Maintaining and Creating Social Infrastructures: Towards a Theory of Resilience

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ABSTRACT

Societies rely on the social infrastructure for proper societal function. When crises emerge, the importance of the social infrastructure magnifies as people often rely on others, both known and unknown, for support. For citizens experiencing a war environment, however, societal trust can be affected and we show how technologies are used to maintain and create social infrastructures for resilience. Through interviews with 45 Iraqi civilians who had lived through the 2nd Gulf War, we found that people were able to evoke the social infrastructure through technological resources to maintain practices for work, to obtain goods and services, and to receive contextual support. We then theorize properties of social infrastructure that could be developed into affordances for new technologies to promote resilience during crises.

Keywords

Crisis, disruption, human infrastructure, resilience, social infrastructure, technology, war

INTRODUCTION

The world has always been unpredictable, yet human systems comprised of individuals, groups and organizations, find ways to function when wildfires and earthquakes destroy habitat, volcanoes erupt, and other forms of crisis emerge that disrupt daily life (Mileti et al., 1975). When these events become dangerous or negatively impact people's ability to engage in routine practices, human systems must develop strategies to circumvent or deal with the resulting disruption. When crisis events take place, the ways in which people work around disruption and get back on track is known as *resilience*.

ISCRAM and other sociotechnical venues have increasingly used the theme of resilience to design and discuss social computing systems that support natural disaster recovery (e.g. Palen and Liu, 2007; Vieweg et al., 2007). Information and Communication Technologies (ICTs) have become valuable tools for citizens during crisis events. For example, ICTs such as blogs and mobile phones support the spread of community-relevant information (e.g. Hagar and Haythornthwaite, 2005), facilitate accessing and disseminating information and aid (e.g. Palen and Liu, 2007), provide access to social support (e.g. Palen and Vieweg, 2008) and in the case of micro-blogs, support situational awareness (Vieweg et al., 2010). Social platforms, e.g. Facebook and Twitter, especially hold promise as tools for supporting people in disasters. What makes these sites unique is that people can articulate and make their social networks visible to others (boyd and Ellison, 2008). Unlike other technologies, such as the short wave radio, people can make connections that they otherwise would not have made by traversing other people's networks. Importantly, they enable a large number of globally distributed citizens to coordinate efforts in providing aid for disaster victims.

Previous studies have mostly focused on information dissemination and situational awareness during the *acute* stages of crises—especially those directly following a disruptive event caused by natural disaster. As such, they have focused on the non-routine activities that emerge in order to restore order and societal function—or, the activities associated with the recovery process. In this paper we depart from this focus and examine how technology supports resilience in a *chronically* disrupted environment. That is, we look at what underlies resilience through an examination of a population undergoing the ongoing disruption of war. When societies

experience the protracted disruption of war, routine activities such as work, socializing and travel become a struggle. Disruption becomes the new normal. In order to be resilient, people must constantly find ways to counteract what is taking place in the environment, yet little is known about the set of underlying practices that support resilience.

Here, we explore what underlies resilience, arguing that resilience is accomplished by the creation, recreation, and ongoing maintenance of *social infrastructures*. We envision these social infrastructures as a hybrid of the concepts of *human infrastructure* (Lee et al., 2006) and *social-media-as-social-infrastructure* (Nahon & Hemsley, 2013). That is, we extend the concept of social-media-as-infrastructure put forth by Nahon & Hemsley (2013) to acknowledge the practices of humans as a necessary element of a social infrastructure and use this lens to identify the properties of social infrastructures that enable resilience. Our intent is to begin developing a theory that can be utilized in studying resilience and ultimately into the development of technologies that help promote resilience.

Resilience during crisis events

Resilience has been defined in various ways, but the most common definition from recent literature centers on the reactive abilities (coping with a situation or "bouncing back") that individuals, groups and/or communities possess in the face of threat or disruption (Wildavsky, 1991). Discussions of resilience have identified various ways in which human systems are resilient (e.g. Kendra and Wachtendorf, 2003), and where one of the major sources of resilience is *improvisation* (Weick, 1993): the new behaviors that emerge in order to cope with unpredictability (Rodriguez et al., 2006).

