

“WE ALWAYS THINK IT’S NEVER GOING TO HAPPEN TO US”: UNDERSTANDING WHAT MOTIVATES COMMUNITIES TO ENGAGE IN EMERGENCY PREPAREDNESS

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ABSTRACT

Community-based disaster risk reduction is an effective approach for emergency management to address the needs of communities. This approach focuses on identifying the community-specific needs and context of emergency management in that area to develop technologies that help mitigate effects of disasters. The complex network of community, technology, and user motivation makes it challenging to understand how to encourage users to adopt preparation efforts, as opposed to reactive measures that have been shown to be less effective and can lead to inequitable results. To address this research gap, qualitative interviews were conducted with participants from one medium-sized midwestern city in the United States to understand how community members think about preparation and make decision about adopting preventative technologies. The results of the qualitative analysis reveal that there were 5 main themes that are important to consider when developing technologies for emergency preparedness; Importance of communication during emergencies, the role of technology in emergency management, unequal access to resources, reaction instead of preparation, and motivation to engage in community preparedness and response.

Keywords: Design methodology, Design process, User centred design, emergency management, community resilience

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1 INTRODUCTION

One of the biggest challenges facing communities, cities, and society is the increasing threat of natural disasters affecting complex systems and taking countless lives in events such as flooding, wildfires, and hurricanes (Baudoin et al., 2016). Beyond the loss of life and damage to property, these disasters and the structures in place to manage recovery have created barriers that keep communities that are affected from improving their circumstances (Newman and Yeates, 2009). This complex network of infrastructure, technology, and communities taxes our modern systems through increasingly frequent and severe disaster events (Perrow, 1999). As designers, we are called to develop solutions to mitigate the effects of these devastating events through building robust infrastructure, emergency management technology systems, and personal devices for use during emergencies. However, research in the field of emergency management emphasizes the importance of preparedness prior to an emergency as opposed to reactive measures after disaster has struck (Izumi et al., 2019), since it has the potential to strengthen organizational relationships and improve the effectiveness of response operations and community coordination (Vaugh, 2015). However, the vast majority of approaches used in design focus on developing solutions to problems that *already* exist, as opposed to problems that *might* exist. An important challenge in developing technology solutions for disaster pre-planning and mitigation are humans' natural tendency to focus on the most salient stimuli to make a decision, to place a higher value on the present versus any future point in time, among many other cognitive biases (Linnemayr et al., 2016). Further compounding this complex relationship between human cognition and disaster preparedness is the recognition that a one-size-fits-all approach will not meet the needs of every community (Ramstad et al., 2020).

While prior work in design has begun to explore possible approaches for designing solutions for emergency management (Cardin et al., 2013; Westermeyer et al., 2011), empirical research is needed to better understand individuals' motivations and adoption of tools in emergency management pre-planning in a community setting. This is important for understanding community needs and the context of potential solutions to ensure equitable access and effective adoption of such technologies. In fact, researchers in public administration consider social equity as one of the measures of effectiveness of any emergency management effort or intervention (Frederickson, 2015). Careful assessment of individual needs in a community context is the first step in understanding how to build technologies that will be most effective in encouraging people to pre-plan for emergency management. Thus, the research question central to this study is: **How do individuals in communities make decisions about adopting technology and tools for emergency preparation and what factors influence this decision-making process?** To address this question, semi-structured interviews were conducted with community stakeholders in a medium-sized midwestern metropolitan area in the United States. Interviewees were chosen from a variety of roles related to emergency management in the community in order to capture the range of perspectives and experiences affecting user behavior in the region.

