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Title

Organizational Characteristics of a Disaster Call Center

A Study of Information Management

By

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

MASTER OF SCIENCE

ABSTRACT

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This study examines how information was managed in a call center during the response to a major flood event on the Red River in the upper Midwest. The event affected the cities of Fargo, North Dakota and Moorhead, Minnesota. This study involved two rounds of data collection: first, complete participant observation in the call center, and second, in-depth qualitative interviews of call center workers. It also includes a 19-day reconstruction of the flood event based on newspaper articles during the incident. The results of this study are examined within the context of complex systems theory and other theoretical concepts within the scope of information management in emergency management response systems. This study discusses the impact of role familiarity and the assumption of collective intelligence on the disaster call center's ability to manage information during the flood response operations.

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I am indebted to my parents and family for their endless support and encouragement without which I would not have been able to complete this degree.

And, finally, to my emergency management colleagues for their selfless dedication to the study of disasters and emergency management and commitment to the well-being of others that inspires me every day.

DEDICATION

For Nene.

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ABBREVIATIONS AND TERMS

EOC: Emergency Operations Center

PIO: Public Information Officer

FEMA: Federal Emergency Management Agency (an agency within DHS, the U.S. Department of Homeland Security)

USGS: United States Geological Survey

CHAPTER ONE. INTRODUCTION

One of the common themes in emergency management theory is the extent to which we can understand how structure emerges and how information flows within a system during a disaster response. A variety of writers have addressed structural emergence in emergency management systems (Quarantelli, 1966; Dynes and Quarantelli, 1968; Dynes, 1970; Parr, 1970; Gillespie, Mileti, and Perry, 1976; Drabek, 1986). These writers have identified various processes that are consistently observed as systems evolve. In this study, I focus on how information was managed in a call center that was established in response to record-level flooding in Fargo, North Dakota and Moorhead, Minnesota. My participation in the call center allowed me to conduct an institutional ethnography and identify a highly detailed sequence of events that describe the evolution of the call center and its ability to manage information (Rudestam and Newton, 2007; Smith 2005; Gold, 1953, 1997).

Kapucu et. al (2008) describe information management or emergency information management as "The activity of information collection, processing, decision making, and dissemination" (Kapucu et. al, p. 172). There are a number of authors who discuss information management in emergency management systems, but, specifically, I will examine these information management capacities within the context of Comfort's (2008) work on complex dynamic systems. Comfort maintains that complex systems progress through an evolution beginning with the most primitive state of operation, the non-adaptive system, moving to the intermediate system, the emergent adaptive system, and finally the most advanced state, the operative adaptive system. Comfort (2008) outlines a detailed description of the information management capacities of each of the three progressive

system levels. This study will show how the call center evolved through these three stages and the additional characteristics that can be added to Comfort's (2008) framework. This study discovered impacts of the components of role familiarity and the assumption of collective intelligence on the call centers ability to manage information implying that these two organizational characteristics are critical to the call center's ability to manage information.

Background

In late March of 2009 in Fargo North Dakota, the Red River began to rise above flood stage. Flooding, a familiar hazard to citizens of Fargo and the neighboring city of Moorhead, Minnesota, was expected to be significantly worse than previous years. The cities began to mobilize to protect the citizens and their homes from the rising water. All levels of government committed to the response. Local, county, state, and federal officials activated resources as the flooding worsened. The counties and cities involved in the flood response had a standing contract with a community non-profit agency to activate a disaster call center in the event of a flood. On a daily basis, this non-profit agency is responsible for taking calls for general information and assistance. The call center also provides community education. In the event of a large-scale disaster, the organization's contract with the local government stipulates that they are to set up a call center to field calls from the community and share up-to-date information with citizens and interface with local officials to provide information from the callers and the general public. On Friday, March 20, 2009, with augmented operations with almost 20 call takers and phones, the call center was activated and stationed at the Public Safety Building on the west side of the City of Fargo.

During the operation of the call center, there were significant challenges with the management of information, its accuracy, and its timeliness. The management and communication of this information was vital to an effective response to the flood. The volunteer resources were the key to quickly building sandbag dikes to prevent the Red River from flooding the city. This thesis will aim to answer the following research questions:

1) How was information managed in the call center?
2) Did the call center evolve throughout the period of its operation? And, if so, how?
3) What factors helped or hindered the call center's ability to manage information?
4) What actions or capabilities might improve the call center's ability to manage information?

In Chapter Two, I will first review existing literature on information management in emergency management organizations and its contributions to understanding an organization's ability to manage information. In Chapter Three, I will discuss the unique nature of this study that involved the use of a combination of two rounds of data collection. I will then outline and describe the research methods of the 19-day event reconstruction, the complete participant observation of the call center, and the methods of the qualitative interviews of call center workers.

Next, in Chapter Four, I will present the event reconstruction and the complete participant research data. In detail, I will cover challenges and gaps in information management during the flood response and present a call center framework I constructed

following the event that compiled based on my complete participant data. Finally, I will present the qualitative interview data.

In Chapter Five, I discuss the call center data within the context of Comfort's (2008) organizational characteristics and the call center's evolution beginning with its classification as a non-adaptive system and I will explain what prevented it from achieving Comfort's (2008) most evolved state of operative adaptive classification. I will then describe this study's two primary contributions to Comfort's (2008) model – the continuum of collective intelligence and role familiarity and their impacts on this organizations' ability to manage information.

Lastly, in Chapter Six, I offer my conclusions and identify opportunities for future research on the study of disaster response organizations and characteristics that contribute to those organizations' ability to manage information during a response operation.

CHAPTER TWO. LITERATURE REVIEW

What Can Theory Explain About Information Management?

There is a limited body of theory that is applicable to the topic of information management in disaster response (Hiltz et. al, p. 6, 2010). This topic is an analysis of an organizations' capacity to manage information in a disaster. This theory aids in the understanding of the call center itself and its emergence as a nonlinear, dynamic response social system. Comfort's (2008) "Shared Risk: Complex Systems in Seismic Response," offers possible structure within the scope of this study. While I will discuss Comfort (2008) at length, I will begin by examining the array of articles that contribute to the discussion of information management in disaster response.

In Figure 1 below, I illustrate how the information management literature exists relative to two unique bodies of literature that exist beside it, information technology (computer based data management) and sociology of organizations.

