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Emergency Management Planning as Collaborative Community Work

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Emergency Management Planning as Collaborative Community Work*

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Abstract

Emergencies often have causes and effects that are global. However, emergencies are also inherently local: They occur in a particular place and point in time. While it is critical for governments and society to better organize emergency management top-down, it is also important to become more aware of local community-level values, planning, involvement, knowledge, and skill. Local communities plan collaboratively for potential emergencies of varying scales.

Our discipline of Human-Computer Interaction studies the interaction between people and computers. Researchers in this field consider how information technology affects emergency management. They aim to improve emergency management through the design of useful and novel interfaces to technology. The purpose of our work was to take a broader perspective on emergency management and investigate the models and patterns of emergency-related work practices. In particular, we examined emergency management from a local community perspective. This focus on local communities partly stems from our prior research on community groups and their use of information technology. It is also motivated by the realization that emergencies are local events, which happen in communities.

This paper reports on a study of one community's emergency planning activities. Five aspects of community preparedness are discussed: collaborative efforts, local area details, local culture, geographic information, and emergency plans, and a case study provides concrete examples of each. Local community preparedness is complex and gives rise to many collaboration issues. Revealing this complexity, the paper offers some implications for community emergency management technology.

KEYWORDS: emergency planning, ethnography, field study, human-computer interaction, community informatics

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INTRODUCTION

Emergency management is the planning, response, recovery, and mitigation that occur around a variety of potentially catastrophic events [6]. The focal events of emergencies can be human-caused or natural; they include acts of terrorism, bridge failures, and severe weather, among others. Emergency management (ideally) starts long before an emergency occurs, and often continues long after the immediate consequences of the emergency have been resolved. Vivid examples are the World Trade Center attacks of September 11, 2001, the Indian Ocean tsunami of December 2004, and the landfall of Hurricane Katrina in August 2005. Each of these emergencies had a focal event, but each entrained years of emergency management activity. Indeed, in these examples, emergency management is ongoing.

Although there are many debates about why, there is no doubt that emergency management has become a highly salient arena of work and activity in contemporary society. Many of the high-visibility challenges and controversies in emergency management pertain to the coordination of humanitarian relief across organizational boundaries and often from great distances from the scene of the emergency. Tragically, this point is often best evidenced by emergencies that become disasters. In the aftermath of the World Trade Center attacks, a lack of planning for communication caused many deaths [12, 13, 14]. The Hurricane Katrina response has become a textbook example of how well-funded but uncoordinated relief capabilities of local, state, and federal agencies can be ineffective.

An obvious and urgent response to these failures is to standardize communication protocols and to formulate explicit plans about how various assets and capabilities can be effectively coordinated. Many initiatives throughout the world are addressing such issues, but in many cases these initiatives are mandated, funded, and managed *top-down*. For example, in the United States one of the most visible emergency management initiatives was the organization of the Department of Homeland Security, a cabinet-level organization designed explicitly to redress communication failures that had allowed and aggravated the World Trade Center attacks.

It is certainly appropriate for government agencies to take initiative in organizing social and technological infrastructures to better respond to emergencies. However, initiating these reforms strictly top-down could fail to effectively leverage (or perhaps take notice at all of) locally based resources that could play useful, and perhaps critical roles in given emergency operations. But worse than just overlooking such local resources, top-down initiatives might even undermine locally based capacities for planning, detecting, responding, recovering from, and mitigating risks, threats, and emergencies. Indeed, the

miscoordination across levels of government in the Katrina response is a case in point. In that case, the Federal Emergency Management Agency (part of the Department of Homeland Security) failed to make any use of sources of local knowledge with disastrous consequences.

Our research approach is to consider emergency management activities from a community perspective [18]. Emergencies may be natural or induced by human agency, but they always directly impact geographic communities. Because of this effect on communities, we conducted a field study of the emergency planning activities in one community. We asked questions about their preparedness and the activities they engage in to be prepared. Our goal was to understand how one local community is arming itself for the next terrorist attack or natural disaster.

