Examining the Role of Social Media and Volunteer Contributions and Coordination in Disaster Response: A Survey Study

Camryn Munroe
Christopher Newport University

John Capriotti
Christopher Newport University

Emre Kirac
Christopher Newport University

This research focuses on how emergency management professionals and their organizations use social media and volunteers in their operations. The project implements a survey study where data was collected through an online form by asking questions to the participants. The survey study was sent out and provided to emergency management professionals through listservs, social media groups, and word-of-mouth. The survey consists of twenty-five questions ranging from closed-ended yes or no, to select all that apply multiple choice. The survey has been pulled from four levels of emergency management organizations which are national, state, local, and educational. Each level has distinct responsibilities, reflecting their unique use of social media and volunteers. Social media in emergency management may be utilized in a variety of ways depending on why the organization is using it. Volunteers have a role in emergency management that extends an organization's functions and capabilities in many different phases of their operations. The results provide insight into how emergency management professionals use social media and volunteers in their organizations.

Keywords: social media, spontaneous volunteers, survey, digital volunteers, humanitarian relief, disaster response, emergency management, verification

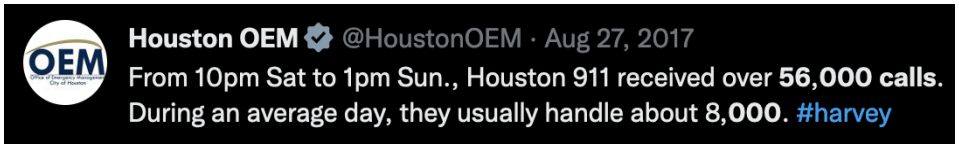
INTRODUCTION

Emergency management professionals use social media and volunteers in their operations to respond effectively to and mitigate catastrophic disasters. Disasters becoming more intense and frequent have expanded the critical needs in response efforts. The Red Cross reported 30 named hurricanes in the 2021 season, which is more than two and half times the average of reported storms in a season. (Red Cross, 2021). Social media is being used as a communication technology to meet these critical needs. Social media has been of increasing significance in emergency management and disaster response. More specifically, social media is being implemented into operations to verify information, provide information across platforms and respond to social media requested aid. During Hurricane Harvey, individuals started to post

on Twitter and Facebook requesting assistance. A tweet shared over 4,800 times concerning a nursing home needing critical help in Dickerson, Texas, reached the top of the rescuers' priority list (Rhodan, 2017). The tweet contained a picture of the stranded individuals in the nursing home and text that read, "Need help asap emergency services. Please RETWEET" (CBS Miami, 2017). The use of social media during Hurricane Harvey demonstrates the power of how requesting aid can meet critical needs in disasters when organizations implement them into their operations.

On February 6th, 2023, a massive 7.8-magnitude earthquake struck Turkey and Syria. The death toll is currently 35,000 and will continue to rise as response and recovery efforts will be in effect as Turkey has declared a three-month state of emergency. The massive disaster response effort has made tech volunteers rush to save earthquake survivors. The mobilization of aid through digital volunteers is called the "Earthquake Help Project." These tech or digital volunteers have been implementing an application to help locate individuals and distribute aid. The digital volunteers range from developers to project managers who want to try to help as much as possible, as this earthquake disaster response in Turkey will take all the help it can get. The application has tools that collect information on impacted individuals' contact information and allows people to report their safety status. It is important to note that the applications flooded with volunteers at once, so organizing individuals into a role has been difficult (Huang, 2023). There have already been messages that the application has saved lives as it has gotten rescue teams to help people faster. Technology and digital volunteers can have an impactful role in disaster response as we start to leverage and implement it.

One of the most significant challenges for authorities in disaster response is to identify needs in a short amount of time and improve situational awareness. The National Emergency Number Association (NENA) director of government affairs, Trey Forgety, stated, "*One of the biggest problems that our members are facing right now is that there are simply too many calls to be answered. There are not enough people in these centers to handle the influx of calls, and moreover, they might not have enough phone lines to handle as many calls as come in at one time*" (Johnson and Kasperkevic, 2017). The extent of the rainfall experienced during Hurricane Harvey flooded most of Houston, leaving thousands of households calling and pleading for help and rescue. Houston Mayor Sylvester Turner tweeted, "*There are a number of stranded people on our streets calling 911 exhausting needed resources*" (Turner, 2017). Due to the massive impact of Hurricane Harvey, 911 dispatchers were too overwhelmed with rescue calls. Critical hours pass while information is collected.



Houston OEM (@Houstonoem) On Twitter 2020. Available at: https://twitter.com/HoustonOEM

According to the City of Houston Office of Emergency Management, 911 emergency lines received over 56,000 calls between 10:00 pm Saturday (Aug 26) to 1:00 pm Sunday (Aug 27), which is more than eight times the average 24-hour load (Houston OEM on Twitter, 2020). Since 911 could not handle all the calls, many people affected by the floods turned to social media. According to a survey carried out by Communications Network (CN) and The National Emergency Management Association (NEMA) in 2012, many agencies in the disaster response community indicated that they expect social media to have at least a moderate impact on future response efforts to identify a more significant number of needs in a shorter amount of time following a disaster. However, the Houston Police Department and US Coast Guard issued a statement urging people not to contact their social media accounts for rescue requests. Even though social media platforms provide a new and potentially valuable source of information to improve disaster response, the government's social media accounts were not checked for requests for help. Therefore, questions arise: why did government organizations discourage people from posting their urgent needs on social media? What is the government's research status on how social media can aid or hinder emergency responses, and how might they utilize that data? Do they have a tradeoff between the timeliness and accuracy of social

media requests? What data was available to the government officials during the disaster response planning? Answering these questions requires detailed interviews with emergency management professionals.

Depending on the level of emergency management allocation of volunteers during a disaster and the implementation of social media in daily operations are likely to differ across levels. This study recorded responses from three levels of emergency management: local, state, and national. The differences between the levels may be attributed to available resources, budgets, capacity to implement operations, the scope of jurisdictions, and the quantity of personnel. A 2013 National Emergency Management Association report found that local emergency management organizations cannot implement full-scale social media operations due to lacking resources and capacity (Haddow and Haddow, 2013). The differences between the levels in our survey study evaluate the use of social media and volunteers in operations and how that may impact an organization's ability to meet critical needs.

When an emergency management organization cannot meet the critical needs in response efforts due to a lack of personnel, they rely on volunteers. The impact of volunteers can range from positive to negative, depending on various circumstances. Most importantly, volunteers add to the capacity of disaster response. FEMA Agency Administrator during Hurricane Harvey recognized the importance of volunteers stating, "*We need the whole community. Not only the federal government forces, but this is a whole community effort from all levels of government and it's going to require the citizens getting involved*" (Johnson, 2017). When organizations implement volunteers into their disaster response, they can meet the capacity needed to respond effectively and efficiently.