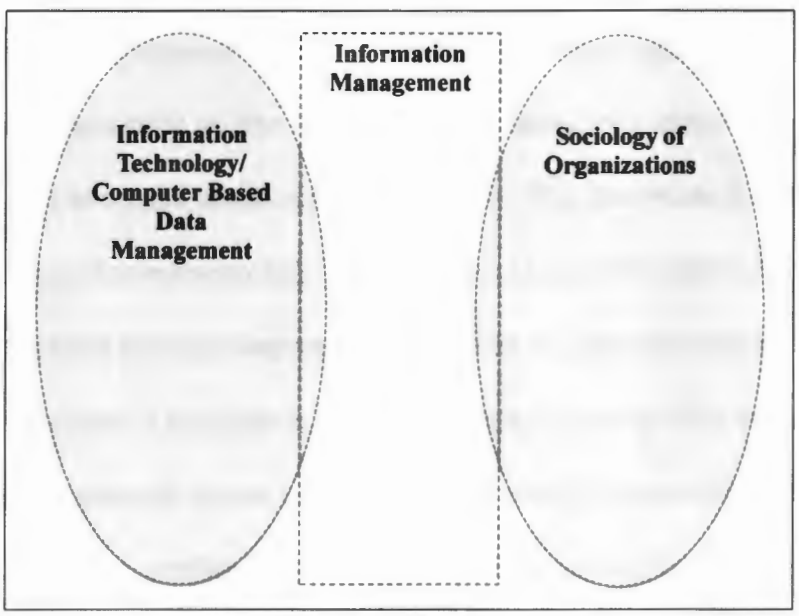

Figure 1. An illustration of the literature relevant to this study.

The information technology literature is primarily computer based information systems material that is not the focus of this study, however, computer systems lend capacity to organizations' ability to manage information. On the other side of information management is the sociology of organizations where there is extensive knowledge of how organizations behave. But, between these two bodies of literature is the narrow band of information management literature. Since this is not a study of organizations, but instead, a study of how an organization managed information, the literature reviewed here borrows slightly but not exclusively from the sociology of organizations and the study of computer information systems. As I have done in this diagram, it is important to articulate the distinction of the unique classification of the study of information management in organizations.

Information Management and Effective Disaster Response

There seems to be a general consensus that information is part of an effective disaster response (Celik and Corbacioglu, 2010, p. 137), but the *management* of that information is a critical component. The Pan American Health Organization (PAHO) (2009) identifies information as "the most valuable commodity during emergencies or disasters. It is what everyone needs to make decisions" (Pan American Health Organization, p. 13). Some researchers go as far as to say that the implications of ineffective information management are a large part of the general problems with emergency management. Thanurjan et. al (2009) states, "a lack of effective information and knowledge management dissemination can be identified as one of the major reasons behind the unsatisfactory performance levels of current disaster management practices" (Thanurjan et. al, p. 67). Other sources agree, highlighting Hurricanes Andrew and Katrina

and 9/11 as significant examples of poor information sharing and management capabilities domestically (Kapucu et. al, 2008, p. 170). There are four themes, in addition to Comfort's theory (2008), that emerge from the existing literature. They are sense making, information sharing, actionable knowledge, and standardization.

Sense Making

Sense making theory begins by stating a need to collect a large amount of information to inform an organization's ability to make sense of an environment (Kapucu et. al, 2008, p. 171). The second step in the information management process is to discover meaning within the vast body of information collected (Kapucu et. al, 2008, p. 171). This second step allows information to be shared more easily with organizations that will find that information relevant (Kapucu et. al, 2008, p. 171, 190). Lakovou et. al (2001) stipulates that, where there is an excessive amount of information, or if that information is not oriented towards the end user, it will impede the user's ability to understand and use that information to take effective action (Lakovou et. al, p. 257). As a way to curb the amount of information that is input into a given information management system, the Pan American Health Organization (PAHO) (2009) recommends that it is imperative for emergency managers to know and coordinate with the relevant stakeholders because emergency and disaster situations present a myriad of sources that produce information (PAHO, p. 13, 45). This reduction to only the relevant sources of information will presumably aid in a system's ability to manage information.

This is closely tied to information overload, where the amount of information exceeds individuals' ability to make sense of situations (Plotnick and Turoff, 2010, p. 73). This overload exploits humans' cognitive limitations on sense making and rational

adaptation or response, a concept called bounded rationality (Plotnick and Turoff, 2010, p. 73). Information overload or lack of sense making capacity can lead to information entropy, where "important information is not recognized by the user because of information overload or poor organization of the data" (Plotnick and Turoff, 2010, p. 83). Acknowledging both the broad range of information inputs and also the dynamic nature of those inputs, Zhang et. al (2002) state that a good understanding of the disaster environment is informed by sound information, which is a prerequisite to effective disaster response operations (Zhang et. al, p. 381).

Information Sharing

The second significant trend in the information management literature is the idea of information sharing. Information can be shared in different ways, but how that information is shared and with whom is critical to a system's ability to manage information efficiently and act appropriately on that information. In their study of an emergency operations center, Militello et. al, (2007) discussed several mechanisms for information sharing; they make a foundational assertion,

> In order for the coordination [in a disaster response] to go smoothly, it is important that all participants in the EOC [Emergency Operations Center] have a shared understanding of the situation, current priorities, and actions being taken. The amount of information sharing that must happen within and outside of the EOC is quite daunting. (Militello et. al, p. 28)

Militello et. al (2007) state that having both frequent verbal updates and shared computer displays, and also the use of voice loops (where individuals can listen in on conversations of which they are not a part), facilitate this notion of information sharing (Militello et. al, p.

28, 30). K.J.E. von Lubitz et. al (2008) support the emphasis on information sharing as key to producing effective information management systems in their discussion of network enabled capability (NEC) (K.J.E. von Lubitz, et. al, p. 579). K.J.E. von Lubitz et. al (2008) assert that, "NEC will help to dispel the erroneous and potentially dangerous philosophy of offering different levels of information and knowledge to different levels of operators working in the same 'battle space'" and will produce a common operating picture (K.J.E. von Lubitz, et. al, p. 567, 579), a concept also known as collective intelligence resulting in the improvement of collective sense making (Plotnick and Turoff, 2010, p. 380). In other words, all responders know what every other responder knows so they have a complete picture of the situation. The benefits of collective intelligence creating a common operating picture are significant, as Mills et. al (2008) state, "everyone benefits in direct proportion to what everyone contributes" (Mills et. al, p. 476).