2 RELATED WORK

2.1 Emergency management and community resilience

Prior work in public administration has long since grappled with understanding the complex system that is emergency management and the institutions, information systems, and communities involved. In this way, emergency management and the use of technology in this space is an archetypal example of a complex design system that requires effective design methods and approaches capable of addressing the ill-structured and wicked nature of problems in this domain. Early work in the 1970s and 1980s began with outlining a framework for understanding the different phases of emergency management: mitigation, preparedness, response, and recovery (McLoughlin, 1985). Starting with the most proactive of these phases is *Mitigation*, which involves activities undertaken long before disaster strikes, including analysis of geographic data to identify areas of a community that are most vulnerable to disaster events. Next is *Preparedness* which involves shorter term activities that happen before the disaster event, that aim to enhance readiness of community or organization using approaches such as training and education. *Response* is the phase most recognizable by citizens and those affected by disasters since it involves the activities that occur directly following a disaster to aid those in need and restore critical infrastructure (e.g., electricity, internet, water). Last is the *Recovery* stage that typically

involves attempts at restoring the community to its prior state before the disaster event and help rebuild longer term infrastructure affected by the disaster (property, wealth, culture) (Reddick, 2011). In considering the four main phases of emergency management, researchers in this space have long since emphasized the importance of planning (mitigation and preparation) in reducing the negative effects of emergencies and disasters affecting a community (Schafer et al., 2008). However, many barriers exist that result in lower emphasis placed on planning efforts, such as clear incentives for elected officials to spend on relief funding as opposed to preparation funding (Healy and Malhorta, 2009; Gailmard and Patty, 2019). In addition, the lack of support and understanding of climate hazards results in poor adoption of mitigation and preparedness policies (Lee and Hughes, 2017). While these barriers certainly influence the effectiveness of emergency management efforts, one key dimension that has seen increased attention in this space is that of community resilience, defined as “the ability of structures and infrastructures to withstand the forces of powerful agents, minimizing damages” (Geis, 2000, p. 151). Research on the role of community and resilience has focused on how communities affected by disasters deal with emergencies together (Thaha and Ismail, 2021), and a recognition of the importance of the work between communities and the local governments and agencies (Baudoin et al., 2016; McCallum et al., 2016). Community centric approaches to emergency management is an increasingly common practice to addressing risk reduction and emergency preparedness (Baudoin, 2016) in part due to the recognition that disasters are inherently geographically local events (Schafer et al., 2009) that affect every community differently. Many researchers have identified the important role that social organization play in creating resilience during disaster management, noting that much of local organizing work happens in the background, and is invisible to entities beyond that community (Star and Strauss, 1999). This hyper-local resilience has implications for the wide variety of communities affected by disasters. Research in this space has identified the unequal effect that emergencies have on various communities, with under-resourced communities struggling more to prepare for disasters on their own and are disproportionately affected by them (Ferdinand et al., 2012). The vulnerability paradigm argues that the people affected by a disaster already do not have the money and resources to become resilient from disasters (Ramstad et al. 2020), perpetuating this cycle. Therefore, the main goal of this research stream is to develop design theories and approaches that are sensitive to this context in order to develop solutions that will be effective in the context that they are to be adopted in.

2.2 Design methods and considerations for emergency management technology

The previous section highlighted important research streams in the emergency management field. In design, researchers have begun to respond to these critical events and their effects on communities using established design methods and approaches such as human-centered design and participatory design (Westermeyer et al., 2011; Izumi et al., 2019). This community-centered approach also creates buy-in from the community and results in higher adoption rates (Paul et al., 2018). Even though the literature supports this community-based approach, these efforts face many challenges in adoption, all which need to be taken into consideration when designing technologies for this complex application.

One of the most important considerations in emergency management technology design is the adoption and trust of technologies involving citizen participation (Selin et al., 2007). Technology for emergency management workers often needs information and participation from citizens (Kapalo and LaViola, 2019). Volunteered geographic information is used in the emergency management field to provide emergency management professionals with important information that can aid in response and recovery efforts during a disaster (McCallum et al., 2016). Crucially, solutions that involve user input require widespread adoption and user trust to voluntarily share personal information about their families and homes with authorities. Participatory design approaches tend to lead to more trust from the participants, which is vital with adoption of new technology (Selin et al., 2007). However, the transparency of information handling and governance need to be evident to all users of the system to ensure long-term cooperation and participation (Choi and Wehde, 2020).

