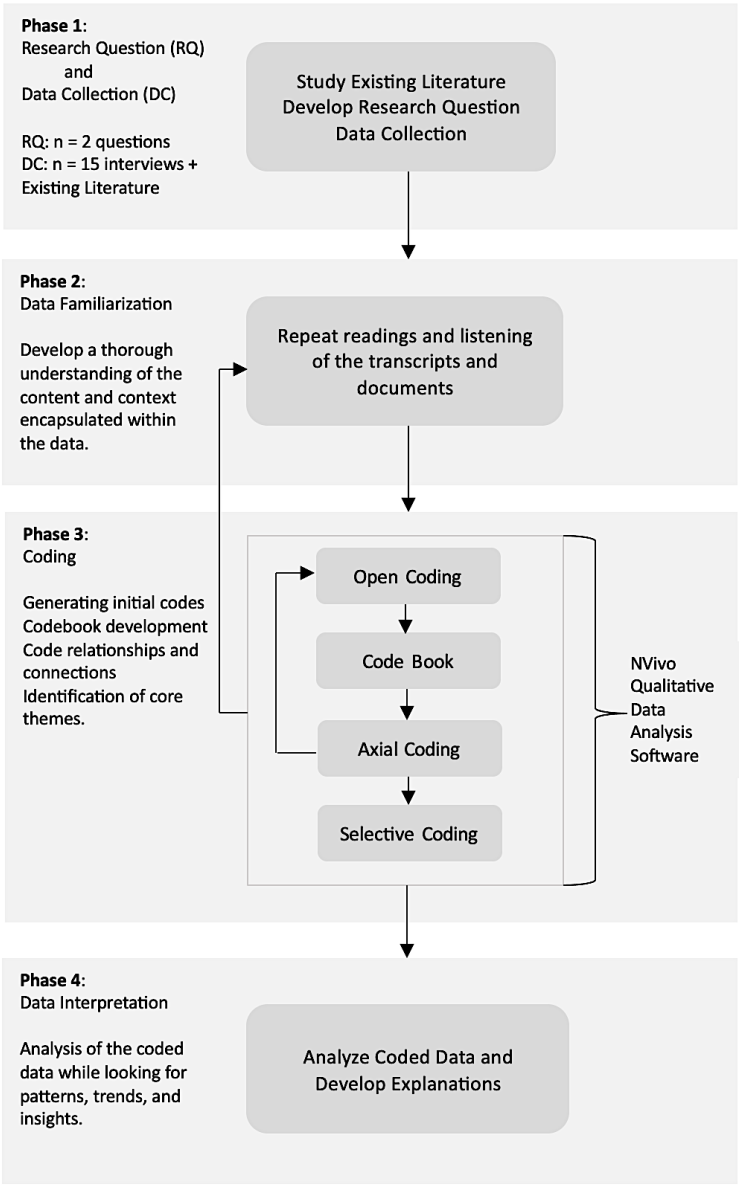
3.1 Phases of Data Collection and Analysis

In order to promote transparency and enable the replication of our research, we implemented a four-phase iterative process. The details of each phase are outlined below and can be found in Figure 1. To analyze the data, we utilized the NVivo data analysis tool.

Phase 1: Research Questions and Data Collection
The first phase entailed formulating the research questions and gathering data specifically aimed at investigating social media challenges and exploring alternative technologies in the face of social media disruptions during disasters. To summarize, the research questions were as follows:

1. What are the limitations and vulnerabilities of relying solely on social media for disaster communication?
2. What alternative technologies are available for effective communication during disasters?

Figure 1
Data Collection and Analysis



We first study literature to understand vulnerabilities and limitations on social media platforms and then we conducted semi-structured interviews to gather data from a total of fifteen (15) individuals who were associated with five (5) disaster management organizations (DMOs) in Ghana. The selection of these

participants was based on their extensive knowledge of the case organizations and their involvement in communication activities on social media. The sample for this study included individuals holding various positions within the DMOs, such as heads of communication units, operations assistants, and research and ICT personnel. The purpose of selecting these participants was to gain insights into how their respective organizations used alternative technologies for communication during the Accra floods that occurred in 2021. Table 1 provides a breakdown of the participants, including their roles or departments.

