Megan Finn

Post-Disaster Information Environments: 1989 Loma Prieta Earthquake
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Government reports and members of the media blame information systems as the culprit of what has been characterized as faulty responses to disasters such as Virginia Tech and Hurricane Katrina. In the process they propose information and communication technologies (ICTs) as solutions to disaster response. Calls for new ICTs following recent American disasters reveal a poor understanding of the socially situated nature of ICTs. Disaster-related research does not expound a sophisticated understanding of ICTs either. As a consequence, information systems are seen as an unproblematic means of informing the right people with the right information at the right time.

In my dissertation, I will challenge these simplistic notions of information systems as solutions to disaster response by proposing two case studies of "information environments" from the period following the 1989 Loma Prieta earthquake. I will introduce an analytical framework from the social studies of information which situates information systems in the social environment. The theoretical construct, the "information environment," is meant to overcome the limitations of studying ICTs from a purely technical perspective.

The information environment is a synthesis of theoretical work that enables me to look beyond the simple view of ICTs as mere conveyors of information to ask how ICT use is shaped by and shapes the social world. Though the focus of my research is "post-disaster," the information environment construct emphasizes a longer time horizon. For example, one of the information environment approaches poses questions about the *values* that may be embedded in the design of an ICT. Another approach asks about the *conventions of practice* around an information infrastructure. Both "values" and "conventions of practice" point to activities which occurred prior to a disaster, calling to mind the question of how far in the past one must look.   Additionally, one or both of the "values" or "conventions of practice" concepts might be useful to explain actions following a disaster. The information environment is an intentionally broad (but by no means comprehensive) construct able to include many approaches which socially contextualize ICT use. Part of this project is then determining which aspects of the information environment are most important to understanding ICT use following a disaster. By iteratively going back and forth between the numerous approaches included in the information environment and the case data, I will expand and refine the salient aspects of the information environment construct for the "post-disaster" cases. Thus, this dissertation will not only apply ideas from the social studies of information to expand disaster related research, but also the somewhat novel post-disaster environment will challenge approaches from the social studies of information.

My primary research question is:

    (a) How do people use ICTs to make sense of the world in the period following a disaster?

The information environment construct also proposes the questions:

    (b) How is ICT use shaped by formal and informal social structures?

My case analysis should also help to answer the question:

    (c) How can the information environment be refined and synthesized to best understand ICT use following a disaster?

If I can answer questions (b) and (c), I will gain an understanding of ICTs situated in the local social context. This knowledge will then help to answer my primary question about the cases.

Using the case studies, this dissertation will facilitate an analysis of two propositions:

    (i) Understanding the information environment is crucial to discussions about information systems for disaster response.

    (ii) Variations in how people use ICTs helps to explain how particular communities can experience the same disaster differently.

In order to address my research questions I propose a theoretically informed, multi-method, pragmatic examination of historical data about the 1989 Loma Prieta earthquake. Using the information environment framework, I will closely examine two cases of community use of an information and communication technology post-disaster. I will look at the following two cases studies: Radio use by the Spanish-speaking community, particularly in Watsonville; and use of the internet, specifically the online community on The Well. Secondary survey data will serve to contextualize my cases within the greater Loma Prieta disaster. By analyzing post-disaster ICT-related practices in two distinct communities, I will show how the information environment framework both elucidates these practices, as well as explains differential post-disaster experiences.

The unique combination of historical work on information environments in a post-disaster social context will allow me to make contributions to the social studies of information, and to research on disasters. Finally, my work will provide a case study for doing historical research utilizing new media tools and techniques.

This poster will present ongoing research about the information infrastructure after the 1989 Loma Prieta Earthquake. Disasters represent a particularly interesting site for research, and particularly research about "information" because of the paucity of information after a disaster. People simply need "information" to make sense of what has happened. I will look at several cases of information infrastructure in several communities affected by Loma Prieta. There are three questions which my dissertation proposes to address about each case:

1. How do people make sense of their environment after a disaster via the information infrastructure?

2. How is information infrastructure shaped by formal and informal social structures?

3. Why is it problematic to try to understand how "information" "works" after a disaster without looking at the ways in which information infrastructure is shaped by and shapes social worlds?

Introduction

Recent events such as 9-11, The Virginia Tech Massacre, and Hurricane Katrina have put questions about the role "information" at the center of discussions about disaster planning and response. Systems for management of documents for assessing risk (after 9-11[1]), plans for alerting individuals of risk via SMS (after Virginia Tech [2]), and technologies which would enable federal officials to understand "incidents" happening on the ground (after Hurricane Katrina [3]) have been proposed. There have been numerous calls to create information systems which will aid in disaster response planning, but little is understood about how "information" actually "works" after a disaster. Furthermore, there is a danger in reframing the "problem" of disasters as an "information problem," like Brown and Duguid (2000) point out with the term "infoprefixation" or Light (2003) points to with the idea of "cybercities." There is an implicit question, "How would disasters be understood differently if the technology were different?"

Nonetheless, most of the proposals for information systems to aid in disaster response start with a simple and reasonable assumption that there is a paucity of "information" after a disaster. Everyone, from the Emergency Operations Coordinators to a random person on the street needs to make sense of what has happened after a disaster when there is great uncertainty about their environment. I this assumption without any assumptions of intentionality from the part of the "receiver" of information.