Actionable Knowledge

Actionable knowledge emerges from the ability of organizations and individuals to share information. If information is shared effectively, systems merge various pieces of information into a cohesive piece of *actionable knowledge*. Actionable knowledge creates an illustration of the environment for a given organization to act upon (K.J.E. von Lubitz et. al, 2008, p. 565). K.J.E. von Lubitz et. al (2008) state that effective information sharing produces actionable knowledge within the context of maximum situational awareness (K.J.E. von Lubitz et. al, p. 566).

Standardization

Finally, standardization of technology is a commonly identified challenge. Ryoo and Choi (2006) detail a significant problem,

> One of the main stumbling blocks is the lack of standardization in data formats. Information can exist in many forms (on paper or a whiteboard, in a computer file, etc). Even after being digitized, the same type of data can be found in as diverse data types as emails, documents, pictures, movies, and audio files. (Ryoo and Choi, p. 270)

In addition, Ryoo and Choi (2006) highlight the need for the computer information system to link in with the Incident Command System to achieve optimal information management capacity (Ryoo and Choi, 2006, p. 276). Ryoo and Choi (2006) emphasize the computer system's and social organizational system's capacity to be scalable and flexible to shift with the dynamic external environment (Ryoo and Choi, p. 276).

Complex Systems Theory

While the influence of these four factors (sense making, information sharing, actionable knowledge, and standardization) is considerable, the literature review discussed above leaves much to be desired and explained. Comfort (2008) dives much deeper into the theoretical dynamics of information management in emergency management response systems, and it is crucial to discuss complex dynamic systems at length. Eriksson (2009) and Marincioni (2007) provide some additional nuances of effective information management. While these authors contribute to the understanding of characteristics that are influential in an organization's ability to manage information, simply checking for the manifestation of these four factors is not sufficient to understand the nature of how information is managed in an organization like a disaster call center. A study seeking to understand the characteristics that allow an organization to manage information must appreciate additional influences on that organization's structure and operations.

The nature of emergency management is inherently multi-organizational, multi-disciplinary, and highly dynamic as it attempts to work in and understand disasters. In an attempt to understand and explain this flooding event in March 2009, the following theory is applicable. Comfort (2008) developed theories, through four extensive disaster studies, that attempt to explain the following: the conditions leading to self-organization, requirements for problem-solving processes, the requirements of transition in complex systems, the dynamic response system model, the organizational transition model, and the conditions that facilitate or inhibit self organization (Comfort, 2008). Most importantly for this study is Comfort's identification of the following systems: nonlinear systems, dynamic response systems, non-adaptive systems, emergent adaptive systems, and operative adaptive systems. The non-adaptive systems, emergent adaptive systems, and operative adaptive systems represent an evolution of system development that accounts for a system's capacities to manage information.

Before I go further, I have two questions that must be addressed. First, why study information management and complex systems? And, are Comfort's (2008) theories needed? Celik and Corbacioglu (2010) and Dynes (1978) concisely address these questions. Celik and Corbacioglu (2010) state that "Complexity refers to the emergence, development, and evolution of new structures and patterns" arising from "numerous interactions among components within the organizational system and its environment" (Celik and Corbacioglu, p. 138, 140). Understanding these emerging complex systems within the context of established complex systems theory is paramount. Next, Dynes (1978) states, "Information needs to be exchanged between them [response organizations and entities] and groups that may have need of their resources. An information center is

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needed. Because the community is normally pluralistic, it requires structural modifications for more unified decision-making" (Dynes, p. 61). He fortifies the argument to acknowledge the study of information management within the context of complex organizational systems when he concludes, "By examining interorganizational relations in communities under stress, it is possible to see how a community can, in a relatively short period of time, mobilize its resources to cope with an emergency" (Dynes, 63). He identifies that interorganizational coordination will give a community the capacity of an effective response to collective problems (Dynes, p. 63).

With Celik and Corbacioglu (2010) and Dynes' (1978) in mind, Comfort (2008) informs my study on information management. It should be noted what Comfort (2008) means when she uses the term "shared risk" as it appears throughout many of her models. Comfort (2008) states, "Shared risk represents public risk, one which affects all residents of a risk-prone community, whether or not they have contributed to the conditions producing the threat" (Comfort, p. 3). In this study, the shared risk is the public risk of the Red River flooding to the communities of Fargo North Dakota and Moorhead Minnesota. Despite various political conditions that may or may not have contributed to the vulnerabilities of this community (events that will not be discussed in the context of this study) the flood risk is seen as a risk faced by the entire community and the cause of the flood risk is irrelevant to this study.

Evolution of Complex Systems

One of the most critical and applicable components of Comfort's (2008) theory is her three-step evolution of a system. Comfort (2008) describes complex systems in a three-step evolution moving from Non-adaptive systems, to emergent adaptive systems, and

finally to operative adaptive systems. Within this evolution, Comfort (2008) goes much further than other authors in her discussion of organizational characteristics. She comments specifically on organizations' ability to manage information and various characteristics that she maintains impact those organizations' capacity to manage information in a complex environment (i.e. in response to a disaster). First, non-adaptive systems use little technology or computer infrastructure, implement a low amount of organizational structure (a social organization hierarchy), have a low degree of organizational flexibility, and therefore difficulty managing information (Comfort, p. 68, 81). Emergent adaptive systems, however, use a slightly increased amount of technology as a tool to organize people and information, have increased organizational structure, a greater degree of flexibility, and therefore a higher capacity to manage information effectively (Comfort, 2008, p. 70). Finally, at an organization's most evolved state, the operative adaptive system, it has a high capacity to manage information effectively (Comfort, 2008, p. 159-160). Compared to the other two stages of evolution, Comfort (2008) describes operative adaptive systems as utilizing technology and computers to the highest degree, having a articulated organizational structure hierarchy, being highly flexible, and having a high degree of information management capacity (Comfort, p. 159-160). Additional characteristics of the operative adaptive system include having an information management infrastructure in place and trained personnel on hand prior to the disaster event (Comfort, 2008, p. 159-160). I have constructed the diagram below (Figure 2) to illustrate Comfort's (2008) classifications.