Table 1. Overview of interview participants and their organizations.

DMO	Function	Informant/Department	Participants
A	An overarching entity responsible for coordinating all disaster events.	Head of Communications	1
		Communications Assistant	1
		Operations Assistant	1
B	Responsible for fire events as well as responding to the consequences of storm and flood events.	Research and ICT	1
		Operations Assistant	1
		Public Relations	1
C	Responsible for health events	Health Communications	1
		Advocacy and Social Mobilization	1
		Research and Health Policy	1
D	Environment protection and responsible for all hazards.	Operations	1
		General Services	2
E	Protection of live and properties	Intelligence Directorate	2
		Communications Department	1
		Total	15

Phase 2: Data Familiarization

In this stage, we thoroughly engaged with the data through repeated readings and attentive listening to the transcripts and documents. This meticulous examination enabled us to gain a comprehensive understanding of the content and context inherent in the data.

Phase 3: Coding

Coding refers to the systematic process of assigning labels or categories to specific segments of data in order to aid in organization, interpretation, and analysis (Saldana, 2015). It entails a methodical review of the data, the identification of patterns, themes, or concepts, and the allocation of descriptive codes to these segments (Miles, 2020). This phase consisted of four distinct stages, outlined below:

1. Open coding: The coding process commenced with the generation of initial codes, also known as open codes, which captured the meaning of the data. This involved a detailed examination of the data line-by-line, assigning descriptive labels to different segments of the data.

2. Codebook development: As the coding process progressed, we developed a codebook to serve as a guide, providing definitions and descriptions of the codes and their meanings. The codebook ensured clarity and consistency throughout the coding process.

3. Axial coding: After generating the initial codes, we identified relationships and connections between the codes. This involved reorganizing the codes to create a more comprehensive coding structure, facilitating the identification of broader themes that encompassed these relationships.

4. Selective coding: The focus of this stage was on identifying the core themes that emerged from the data. We achieved this by refining the codes and categories to capture the most significant findings. The objective was to develop a more concise and meaningful representation of the data

To establish inter-coder reliability, we followed a systematic procedure by familiarizing ourselves with the coding guidelines and procedures which helped to ensure that all coders have a clear understanding of the coding process. Then a subset of the data was selected for pilot testing. Each coder independently coded this subset of data, following the established coding guidelines. The coding results were then compared and assessed for agreement. The researchers (coders) discussed any discrepancies in coding decisions. We reviewed the coding guidelines, clarified any ambiguities, and came to a consensus on the appropriate coding approach for ambiguous cases.

Phase 4: Data Interpretation
Finally, we proceeded with the interpretation and analysis of the coded data, aiming to identify patterns, trends, and insights. This entailed a comprehensive examination of different categories, comparing and contrasting their characteristics, exploring relationships between themes, and formulating explanations based on the findings.

4. FINDINGS

In the following sections, we present the major findings that emerged from the analysis of the collected data.

4.1 Social Media Challenges During Disasters

During disasters, social media platforms face several challenges that can hinder their effectiveness as communication tools. One of the challenges is infrastructure dependency. Social media platforms rely on functioning infrastructure, including power supply, internet connectivity, and cellular networks. Disasters such as earthquakes and floods can cause infrastructure damage, leading to communication breakdowns and rendering social media platforms inaccessible (Sutton et al., 2008; Tal & Tali, 2023). Information overload and misinformation is another challenge faced on social media. The influx of information during disasters, leading to information overload is one of the issues social media users grapple with during disasters. Users may struggle to sift through the vast amount of data to find accurate and reliable updates. Additionally, the spread of misinformation, rumors, and fake news can quickly propagate on social media, leading to confusion and potentially harmful consequences (Starbird, et al., 2013).