Researchers studying human behavior in the aftermath of disruptive events, ranging from hurricanes to tornadoes, have identified several improvisational behaviors that emerge within organizations and groups, including: altering work locations (Webb, 2004), developing ad-hoc facilities to maintain organizational function (Kendra and Wachtendorf, 2003), modifying work hours to accommodate unpredictability (Quarantelli, 1996), or by developing new, or assuming additional organizational roles, where roles are the expected tasks associated with specific occupations. Other organizational properties of resilience have also been identified, namely: robustness, resourcefulness, redundancy and rapidity (Kendra and Wachtendorf, 2003). Moreover, human properties of resilience have also been classified, which enable individuals to respond to rapidly changing, unpredictable situations, including: communication, creativity, wisdom and respectful interaction (Weick, 1993).

Resources have also been found to play a crucial role in enabling resilience and have received special attention since they enable people to act in various contexts. People often improvise the ways in which they use tools or equipment to perform tasks (Weick, 1993) and from an organizational perspective, Feldman (2004) showed that when people's practices change, so do the ways in which they use resources. The meaning and use of resources depends on the situation. Thus, in the context of disasters, the meaning and use of resources will change accordingly. Although recent studies have started paying attention to the role of resources in the context of resilience, the role of technological resources and how they enable resilience through the evocation of social infrastructure have not received much attention.

Resilience and the social infrastructure

Whereas infrastructure is typically viewed as consisting of the physical or technical foundations of society that enable human action, such as power grids, highways, and communications infrastructure (i.e. satellites, landlines and cellular networks), and social media as a social infrastructure (Nahon & Hemsley, 2013), recent analytical attention has been paid to the importance of the *human infrastructure*. Lee et al. (2006) describe the human infrastructure as "the arrangements of organizations and actors that must be brought into alignment in order for work to be accomplished" (2006, p. 484). For our purposes here, *work* is the work of being resilient in a chronically disrupted environment. Like "artifactual" infrastructures (Lee et al., 2006), human infrastructure is composed of various social, organizational and technical components, including shared social practices, information and material flows, and the associated processes involved in building and maintaining these practices and flows (Star and Ruhleder, 1996), but the conceptual focus is on the alignment of human action and interaction in support of a common goal, such as work or community resilience.

For this work we extend the concept of the human infrastructure through the lens of *social infrastructure, which* includes, but goes beyond, the technologies that support the alignment of human action and interaction to include the conceptual broadness of human infrastructure. A social infrastructure can consist of known and unknown connections. That is, our family and friends are members of our social infrastructure as are the highway maintenance crews who sustain the roads that we rely on to visit our friends and family. Members of the social infrastructure that are unknown to us play a crucial role in the alignment of human action and

interaction in support of common goals such as work and social activities. Thus, the social infrastructure serves as an underlying foundation of social systems like workplaces, social activities and even societies (Lee et al., 2006). We use this concept of a social infrastructure as a lens to study how humans in technology act and interact to accomplish resilience.

Star and Ruhleder (1996) note that infrastructure is typically invisible until it breaks down. Societies often take roadways and freeways and freeways for granted until a bridge collapses. People become highly cognizant of the transportation infrastructure during such failures. In the case of social infrastructures, external forces, such as natural disasters, can disrupt and make visible these social infrastructures. This can result in changes to the social system through a process that Barley (1986) referred to as *slippages*. That is, when individuals act in ways outside of the rules and norms of the social system, those rules and norms can change. When physical or technological infrastructures are disrupted or changed, the human infrastructure will likely adapt to changes in other infrastructures as a result of new forms of human agency.

Moreover, a social infrastructure often engages in *articulation work*—the work necessary to resolve breakdowns (Star and Bowker, 1999). This is especially true during disruptive events which can trigger changes to the human infrastructure. These changes result from people adapting their practices to work around environmental ambiguity. This perspective is important to our understanding of disaster recovery. When societies experience disaster events, citizens often undergo a period of adaptation—known as the recovery process—whereby people engage in a variety of activities to restore normal life. Several models of the recovery process exist, such as those developed by Powell (1954) and Hoffman (1999), which describe the various pro-social activities that emerge in order to restore societal function in the aftermath of disaster. Here, we are not concerned with the details of these models, but emphasize that across the various models that have been developed, the key construct enabling resilience is the emergence of old and new forms of social infrastructure that engage in the articulation work necessary to resolve breakdowns and restore societal function (Hoffman, 1999; Powell, 1954). For example, old social infrastructures consisting of formal responses such as police and firemen arrive on the scene to provide assistance and aid to those who need food and clothing. Similarly, new social infrastructures, or emergent groups, often form to engage in a variety of activities, such as establishing shelters for those who have lost their homes. The aid and assistance being provided by people affected by a crisis can consist of close ties, such as family, friends and neighbors, and/or unknown ties, such as strangers from the surrounding community.