In addition to trust, the value and benefits of any technology system must be effectively communicated to citizens as a prerequisite for adoption. Due to the highly localized nature of disaster events, the value of the system must be highly tailored to the needs of a community. For example, citizens in an area that has a high likelihood of flooding are more likely to care about flood preparation (Botzen et al., 2019). This aspect of emergency management technology requires highly customizable design processes and artifacts specific to the concerns of a community (Cardin et al., 2013) through investments in time consuming methods such as ethnographic observations and interviews.

Lastly, environmental factors are important considerations in the design of emergency management technology. The most common environmental factor that affects the use of technology during emergencies is the lack of electricity due to failures in infrastructure resulting from large scale natural disasters such as hurricanes and wildfires. Solutions that are designed for use during and after an emergency need to account for the lack of a stable internet connection, and limited battery charging capacity. These designed solutions also need to be available to those with limited financial means since individuals with fewer resources are often hit the hardest by emergencies (Carter and Peek, 2016).

The findings from current work on emergency management sheds light on important considerations for the design of technologies to be used during and after emergencies, but a lack of data exists on how individuals who are part of specific communities make decisions about adopting technology and tools for preparation and what factors influence this decision-making process. This study responds to this research gap.

3 METHODS

Ongoing work in emergency management shows that careful assessment of individual needs, community context, and the relationship with existing institutions involved in emergency management is the first step in understanding how to build technologies that will be most effective in encouraging people to pre-plan for emergency management. However, not much is known about how to best elicit specific community needs for involvement in preparation efforts *prior* to an emergency. Thus, the research question central to this study is: **How do individuals in specific communities make decisions about adopting technology and tools for emergency preparation and what factors influence this decision-making process?** To address this question, semi-structured interviews were conducted with community stakeholders in a medium-sized midwestern metropolitan area of around one million in the United States.

3.1 Participants

A total of eight participants were recruited for this study using purposeful sampling which aims to select information-rich cases for an in-depth study to gain deeper insight into issues of central importance to the research (Patton, 1990). Purposeful sampling has been used in cognitive science (Chase and Simon, 1973) and engineering to uncover valuable insights on complex phenomena and human experience through a detailed analysis of in-depth studies on behavioral patterns, performance, and reflections. In this study, specific cases (community members) were chosen that intensely manifest the phenomenon of interest (emergency management roles, neighborhood association involvement). To understand how different levels of community interact within technology adoption, community members from neighborhood associations and volunteer groups as well as professionals in emergency management were recruited for this study, all from the same metropolitan area. Interviewing both at a neighborhood level and a professional city level allowed for us to gain a broader perspective on community motivations for emergency preparation. These participants were recommended by people who were in neighborhood associations and found through local emergency department websites. To organize the results for readability, below are descriptions of the interviewees with associated user characteristics:

1. **Professional City Manager:** A professional, spreads awareness about preparedness.
2. **Neighborhood Association President 1:** Has connections with people in the city, very involved.
3. **Professional Flood Manager:** Emergency planning community member, deals often with flooding.
4. **Community Garden Volunteer:** Volunteers with community gardens & food informative learning.
5. **Neighborhood Association President 2:** Association president in a small neighborhood.
6. **Neighborhood Volunteer:** Active community member, not in formal neighborhood association.
7. **Neighborhood Association Member:** Has a lot of personal connections in the community.
8. **Church & Tribal member:** Has some professional emergency management experience.