This study highlights a growing function and type of volunteer - the spontaneous volunteer. Spontaneous volunteers arrive unsolicited at a disaster scene and may not have the necessary skills to respond adequately. Spontaneous volunteers take part in informal voluntary action. They are individuals from within or outside the disaster-affected community who often improvise when responding to a crisis before formal organizations arrive in the affected area. In 2015, the earthquake in Kathmandu exhibited emergent behavior from spontaneous volunteers that were the first to respond by rescuing individuals in collapsed buildings and constructing temporary shelters (Twig, 2017). Spontaneous volunteers provide capacity for emergency response. Their capacity will become necessary due to growing urban populations that rely on an immediate response (Twig, 2017). This survey study benefits the understanding of how emergency management organizations use social media and spontaneous volunteers to meet critical needs in disaster responses and daily operations.

LITERATURE REVIEW

There have been several studies in the field of humanitarian and emergency management on how social media and volunteers are integrated into disaster response. These studies provide a foundational base and offer key findings for the understanding of our survey study. It is important to note that these studies differ in scope and specifications yet they are a resource for our survey study.

Social Media

The Center for Naval Analyses (CNA) conducted a comprehensive survey study on the utilization of social media in emergency management (Wardell and Su, 2011). The study involved 56 questions directed at emergency managers, aiming to capture their perspectives on adopting social media in the field. Data analysis incorporated pre- and post-surveys, as well as comments shared on social media during the 2011 social media in the emergency management camp. The CNA survey study emphasized the variations in social media usage across different levels of emergency management, mirroring our research. Findings revealed a disparity between state and local levels, influenced by factors such as laws, structure, resources, and engagement. The response enterprise which is a system that takes inputs and develops outputs for specific purposes was a key finding in the survey. The survey study suggests the idea that a response enterprise needs to be defined and intensified in order to implement new technology into the field. The web-based survey conducted in 2012 by the National Emergency Management Association in collaboration with CNA further explored social media usage at state, country, and local levels, emphasizing the push for

information dissemination and the importance of verifying information received from social media (Su et al., 2013). The 2012 social media in the emergency field study gathered results that illustrated how social media was currently being used and understood in the field. In addition to at least being moderately familiar with social media, all three levels were using social media to mainly push out information. The study highlighted that almost all respondents indicated that they would attempt to verify information received from social media. This study addresses the question of how social media is being used and provides a perspective on why it may vary from state to state which is an important area to address when it comes to meeting critical needs in disaster response.

A case study conducted by Lovari and Bowen (2020) examined the use of social media by public affairs officials during a flood disaster. For the case study, they used interviews with state emergency managers to explore the many topics, uses, and issues involving social media in their field of work. The case study found that Twitter and Facebook were the most used social media platforms used to convey information to citizens. These two social media platforms play a key role in the dissemination of information when a disaster strikes and there is not enough time to thoroughly coordinate messages to be sent out to the public. Participants expressed that traditional news releases are too slow in keeping up with an unfolding disaster, this emphasizes the importance of the use of social media in the field and why it is relied on during disaster response. Hiltz et al., (2013) analyzed the issue of social media information overload in emergency management and proposed solutions such as creating information systems to aggregate and filter social media information. Individuals are now using social media during emergency events which are causing emergency managers to deal with an influx of information on top of their other activities during a disaster. The issues of social media overload involve the trustworthiness of information, the privacy of the users, and the lack of personnel. To combat the issues is to create information systems that have an infrastructure to aggregate and filter social media information. Incorporating digital volunteers into the issue of information overload by having them filter through social media posts like hashtags will combat the issue. Similarly, Zhang et al., (2019) examined the participatory structure of social media and the dissemination of information during disasters, highlighting the challenge of information inequality based on follower capacity and access to social media. The review aims to provide a framework on how to analyze the dissemination of information on social media during a disaster. The way social media is used during disasters is unique to each individual disaster event. For example, how social media is used by individuals during an earthquake differs from how individuals use social media when there is a hurricane. This being the case makes it harder to find a pattern in the use of social media in disaster response. The review highlights the challenge of how information posted by an account with more followers is likely to draw more engagement. This is a challenge because it leaves those who do not have the same capacity or access to social media left to potentially experience more severe impacts and vulnerabilities in a disaster.

In our study we analyzed if emergency management organizations rely on social media information and if they verify it. We can see that emergency management organizations deal with multiple issues that may prohibit them from relying on social media and verifying it in disaster response.

Volunteer

Sauer et al., (2014) examined the use of spontaneous volunteers during disaster response by assessing the experience of nongovernmental voluntary organizations with spontaneous volunteers along with how they are used by an organization. They found 79% of organizations use spontaneous volunteers frequently and that most of them find them helpful. While there is a prominent use of spontaneous volunteers, 58% of organizations that are using spontaneous volunteers have denied the use of spontaneous volunteers at least once in a previous disaster response. The reason for the denial of using spontaneous volunteers may be because there was not a need for them or volunteer organizations fulfilled their role during the response. The Federal Emergency Management (FEMA) has examined and provided guidelines for the use of spontaneous volunteers since 2006. FEMA's independent study illustrates the importance of an organization having a plan in place for dealing with spontaneous volunteers. In the terrorist attacks of September 11th, the importance of having a plan for spontaneous volunteers became apparent as there were several logistical issues spontaneous volunteers caused when arriving on the scene (FEMA, 2006). One

logistical issue was spontaneous volunteers "created a physical logjam that interfered with the response". The independent study also highlights that spontaneous volunteers will always show up at any major disaster. Upon their arrival to the disaster local, state and national agencies should have a plan in place to have them be a valuable asset rather than bring potential issues and dangers to the scene.

Smith et al., (2021) conducted a study that identified the behind the scene actions digital volunteers used during the disaster response of Hurricane Harvey in 2017. This qualitative study used interviews in addition to images from private social media. The study illustrates that digital volunteers provide meaningful help by coordinating and communicating functions. Our study uncovered that most organizations are not using digital volunteers. It is suggested that organizations expand their volunteer training to account for spontaneous and digital volunteers so multiple skill sets can contribute to disaster response. Brennan et al., (2005) wrote an article that identifies and provides suggestions for linking community volunteers to local organizations. Local communities have embraced the role of being active volunteers in disaster as they are the first line of defense in preparing and responding to an emergency. In our study, we found that Community Emergency Response Teams (CERT) were the most used volunteer training program organizations used. CERT is one robust way local governments can mobilize local participation in disaster response and preparedness. Whittaker et al., (2015) wrote an article reviewing informal volunteerism that occurs in disasters and specifically highlights the growing digital volunteerism. The emergency management workforce heavily relies on volunteers that are affiliated with their organization. This was apparent in our study as we found that most if not all organizations do not use digital volunteers. Those volunteers who are not affiliated with the emergency management professionals are likely to be seen as a liability or nuance. The lack of involvement of digital volunteers in emergency management organizations can be attributed to the fact that the quality of data coming from digital volunteers cannot be guaranteed. On the other hand, digital volunteers add value to disaster response by not having to be near the emergency or disaster-affected area.