Access and participation barriers are other significant challenges that must be considered. Not everyone affected by a disaster has equal access to social media platforms or possesses the necessary digital literacy skills to use them effectively. The digital divide can exclude vulnerable populations, including those with limited internet access, language barriers, or lower technological proficiency, from receiving critical information and accessing essential resources (Vieweg et al., 2010; Sutton et al., 2008; Tal &

Tali, 2023). Network congestion could also be apparent during disasters. The increased demand for communication can overload cellular networks, causing network congestion. This congestion can lead to service disruptions and delays in accessing social media platforms, impacting the ability of affected individuals to communicate and seek assistance (Pfefferbaum et al., 2018). Again, social media as a platform relies on third-party infrastructure providers and any disruptions or failures in these systems can affect their availability. Disasters can cause power outages, damage to data centers, or disruptions in internet connectivity, rendering social media platforms inaccessible or unstable (Sutton et al., 2008; Tal & Tali, 2023). It is important to recognize these challenges and consider alternative technologies and communication strategies to supplement social media platforms during disasters, ensuring effective communication even in adverse conditions.

Social media platforms are known to employ algorithms and content moderation policies that can introduce biases and impact the visibility and prioritization of disaster-related information. These biases can influence the dissemination of critical information and potentially hinder effective response efforts. Algorithmic biases in social media platforms can result from various factors, including the algorithms' reliance on user engagement metrics, such as likes, comments, and shares, to determine content visibility (Noble, 2018). This can lead to a prioritization of popular or sensational content over important disaster-related information that may not generate as much engagement. Consequently, crucial updates, emergency alerts, and official communications related to disasters may not reach a wide audience, impacting the dissemination of critical information during disaster situations. Moreover, social media platforms employ content moderation policies to regulate user-generated content. While these policies aim to filter out harmful or inappropriate content, they can inadvertently affect disaster-related information. Content moderation practices, such as automated filtering, may result in the removal or suppression of legitimate content related to disasters, leading to the loss of vital updates and relevant resources (Starbird et al., 2019).

4.2 Alternative Technologies

Effective disaster management relies heavily on disaster communication, which serves two essential functions: data gathering and information dissemination. To expand their communication efforts, DMOs have incorporated non-traditional social media platforms in addition to well-established ones like Facebook, Twitter, and YouTube. A representative from DMO D, serving as an operations officer, provided insights into their experience in utilizing these platforms.

> *"In response to the Accra floods, we made extensive efforts to ensure our readiness in receiving distress calls from various channels. To achieve this, we leveraged our website to receive emails and text messages. This approach not only enabled us to offer assistance to survivors but also provided an avenue for the public to share information and provide feedback on our emergency response initiatives."* — Operations Officer 1, DMO D.

Another operations officer from DMO D added,

> *"...our team implemented a range of measures, leaving no aspect overlooked. We took proactive steps to establish multiple channels for receiving distress calls, covering all possible angles. An especially notable strategy we adopted involved harnessing the capabilities of our website to receive emails and text messages, thereby expanding the avenues through which we could provide assistance to survivors."* — Operations Officer 2, DMO D.

The implementation of websites by the DMO for information gathering and public engagement during emergency situations demonstrated significant potential. This approach not only provided a means for survivors to seek assistance but also fostered active participation from the general public in relief efforts. By promoting information sharing, addressing concerns, and encouraging input, the DMO created an inclusive and collaborative environment. The use of emails and text messages played a critical role in facilitating quick and efficient communication, particularly when social media platforms were unavailable due to disaster-related disruptions. Survivors and affected individuals could rely on these channels to urgently request aid, ensuring that their distress calls received immediate attention and assistance. Moreover, by inviting the public to contribute information and provide feedback, the DMO established a valuable mechanism for capturing insights from diverse perspectives. This collective knowledge could greatly enhance their overall disaster management endeavors, enabling them to make real-time improvements to their emergency response strategies.

The DMOs also employed the short message service (SMS) as another alternative technology for data gathering, working in collaboration with mobile network operators. This approach proved to be highly effective and valuable. Through the utilization of SMS, the DMOs were able to swiftly and efficiently collect information from affected individuals, even in circumstances where internet connectivity or other communication channels were disrupted. An officer from DMO B stated,

> *"We actively received SMS messages that contained crucial information and requests for assistance, playing a role in our ability to assess the situation and allocate resources effectively. To streamline the data collection process, we employed SMS templates specifically designed to capture vital details such as location, medical needs, and resource availability. This approach significantly improved coordination within our team. The utilization of SMS proved immensely beneficial to us due to its widespread accessibility. The fact that most mobile phones are capable of sending and receiving text messages made it a highly accessible communication medium, even in areas with limited internet connectivity or during network disruptions. This accessibility greatly facilitated our operations and ensured the efficient delivery of important information to us."* — Public Relations Officer, DMO B.