3.2 Procedures

To address our research question, a series of semi-structured interviews were conducted with the 8 participants using individual video conferencing technology (i.e., Zoom). All interviews were audio recorded and took approximately 30 minutes. Due to the variety of perspectives and backgrounds of our participants, each interview contained four core questions that focused on better understanding the interviewees' experiences with emergency preparedness in their communities. Each core question

contained several detailed follow-up questions that were posed to participants depending on their response to prior questions and their particular role within the system. These core questions and justification for asking each question, are as follows:

Core Question 1: Can you tell me about one of the most recent disasters that you had to deal with [personally/professionally]?

Core Question 2: What type of emergencies most often occur in your area now? Is it different from what you described in the previous question?

Core Question 3: Reflecting on the previous questions: what, if any, communities play a role in your disaster preparedness or awareness? (neighborhoods, clubs, groups)

Core Question 4: Can you tell me about what technology, if any, you use to prepare for emergencies?

These questions began with an exploratory prompt to be a starter question towards thinking about emergency preparedness and allowed us to understand what disasters impact individual. Question 2 is key to understanding what emergencies have impacted the participants in a wider area and therefore at the larger community level. The remainder of the questions allowed us to explore the factors that lead to acceptance of technology as it has been shown that perceptions of usefulness play a role in adoption (Davis et al., 1989). Previous research has shown that preparation happens at the community level and the 3rd question assesses the current preparation efforts ongoing in this community (Thaha and Ismail, 2021), and understanding of what barriers there are to community preparedness adoption. Interviews allowed for the interviewee to set the context of what place emergencies live in their life and to further delve in depth into questions dependent upon what the participants' experience and assess users' current behaviors to better understand their needs when it comes to preparation (Holtzblatt, 2007).

3.3 Data analysis

Once the interviews were concluded they were transcribed using Otter.ai and qualitatively analyzed using the principles of inductive content analysis using the atlas.ti platform (Mayring, 2004). The primary aim of this analysis is to identify the themes that emerge from the interview when it comes to how individuals in specific communities make decisions about adopting tools for emergency preparation and what factors influence this decision-making process. The limited and fragmented prior knowledge about motivations to prepare for emergencies and adopt technologies for this purpose makes this method useful for analysis in this study (Lauri and Kyngas, 2005). Following this approach, the interview transcripts were analyzed sentence-by-sentence through open coding, and initial categories of themes were created. The researcher classified instances of discussion (defined as a block of dialogue between the interviewer and the interviewee about a particular topic) and classified these discussions into the initial categories. Next, general groupings of these discussions were identified, similar categories of discussions were grouped together to reduce the number of categories (Burnard, 1991), in order to sufficiently describe the types of topics that interviewees discussed as being relevant to their willingness to prepare for emergencies and adopt technologies to assist in this process. The development of these themes and their subcategories were directed by the content of the interview transcripts and the themes were supported on prior research on individuals' motivations and decision-making processes for emergency preparedness (Jensen et al., 2021; Baudoin et al., 2016).

4 RESULTS FROM QUALITATIVE ANALYSIS

The results from our interviews showed that flooding, wind storms, snow storms, and tornados were the most common types of emergencies that participants in the particular metropolitan area discussed. COVID-19 was occasionally mentioned but was not a focus of the interviewees. Following the analysis process described in the previous section, 5 main themes emerged from the interviews. These themes are described in the following sections, along with example quotes from the interviews, and discussion relating to current literature in this space.

4.1 Importance of communication during emergencies

The first main theme was the impact of communication in a community. The majority of participants (n = 6) remarked upon efforts to ensure they knew who to contact in case of an emergency. One instance was from a **Community Garden Volunteer** where they discussed how he had manila folders full of people to contact after an emergency because he knew they would come and help. Whether it

was direct like this, or indirect in just knowing that they could depend on their neighbors, many participants acknowledged that they knew that there was a support structure to help them after an emergency. Technology played an integral part of this communication, as information was often spread through social media groups like Facebook and Twitter. Additionally email and text messages were used often for communications between neighborhood associations. This highlights the importance that technology has for emergencies. In fact, **Neighborhood Association Member** remarked that when the power went out in the neighborhood but not in their house, they set up a power bank for neighbors to charge their devices. When the power is out for 7 days, access to resources like this has become a necessity for getting help, highlighting the importance communication networks during an emergency.