Recent work in the field of crisis informatics has shown that, today, the recovery activities that were once confined to the site of disruption, are now emerging across the assemblage of communication technologies at people's disposal, such as mobile phones, Twitter, Facebook, blogs, and photo-sharing sites (e.g. Palen and Liu, 2007). Prior to the emergence of online media the social infrastructure was confined to the physical environment, the current social infrastructure is distributed both in the physical world and through the technologies that connect people together. Thus, our concept of social infrastructure is a departure from the human infrastructure in that it includes *the combination of interconnected media and collocated interactions*. It is enacted face-to-face or when using technology to interact with others. When disruption occurs people may seek information about family and friends by traveling to the site of disruption or via technological resources, such as mobile phones or Facebook.. Moreover, they may also choose to connect with strangers on Twitter to gain resources that will help them make sense of the environment and inform their decision-making processes.

This study builds on previous work that has found technology to be valuable during prolonged disruptive events (Mark and Semaan, 2008), which have reported on how people experiencing ongoing disruption have used ICTs such as blogs and Facebook to be resilient in collaboration through their ability to create assemblages of physical and technological resources (Mark and Semaan, 2008), create trustworthy contexts through which they can engage in daily practices (Semaan and Mark, 2011), engage in recovery practices such as receiving aid, assistance and emotional support (Al-Ani, Mark and Semaan, 2010), and develop new social arrangements through which they could constantly repair the infrastructures supporting practices for education, travel and information (Semaan and Mark, 2011). Through our analysis of qualitative data with a population living through war, we present how people both maintain and build new social infrastructure in order to maintain practices and, in turn, facilitate resilience.

METHODOLOGY

The data presented in this paper is from an ongoing study that investigates how people use technology to maintain routine practices during war (Mark and Semaan, 2008). As such, we examined technology use amongst the Iraqi population during a protracted period of disruption: the 2nd Gulf War in Iraq from March 2003 until December 2011.

Due to the risks associated with traveling in a war we conducted interviews using telephone or Skype. When possible, we interviewed refugee's in-person in Southern California. The data for this work consists of the

transcribed interviews of 25 male and 20 female informants, conducted between April 2010 and May 2011.Interviews lasted from 2 to 6 hours and were conducted in both English and Arabic.

Our interview protocol built on our previous work (e.g. Mark and Semaan, 2008) and was structured as follows. We first asked participants to describe themselves, giving us basic demographic information. We also asked people to identify the technologies they used in their daily lives. This reflected our assumption that people's activities are multi-mediated and enabled us to collect data on the use of a variety of technologies. In subsequent sections, we asked people to compare their daily routines before and after the war.

Using Atlas.ti, the lead author employed a grounded theory approach (Strauss and Corbin, 1998) to code the documents. That is, open coding techniques identified general themes in the interview data. These themes were then reduced, under axial coding, to the themes presented in this paper.

RESEARCH SETTING

Our research findings emerged out of activities described by Iraqi civilians who lived through the 2nd Gulf War, beginning in March 2003. The conflict led to a complete breakdown in normalcy. With the physical infrastructure crumbling, clean water was scarce and electric service was sporadic. Random bombings made travel difficult and disrupted work and social life routines. Public spaces became fraught with danger as any stranger could be part of a militia and insurgent group. Individuals were suspicious of anyone they had not known before the war. The war displaced and separated family and friends, with some leaving the country altogether. New social norms emerged that severely and negatively impacted the lives of women and minorities. Simultaneously, the adoption of mobile phones and the Internet rose dramatically. Our focus is on the novel practices with witch these technologies were used for resilience.

MAINTAINING AND CREATING SOCIAL INFRASTRUCTURES FOR RESILIENCE

From our data, we learned that our informants were transitioning their sources of social infrastructures from being mostly within the physical world environment to online. During the war, mundane activities like working together and socializing became a burden due to the constant disruptions within the environment and the distance that separated family and friends. As such, our informants began using an assemblage of technologies, such as Facebook, mobile phones, Instant Messenger (IM) and Skype, through which they could connect with and, in turn, re-establish the pre-war social infrastructure. Forty of our informants described using these technologies for this purpose.