Thus, the utilization of SMS templates, along with the functionality of mobile phones to send and receive text messages, not only facilitated the collection of data but also enhanced coordination among team members. This approach enabled prompt gathering of information, facilitating informed decision-making and efficient allocation of resources.

DMOs recognize the significance of having contingency plans to maintain effective communication during disruptions to social media platforms. By diversifying communication channels and preparing alternative supporting technologies, they can ensure continued engagement with the public and stakeholders. In response to the question about the information dissemination strategies in place during social media disruptions, an officer from DMO C responded,

> *"In collaboration with network operators, we have effectively implemented an SMS alerting system to communicate with the public. Besides, we have a regularly updated website where we share information and provide timely updates to keep the public well-informed..."* Health Communications Officer, DMO C.

To ensure widespread dissemination of information, the DMOs employ a multi-channel strategy. This approach allows for broader engagement with the public, fostering informed decision-making and enhancing community resilience during disasters. While the significance of social media has grown, the importance of traditional mass media remains evident, especially in instances when disruptions arise within social media platforms. An officer from DMO A disclosed,

> *"...although we acknowledge that reaching a large audience may pose challenges compared to social media platforms, we have implemented contingency plans. These plans involve leveraging traditional mass media outlets like television and radio to ensure the widespread dissemination of information. By utilizing multiple channels, our objective is to effectively reach and inform as many individuals as possible, even in situations where social media may be inaccessible or unreliable."–* – Operations Assistant, DMO A.

During periods when social media platforms are unavailable, emails and phone calls continue to serve as reliable methods of communication. Emails can be utilized to send updates, announcements, and important information to stakeholders, enabling one-to-one or group communication. Additionally, file attachments can be sent to reach a large number of recipients. Phone calls, on the other hand, provide a direct and real-time means of communication when social media platforms experience disruptions. Stakeholders can be contacted directly through voice calls, allowing for immediate updates and addressing any concerns or queries. It is important to note that within the DMOs, emails and phone calls are also employed for internal communication among their teams, as highlighted by an officer from DMO C.

> *"Apart from utilizing social media for information sharing during disaster operations, we employ emails to disseminate situation reports, action plans, and logistical details among our team members. This practice significantly facilitates coordination within our team, streamlining our collaborative efforts."* Research and Health Policy Officer, DMO C.

Regarding the utilization of phone calls as a supporting technology during social media disruptions, an officer from DMO D provided insights on the matter. The officer underscored the importance of employing phone calls as an alternative communication method when social media platforms are temporary unavailable or experience disruptions. This approach ensures the timely and efficient exchange of vital information. By leveraging phone calls, the DMO maintains uninterrupted communication channels, facilitating swift decision-making and immediate updates, despite challenges faced by social media. This strategy plays a crucial role in maintaining effective coordination and prompt response within the DMO, ultimately contributing to its overall operational resilience.

5. DISCUSSIONS

The findings of the study indicate that social media platforms are vulnerable to failure during disasters and that the utilization of alternative technologies for communication proves to be effective during social media disruptions, which will be elaborated further in the subsequent discussion.

5.1 Social Media Vulnerabilities and Limitations

In exploring the effectiveness of alternative technologies for communication during disasters, it is essential to acknowledge the vulnerabilities and limitations of relying exclusively on social media platforms. The study's analysis reveals several challenges associated with social media that highlight the need for diversifying communication channels. One significant vulnerability is the potential for social media platforms to experience disruptions or breakdowns during disasters. These disruptions can occur due to various reasons, including infrastructure damage, overwhelming user activity, or deliberate actions to limit access. Such interruptions can hinder the timely dissemination of critical information and impede effective communication between DMOs and the public. Moreover, the reliance on social media platforms alone may exclude segments of the population who do not have access to or are not proficient in using these platforms. This digital divide can hinder the reach and accessibility of information to

certain demographics, potentially leaving them uninformed or unable to seek help during emergencies. Another limitation is the potential for misinformation and rumors to spread rapidly on social media platforms during disaster events. False or misleading information can lead to confusion, panic, and misallocation of resources, making it crucial for organizations to have mechanisms in place to verify and authenticate information before disseminating it to the public.