Ludwig et al., (2017) carried out an empirical study to highlight an approach that uses coordination practices of spontaneous volunteers and emergency services in disaster response. Voluntary relief has always existed in disaster response and the implementation of social media in the emergency management field has allowed for multiple types of communication along with the coordination of activities. To merge voluntary efforts with the use of technology, this study illustrated how their own public display application can be used to manage the offers and demands of activities occurring in disaster response. They argue that the public display application will support affected individuals, spontaneous volunteers, and emergency services. This approach to managing the efforts of spontaneous volunteers can address the issues and low implementation of spontaneous volunteers in the field of emergency management. Daddoust et al., (2021) developed a survey questionnaire consisting of 69 questions that were completed by emergency managers in Ontario, Canada. The study aimed to focus on the opportunities, challenges, and risks of coordinating spontaneous volunteers during disasters and emergencies. Spontaneous volunteers offer the opportunity to provide a wide variety of skill sets to a disaster as they are flexible and have the ability to switch tasks and behaviors. The study identified the highest risks that spontaneous volunteers bring to an emergency are lack of training and unrealistic expectations of issues. The challenges of coordinating spontaneous volunteers come from operational and human resource management-related issues which can be addressed by enhancing communication, the liaison process, development of procedures and policies. Unfortunately, these issues cannot be addressed quickly due to local resources and budget being limited. On the other hand, if these issues were addressed at a state or macro government level it would be more efficient and all levels would benefit.

SURVEY METHODOLOGY

This study is aimed to understand and analyze the current use of social media and volunteers across emergency management agencies. The process of the survey started with conducting a literature review to gain knowledge on the current status of these two areas in emergency management. The literature review set the foundation for the survey study that allowed the development of what questions were asked to be

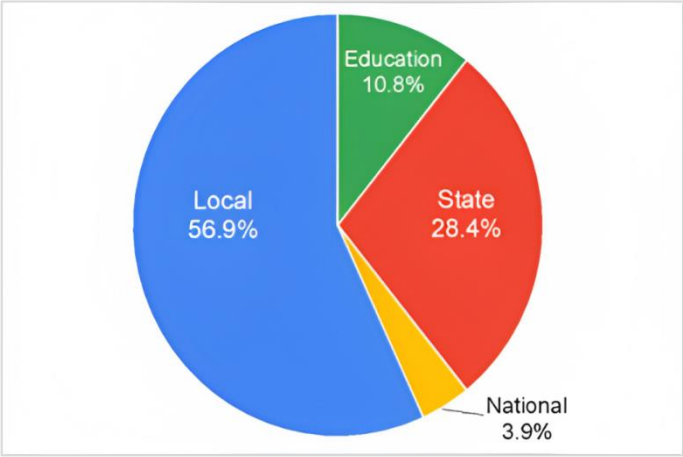
implemented into the research. Based on this the questionnaire was refined into 8 sections depending on the category the question corresponded to. The questionnaire involved both-closed and open-ended questions to obtain data that would contribute to the research. The content of the survey included questions across these topics regarding the use of social media, volunteers, spontaneous volunteers, disaster response, the verification of information from social media, and training programs. No personal data was collected.

During the period of April 25 to October 1, 2022, the web-based survey was conducted and sent to some Public Information Officers and Emergency Managers in national, local, and state governments, institutes of higher education, and non-governmental organizations in the United States through the email lists. These officers and managers were also asked to share the survey link with corresponding county and local emergency management agencies and encourage their participation. In total, 102 individuals responded to the survey. Once we obtained the responses, we categorically analyzed the responses. We further analyzed the responses and illustrated them into graphs in order to visually represent the results and discussions.

RESULTS AND DISCUSSION

The responses are divided into four sample groups: local, state, educational, and national agencies. Since the public institutions of higher education are considered state agencies, but most of their operations are considered to be on the local level, we will designate them as a separate group. The response rate for local-level was 56.9%, state-level agencies were 39.2%, and higher education was 10.8%, while the response rate for national agencies was much lower, with approximately 3.9%, as shown in Figure 1. Thus, readers should use caution if tempted to generalize national-level survey results. However, this study still represents one of the most all-inclusive sets of survey data from emergency management agencies on the topic of social media and spontaneous volunteers.

FIGURE 1
LEVEL OF OPERATION



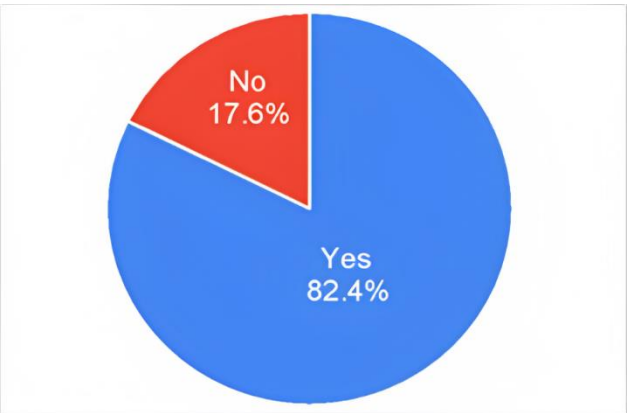
The collected data from the 25-question survey is categorized under two areas of interest, focusing on social media usage and spontaneous volunteering areas separately. Dividing the collected data from the survey into two groups allows for a more focused analysis of the responses. By separating the data into these two distinct categories, readers can better understand the specific ways emergency management agencies utilize social media and how they engage in spontaneous volunteering. This can lead to more targeted recommendations to improve emergency management practices in these areas. Additionally, separating the data into these two categories may help identify any unique challenges or opportunities

specific to social media or spontaneous volunteering, which may have yet to be apparent if the data were analyzed wholly.

Familiarity and Capacity of Emergency Management Agencies to Use Social Media

The first set of survey questions provides insight into how emergency managers and organizations use social media. The main objective is to gather information about the organization's current familiarity with social media and its interpretations of how it can be utilized during a disaster. We began by asking respondents whether they use social media in their current program, with 17.6% of the respondents indicating that they do not use social media, as shown in Figure 2.

FIGURE 2
SOCIAL MEDIA USAGE



Many emergency managers (82.4% of respondents) stated they had explored ways to use information posted on social media to identify needs in a shorter amount of time after a disaster. Examples of these social media requests include search-and-rescue, food, life-saving supplies, or information about essential real-time updates.