Much of this need for communication is rooted in the fact that once an emergency had happened, people did not know what to do after. **Neighborhood Association President 1** remarked: “Well, lots of big cities, you don’t necessarily know who to talk to, or how to get hold of people, but you do know your block you know do know, your neighborhood, should, you should have a way to contact somebody who can get to the right person quickly.” This need for important information during emergencies also impacts communication between civilians and government. Participants in our study were often unsure what to do after an emergency and needed more guidance from their local city officials. This is supported by prior research that observes that the amount of information coming in after a disaster can be overwhelming and therefore make it hard to make important decisions (Thaha and Ismail, 2021). In this information dense environment, transparency of information handling and governance need to be evident to all users of the system to ensure long-term cooperation and participation by community members (Choi and Wehde, 2020). Citizens are often in a vulnerable space during and after an emergency due to the high stress context of emergencies, increasing the challenge of effective and open communication in this context (Jensen et al., 2021).

4.2 The role of technology in emergency management

The next dominant theme that emerged from our analysis of the interviews centered around the use of technology, of which there were two main types: The first was social media and various communication systems discussed in the previous section. The second type of technology mentioned was drones and different image capturing technology. This was used in the collection of land data in the aftermath of a disaster to submit to the Federal Emergency Management Agency [FEMA] (**Church & Tribal member**), and surveying potential flooding areas (**Professional Flood Manager**). This was both to save time and money in areas that are potentially hard to reach. At the neighborhood level, the main role that technology played was in the contact lists in various forms like text, email, and Facebook. There seems to be a potential gap in easily accessible local emergency contacts for people to follow so people depend upon their own personal network. Interviewees valued their family and loved ones and wanted safety, but were unsure of what steps should even be taken and there is an overwhelming amount of information online. Additionally, the importance of environmental factors such as the loss of electricity during emergencies was discussed by participants. For example, the experience of **Neighborhood Association Member** who set up a power bank for neighbors to charge their devices during an emergency discussed in the previous section shows the importance of critical infrastructure for effective adoption and use of technology during an emergency.

4.3 Unequal access to resources

The third theme that emerged from the interviews is that many people simply do not have the money and resources to fully prepare for emergencies that may or may not happen in the future. When discussing food emergency supply preparation, **Church & Tribal Member** remarked “But I remember thinking not everybody can do that because it was expensive, you know, getting the things ready”. There is a lack of mental and monetary resources to even address potential future emergencies (Ramstad et al. 2020). If there are no structural preparedness changes, some people will not be able to prepare, even if there is an attitude change. When asked what the biggest barrier to being prepared was, **Neighborhood Association President 2** illustrated “education, poverty, people are worried about the cockroaches in their childrens cribs”. Research in emergency management often discusses the unequal effect that emergencies have on those that don’t have the resources to prepare for them. Oftentimes lower economic status communities are going to have a harder time preparing for disasters on their own and be disproportionately affected (Ferdinand et al., 2012). The vulnerability paradigm argues that the people affected by a disaster already

do not have the money and resources to become resilient from disasters (Ramstad et al. 2020). Access to resources is a large part of addressing true change to preparation.

The resources needed are also going to depend on the population in need. Older adults might need more resources to account for health and movement, as this was discussed by a participant. This is vital to note because it highlights an important aspect of emergency preparedness literature, the need for community participation in risk reduction management (Izumi et al., 2019). One of the benefits of a community approach to preparedness is that it addresses the needs of the community by involving them instead of assigning a solution. This can also create buy-in from the community and lead to potentially higher adoption rates (Paul et al., 2018). User centered design is a very common design concept that is very applicable to this area. Keeping in mind the various resources that a community has is important to good preparedness and risk reduction.