Through this work we realized that there is an enormous underground effort occurring within our town. It involves many community players with an approach that solicits local area knowledge and relies on local expertise. This type of preparedness contrasts with that managed by top-down forces such as the Department of Homeland Security, the Federal Emergency Management Agency (FEMA), or even the state-level Pennsylvania Emergency Management Agency (PEMA). The local planning occurs through a collaborative effort with a focus on local area details.

Emergency planning and management is often characterized as a professional work activity supported by advanced interactive technologies. In our home discipline of Human-Computer Interaction there have been studies of emergency call centers and hurricane crisis management centers [3, 10, 15, 22], and technology-focused studies of how ubiquitous computing systems [7,8], interactive large screen displays [8, 17, 19], and simulations [9, 11] can improve performance. Obviously, the view of emergency planning and management as high-tech professional work is important, but we would argue that it is not comprehensive. In this paper we report on a field study of emergency management in a small community. What we observed was fairly low-tech but very broadly collaborative *community work*.

In the following sections, we describe our ethnographic approach and highlight five aspects of local community emergency planning: collaborative efforts, local area details, local culture, geographic information, and emergency plans. Each aspect is explained using examples from a case study of a small airport. The paper concludes by discussing some requirements for supporting community emergency management.

ETHNOGRAPHIC APPROACH

To study community emergency management, we adopted an ethnographic approach and partnered with local emergency management in rural State College, Pennsylvania. This is a university community with about 40,000 full-time students and 80,000 residents in the surrounding townships. We established a relationship with the local emergency management coordinator (LEMC). His job is unique in that it includes two positions: emergency management coordinator for the University and for the six local townships of Centre Region. He also fulfills the Pennsylvania state mandate requiring each township to have an emergency manager. The LEMC has much experience with emergency management, especially in dealing with hurricanes and their effects. He spent over ten years in Florida in a similar position that involved a large university.

In a nine-month period, we conducted five semi-structured interviews with the LEMC and accompanied him at eleven, emergency-related meetings in the community. The primary method of data collection was observation, which was recorded in field notes. Secondary sources of data collection included meeting documents (e.g., agendas, minutes, and other handouts), archival records (e.g., emails and web sites), and audio recordings of some of the emergency planning meetings. The interviews focused on the LEMC's approach to emergency management and his perception of the local activities in the community. They were not recorded or transcribed in order to develop a mutual partnership.

To analyze the data, we triangulated the multiple sources of data collected. This occurred in monthly research group meetings. The group reflected on the collected data to generate collaborative interpretations. This process of data analysis helped to remove the individual researcher's subjective bias, thus increasing the reliability of data analysis.

LOCAL COMMUNITY EMERGENCY PLANNING

Local emergency planning work is invisible work. The planning activities are both expected and part of the background, making them invisible. This corresponds to the concept of disembedding background work [21]. As a member of a local community, one often *expects* that an ambulance will respond to a multiple vehicle accident and that preparations have been made for severe winter storms. Many community members know the physical locations of the local fire stations, and they expect a coordinated response in the event of a burning building. The expectation is not always explicit, but rather people assume that the emergency planning work occurs. In the U.S., this was also part of the shock

regarding Hurricane Katrina – people couldn't believe that provisions had not been made for rescuing the poor.

For many community members, emergency planning occurs in the background. The community members are not engaged in the planning activities, nor do they observe the meetings or memos that are exchanged. People see the effects of planning, however. For instance, in attending a sporting event, security guards and ambulances are often visible, an indication of emergency planning. The security and ambulances are not the community members' primary interest, though, and they view them as background to the sporting event. Emergency planning work could even be considered "going backstage" [21]. Much preparation occurs behind the scenes and results in a visible public display. Their training and practice typically occurs outside the public eye, while their response in an emergency is visible and often criticized by the public.

Collaboration to Ensure Preparedness

The community of State College is not particularly large, but it has a single person dedicated to local emergency management. There has not been a major emergency event since the LEMC took the position two years ago, but he has been planning and preparing for emergencies. In addition to this individual commitment, the community is prepared through multiple collaborative efforts. The LEMC facilitates much of this collaboration, bringing together different first response agencies, townships, University departments and administrators, managers of local businesses, and other community members.