In recent years, the emergency management community has increasingly turned to social media to disseminate information to vast audiences during emergencies and disasters quickly. These platforms are helpful for government and humanitarian agencies to send alerts, warnings, and other communications to the public, as well as to monitor public interaction and assist with preparedness, response, and recovery efforts. Emergency management organizations use a variety of social media platforms to support their current level of operations. According to the survey study, the most used social media platforms were Twitter and Facebook. LinkedIn, YouTube, and others are the least used platforms, as shown in Figure 3.

A higher number of followers on an organization's social media accounts can help increase the reach and visibility, helping to ensure that the emergency services' messages are seen by more people, including those who may need emergency assistance. Figure 4 shows the number of followers emergency management agencies have across their social media platforms. The agencies do have an audience that can benefit from their implementation and use of social media. In the case of the 37 agencies that do know how their number of followers can cause the issue of them not knowing how to structure their use of social media and what message they need to get across to their audience. An unknown audience and number of followers can lead to ineffective use of social media.

FIGURE 3
SOCIAL MEDIA PLATFORM USAGE BY EMERGENCY ORGANIZATIONS

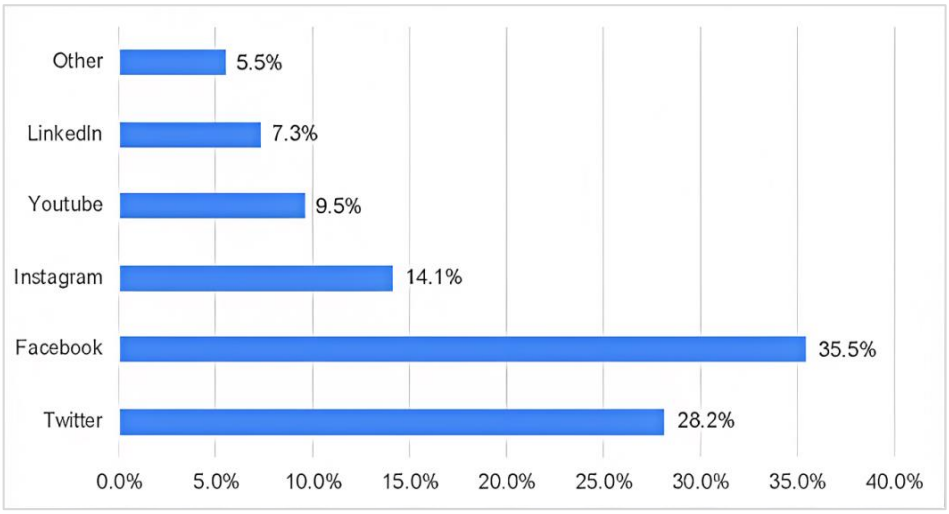
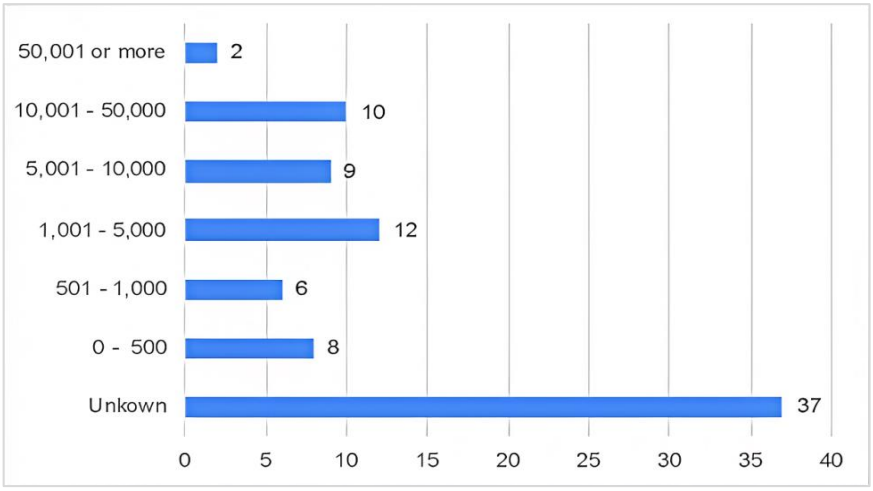


FIGURE 4
NUMBER OF FOLLOWERS ON ORGANIZATIONS' SOCIAL MEDIA ACCOUNTS



Social media is a powerful tool that emergency services can use to promote awareness, educate the public on health and safety issues, and send out real-time emergency information and updates. Another way social media can be utilized is to build communities, allowing for the easy flow of thought and ideas among participants and organizations. Inspiring action, acting on real-time emergency information, and sending out updates are among the many other ways social media can be a great tool. Figure 5 shows that emergency management services often utilize social media to provide information and send out updates; however, it is less commonly used to build communities and inspire action.

Many individuals posted on social media during Hurricane Harvey requesting rescue and relief when they could not contact 911. We asked the disaster response community whether they would act on these posted unverified social media requests shown in Figure 6. Among the emergency managers who use social media at their organizations, only 61.9% of respondents (representing 51.0% of all participants) reported that they would act on these requests, while 38.1% of respondents (representing 31.4% of all participants)

would not. The ratio is equally distributed between acting and not acting on unverified requests among the respondents who do not use social media.