Furthermore, social media platforms are subject to algorithmic biases and content moderation policies, which can affect the visibility and prioritization of disaster-related information. This may result in important updates or requests for assistance being overshadowed or suppressed in users' feeds, hampering the effectiveness of communication efforts. By recognizing these vulnerabilities and limitations, DMOs can adopt a more comprehensive communication strategy that incorporates alternative technologies alongside social media platforms. This approach ensures that communication channels remain robust, reliable, and inclusive, reaching a wider audience while mitigating the risks associated with relying solely on social media.

5.2 Alternative Technologies for Disaster Communication

The study's results not only suggest the effectiveness of using alternative technologies for communication during disasters but also provide valuable insights into the advantages they offer. By employing alternative approaches, such as SMS, emails, websites and phone calls, organizations can overcome challenges posed by disruptions to social media platforms and ensure the seamless exchange of critical information. One notable advantage of these alternative technologies is their reliability in situations where social media may be inaccessible or unreliable. While social media platforms are commonly used for information dissemination, they can be prone to technical issues or disruptions during disasters. In contrast, technologies like SMS, emails, and phone calls offer more dependable communication channels that can be relied upon to reach a wider audience, including stakeholders and affected individuals. Furthermore, the study highlights the efficiency and practicality of these alternative approaches in both gathering and disseminating disaster information. For instance, the use of SMS templates enables rapid data collection, allowing organizations to promptly gather essential details such as location, medical needs, and resource availability. Similarly, emails provide a versatile platform for sharing situation reports, action plans, and logistical details among team members, facilitating smooth coordination and collaboration. By diversifying communication channels and leveraging alternative technologies, DMOs can enhance their overall disaster management efforts. These approaches enable prompt information sharing, effective coordination, and real-time updates, contributing to better decision-making, resource allocation, and response strategies.

6. CONCLUSION, IMPLICATIONS AND FUTURE RESEARCH

This study has shed light on the effectiveness of alternative technologies for communication during disasters. The findings highlight the importance of diversifying communication channels to overcome vulnerabilities and limitations associated with relying solely on social media platforms. The utilization of SMS, emails, websites, phone calls, and other supporting technologies has demonstrated their reliability, efficiency, and practicality in gathering and disseminating disaster information. By leveraging these alternative approaches, DMOs can enhance coordination, prompt decision-making, and improve overall disaster management efforts.

The study is significant for DMOs and policymakers involved in emergency and disaster response and communication strategies. By recognizing the vulnerabilities and limitations of social media platforms,

DMOs can develop comprehensive communication plans that incorporate alternative technologies. This diversification ensures a more resilient and inclusive approach to reaching stakeholders, including those who may not have access to social media or face disruptions during disasters. The findings also emphasize the importance of having contingency plans in place to ensure effective communication even in the absence of reliable social media platforms.

This study opens avenues for future research in the field of disaster communication. Further investigation can delve into the specific challenges and opportunities associated with each alternative communication channel, such as SMS, emails, and phone calls. Comparative studies can explore the effectiveness and efficiency of different strategies in different disaster scenarios, considering factors such as geographical location, demographics, and technological infrastructure. Additionally, research can focus on the development and evaluation of technological innovations that can enhance communication resilience during disasters, including the integration of artificial intelligence, Internet of Things (IoT), or mobile applications.

REFERENCES

Artman, H., Brynielsson, J., Johansson, B. J., & Trnka, J. (2011). Dialogical Emergency Management and Strategic Awareness in Emergency Communication. *8th International Conference on Information Systems for Crisis Response and Management*, ISCRAM 2011. Lisbon.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Bruns, A., Burgess, J., Crawford, K., & Shaw, F. (2012). Crisis Communication on Twitter in the 2011 South East Queensland Floods. *QUT*. Brisbane.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE Publications.