In many cases our respondents could not always re-establish their pre-war social infrastructure. In other cases, even when they could connect, their pre-war social infrastructure did not possess the information they needed in order to act in their new disrupted environment. Thus, a new activity emerged after the war. Of our informants, 37 reported using technologies to establish new social infrastructures, which consisted of old and newly formed connections, supported by the gamut of tools that became available to them, such as Facebook and blogs.

The combination of old and new social infrastructures, in turn, enabled them to activate different networks across the spectrum of offline and online social infrastructure, depending on their context and personal needs. The result was with a set of new mechanisms through which they could be resilient in maintaining routine practices. Whereas these new activities enabled resilience across a broad range of activities, such as for social life, travel and education (Semaan and Mark, 2011) here we will describe these practices with respect to obtaining goods and services, for work, and for contextual support.

Obtaining goods and services through the maintenance and creation of social infrastructure

Our informants indicated that, prior to the war, they trusted local shop owners and doctors and felt safe to travel, both locally and between cities. Today, Iraq's citizens face several challenges in obtaining services. After the fall of the UN-imposed embargo and Saddam's regime, Iraq's borders re-opened. New people arrived and established businesses offering new products and services. Mobile devices, computers, refrigerators and air conditioning units could be purchased from new local vendors. However, our informants noted that one post-war norm was a distrust of strangers. This made it difficult for people to know which shop owners were reliable.

Additionally, during the war militia targeted and attacked skilled professionals and educated elites. Many doctors were either murdered or fled the country. Thus, people found it difficult to find dependable doctors. The majority of doctors in Iraq today have only recently graduated.

Thirteen of our informants described using a broad range of technologies to constantly connect with old social infrastructure to seek trustworthy services. This practice enabled them to restore former practices. As such, when people needed to find a reliable doctor, purchase a computer, or obtain other services, they would contact

an individual with whom they had interpersonal trust using ICTs like the mobile phone, e-mail and Instant Messenger, to seek recommendations, or to receive assistance directly.

One informant, a male university lecturer in Mosul, described how he needed to find a doctor to perform a surgery in 2007. He faced several difficulties: the procedure was time-sensitive, the doctor he once relied on had been murdered, and as a new resident in a village in Northern Iraq, he did not know of other reliable doctors in the vicinity. He described how many of the best doctors had left the country, and how many were cautious in providing medical services for strangers, who, during the war, could have been hostile militia. Seeking one of the "few good doctors remaining", our informant used his mobile phone to contact colleagues at the university in Mosul, who also lived locally. His colleagues recommended a local doctor and also vouched that our informant was not a threat to the doctor's life. In this case, the informant's colleagues became the connecting link between himself and the doctor who ultimately performed a successful surgery.

Our informants also utilized their social infrastructure to solve problems related to the risks of travel. For example, one of our informants working in Northern Iraq needed to obtain his college transcripts from the university in Mosul, more than an hour's drive south. However, our informant, a member of the Shiite sect of Islam, described his fear of being stopped at a fake checkpoint and kidnapped or murdered due to his sect. Mosul was an area governed by Sunni militias who often targeted members of the Shiite sect and minority groups who traveled to and from the city. Instead of making the trip himself, he used using e-mail and Instant Messenger to contact friends from before the war who were of the Sunni sect of Islam. Through these contacts he was connected with a friend of a friend who lived in Mosul and could pick up the transcripts for him.

From these two cases we can see that our informants found that engaging in activities that were routine before the war were now fraught with difficulty or risk. We also note that our informants worked around these disruptions using a combination of newly imported technologies and their existing human infrastructures. That is, the social infrastructure, made up of the human infrastructure within which there were embedded along with the newly available technologies, afforded their local practices in support of resilience.

Going virtual and assuming multiple roles for work

A byproduct of the influx of people and militia groups is that Iraqis no longer feel safe in public places. Our informants reported being afraid to interact with others in public, which disrupted the working practices of those who worked in public places. This was especially true for those working for U.S.-based organizations. Terrorist and militia groups routinely targeted Iraqis who worked for, were seen with, or needed to use English to communicate with their American colleagues. Indeed, such attacks were considered the new norm and were expected.