FIGURE 5
RESPONSES CONCERNING HOW SOCIAL MEDIA IS USED

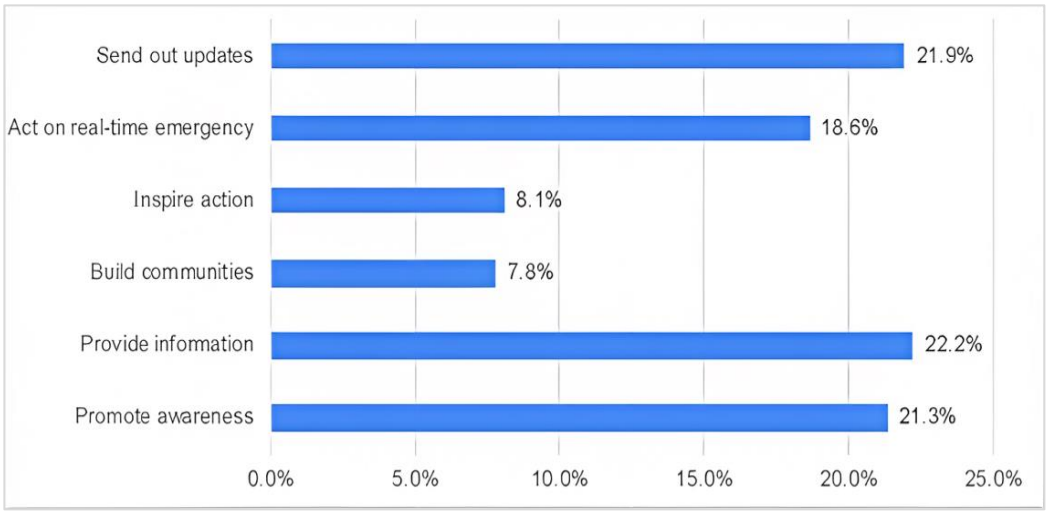
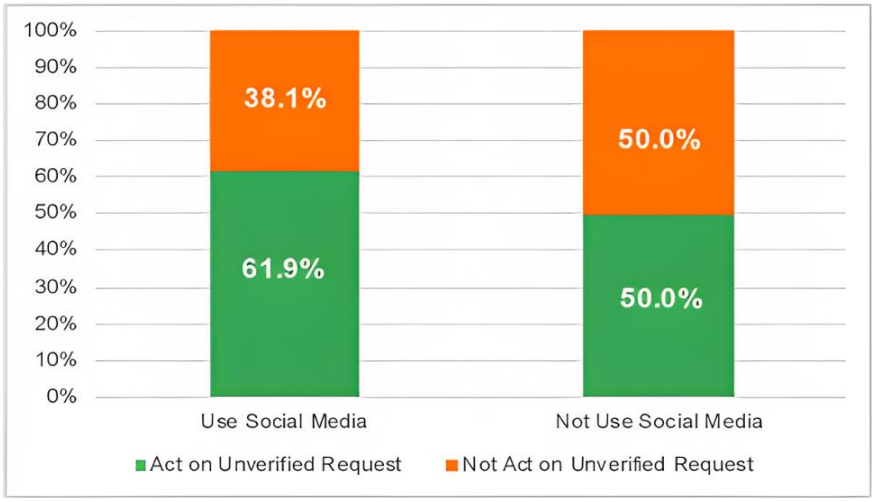
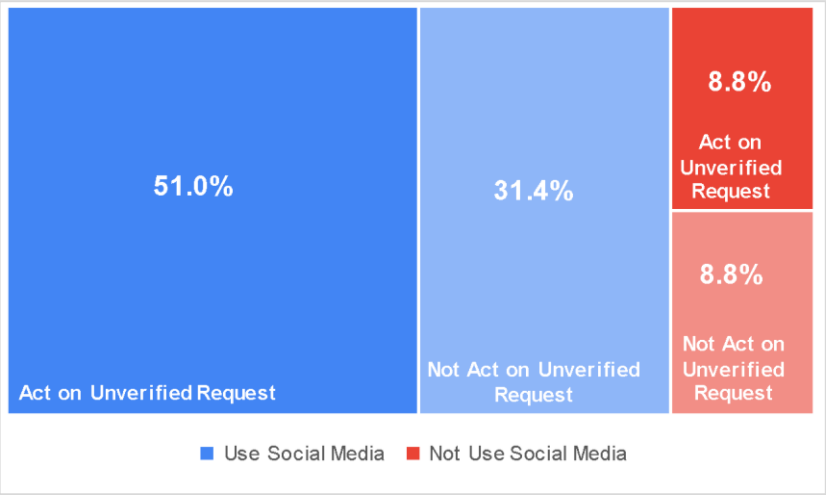


FIGURE 6
RESPONDENTS' SOCIAL MEDIA APPROACH TOWARD ACTING ON UNVERIFIED INFORMATION



As shown in Figure 7, overall, the total percentage of respondents who act on unverified requests represents 59.8% (51.0% + 8.8%), while 40.2% (31.4% +8.8%) of respondents do not act on a request unless it is verified. It is essential for emergency managers to ensure the authenticity, credibility, and accuracy of information during emergencies. It helps them make informed decisions, maintain situational awareness and allocate resources effectively. Emergency managers have difficulty verifying requests due to the volume of information, limited context, and prevalence of misinformation. Overcoming these challenges requires a combination of expertise and collaboration within organizations.

FIGURE 7
OVERALL RESPONDENTS' SOCIAL MEDIA APPROACH



As shown in Table 1, the surveyed local and state emergency managers trust unverified social media about the same at 63.8% and 62.1%, respectively. On the other hand, the surveyed emergency managers at higher education instructions trust social media less than (36.4%) of the different levels. Surprisingly, overall social media usage (72.7%) among emergency managers at higher education is less common than at local and state levels of agencies, with 87% and 79.3%, respectively. While social media can be an effective tool for emergency management, some government agencies and emergency organizations may not know how to use these platforms effectively. Social media can be used to disseminate important safety information, correct misinformation, and increase situational awareness during emergency management efforts. One thing to remember when analyzing these findings is that there is also the possibility of these organizations using their own websites and online portals to communicate with the public. While social media can be easy to use, there is a chance that it's not being utilized because the organization has chosen a more formal communication platform.

TABLE 1
SOCIAL MEDIA USAGE AND TRUST

Level of Social Media Operation and Trust	Local (n=58)	State (n=29)	National (n=4)	Education (n=11)	Overall (n=102)
Emergency management agencies use social media	87.9%	79.3%	50.0%	72.7%	82.4%
Emergency managers would act on unverified request	63.8%	62.1%	50.0%	36.4%	59.8%
Emergency managers would attempt to verify information coming from untrusted sources before responding	91.4%	89.7%	100.0%	100.0%	92.2%

Volunteer Participation in Emergency Preparedness and Response

In the second half of the survey, we asked about the organization's volunteer participation in emergencies and natural disasters, specifically their training programs. Figure 8 illustrates the use of training programs for volunteers among the organizations that participated in the survey and shows the distribution of these programs across different types of organizations. The figure shows that 48% of

organizations reported having volunteer training programs, while 52% did not. Multiple factors can be attributed to that, such as a restricted budget, lack of personnel, and availability of resources.