Many local agencies are involved with community emergency planning. In State College, the LEMC converses with fire departments, police departments, local ambulance services, the hospital, hazardous material experts, the Red Cross, the local school board, and the 911/Emergency Communications Center. All of these people work together to help ensure community preparedness.

Emergency planning is not accomplished through one meeting of the appropriate representatives. It is an ongoing process within the community. Multiple, simultaneous projects explore different aspects of preparedness. For instance, there are ongoing discussions about purchasing generators for shelter locations, developing an airport emergency plan, and establishing the University's essential services, among others. These activities occur through public and private meetings. Planning groups consider the potential emergencies, develop emergency plans, and then exercise the plans in practice situations.

Local Airport Case Study

A specific example of the collaboration involved in emergency planning is the local airport at State College. The University Park Airport is small and offers both

limited commercial flights and services for private planes. It has one runway and no air traffic control tower. Recently, there have been regular meetings at the airport to discuss the emergency plan. The director of the airport invites representatives from the county 911/Emergency Communications Center, Penn State's Department of Public Information, Penn State's Hazardous Materials Team, Bellefonte Fire Company, University Police, University Ambulance Service, and the local FBI office. There are no computers at the meetings; everyone takes notes with pen and paper.

The group is currently meeting to plan a simulated exercise. A year from now they anticipate conducting a more extensive drill. Their current goal is to evaluate and improve interagency communication among first responders. At the meetings, they work together to decide how the exercise will be played out and how they will evaluate it. The exercise will be a "functional," as people will walk through their response to a simulated event from different physical locations using landline phones, portable radios, and cell phones.

One meeting focused on the anticipated radio communication procedures. The group was working to determine the different channels when the county-level emergency management coordinator said, "Let's walk through that once.... The first unit on scene obviously's going to be the two guys standing up there, line services. Where should they go? The second group of people on scene is probably going to be the police. Where should they go? And how should that transfer happen, if the transfer in fact happens. You're coming in. How should that happen? Let's go through that whole thing step by step." This shows the group's attention on coordinating the sequence of response steps. They wanted to identify who would be communicating on which radio channel as each first responder arrived.

Local Area Details Focus Planning Efforts

Community emergency preparedness requires an understanding of the local area. Individual communities differ in size, location, and organization, among other things. These characteristics are reflected in the emergency plans. The plans are tailored to the community and the local area details provide the context.

Numerous community details can be considered in generating an emergency plan. Arguably one of the most important details is first responder information. The types of first responders, the number of first responders, the locations of first response agencies, and their corresponding capabilities are all crucial. For instance, in State College there are three fire companies and five police departments. There is also a hazardous material team, two ambulance services, one hospital, and a county-run 911/Emergency Communication Center.

Another local area detail is the community's demographics. Information about the population is important to identify. State College is a unique community

with students between the ages of 18 and 22. Most of these students are away from home and their parents are concerned for their safety. There is also a significant international population with many non-native English speakers. This could necessitate interpreters during an emergency event.

In addition to demographics, local communities differ in their available facilities and infrastructure, including: transportation terminals, industrial sites, nuclear reactors, power-generation plants, and large-capacity buildings and venues. The State College community has many specialized emergency plans for its facilities. The University, for example, has a small nuclear reactor and many large-capacity venues (e.g. dormitories, academic buildings, sports facilities, and theatres).

Emergency planning also examines details about the geographic area. The terrain, geological structure, weather patterns, and major highways are all indicators of likely emergencies. State College is located within a valley and the surrounding hills either protect it or harbor the weather effects. There is also a history of sinkholes. An interstate highway lies just north of the region and another is being constructed that will pass through the area. Looking at weather patterns, winter storms, summer heat, and lightning are likely. As an aside, tornados were thought to be the greatest threat when the LEMC began his position, but he has since discovered that no tornados have ever touched down in the community. This emphasizes the need for local details that are accurate and not based on local folklore.