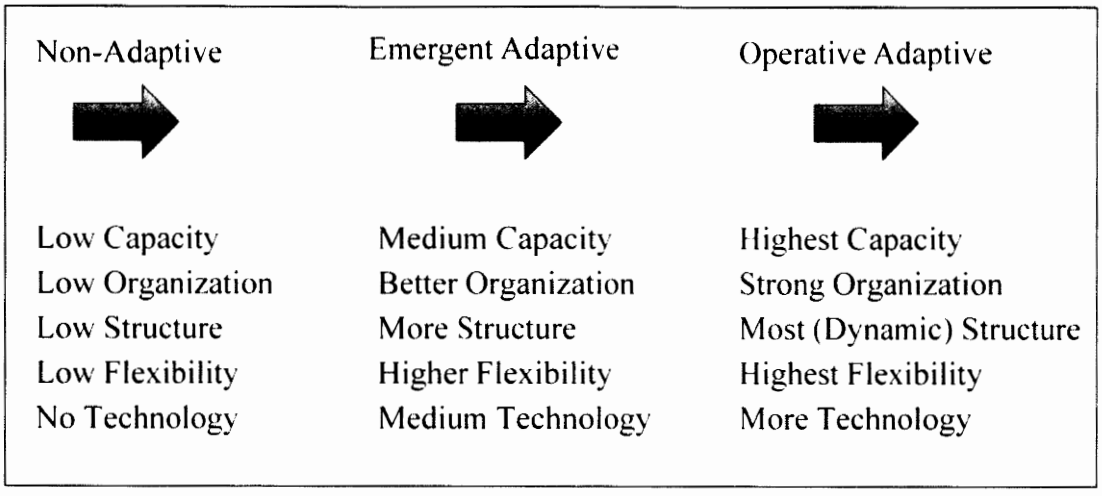


Figure 2. System evolution from non-adaptive to operative adaptive system and characteristics of each level system.

Two additional studies are consistent with Comfort's (2008) identification of the operative adaptive system's need for pre-planned information management capacities. First, Eriksson (2009) found that "Establishing networks for flow of information and material both within the organization and outside is an important preparation" (Eriksson, p. 167). Second, Marincioni (2007) describes the relationship between technology, social organization, and individuals within a response organization with the following:

> These findings seem to confirm the assumption that while technological infrastructure is essential to sustain disaster communications, effective transfer of disaster knowledge requires well-planned exchange protocols and, most of all, a desire on the part of disaster professionals to share their experience and interact with each other. (Marincioni, p. 465)

While the complete participant observation portion of this study was not framed by this literature review, these theories do not fully explain the various elements contributing to the achievement of each of the characteristics of the levels of complex system evolution.

What remains to be understood is what variables impact a call center's ability to evolve through the three stages from a non-adaptive to an operative adaptive system. Moreover, what is not explained are specific dynamics of information management and how that information flows through a system such as a disaster call center. Further study is needed on the dynamics that help or hinder information management capacities and can recommend specific organizational and technological characteristics of such a center. This study aims to build an understanding of the dynamic nature of information management processes in the call center.

CHAPTER THREE. RESEARCH METHODS

The methods of this study resemble Comfort's (2008) study of Complex Systems in Seismic response. While Comfort (2008) examined 11 incidents, this study employs her methods with four steps of inquiry: 1) field observations of organizational capacity, 2) review of records and after-action reports, 3) interviews with key personnel, and 4) a review of news reports on disaster operations from local newspapers (Comfort, p. 47-48). The present study's review of records and after-action reports was much less extensive as compared to Comfort's (2008), but the flood after-action report from the Cass County Sheriff's Department was included as a source in this investigation. One advantage of the complete participant aspect of this study, however, was my ability to collect artifacts from the call center. The items I classify as artifacts are the spreadsheets of call information, the computer files used for overhead projector updates for call takers, images of the whiteboard at the front of the room, and images of the wall posters in the call center.

Unique Nature of This Study

My study began with complete participant data collection (Gold 1953). I was informed of the existence of the call center only hours before I was to arrive and assess its operations. Only after I arrived did I understand that my involvement in the call center and its information management activities could and should be studied. I began taking detailed observational notes of the call center's operations upon my arrival and I began keeping vital documents from the call center so I could revisit them to study in greater detail.

My involvement in the call center and its operations enabled me to understand the call center at the depth necessary to produce a valuable and rewarding study. I classify this study as an institutional ethnography as defined by Smith (2005), Gold (1953, 1997), and

Atkinson and Hammersley (1994). Smith (2005) describes institutional ethnography in the following manner, "Institutional ethnography begins by locating a standpoint in an institutional order that provides the guiding perspective from which that order will be explored" (Smith, p. 32). In addition, "Institutional ethnography works from people's experiences in and of institutional forms of coordinating people's doings" (Smith, p. 44). She later states that, "The ethnographer is not looking for agreement among different informants but for the intersections and complementarities of their different accounts in the relations that coordinate their work" (Smith, p. 63). As Rudestam and Newton (2007) articulate, ethnography is based on immersion of the researcher in the organization or culture being studied, and the researcher is specifically interested in the *nature* of social phenomenon as opposed to testing hypothesis (Rudestam and Newton, p. 41).

The present study qualifies as an institutional ethnography because I was centrally involved in the call center operations, the design and implementation of the information management system, and the decision-making processes. While I am classified as a complete participant (Gold, p. 219), the recognition of the ethnographic characteristics of my data collection adds additional data from the event reconstruction (discussed below) and qualitative in-depth interviews in an attempt to gain "multiple assurances" that these data are valid (Gold, 1997, 395-396). Additionally, because I did not have the advantage of conducting a literature review prior to arriving at the call center, this study does not test a hypothesis, but rather, as Atkinson and Hammersley (1994) state, it investigates "the nature of a particular social phenomena, rather than setting out to test a hypothesis" (Atkinson and Hammersley, p. 248). Commenting on ethnography, Gold draws on Weber's critique of social inquiry that requires social researchers become "personally and deeply acquainted

with their informant's experiences and views" in order to "understand society for what it is" by "studying it from the points of view of its members" (1997, p. 389). In this case, I use complete participation in the call center to achieve the stated benefits of the point of view of a call center worker.