FIGURE 8
AVAILABLE VOLUNTEER TRAINING PROGRAMS

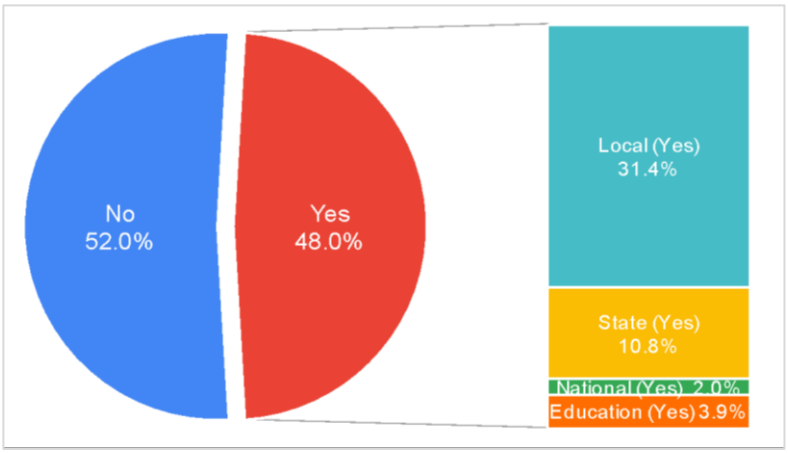
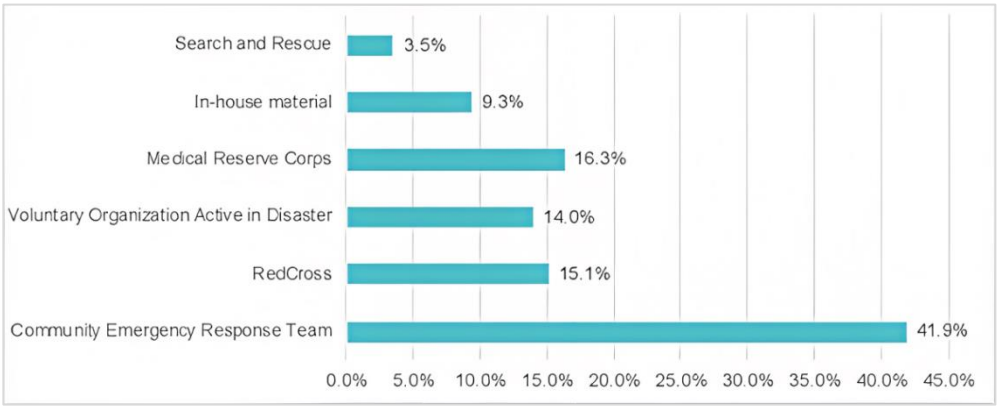


Figure 9 shows the types of volunteer training programs used by organizations that reported having such programs. Community Emergency Response Team (CERT) training was the most commonly used program, with 41.9% of organizations responding to its use, followed by Medical Reserved Corps training, which was used by 16.3% of organizations. CERT is sponsored by local emergency management agencies to educate volunteers about disaster response and preparedness to develop a community effort. CERT, being the most used training program, corresponds with how the local level more frequently has a training program for volunteers in effect. Other training programs used by organizations included Red Cross (15.1%), Voluntary Organization Active in Disaster (14.0%), In-House Materials (9.3%), and Search and Rescue Programs (3.5%).

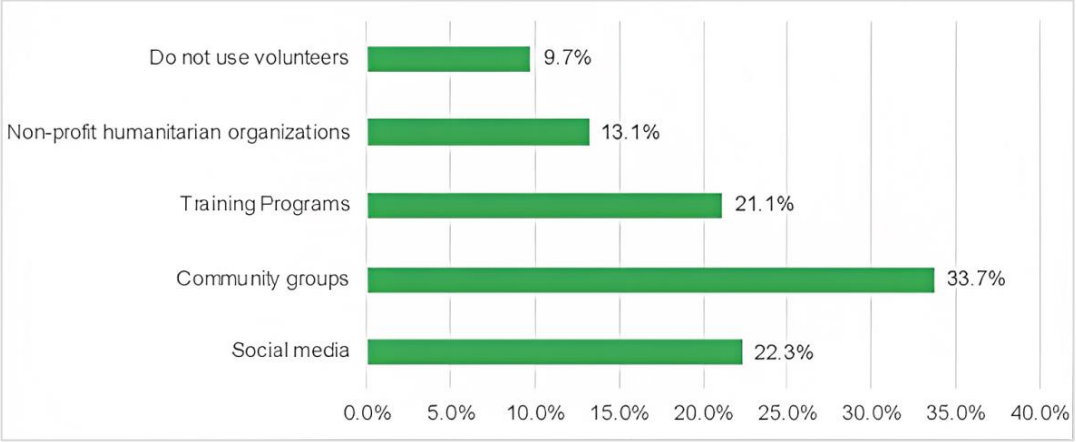
FIGURE 9
VOLUNTEER TRAINING PROGRAMS



Emergency management organizations can recruit volunteers in various ways, as shown in Figure 10. The most common form of recruitment is done through community groups (33.7%), while the least common way is through non-profit humanitarian organizations (13.1%). Their in-house training programs are likely their most stable and effective way of recruiting volunteers. Considering collegiate internships and required

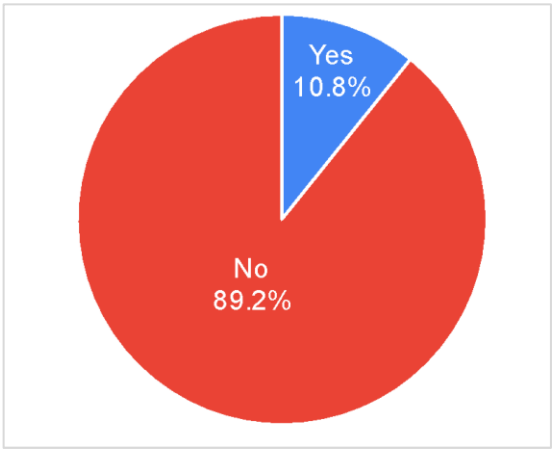
community service/volunteer hours for medical students, recruiting from these pools allow for experienced and dedicated volunteers.

FIGURE 10
VOLUNTEER RECRUITMENT METHODS IN EMERGENCY ORGANIZATIONS



Digital volunteering is a network developed for crisis response as a volunteer-based, decentralized group formed by the concerned public across the globe. We asked the emergency response community whether they utilize digital volunteering efforts. Only 10.8% of responders stated that they use digital volunteering at some level, while most emergency organizations do not rely on online volunteers, as shown in Figure 11. The network that digital volunteers create collaborates with one another to address disasters collectively and innovatively using information, communication, and computational technologies. The most utilized pool of volunteers in digital volunteering comes from the business community. In times of natural disasters, organizations can task volunteers from the business community to organize marketing campaigns to boost fundraising. Additionally, they can help in planning workforce distribution and allocating resources to their large-scale projects.