4.4 Reaction instead of preparation

The fourth theme from our study was that most preparation efforts were focused on preparing for the effects of a disaster, and not to help mitigate those effects. This focus on *reaction* instead of *preparation* was dominant throughout the interviews with participants from various backgrounds and roles in the community. Participants outright observed this in statements like “We are very reactive instead of proactive” and “generally, people respond beautifully during an emergency. But not until it's hit the fan.” There are structural incentives that can explain this phenomenon. Studies show that politicians are incentivized to spend on relief spending and discouraged to spend preparation money (Gailmard and Patty, 2019). At an individual level, humans have a natural tendency to focus on the most salient stimuli to make a decision, to place a higher value on the present versus any future point in time, among many other cognitive biases relevant to emergency preparation (Linnemayr et al., 2016). These natural human tendencies are rooted in the fundamental paradox of emergency management and planning: that “crises and disasters are inconceivable threats come true- they tax our imagination and outstrip available resources” (Boin and Hart, 2010, p. 358), yet we must use our imagination to plan and prepare for the worst events imaginable that threaten our life-sustaining functions. The choice architecture during emergencies also poses a challenge for government agencies and community members to prepare before disasters strike, since these events and their effects are far-reaching and complex, and often pose impossible choice options that are never optimal solutions.

An illustrative example of this tension can be found in **Church and Tribal Member's** comments on making 72 hour kits with their family, they looked back on their childhood “To me, it's just like I said, being able to have the resources to do that when I was younger and had eight kids and usually it was a challenge is to keep enough food in a cupboard to last you for the week, let alone try to put stuff away for months or even a year in advance.” The second most popular form of preparation mentioned was creating food emergency preparedness packs. This is an accessible and reasonably cheap way to prepare for emergencies, though still not accessible for those living paycheck to paycheck. Overall reaction becomes the only option some have or know.

4.5 Motivation to engage in community preparedness and response

When it came to motivation to help their community, the impact on loved ones and family was an important factor. **Neighborhood Association Member** remarked: “I think it's because of the fact that there are multi-generational families living in these neighborhoods [...] You know, there's a lot of that sort of backbone of community here.” This remark illustrates the significant influence that having strong ties to a community has on motivation to prepare for emergencies. If emergency management technology does not address the needs of the larger community (e.g., families, neighborhoods), it will be less effective and have lower rates of adoption.

This focus on community is not static. As **Community Garden Volunteer** stated “I know, we're all part of one community. And sometimes I forget until it becomes really scary”. Similarly, **Professional Flood Manager** observed that interest in preparedness can change relative to the recency of a disaster. This transient nature of preparation once again illustrates the cognitive biases at play during emergency management (Linnemayr et al., 2016). One recent example that might have prevalence for some is one participant's recollection of the toilet paper shortage at the beginning of the pandemic. The participant had access to lots of toilet paper at the beginning of COVID-19 and shared it with his close-knit network of friends and family, showing this dependence upon networks of community. Specifically from the neighborhood association interviewees, there was a very physical component to

the support. If the power goes out in a windstorm for a neighbor but not another, it was remarked upon how they would help each other with a power cord. During COVID-19 a neighborhood used an app where the older adults could list what they needed and members in the community could bring it to them to lessen their risk of going out. Being in close proximity to visible needs in the community is another contributing factor that motivates people to help others.

5 IMPLICATIONS FOR RESEARCH ON THE DESIGN OF EMERGENCY MANAGEMENT TECHNOLOGY

The findings from the interviews provide insights into how to design and implement emergency management technology that is effective for meeting the needs of communities impacted by climate events and natural disasters. These findings add to our knowledge of designing artifacts for complex systems through the following contributions:

- There are significant barriers to investing in and engaging in preparedness on the part of individuals in a community. Even though communities provide collective resources during and after an emergency, the decision to prepare for emergencies before they happen is largely an individual decision and more work is needed to understand how these decisions are made. There are structural incentives and cognitive biases that need to be addressed in order to foster a culture of preparation instead of reaction, which is the dominant attitude of many individuals impacted by disasters.
- There exists a significant disparity in resources available to individuals within the same metropolitan area which results in a lack of willingness to engage extensively with preparation efforts since resources are so scarce already.
- This work brings together findings from the field of Emergency Management and Engineering Design through the application of design methods for needs elicitation and the development of future directions for the design community to engage with developing solutions for these complex systems.