The first portion of data collection for this study qualifies as an ethnography for the following reasons. To begin, I was able to observe individuals' (call takers and response organization representatives) experiences and factors impacting the decision-making process based on call center data. I was able to identify the phases of call center development from a non-adaptive system to its formation as an operative adaptive system (as I will discuss in Chapter Five). The observation for this study and data collection of relevant materials could not have been accomplished with anything short of a complete participant researcher role due to the necessity of participation to acknowledge and recognize challenges within the information management system.

This study acknowledges additional perspectives in a critical approach through following a data collection process similar to Comfort's (2008) to implement a critical analysis. I collected situational data from newspapers and conducted in-depth interviews of call center participants. Again, because of my involvement, I had the ability to understand intimate detail of the events within the call center and that knowledge guided the interview process and event reconstruction. Through looking at these other perspectives, those of other response organization representatives or call center workers, the present study is able to verify information within the context of the institutional ethnography. Moreover, my purpose at the call center was to evaluate its function and help improve it on an ongoing basis, I was aware of my role and responsibility to constantly evaluate the center

throughout my time there, which, as Gold (1953) states, is a requirement of complete participant research (Gold, p. 219).

Methods for Reconstructing the Flood Event of 2009

In order to frame the call center operations I carefully assembled a reconstruction of the flood event. This reconstruction is a daily synthesis of all of the flood related newspaper stories from the Fargo-Moorhead newspaper, *The Forum*. I also referenced my personal observational notes from the flood to add specific detail regarding the call center activities. Each daily description has the associated river gage height according to the United States Geological Survey Historical River Level Data. Using the daily descriptions from the local paper I can more easily illustrate the significant characteristics of the flood each day from the perspective of countless sources and reporters throughout the city. It is advantageous to use the newspapers in this manner because it would have been impossible for me to interview as many sources as *The Forum* did. The drawback to this method is that I rely heavily on the integrity of information the reporters collected. There is no way I can conclusively verify all of the information described here. Instead, I trust the abilities of the reporters and the reliability of their sources to provide an account of the flood that outlines a background to the call center operations.

Methods of Complete Participant Observation and Ethnography

When I first arrived at the call center, my primary concern was to assess its function and ability to record and manage information. I had been assigned to the call center under the premise that the center was not effectively recording and managing the information due to the high volume of calls coming in from the community. I understood my assignment was to assess the current structure of the call center then propose a system that would

create the capacity for the center to function with a greater ability to manage the specific information being injected from the two emergency operations centers (EOC) (down the hall) and the information coming in through the phone lines. My function was to observe and collect data on the call center's operations. I was then to analyze that data to develop an effective and enhanced call center structure.

I did not understand, at this point in the event, that I would soon be formally studying the call center, however, I employed basic qualitative methods to collect data because my purpose there was to constantly evaluate the call center's effectiveness in managing information both upon my arrival, but also throughout the implementation of new systems and organization. First, I watched the activities of the call takers and the call center supervisor. I took detailed notes of the interactions and the roles of the various positions. I watched the supervisor as she interacted with the call takers and I paid particular attention to the information exchanged between the call takers and the supervisor. One of the supervisor's responsibilities was to write notes on large sheets of paper on the wall. I also noted the call takers' actions while on the phone. I noticed they were logging each call on a small sheet of paper with a standard form on it. I took note of the call volume and the discussions call takers were having on the phone with each caller.

After several minutes of focused observation, I began to ask questions of those working in the call center. This proved especially difficult because of the chaotic nature of the call takers' and supervisor's workload. I attempted to follow the supervisor around the room to ask questions. The questions I asked of the supervisor were:

1) What is your job function?

2) What information are you writing on the posters on the wall?

3) What questions are being asked of the call takers?

3) Where do they get the information they are explaining to people?

4) What are the main types of calls you are receiving to the call center?

One of the call center functions I identified, as a result of the first two questions above, was a volunteer management function. I then asked the call center supervisor a follow-up question to the first three: How are you managing volunteers and how do you determine which volunteers you should send to which locations? These questions prompted several-sentence answers. Because of the heavy demand of calls on call takers and the supervisor, highly detailed and lengthy answers were not practical based on the time the situation allowed. In order to restructure the call center, I needed to obtain relatively small pieces of information from a number of call center workers as opposed to in-depth information from one or two individuals. I believed that, by getting information from a number of individuals, I would be able to create a better picture of how the center was operating and what resources the different individuals in the call center needed.

I then moved to asking questions of the call takers. I spoke with four or five call takers. My primary question for them was:

1) What is your job? I then asked,

2) What are the main types of calls you are receiving?

3) What information are you writing down on the form for each call?

4) What happens to that information once you have completed the form?

I asked many of these questions to verify the information being provided to me from the supervisor. With so much happening in the call center, I believed it necessary to ask similar questions of individuals in different roles.

Part of the new system I proposed involved recording call information into spreadsheets. By virtue of the fact the call center would now be recording certain types of call information via Microsoft Excel, I was able to oversee much of the data collection that, I would soon learn, is vital to this study. Information from callers was collected on the same standard form as mentioned above. However, the data collection took a more meticulous nature when I requested that call information of a certain nature be entered into two separate spreadsheets. I was then able to code that information with basic Microsoft Excel functions.

Over the course of the day I continued to make observations and notes on the newly reformed and constantly evolving structure of the call center. By being involved as a complete participant in the call center, I was able to track information exchange among different individuals within the center. I quite literally *experienced* the transportation of information from one hand to another and the result of the information exchange. Again, emphasizing that my purpose in the call center was to evaluate how well it performed its functions, my role involved recording and understanding its organizational dynamics especially as they related to the management of information management.

By recommendation of one of my colleagues, I began taking personal notes about the event and my involvement in the call center. Soon after, my department chair expressed a desire to formally study the call center and its operations. Following my agreement to help with additional data collection beyond what I had already done, I began investigating other avenues of collection. I kept close watch over the input into the Excel spreadsheets and carefully stored these data to analyze after the flood had passed. I took pictures of the call center, the people interacting within it, and the posters around the room. I made careful

note of the call center layout and where different individuals sat in the room. I connected with the information technology specialists responsible for maintaining the call center's phone systems and asked for call volume data when it became available. I took note of my actions and the processes I went through to handle information. In total, I spent just under 109 hours observing and participating in the call center from March 23 to April 1. These methods supplied the data for a detailed analysis and reconstruction of the call center and its information management functions.