In State College, the LEMC has compiled these local area details to analyze different hazards, or emergencies, and their likelihood. This has focused the planning activities and increases the community's preparedness. He has also investigated the local area resources, such as dump trucks, buses, generators, and traffic cones, which are available for use during an emergency event. A dump truck is not limited to hauling away debris, but it also can block a roadway to limit traffic around an emergency scene.

Local Area Details with the Airport

The University Park Airport is unique to the State College community. Most of the air travel is University-related involving sports teams and University visitors. Such local area details are reflected in the emergency planning efforts. For instance, a representative of the 911 Center made this comment about news reporters: "But they're vultures! If there's a crash … and it's the football team!" The University's football team is cherished within the community, and her comment shows how this influences the planning discussions.

Another local detail to consider is the local first response resources. At the airport, there is an onsite fire service that is expected to arrive first. Their capabilities are discussed in the following excerpt:

> **Policeman:** I'd be concerned with that, with your staffing. If you only have two people in your truck and you have an active fire, you're going to be putting the fire out, you're not going to be answering your radio.
>
> **Onsite fireman:** The other side of the coin is, there's times when there's only one guy in that truck too!

The group is walking through an after work hours situation at the airport. Their concern is how the onsite firemen will communicate the extent of the incident to those in route. The local detail that only one or two people will be available prompts the conversation.

Local Social Structure and Culture Direct Emergency Planning

Community member roles, such as first responder, emergency manager, and local businessman, offer different perspectives on planning. Each individual involved brings a unique set of beliefs and opinions. In State College, mediating this social landscape and agreeing upon a common emergency plan can be challenging at times.

Many first responders are volunteers who contribute when they can. This is especially true in rural towns, such as State College. First responders, such as firemen, often do not commit to weekly work schedules or promise a certain number of hours. This creates a significant dilemma for sharing planning information. How will everyone know the plan? One solution is to rely to on word-of-mouth. For example, the LEMC in State College holds meetings with local fire chiefs to convey an emergency plan. After the meeting, he leaves it to the fire chiefs to pass on the information to the social network of volunteers.

Another issue is that the social dynamics within a local, first response agency, including the organizational leader, will periodically change. This emphasizes the need for emergency managers to establish relationships with agencies as a whole. Engaging the entire organization in the collaborative planning activities ensures multiple perspectives are voiced. It also discourages the negative formation of social divisions within an agency, which is currently happening in State College with a local fire district. Many community members are unhappy with a local fire chief and his corresponding board members' decisions. The chief's views are not necessarily those of everyone in the fire district, however.

Social divisions also bring up an important observation about emergency management: local politics and social culture dominate the ongoing planning activities. In the fire district example, some community members believe that the fire chief spent too much money on unnecessary fire equipment and that the organization is financially irresponsible. Such statements have caused the district to be defensive, as opposed to cooperative.

Within the field of emergency management, there are ways to address these social challenges. The LEMC in State College manages the local social structure and culture by taking advantage of the existing people, policies, and procedures. This recognizes the expertise of both individuals and organizations. The goal of the LEMC, then, is to "connect the dots," or in other words coordinate these people and agencies. For instance, it's important for the public works director in one township to meet the town manager in the adjacent township, as the two will likely exchange emergency-related equipment.

Lastly, emergency planning is faced with the issue of vigilance. This is less a cultural issue than a social one. How can community members remember the agreed-upon emergency plans over time? Are there ways they can remind one another of the plan? In State College the LEMC writes plans that are consistent. The idea is to respond in a similar manner as possible for each event, limiting the reliance on personal memories.

Local Social Structure and Culture in the Airport

The airport case study has its own set of social and cultural issues. Over the last few years, there have been numerous unsuccessful exercises at the airport. This social tension is visible in an airport director's remark: "Let's start the discussion off by just going around the room and having each of the agencies talk about what they felt worked and didn't work. . . . judgments aren't being made of the agencies of what went wrong and what went right." The airport director wants to create a positive atmosphere of cooperation and information sharing.