The main goal of this study was to understand how individuals in specific communities make decisions about adopting technology and tools for emergency preparation and what factors influence this decision-making process. The results of our interviews with members of a medium-sized midwestern US community reveal a complex network of interrelated factors at the individual, community, institutional, and society level.

These results have several implications for the design of artifacts to be used in this complex system. First, more research with a broader set of communities is needed to understand the relative tradeoffs of developing solutions geared at helping individuals prepare for emergencies versus solutions focused on recovery after an emergency. Research in this space plays an important role in determining the best strategy for developing technologies that are either built to reinforce existing behavior (e.g., reactive behavior), change behavior (e.g., encouraging preparedness), or a combination of both. Second, efforts to develop technology that does not consider the fundamental capabilities of individuals and communities to behave in a proactive manner are bound to struggle with adoption, and can potentially neglect the needs of underserved and under-resourced communities. Pioneered by economist and philosopher, Amartya Sen, the Capability Approach is a promising framework for understanding how and why individuals prioritize certain behaviors over others, even if said behaviors do not serve their self-interest in the long term, in large part due to individuals' capacity and freedom to make these choices without obstacles (Robeyns, 2005). In other words, simply building technology that helps individuals and communities prepare for emergencies does not take into account individual and community capability and capacity for engaging in preparation. Lastly, research in this space should focus on integrating behavioral theories that are well-studied in emergency management literature such as The Health Belief Model (HBM), Extended Parallel Process Model (EPPM), Theory of Planned Behavior (TPB) and Social Cognitive Theories (Ejeta et al., 2015) with established design theories and approaches such as Robust Design (Hasenkamp, 2009) and Decentralized Design (Bakule and Lunze, 1988) which are both approaches for building systems that are resistant to unwanted perturbations such as those found in the emergency management space.

Future studies should examine the impact that community involvement with government planning of risk reduction can have on emergency management practices. Specifically, our study shows that involving participants in developing these solutions might create a better understanding and buy in from the participants and communities. Assessing baseline knowledge and beliefs about risk reduction is also an important next step. Even if a community has the means to prepare for emergencies,

research has shown that a baseline of understanding about climate hazards for adoption policies is a prerequisite for effective preparation (Lee and Hughes, 2017). Additionally, while generalizability to different types of communities was not the goal of this study, a wider range of participant roles, experiences, and identity will help with gaining a broader perspective on community motivations for emergency preparation. It is important to note that while the original focus was on emergency preparedness, many participants discussed events that happened *after* an emergency. Community members that did not deal with emergencies on a professional level had a hard time recollecting emergency preparedness that they had done, or simply stated that there was not any preparation done. Much of the research on motivation that impacts preparedness at a community level is conducted on attitudes and events that take place after or during an emergency. Future studies should investigate the cognitive biases and motivational factors that individuals have prior to emergencies in order to add to our knowledge about how to develop technology solutions that work prior to emergencies.

6 CONCLUSION

Our study revealed the complex network of organizational structures, community context, and behavioral and cognitive factors that play a role in user perception and adoption of technologies for emergency preparation. Communication between citizens and government employees is an important area of emergency management and needs to be an area of focus for design researchers in this space. Current theories in the emergency management literature should be integrated with established design theories and approaches to build a foundation for understanding how to develop technology that can be implemented in system complex systems. Technology solutions that are intentionally developed with these factors in mind can improve the well-being of communities that have historically been unable to engage in emergency preparedness efforts.

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