Methods of Qualitative Interviewing

To validate and challenge the complete participant and ethnographic observations of the call center, it is necessary to look to additional sources of data to offer perspective on these observations (Gold, 1997, p. 395). Therefore, the final segment of data collection for this study involved three in-depth interviews of individuals who worked in the call center. These qualitative interviews allowed the input of information that specifically addressed questions related to information management in the call center that were informed by the research literature. Three individuals were interviewed for this phase of data collection. They were, first, an individual who was involved in the pre-planning and set up of the call center and then responsible for interfacing with the center and delivering information to it during the flood; second, an individual who was a call taker in the center; and third, an individual who fulfilled a supervisory and more autonomous role in the center. While each of the interview participants were aware of my involvement in the call center, I interviewed them as though I knew nothing of the call center to elicit full and effective responses (Gold, 1997, p. 398). The interview questions asked of these individuals were:

1) What was your role in the call center?

2) How was the information coming into and going out of the call center managed?
3) Did the call center operations change through the period of its operations?
4) What factors helped or hindered the call center's ability to manage information?
5) Do you have any recommendations for what might improve call center operations in a similar type event?

While this study cannot claim to have achieved saturation (Gold, 1997, p. 396), using various data collection methods (i.e. ethnographic observations, collection of information management items from the call center, and qualitative interviewing) provides different perspectives of how information was managed during this event. Each individual data collection method alone cannot provide sufficient material to analyze, but together, they provide a complementary data set.

CHAPTER FOUR. EVENT RECONSTRUCTION/DATA PRESENTATION

Specific background and day-to-day detail about the flood event helps illustrate the context within which the call center operated. Through a daily reconstruction and account of the flood, one is better able to understand the collective action of the community that produced the information being delivered to and asked of the call center. The following is a day-by-day account of the flood.

Reconstructing the Event: A Day-By-Day Account

March 16, 2009 (Monday): River Level: 15.95 ft. (USGS NSIP, 2010).

"Plan dikes now, expert says." The single flood article in the Forum metro section discussed the need for residents to begin planning to build dikes to protect their homes from spring floodwaters. The recommendations provided in the article discussed how to fill sandbags and build dikes. The front page of the paper was dominated by a North Dakota State University basketball story. The weather page projected an outlook of temperatures ranging from 15 degrees to a week high of 49 degrees on Monday (Forum Staff, March 16, 2009, p. C3). A brief statement in the weather section indicated that Fargo and Moorhead had the third-wettest winter on record averaging unusually high amounts of precipitation (Ritchison, March 16, 2009, p. D8).

March 17, 2009 (Tuesday): River Level: 16.11 ft. (USGS NSIP, 2010).

"Flood forecast worsens." In contrast to the previous day, flood news dominated the front page. The front-page article indicated a changed weather pattern and the beginning of road closures in rural areas of the Red River Valley due to water runoff. Fears of projected above-normal temperatures for late March

and precipitation added to the officials' conversations about flood preparations. Overland flooding in rural areas was reportedly reaching a point where many roads would soon be covered in water (Nowatzki, March 17, 2009, p. A1, A6).

Another front-page article, "Levee building projects to begin" described the beginning of levee building projects throughout the city. The Cass County Commission began asking for the state to declare an emergency to open the possibility for dike building assistance from the US Army Corps of Engineers. Projections estimated a 50 percent chance that the Red River would reach 38.5 feet and a 1-in-3 chance it would reach 39.6 feet (Olson, March 17, 2009, p. A1, A6).

March 18, 2009 (Wednesday): River Level: 16.30 ft. (USGS NSIP, 2010).

"Flood preparations under way." Seven counties in North Dakota have declared flood emergencies due to flooding from the Red River and, in rural counties, this emergency is due to overland flooding (Knutson, March 18, 2009, p. C1). "Clay County declares emergency as roads flood." Clay County officials recommended that local residents begin to sand bag and protect their property. Public meetings are set to discuss flood fight efforts (Olson, March 18, 2009, p. C10).

March 19, 2009 (Thursday): River Level: 16.55 ft. (USGS NSIP, 2010).

"Flood fight starts early." Centered on the front page of the paper an article quotes a rural North Dakota resident, "It's really coming in. We've got water in every direction" (Roepke, March 19, 2009, p. A1, A8). Other articles detail the US Army Corps of Engineers levee construction operations in south Fargo. The highest predictions from the National Weather Service indicated a 38.6 foot crest. Cass

County indicated that residents can pick up free sandbags from the county but residents would be responsible for buying their own sand and filling the bags (Roepke, March 19, 2009, p. A1, A8). Another article stated that flooding was beginning to impact Interstates 29 and 94, which would impact the ability to use the roads. A state of emergency is declared in Moorhead with an estimated 600 to 700 residents impacted by the rising flood waters (Nowatzki, March 19, 2009, p. A1, A8).

March 20, 2009 (Friday): River Level: 17.28 ft. (USGS NSIP, 2010).

8:00am – the call center located next to the City of Fargo and Cass County's emergency operations centers was activated. Friday morning's headlines stated, "Latest crest forecast has Fargo scrambling." New crest forecasts project water levels to rise above the 1997 record of over 39 feet. Local officials begin to ask for volunteers to increase sandbagging operations (Nowatzki, March 20, 2009, p. A1, A6). A special column on the front page announced numbers for residents to call. The call center was listed for residents seeking information about how to volunteer, a City of Fargo flood information line for residents was listed, Cass County listed a flood information line, Moorhead also listed an information line and stated that anyone seeking volunteers should contact the call center, and finally Oakport Township indicated that residents should call their township supervisors and township board chairman.

The front-page story projected a storm beginning Sunday night and going through Tuesday to drop two to three inches of rain on the Fargo-Moorhead area.

Twenty-four hour sandbagging operations were set to begin Saturday, and Fargo suspended garbage pick-up (Nowatzki, March 20, 2009, p. A1, A6).