The organizations within this planning group have worked together during prior emergency events and will continue to interoperate in the future. This brings up both the positive and negative experiences of the past. For example, the first responders have communication issues that have gone unresolved. The county emergency manager makes this point: "When you initially come on the radio . . . do you come on as 2031 or do you come on initially as command? The reason I bring that up is at least in the three years I've been here that's been the confusing part . . ." This statement has a negative tone, which shows how personal opinions and, on a broader level, the local culture impact the planning process.

Geospatial Information in Emergency Planning

Geospatial information plays an important role in emergency management activities [2, 4]. A common way to communicate geospatial information is through a map. In our fieldwork, maps outlined: the floor plan of a building, the roads through the University's campus, the parking lots surrounding a sports arena, and the hydrants within town. The LEMC used these geospatial representations to document aspects of his plan. For instance, a map is included

with the University football stadium plan to mark the staging areas where emergency responders are to report.

Maps can also be used in developing the plan. Examining emergency planning meetings in State College, much geospatial information is shared. The stakeholders deal with different understandings of space as they develop a plan. They find that they need to agree on the terms used to reference physical locations. When all of the first response agencies are in agreement and knowledgeable about who goes where and when, this will lead to an efficient and effective response. For instance, with the football stadium the LEMC wants to make sure that there is no confusion over the planned emergency vehicle traffic routes. These routes need to remain open and accessible during a response, not cluttered with first responders' personal vehicles.

In response planning, participants also exchange information to understand the likely hazard locations. For instance, in the State College planning meetings, they use a geospatial map to identify the concession stands in the football stadium, which are susceptible to fire. They also use a map to discuss stadium evacuation and vehicle traffic management in case there ever is an emergency. Mass and/or partial evacuation of a 107,000-seat stadium because of bomb threat, lightning strike, etc., and game day traffic and vehicle parking are real concerns.

Geospatial Information with the Airport

The airport case study provides many examples of geospatial information sharing. At one airport meeting, a large map of the airport grounds was hung on a wall to establish common ground among the meeting participants. The map on the wall was part of a Tabletop Exercise. They used an airplane crash scenario walking through, step-by-step, every action in the response and considering the likely locations of vehicles and people.

Subsequent airport planning meetings have also involved geospatial information sharing. As the group works to plan the "functional" exercise, they have considered the media staging area:

> **Police chief**: What is the old admin building being used for?
>
> **Airport manager:** There's no room this big over there . . .
>
> **Hazardous Materials expert:** What about across the street in State-of-the-Art or something? Cause obviously in a major incident they're not going to be here within the first 15 minutes like Centre Daily Times and everybody else.
>
> **Airport director**: We can make use of one of our hangars as a staging area for the media.

Airport manager: Yeah, what about Hanger I.

Public Information Officer: How far from this building is it?

Airport manager: About a half mile. It's the last building down there.

Police chief: And there'd be room, like in the parking lot, for satellite trucks and stuff like that?

In this dialog, the group uses geospatial references to physical buildings, rooms, and parking lots. They also include many spatial concepts, including the size of rooms, the distance between locations, and the capacity of a parking lot. This shows the range of geospatial information exchanged in emergency management.

Documented Emergency Plans Collect Useful Information

When we think about emergencies one of the first thoughts that come to mind is: "We need a plan." Establishing this plan is the overarching goal of emergency planning. In State College, most of the formal, emergency plans correspond to a text document typically printed in hardcopy, bound, and placed on a bookshelf. Other plans are more informal and spontaneous. For instance, in the State College meeting shortly before Tropical Storm Ivan, each participant stated his anticipated response. This allowed everyone to understand the plan as a whole, but the only documentation was in the participants' individual notes.

Emergency plans inevitably have time-sensitive information. Populations change, contact information changes, as do government officials, leaders of organizations, and local area business managers. Geospatial information also changes as land is developed and buildings are razed. According to the LEMC, all plans correspond to a moment in time. Such timeliness is partly due to the printing and distributing of information, but placing the information in a central, online location is also not realistic. In Pennsylvania, there are restrictions on making plans publicly available because they pose a security risk. If someone knows the planned response, they can undermine it. Another reason not to post online is that the Internet may not be available in an emergency situation.