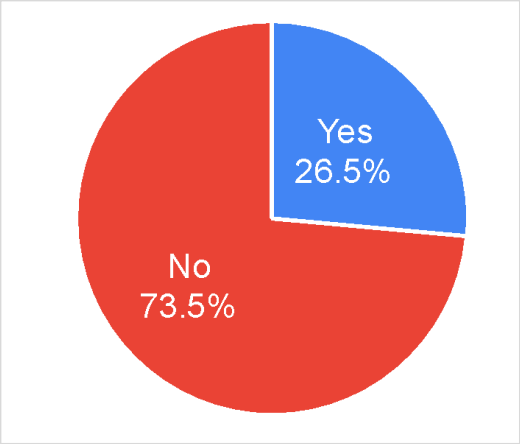
FIGURE 11
USAGE OF DIGITAL VOLUNTEERING



Spontaneous volunteers are individuals who arrive unsolicited at a disaster scene and may not possess the necessary skills to respond to the current disaster. Figure 12 illustrates that only 26.5% of organizations

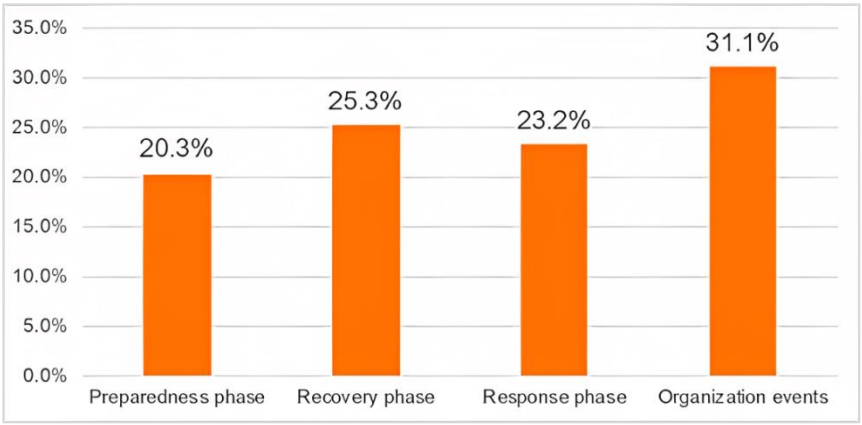
use spontaneous volunteers. It can be noted that among the organizations that use spontaneous volunteers, there is a principle that is developed by FEMA in order to manage these inexperienced individuals.

FIGURE 12
USAGE OF SPONTANEOUS VOLUNTEERS



The majority of organizations (73.5%) do not use spontaneous volunteers. This is due to the disconnect between the spontaneous volunteers and them rarely incorporated into formal disaster planning. The barriers contributing to spontaneous volunteers' full and effective use are lack of budgeting, increased risk of injury, and liability issues. The local level of emergency management is not accustomed to spontaneous volunteers as they do not have the resources to implement them and do not have disasters that require their capacity. When disasters like hurricanes happen, they reach a certain threshold where the national and federal levels are required to respond. In most disasters that reach the national level, the capacity of spontaneous volunteers to be used is more reasonable than at the local level because there are more tasks and situations to be delegated among personnel. As most of our responses are contributed to the local level, it reflects the reasoning for not using digital and spontaneous volunteers.

FIGURE 13
WHEN VOLUNTEERS ARE USED IN EMERGENCY ORGANIZATIONS



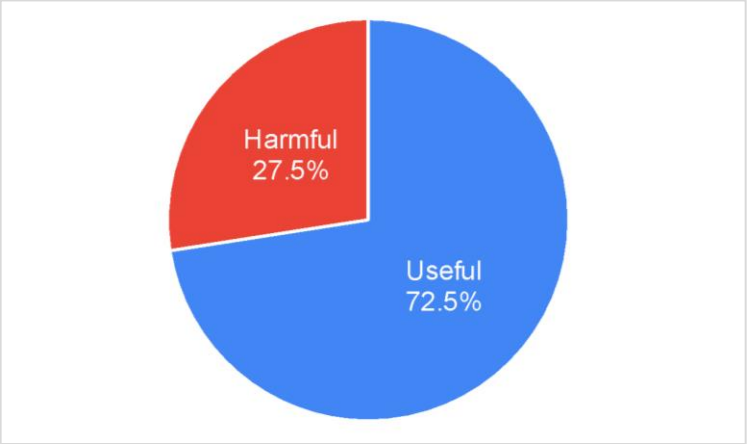
An emergency can be broken down into phases to understand the current situation of the crisis and what resources will be needed to support this phase. Before a disaster strikes, there is the mitigation phase, when actions are taken to help prevent and reduce the damage a disaster might cause. During an emergency

response, the preparedness phase is categorized by when an action is taken to avoid an incident, such as injuries. Preparedness can include the following:

- Training or developing action plans.
- Identifying essentials needed in an aftermath.
- Finding possible structural vulnerabilities that impact a community if they are damaged.

The response phase is carried out immediately after a hazard impact. The measures taken during the preparedness phase are used, which can include search and rescue efforts, food and supply distribution, or the establishment of shelters for displaced victims. During the recovery phase, actions are taken to return a community to normal or near-normal conditions, such as supplying medical attention or financial aid, reconstructing damaged properties, and reinforcing identified vulnerabilities. The assistance of volunteers may also be used during organization events. According to Figure 13, the most common way volunteer aid is used is for organization events (31.1%). The least common way is during the preparedness phase (20.3%).

FIGURE 14
IMPACT OF VOLUNTEERS DURING RESPONSE PHASE TO EMERGENCY ORGANIZATIONS



Some organizations consider volunteers harmful to disaster response operations, most notably by putting themselves in danger. It can be noted that volunteers may not have the necessary skills and thus put themselves in danger due to the lack of a current training program in place. The results in Figure 14 indicate that most organizations believe volunteers are more valuable than harmful. 72.5% do not think that volunteers have a harmful impact when responding to an emergency. In comparison, 27.5% believe that the effect of volunteers is harmful during the response phase.

Our survey study finds that 34.4% of agencies believe that volunteers can put themselves in danger, 30.8% believe they do not have the necessary skills to help, 23.1% believe that volunteers slow down response efforts, and 10.8% believe that they are uncoordinated and unreliable in Figure 15. These findings suggest some potential risks associated with working with volunteers, and it is important to carefully consider these risks before recruiting volunteers.