During interviews, our informants who worked for American organizations expressed great fear in revealing their occupational identity to people they did not trust. Typically, people employed by U.S.-based organizations either worked in the International Green Zone or public locations. The International Green Zone is an area within which U.S. organizations operate and that is patrolled and protected by U.S. armed forces. Our informants felt that they were being followed and monitored by hostile forces when traveling to and from the Green Zone. They also reported that strangers threatened them and their families in public, such as when entering and leaving their workplaces or in their neighborhoods.

One element of resilience is the ability to improvise by altering work locations (Webb, 2004). Sixteen of our informants developed new practices using technologies that supported working virtually. This practice enabled people to work even when bombings, roadblocks and curfews prevented them from traveling to their work place. In the cases we describe below, people purposefully improvised when selecting work locations in an effort to prevent militia and insurgent groups from discovering their identities as employees of American organizations. As such, they utilized technologies to maintain their human work infrastructure, effectively instantiating a new social infrastructure that supported resilience in their work practices.

Our informants who virtualized their work routines described new practices including working from the privacy of their homes, or frequently altering the cafes and other places they worked. These practices allowed them to avoid risking traveling to and from the International Green Zone. As described by another informant, a female journalist in Baghdad:

"The last days I was in Baghdad, they told me they would kidnap [my son], so I took him with me everywhere I went. So I was working from several locations… walking from the house to the Internet café, and I get my work duties from different locations by the Internet. All of my work was done through the Internet from the house or different Internet cafes throughout Baghdad for six months. I was trying to trick [the people who were following me] so they wouldn't think I was working as a journalist…"

Another element of resilience deals with the way in which members of an organization assume multiple roles (Weick, 2003). Of our informants, 10 reported assuming multiple roles in an effort to support organizational continuity. For example, if a member of their organization could not travel or virtually connect to the work social infrastructure, our informants assumed different roles as needed, or sought out others who could..

One informant working as a journalist in Baghdad described how she and her colleagues often assumed multiple roles to maintain organizational function. Whereas she was typically a writer working from home and connecting with her colleagues using technology, at times she would "put on different hats" and work as the ground reporter or as an information facilitator. In cases where her ground reporter colleague was unavailable, she would use technology to seek out other members of the organization who could temporarily fill that. They would then communicate and share information using a variety of tools, such as e-mail, mobile phones and Skype, depending on the situation.

Thus our informants utilized tools such as e-mail, mobile phones and Skype that supported interacting with their human infrastructure in order to be resultant. Their new social infrastructure supported working remotely to protect their personal safety as well to maintain organizational function.

Thinking local, going global for contextual support

In the aftermath of the war, our informants described various issues plaguing Iraqi society that could be improved such as the physical infrastructure, human rights and religious freedom. However, they described not having the knowledge to solve these issues on their own. In an effort to address these issues, fourteen of our informants described a new practice whereby they constantly created new social infrastructure using technologies such as blogs, online forums and Facebook. That is, people wished to create an environment that was more conducive to a healthy and productive future for all of Iraq's citizens without war.

Following the war, electricity power stations were targeted by both Allied forces and later by militias. Efforts by the Iraqi government to re-build the power grid have been fruitless. Through the discussions our informants held with people they met online, they learned of alternative methods for providing power to their homes and workplaces. For example, a professor at a university in Baghdad described how he only had four to eight hours of electricity a day through the main power grid. He wrote a daily blog where he would discuss his situation. Over time his blog began to attract attention. Through the comments section of his blog he engaged in discussions with people living with the same physical infrastructures problems. From his readers he learned about resources explaining how to purchase and setup a generator for his home. After purchasing a generator and using it to power various necessities, he began pass this new knowledge on. Our informant used word-of-mouth networks to spread the information through his neighborhood and employed his mobile phone and Facebook to pass the knowledge on to his family and friends distributed across the country

Similarly, several of our informants described how, following the war, new conditions have emerged concerning gender roles (i.e. women are being subjected to newly emerging Sharia laws), as well as religious oppression in Iraqi society. Leveraging their newly created social infrastructure they learned about how people in other cultures and societies, especially in the West, lived. As a result, they sought to change various aspects of Iraqi society so that they and other marginalized people in the country could co-exist in peace. For example, one informant described forming alliances with Americans she met on Facebook in order to organize social movements. She and several of her American friends created a Facebook group through which they recruited likeminded citizens to help aid in the fight for equality in Iraq. Thus, Facebook facilitated the formation of new social infrastructure. This social infrastructure provided our informants with an awareness of networks of and connection with likeminded individuals that could be tapped into for support, knowledge and other resources. In cases such as the ones described here, our informants utilized new social infrastructures to work around disruptions in the physical world. They leveraged the knowledge, connections, diverse life histories and perspectives of people globally to address issues locally.