The emergency plans in State College do not describe a recipe for every response situation. Rather, they outline a set of common response procedures. They specify the responsibilities for specific individuals. Given this description, an emergency plan is not likely to be followed religiously during an emergency. The intent of the emergency plans is to be used as a guideline for the procedures and responsibilities. This description corresponds to Suchman's view of plans as resources [20] and Bardram's work on "Plans as Situated Action" [1].

In our fieldwork, at least five different types of emergency plans have surfaced. The six townships use an identical emergency operations plan. It is

intentionally short and includes some local area information, procedures for declaring an emergency, checklists for certain personnel roles, and a listing of twelve emergency support functions (ESFs). These ESFs correspond to twelve primary roles that need to be filled in the emergency operations center and they include items such as a transportation role and a communications role.

Examining the ongoing University activities provides a different view of emergency plans. The essential services group is considering a scenario of a weeklong major power outage in the middle of winter. Their plan documents the available resources on campus and outlines the additional resource needs. In the shelter component the group identifies places to house students so that they can be warm and fed without purchasing generators for all 50 dormitories. The Continuity of Operations Plan is a combination of multiple, departmental plans that describe how to continue essential University services during an emergency. The individual department plans specify the activities that must continue, such as the police responding to burglary calls.

Lastly, the townships are composing another type of plan, a hazards mitigation plan. This plan is focused on preventing an emergency situation. One example is to take action so that a road does not become flooded with heavy rainfall. The hazards mitigation plan outlines preventative actions. It lists the effects of different types of emergencies, how the issue is currently resolved, and, most importantly, how the problems can be prevented from reoccurring.

The Airport Emergency Plan

The State College airport's emergency operations plan is different from that of the municipal and university plans. It documents the sequence of events that should occur whenever there is an emergency situation at the airport. It explicitly describes who communicates with whom, when, and what information is passed, at the onset of an event. For instance, at one meeting the group discussed the notifications that need to be made during an incident:

> **Airport director:** We at UNICOM made the initial call to TSA. It's not in our plan right now…. FBI is only upon request. I think that now…. Probably needs to be changed.
>
> **FBI agent**: Yes, that is right. When you go to notify TSA, notify us.
>
> **Airport director:** Is it more for the airport to make that notification automatically to the FBI, or is it just followed down the road - we make the initial call to TSA and TSA makes the call to the FBI?

The group wants to determine how the information about the event will be relayed. Their goal is to document this procedure in the plan.

COMMUNITY WORK

This paper has focused on the planning efforts in one community. It has described how emergency planning is a behind-the-scenes activity, how it is a collaborative activity, and how it is an inherently local activity with geography, local area resources, and culture affecting the effort. This description demonstrates that emergency management is a community activity.

All of the first response agencies observed within the fieldwork were local to the State College area. These organizations were highlighted because of their involvement with emergency planning, but from a larger perspective they are also community organizations. Like a parent-teachers association, the fire department, hazardous material experts, and ambulance service observed are local community groups. The individuals who participated in the emergency discussions representing these organizations were civic-minded people who reside in the local community.

In addition to the agencies and people, the activities and the information exchanged were community-based. The airport group was focused on the particulars of that airport. They were not concerned with the emergency plans of other airports or how national agencies, such as the FBI and TSA, would be involved in the response. They reviewed their specific plan and included arrangements for notifying these agencies. It was a collaborative effort toward a community-based solution. The local agencies met together to discuss their coordinated response to an event. In these deliberations, local geospatial information was also exchanged. The group wanted to mutually agree upon staging areas within their community's locale.

This description of emergency management as community work has been recognized in the past. In the late 1990s, FEMA initiated a program called Project Impact-Building Disaster Resistant Communities. It encouraged communities to perform mitigation steps. The program included four phases, including building partnerships and identifying hazards, but was only aimed at mitigation and did not address the other aspects of emergency management: planning, preparedness, response, and recovery [6].

Prior social science disaster research has also recognized the community-nature of emergency management. This body of work states that disasters impact communities. It reflects on how individual, organizational, community and societal behaviors are complex [16].