FIGURE 15
NEGATIVE IMPACT OF VOLUNTEERS

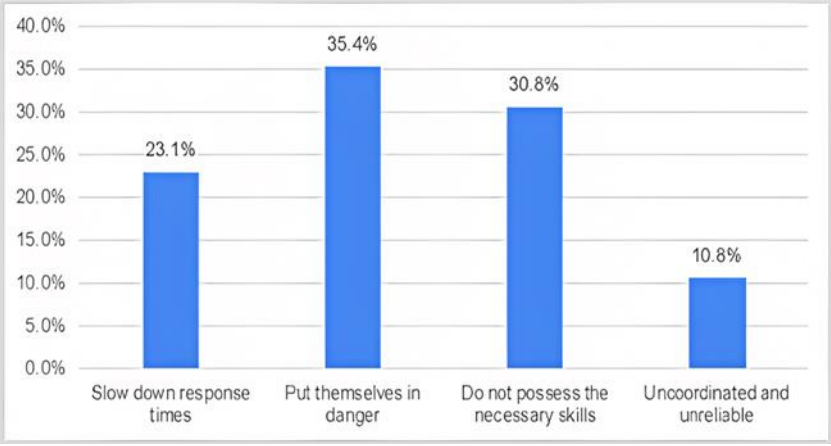


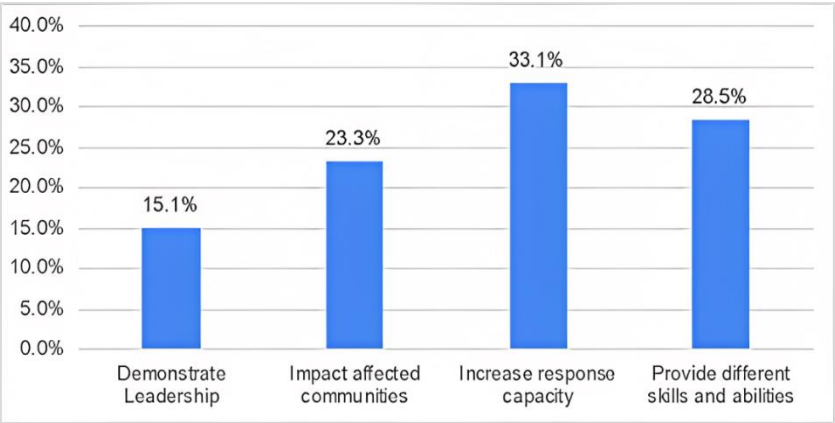
Table 2 provides information on the usage and trust of volunteers by Emergency Management Agencies based on the types of organizations. The table shows the percentage of Emergency Management Agencies that have a volunteer training program, use spontaneous and digital volunteers, and have found volunteers harmful in their respective level of operation (local, state, national, and higher education), as well as the overall percentage. The data shows that overall, nearly half of Emergency Management Agencies have a volunteer training program, and about a quarter of Emergency Management Agencies use spontaneous and digital volunteers. The level of trust in volunteers varies by organization type. Higher education has the lowest level of confidence in volunteers, with over half of higher education respondents finding volunteers harmful.

TABLE 2
VOLUNTEER USAGE AND TRUST

Level of Volunteer Operation and Trust	Local (n=58)	State (n=29)	National (n=4)	Education (n=11)	Overall (n=102)
Emergency management agencies have a volunteer training program	55.2%	37.9%	50.0%	36.4%	48.0%
Emergency management agencies use spontaneous volunteers	34.5%	17.2%	25.0%	9.1%	26.5%
Emergency management agencies use digital volunteers	8.6%	13.8%	25.0%	9.1%	10.8%
Emergency management agencies found volunteers harmful	20.7%	31.0%	25.0%	54.5%	27.5%

Figure 16 displays the percentage of organizations that reported positive impacts of volunteers during a disaster. The figure lists four volunteers who were noted to impact operations during a disaster positively. The figure shows that 33.1% of organizations reported that volunteers helped to increase the response capacity during a disaster. 28.5% of organizations said that volunteers provided different skills and abilities that helped in disaster response. 23.3% of organizations reported that volunteers positively impacted affected communities during a disaster. Finally, 15.1% of organizations said that volunteers demonstrated leadership during a disaster.

FIGURE 16
POSITIVE IMPACT OF VOLUNTEERS



CONCLUSION

The objective of this web-based survey was to evaluate how public information officers and emergency, managers in the US local and state governments, institutes of higher education, and non-governmental organizations utilize social media and spontaneous volunteers. In total, 102 individuals responded to the survey, with responses divided into four sample groups: local government, state government, higher education, and national agencies.

The survey revealed that social media is widely used by emergency management agencies to quickly disseminate information to the public, with Twitter and Facebook being the most used social media platforms, while LinkedIn, YouTube, and others were the least used. Furthermore, the study found that more followers on an organization's social media accounts can increase the reach and visibility of emergency services' messages. Nonetheless, social media is less commonly used to build communities and inspire action. Finally, the study found that only 61.9% of respondents who use social media at their organizations reported that they would act on unverified social media requests for aid, while 38.1% would not.

This study evaluated the roles of volunteers and social media in disaster response and the coordinating actions that emergency management agencies use to implement these functions into their operations. The study found that spontaneous volunteers, who arrived on-site to a disaster ready to help but are often not associated with the existing emergency management response system, are prevalent in disaster scenes, yet 73% of organizations do not use them due to the disconnect between spontaneous volunteers and formal disaster planning. However, the capacity of unused spontaneous volunteers poses an opportunity for emergency managers to implement them into their disaster operations for more efficient and effective responses, although barriers such as lack of budgeting, increased risk of injury, and liability issues hinder their full and effective use.

The study relied on individual survey responses across varying levels of emergency management agencies, with the local level contributing to 56.9% of the responses. The local level of emergency management agencies is vital in being the first line of defense in emergencies and disasters. Yet, they often require more personnel, recovery assistance, and resources, leading to the implementation of volunteers. However, 52% of agencies do not have a training program for volunteers, and small jurisdictions at the local level do not have the time or resources to conduct a volunteer-based program, leading them to rely on state and federal levels for assistance, as well as non-governmental organizations such as The Red Cross.

This study also found that social media is pivotal in critical components of emergency management's response, recovery, and preparedness phases. Through social media's ability to share information, emergency management agencies and the public can communicate during emergencies such as earthquakes,

hurricanes, and floods. However, while 82.4% of emergency management organizations use social media, they run into the issue of managing the vast number of requests coming from social media without any structure to manage, prioritize, and verify them. The information and requests sent from the public are not initially verified and may be inaccurate. This leaves emergency managers to decide whether to vest time and resources into verifying requests or to rather act on unverified requests. Our research found that 59.8% of agencies would act on unverified requests. These agencies are willing to make the tradeoff between timeliness which is a key advantage in effective disaster repones and accuracy of social media requests. Furthermore, while social media can be an impactful tool in emergency management, agencies have yet to develop a uniform course of action for verifying information from social media. Agencies would likely get overwhelmed by the vast amount of requests coming from social media with there being no structure to manage, prioritize, and verify requests.

Overall, this study clearly demonstrates how emergency management professionals and their organizations are using social media and volunteers in their operations. This research has helped identify potential challenges, risks, and opportunities in how social media and volunteers are being implemented into emergency management functions. Although this study provides valuable insights into the use of social media and spontaneous volunteers in emergency management agencies, caution should be exercised when generalizing the findings to national-level agencies due to the low response rate of only 3.9. While the data collected from higher education and non-governmental organizations provide additional perspectives, the relatively low sample size of these groups also limits the generalizability of the study's findings. A one size fits all approach will not be beneficial as different levels of organizations have unique operations, responsibilities, and needs.

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