The Metro/State section of the paper was dominated by flood news and information. One article, "Sandbagging a 'massive effort'" described the City of Fargo's goal of 1 million sandbags filled and placed before March 28. These efforts were aimed at countering flood waters of up to 40 feet, the highest crest projected by the National Weather Service. Coordination is also beginning on a volunteer reception center, set to be up and running Saturday March 21. Additionally, 200 North Dakota National Guard soldiers were allocated to the area. Residents with questions were told to call the city engineering office. A volunteer utilized the social networking site Facebook to mobilize support for the volunteer effort with the group "Fargo Flood Volunteer Network" (Nowatzki, March 20, 2009, C1, C8).

The Metro/State section also included a "Flood preparation checklist" detailing information on how to check a sump pump for proper operation, how to fill and stack sandbags, and how to plug basement floor drains along with other flood preparation actions (Koumpilova and Becker, March 20, 2009, p. C1).

March 21, 2009 (Saturday): River Level: 19.23 ft. (USGS NSIP, 2010).

Again making the front page, the flood story, "Flood-fighting 'Sandbag Central' cranks up" announced the rise of the Red River past flood stage (18 feet). The article stressed the importance of calling the call center prior to coming out to volunteer (Springer, March 21, 2009, p. A1, A12). One article briefly mentions that ice jams will potentially cause surges in river levels (Olson, March 21, 2009, p.

A12). The weather section projected rain for Monday and Tuesday with a chance of snow on Wednesday (Weather section, March 21, 2009, p. D8).

March 23, 2009 (Monday): River Level: 26.02 ft. (USGS NSIP, 2010).

"FROM BAD TO WORSE" tops the headline above the sub heading "Forecast flood crest, earlier, higher than first thought. Volunteers urgently needed to fight rising river." Displayed above the main story, the call center number was listed for individuals needing information. The main article reported the new projected crest level could reach 39 to 41 by Friday – much higher and much earlier than original projections. The revised projections prompted the mayor of Fargo to ask for 2 million sandbags (Springer, March 23, 2009, p. A1, A4).

Additionally, Code Red alerts were set to be broadcast to residents who may be at risk from the rising waters. Employers began releasing workers asking them to help with sandbagging efforts. Additional pleas came from Fargo city officials for more volunteers as local college students are asked by their university administrations to volunteer. City emergency evacuation plans are prepared (Springer, March 23, 2009, p. A1, A4).

At 8:00am, the first North Dakota State University (NDSU) emergency management representatives arrived at the call center. A reorganization of call center and volunteer management operations began within the hour as the call center became inundated with calls. Full reorganization of the call center was complete by 8:00pm.

March 24, 2009 (Tuesday): River Level: 30.76 ft. (USGS NSIP, 2010).

"President Barack Obama declares a major disaster declaration for North Dakota making federal funding available for state and local governments to help fight the flood" (Cass County Sheriff's Office, 2009, p. 6).

March 25, 2009 (Wednesday): River Level: 35.45 ft. (USGS NSIP, 2010).

Within the day, the call center would reach over 36,000 incoming calls since the activation of its operations on Friday. News articles showed that major flood fighting efforts were making progress in holding back high water levels. One article indicated that city officials have tasked a group from the Twin Cities to develop an evacuation plan for the Fargo-Moorhead area expected to be released to the public within the day (Olson and Schmidt, March 26, 2009, p. A1, A10). Voluntary evacuations began in rural areas of North Dakota and Minnesota and the American Red Cross set up a shelter for evacuees at a Minnesota university. Evacuees were said to be able to register on an evacuation hotline. Also, the article described the increased use and effectiveness of Facebook and Twitter in getting the word out to younger groups of volunteers (Schmidt, March 26, 2009, p. A1, A10).

University administrations continue to support the sandbagging efforts by keeping their institutions closed and encouraging students to volunteer. With help from approximately 800 National Guard and Army Soldiers, Fargo surpassed 1.3 million sandbags filled (Nowatzki and Schmidt, March 25, 2009, p. A1, A8). The Fargo Police Chief asked people not to call 911 with non-emergency questions.

One article reported a sense of optimism in Oakport Township in Minnesota. According to the article, some residents were confident that the sandbag

dikes they built would be adequate to protect their property. Some residents were reportedly not preparing (Olson, March 25, 2009, p. C8).

A separate section called "Flood Digest" detailed information about the threat of contamination in private water wells as a result of the flooding. Another news briefing stated that there were too many people calling 911 with non-emergency calls about the flooding. The briefing listed Fargo, Cass County, Moorhead, and Clay County numbers for individuals to contact for information (Forum staff, March 25, 2009, p. C9).

The Fargo City Commission voted to approve an evacuation plan while a North Dakota representatives met with President Barack Obama to brief him on the state of the flooding and discuss federal support to the region (Smith, March 26, 2009, p. A6).

Seven inches of snowfall reported for the Fargo-Moorhead area (Weather For the record, March 26, 2009, p. D6).

March 26, 2009 (Thursday): River Level: 38.83 ft. (USGS NSIP, 2010).

New river crest projections predicted a crest of 41 feet on Saturday. Additional calls for volunteers went out from both Fargo and Moorhead officials. Moorhead officials indicated that they were looking to build their dikes to 43 feet by Saturday (Schmidt, March 26, 2009, p. A1, A10).

The American Red Cross coordinated with city officials to identify shelters outside the impacted areas. (Schmidt, March 26, 2009, p. A1, A10).

Individuals who needed help evacuating were told to call the Cass County emergency operations center. Additional American Red Cross shelters were opened (Schmidt, March 26, 2009, p. A1, A10).

The back page of the State/Metro section outlined the evacuation plans to help residents understand the seven sections city officials delineated to facilitate effective evacuation efforts. Oakport Township began evacuating (Maps, charts help you plan, March 26, 2009, p. C10).

An evacuation call center was established for Moorhead and Clay County for residents who needed information about evacuation. The 24-hour call center, staffed by volunteers, collected information from individuals who were evacuating so they could be contacted when the evacuation orders were lifted and also provided information to callers about evacuation instructions (Olson, Schmidt, March 26, 2009, p. A1, A10).

March 27, 2009 (Friday): River Level: 40.57 ft. (USGS NSIP, 2010).

As hospitals, senior living communities, and some residents begin to evacuate, the North Dakota National Guard was mobilized to prepare to begin the city evacuation if that were to be necessary. Fargo city officials banned all non-essential travel on major roads to keep traffic to a minimum (Nowatzki, March 27, 2009, p. A1, A8).