DISCUSSION AND CONCLUSIONS

Our goal in this article was to highlight the relationship between social infrastructures and resilience. We showed how citizens of Iraq, living through ongoing disruption, utilized newly available technologies to continuously maintain and create social infrastructures. These social infrastructures enabled them to maintain routine practices, thereby supporting resilience.

Whereas in our study people were experiencing protracted disruption, our findings can extend beyond the war zone and into other contexts where people are experiencing disruption. The maintenance and construction of social infrastructures for resilience are not constrained only to war, but can be seen across the range of

disruptive events; from natural disasters to migration or job loss. Recent work in crisis informatics has shown how people utilize a gamut of technologies to seek information and aid, and for situational awareness (e.g. Palen and Liu, 2007). Through the analytical lens used in this paper, we view action as being enabled via people's ability to connect with and activate social infrastructures that address people's needs, given their respective situations and environmental contexts.

Towards a theory of social infrastructure and resilience

In this section we intend to highlight how social infrastructures enable resilience. Our purpose is to begin to develop a theory of resilience and its relationship with social infrastructures. Through our analysis of social infrastructures, as presented here and across the work being disseminated in the field of crisis informatics, we have identified properties of social infrastructures that can help build resilience when people undergo disruption. We believe that these properties can be developed into technological affordances that both support future research in the area and facilitate resilience in response to crises.

Social redundancy. The first property of social infrastructures—social redundancy—refers to the idea that social infrastructures contain people who can serve the same function. That is, when one individual is unavailable or unable to act as a resource, the redundancy of people who can fill the same role allows others to work around disruption. In our study, informants were able to maintain practices for work through the evocation of social infrastructure who could perform the same function, as was illustrated by our examples of people working as journalists. Online environments geared toward supporting resilience in crisis situations ought to allow people to identify people who fill the same role. This might be accomplished by self-identified tagging mechanisms.

Social diversity. Social diversity refers to the idea that social infrastructures contain people with a wide range of skills and abilities. Disruptive events are often full of ambiguity. As situations develop the kinds of help and information people need to work around any given situation will change. Diversity in infrastructures can support these changing needs. In our study, informants were able to learn from a diverse set of actors spread globally across the assemblage of technologies at their disposal, which allowed them to address local, emerging needs. Technologies that support the identification of the kinds of skills and abilities that are in short supply can enable those farther away to mobilize individuals who can fill the gaps. Again, self-identified tagging mechanisms can help by indicating what skills are plentiful. Individuals may also identify shortages of skills with tags.

Activating different networks: moving between invisibility and visibility. The property of activating different networks is the idea that people in disrupted environments often need to develop new networks in order to work around disruption. It may be that their original networks are no longer accessible or that their new needs require them to be in contact new people or support networks. In our study, trusted associations in the local context were often inaccessible, and our informants developed ways in which they could make unknown connections visible to engage in typical practices and behaviors, such as locating reliable doctors. Online environments that support resilience should enable personal referral features that provide people with the ability to leverage the networks of visible members within their existing social infrastructures, and move invisible members into their personal networks.

Trust. The final property of social infrastructure—trust—refers to the idea that people should be able to trust members of the social infrastructures that are available to them. Online environments must provide users with the ability to establish trust in others, as well as provide mechanisms for trust propagation, especially if people are going to rely on others as informational and social resources for resilience. In our study, informants found ways to establish trust in others via word-of-mouth recommendation or by spending time establishing trust in unknown citizens distributed across the social infrastructure. We believe trust to underlie the actions enabled by social infrastructures in times of duress. Again, personal referral features that enable individuals to vouch for others are critical here.

Conclusion

Disaster studies have mostly focused on the acute phases of crisis events. Our findings suggest that when disruption persists, the role and importance of social infrastructures magnify. We believe that by continuing to understand and uncover the role of social infrastructures in facilitating resilience, and developing technologies that specifically enhance people's ability to create and utilize social infrastructures, we can better aid them when experiencing disruption. Technologies, as was the case in our study, allowed people to maintain and build social infrastructures that could help them re-structure their lives.

ACKNOWLEDGMENTS

This research was supported by the National Science Foundation under grants no. 0712876 and 0910640.

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