Ehnis, C. (2017). *Social media within emergency management organizations – a case study exploring social media utilization for emergency and disaster management*. University of Sydney. https://ses.library.usyd.edu.au/handle/2123/17938, last accessed 2022/03/13

Ehnis, C., & Bunker, D. (2012). social media in Disaster Response: Queensland Police Service Public Engagement During the 2011 Floods. *ACIS 2012 Proceedings*. https://aisel.aisnet.org/acis2012/107, last accessed 2022/03/05.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 1*4*(4), 532-550.

Houston, J. B., Hawthorne, J., Perreault, M. F., Park, E. H., Goldstein Hode, M., Halliwell, M. R., ... Vaid, S. (2015). Social media and disasters: A functional framework for social media use in disaster planning, response, and research. *Disasters*, *39*(1) (pp. 1-22).

Kankanamge, N., Yigitcanlar, T., & Goonetilleke, (2020). How engaging are disaster management related social media channels? The case of Australian state emergency organizations. *International Journal of Disaster Risk Reduction*, *48.*

Miles, M. B., Huberman, A. M., & Saldana, J. (2020). *Qualitative data analysis: A methods sourcebook*. SAGE Publications.

Mirbabaie, M., Ehnis, C., Stieglitz, S., Bunker, D., & Rose, T. (2021). Digital Nudging in Social Media Disaster Communication. *Information Systems Frontiers*, (pp. 1097–1113). https://doi.org/10.1007/s10796-020-10062-z.

Noble, S. U. (2018). *Algorithms of oppression: How search engines reinforce racism*. NYU Press.

Pfefferbaum, B., Reissman, D. B., Pfefferbaum, R. L., Klomp, R. W., & Gurwitch, R. H. (2018). Building back a disaster-impacted community: Psychological and ecological strategies. *Current Psychiatry Report*s, 20(12), p. 110.

Potter, E. (2016). Balancing Conflicting Operational and Communications Priorities: Social Media Use in an Emergency Management Organization, *ISCRAM 2016 Conference*. Rio de Janeiro, Brazil.

Power, R., & Kibell, J. (2017). The Social Media Intelligence Analyst for Emergency Management. *Proceedings of the 50th Hawaii International Conference on System Sciences*, Hawaii, USA.

Procter, R., Crump, J., Karstedt, S., Voss, A., & Cantijoch, M. (2013). Reading the Riots: What Were the Police Doing on Twitter? *Policing and Society*, *23*(4).

Tal E., & Tali, G. (2023). No social media for six hours? The emotional experience of Meta's global outage according to FoMO, JoMO and internet intensity. *Computers in Human Behavior*, 138. https://doi.org/10.1016/j.chb.2022.107474.

Teresa, A. S. (2012). *Emergency Managers' Perspectives on Social Media Use for Situational Awareness During Disasters*. Walden University.

Saldana, J. (2015). *The coding manual for qualitative researchers*. SAGE Publications.

Starbird, K., Muzny, G., Palen, L., & Hughes, A. L. (2013). "Voluntweeters": Self-organizing by digital volunteers in times of crisis. *Proceedings of the 10th International ISCRAM Conference*.

Starbird, K., Spiro, E. S., & Baker, K. S. (2019). *Disinformation, misinformation, and online conspiracy theories in the context of disasters: Research roundup*. Harvard Kennedy School Misinformation.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. SAGE Publications.

Subba, R., & Bui, T. (2017). Online Convergence Behavior, Social Media Communications and Crisis Response: An Empirical Study of the 2015 Nepal Earthquake Police Twitter Project, *Proceedings of the 50th Hawaii International Conference on System Sciences,* Hawaii.

Sutton, J., Palen, L., & Shklovski, I. (2008). Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires. *Proceedings of the 5th International ISCRAM Conference*..

UNISDR (United Nations International Strategy for Disaster Reduction). (2009). *UNISDR Terminology on Disaster Risk Reduction*. https://www.undrr.org/publication/2009-unisdr-terminology-disaster-risk-reduction

Vieweg, S., Hughes, A. L., Starbird, K., & Palen, L. (2010). Microblogging during two natural hazards events: What Twitter may contribute to situational awareness, *Proceedings of the 28th international conference on Human factors in computing systems*. (pp. 1079-1088).