The second assumption from recent disasters is that the digital information systems help in the process of sense-making. I use this assumption to limit the "kinds" of information I am dealing with in this project. I do not address all that is informative such as the cracks in the sidewalk and conversations with people, but information that is mediated by some kind of technology. The information infrastructure includes a diverse set of elements such as radio, television, newspapers, telecommunications, and building annotation. Thus, the descriptive question driving this research is, "How does information mediated by technology "work" after a disaster?" We turn to literature about disasters to address and refine this question.

Background Literature

Given the problem that I have outlined, there are two theoretical traditions to which must be addressed: the "sociology of disasters" and "information systems for

disaster response." The field of "sociology of disasters" is made of small group of researchers who have come from a tradition of disaster research sponsored by the federal government starting in the 1950s (Tierney, 2007). The research typically deals with issues of organization. Wachtendorf (2004) describes organizational activities after 9-11, particularly focusing on issues around improvisation and organizational persistence.

The "Sociology of Disasters" research has been critiqued recently as being out of step with mainstream sociology because sociology of disaster researchers are: reluctant to deal with issues of race, gender, and class; ignoring the way in which the definition of disasters is socially constructed; taking the perspective that the disaster is a discrete event having a beginning, middle and end rather than as a consequence of modern life; and overly focused on dominant institutions (Tierney, 2007). (There is recent work which are exceptions to the critique.) For the most part the "sociology of disasters" literature does not directly engage with issues of "information" with the exception of the area of "risk communication." However, risk communication work tends to be focused on the transmission of risk related information.

There have been several studies more recently which are considered outside of the sociology of disasters literature which point us in important directions. Sociologist Eric Klineberg's book Heat Wave is a "social autopsy" of the 1995 Chicago heat wave where over 700 people died. Work that is considered to be from organization studies by Perrow (1984) and Vaughan (1996) describes "technological" failures in organizations. Vaughan describes the "social organization of a mistake" which led to the Challenger Launch Decision. The work of Klinenberg and Vaughan deals with the role of information in the "disasters" more explicitly than most social studies of disasters. It suggests that the constructionist approach might help us to understand how information helps to construct disasters via organizational documents (Vaughan, 1996) or via the media (Klinenberg, 2002).

Research from the field of information systems for disaster response tends to emphasize the importance of technical systems, and does not always deal with the social world with the same level of sophistication. Researchers in this field deal often take an approach which could be characterized as approaching the social world as a set of autonomous entities which interact with each other through a series of inputs and outputs. Other research takes a cognitive approach, but deals strictly with micro-level interactions, without dealing with larger social structures.

The two fields concerned with disaster that might be most obviously helpful in framing my quandaries are, on one hand, not concerned with information, and on the other hand, not concerned with social structure. Thus, I turn to literature from the "social studies of information." I take the perspective from the "social studies of information" that information and information technologies are necessarily situated in a social context (Nardi and O'Day, 1998; Bowker and Star, 1999). Saxenian (1994) describes how information flows are shaped by regional culture and social networks. The idea of "notification" describes the social behavior of passing along information (Ryan, 2006). Notification basically says that there are social norms which govern what information we pass along, to whom, and what is the context in which we tell people information. Thus, to understand the role of information infrastructure, one must also address the social forces which shape and are shaped by the information infrastructure. I plan take these perspectives from the social studies of information, that the social world shapes and is

shaped by information, and apply these ideas to a rather unusual set of circumstances – after a disaster. My research questions, set forth in the opening in the opening paragraph, are drawn from this tradition.

Research Proposed

Based on the orientation outlined above, I propose to use theoretical sampling (Eisenhardt, 1989) to identify cases that will help to usefully answer these questions. I am currently in the process of "constructing the archive," which will be treated as my research "field site" (Gupta, 1997). Sources for data include: Academic work, government and NGO reports, Newspaper articles, oral histories, television archives, interviews, and media diaries. Although in the qualitative research tradition, one can argue that you never understand what you have a "case of" until the research is completed, I propose to look at cases of the information infrastructure after a disaster that will allow me to address the questions set forth above. A disaster as large as Loma Prieta can be viewed as many disasters if one takes the perspective that the disaster is experienced differently by different communities. Thus, I propose to look at three cases of post-disaster information infrastructure which cut across several different types of communities, but primarily deal with information and communication technology that is meant to communicate to a group of people:

1. Radio use by the non-English speaking community in Watsonville.

2. Use of Usenet by the online Bay Area community.

3. Television use by local officials in the East Bay.

Potential Implications

In addition to extending ideas from the social studies of information to a "disaster" context, my research will indirectly offer insights into a number of practical issues:

1. There is something of a paradox when thinking about information systems for disaster response: people are going to use what is familiar to them in times of uncertainty, yet one can imagine that special circumstances might demand a special set of technologies. How do you design technologies useful in a special set of circumstances while ensuring that people are using technology that is familiar to them?

2. What are the information needs of individuals and organizations after a disaster and how can those needs be met most appropriately?

3. To the extent that I am studying information infrastructure, I am also studying the documents which people may use to reconstruct the history of a disaster. What does my learning about the information infrastructure tell us about our ability to tell histories from the traces of the information infrastructure?