These sources point to a need to consider community work in studying and designing for emergency management. The findings from this study offer an initial viewpoint. However, each of the aspects covered could be probed further to better understand the nature of emergency work. Such an investigation would

better inform the design of information systems. The next section begins a discussion of the design implications for community emergency management.

DESIGN IMPLICATIONS

Findings from our fieldwork point to a number of general requirements for designing software. The study emphasizes the need for a community informatics approach to design. As defined by Gurstein, community informatics is "the application of information and communication technologies to enable community processes and the achievement of community objectives" [5]. This directly applies to emergency management activities. We have previously described how emergency management can be a community process with community objectives. Adhering to the concept of community informatics, technology designs should foster this community-level work. They should enable communities, like the community of State College, to come together to address emergency concerns.

In our work with the airport, we observed emergency planning discussions. Through these activities the local community was working to be prepared for an airport emergency. In this example, the collaboration occurred through multiple face-to-face meetings. This work practice highlights the importance of social gatherings in emergency planning. By meeting together, inter-organizational relationships are built, and communication is encouraged. This has implications for a community informatics solution. The technology needs to be designed for these same-place meetings and continue to encourage relationship building. One negative aspect of the current meetings is the lack of an agenda and documented decision-making. This is one way technology could enhance emergency planning and possibly improve the response.

Community-Specific Requirements

The airport case study illustrated how local area details, local culture, and local geography influence emergency planning. Every community is unique with its own first response agencies and emergency threats. This corresponds to community-specific emergency expertise, community-specific equipment resources, and a community-specific emergency culture. Information systems designs need to respect these differences among communities.

It may be that a single system design will not support every community. Our observations are based on one community and it's procedures of emergency management. Much of the approach has been initiated by the LEMC based on his years of experience. Other communities may require different system designs than those considered important for the State College community.

Multi-Agency Requirements

One overarching finding of this work is that emergency management is a complex system of intra- and inter-agency collaboration. This is evident in looking at the composition of stakeholders in emergency planning meetings. This multi-agency collaboration is not unique to State College, but rather is a facet of emergency management. This creates a requirement for information systems in that technology needs to support these collaborations. It is important for designs to be inclusive and allow multiple agencies to contribute. Emergencies are extreme events, which can involve people and organizations assisting in unusual ways. First responders from adjacent communities will likely respond, even though they were not part of the planning meetings. Also, local businesses, such as a construction company or a tow-truck company, may be called on for their equipment resources. Information systems for emergency management need to consider the diversity of stakeholders and their need to work together. The design principles for a Dynamic Emergency Response Management Information System also hint at this requirement [23]. They discuss the need for a resource database that is maintained by the owners of the resources.

Volunteer Requirements

With the focus on a community application, it is also important to consider the difference between volunteers and paid emergency workers. In State College all of the firefighters are volunteers. According to the National Fire Protection Association (www.nfpa.org), in 2005 72% of all the firefighters in the U.S. were volunteers. Technology design needs to keep these users and their corresponding role in mind. Systems need to be easy to learn and easy to use, based on the volunteer's intermittent activity. They also need to be widely accessible due to differing work schedules and different levels of computer expertise.

CONCLUSION

We have emphasized the complexity and the importance of emergency preparation and response at the local community level. As we discovered, the planning that is involved at local levels involves substantial understanding of local geography and socio-cultural issues. It is obvious when pointed out that all emergencies occur in some local community. But this is not as obvious in the national and international discourse on emergency management. For example, in the United States, emergency management is concentrated in federal agencies and to a limited extent in state government. Attention and support for local community development and coordination is minuscule.

We see a need and an important opportunity for our Human-Computer Interaction research community to play a more central role in understanding the needs of communities in emergency preparation and management. In the next phase of this research work, we are developing envisionment scenarios with the LEMC to understand, explore, and critique potential technology-based enhancements to current practices [18]. Our goal is to design, prototype, and evaluate a candidate software solution that supports interagency relationship building and geospatial discussions, augmenting the important face-to-face meetings.

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