Acting FEMA administrator Nancy Ward was scheduled to visit. Homeland Security Secretary Janet Napolitano encouraged residents in the Fargo-Moorhead area to prepare to evacuate (Nowatazki, March 28, 2009, p. A8).

The City of Moorhead issued voluntary evacuation for a large number of residents in the southern part of the city (Nowatazki, March 28, 2009, p. A1, A8).

March 28, 2009 (Saturday): River Level: 40.65 ft. (River Crest Level) (USGS NSIP, 2010).

Evacuees began staying at American Red Cross shelters (Dalrymple et. al, March 28, 2009, p. A1, A11). The City's contingency dikes began to cut off some residents from the rest of the city in some areas as National Guard crews worked to patch leaks and breaches in the dikes. One article stated that there were approximately 2,000 National Guard soldiers mobilized to Fargo with an additional 500 mobilized in Minnesota (Dalrymple and Smith, March 28, 2009, p. A9).

USGS data indicates the Red River crested March 28 at 40.65 feet.

March 30, 2009 (Monday): River Level: 39.09 ft. (USGS NSIP, 2010).

North Dakota Department of Emergency Services and FEMA said they would begin damage assessments to determine the extent of assistance that will be needed to both residents and the municipalities (Flood Digest, March 30, 2009, p. A6). Fargo city officials called for volunteers to work to fill 500,000 sandbags as a contingency (Lamb, March 30, 2009, p. A6).

Periodic rescues of residents stranded at their homes continued as a winter storm hit the city (Nowatzki, March 31, 2009, p. C1, C3).

Wednesday's snowfall was reported at almost six inches (Weather for the record, March 31, 2009, p. D6).

March 31, 2009 (Tuesday): River Level: 38.02 ft. (USGS NSIP, 2010).

The City of Moorhead, under improved conditions, lifted its evacuation orders for parts of the city (Schmidt, March 31, 2009, p. C3). The call center number is, again, listed on the front page of the paper. News of a second crest later in April begins to concern residents (Olson, March 31, 2009, p. A1). In St. Paul Minnesota, lawmakers discussed the long-term outlook for flood prevention options in the Red River Valley (Davis, March 31, 2009, p. A8). The paper reported 127 Cass County residents rescued since the beginning of the flood event (Nowatzki, March 31, 2009, p. C1, C3). Local public health officials began discussions on bringing back the 2,000 individuals from nursing homes and assisted living centers who were evacuated earlier. Hospitals also began gearing up operations again as a start of the effort to return to normal operations (Olson, March 31, 2009, p. C3).

The day's snowfall of 4.5 inches brings the month's total to 28 inches (Weather for the record, April 1, 2009, p. D6).

April 1, 2009 (Wednesday): River Level: 37.13 ft. (USGS NSIP, 2010).

The Fargo Mayor said that business can resume normal operations – those that were closed could re-open and the special needs populations were projected to begin returning Thursday (Roepke, April 1, 2009, p. A1, A4). Many headlines detailed the beginnings of clean up and return to normalcy as many of those evacuated began to return to their homes. Schools planned to reopen by Monday with school administrators and bus companies having made special preparations for modified bus routes (to account for the levies in many of the streets) (Smith, April 1, 2009, p. C1, C8). Officials also began discussing how to repair the fields that were dug out to produce clay and dirt for those levies (Smith, April 1, 2009, p. C1,

C8). One area American Red Cross shelter began closing down (Frank, April 1, 2009, p. C3). FEMA was set to begin preliminary damage assessments (Dalrymple, April 1, 2009, p. C1, C8).

April 2, 2009 (Thursday): River Level: 36.35 ft. (USGS NSIP, 2010).

The American Red Cross reported a significant demand for its psychological counseling services from citizens. One article, "Flood fight takes psychological toll" stated that the American Red Cross had over 900 clinical interactions and over 1,600 psychological first aid visits to citizens (Springer, April 2, 2009, p. A1, A6). Preliminary estimates were posted for flood clean up (Olson, April 2, 2009, p. A1, A6). Editorials and articles demonstrate a wave of appreciation for flood volunteers.

April 3, 2009 (Friday): River Level: 35.55 ft. (USGS NSIP, 2010).

As the water level dropped and residents began returning to a limited state of normalcy, a donation fund was established to take donations for preparations for the second crest (Nowatzki, April 3, 2009, A1, A6). Residents were asked to keep dikes and sandbags in place (Nowatzki, April 3, 2009, A1, A6). More hospital patients, assisted living residents, and nursing home residents returned to their respective facilities with aid from medical transport planes and ambulances (Returning after evacuation, April 3, 2009, p. C1).

April 4, 2009 (Saturday): River Level: 34.82 ft. (USGS NSIP, 2010).

Front and center on the morning's paper an article titled "Second Red River crest could top last week's level – WILL THIS BE ENOUGH?" warns fatigued citizens showing a ten percent chance of a 44 foot crest between April 15 and 22 (Roepke, April 4, 2009, p. A1, A5). The article is referring to the 800,000

stockpiled sandbags (Roepke, April 4, 2009, p. A1, A5). Political disagreement between the Fargo Mayor and the National Weather Service began to dominate news and editorial discussion.

April 6, 2009 (Monday): River Level: 33.27 ft. (USGS NSIP, 2010).

Many of the articles began focusing on in-depth stories and the distribution of news began to even out with a lesser number of flood-related news articles. One article focused on the local business TeleSpectrum Communications (www.telespectrum.net), a business messaging service, which handled a larger capacity of calls and messages during the flooding while businesses were closed (Frank, April 6, 2009, p. A5). The City of Moorhead began building contingency dikes in preparation for the possibility of a second crest (Olson, April 6, 2009, p. A1).

This day by day account provides vital context that illustrates the nature of the dynamic event the call center operated in and demonstrates the scope of the event that was producing information the call center was expected to manage.

How Information Was Managed – Participant Researcher Data

Of the personal notes I took throughout the incident, two days in particular, are especially helpful in painting a picture of my involvement in the call center and the way we began to manage information. They read as follows:

Sunday March 22, approximately 10:00 pm: I was called by my professor [*sic*] with a request to assist in the flooding efforts. She assigned me to the call center at the Fargo Public Safety Building. She indicated that they would need strategic support to develop a system to streamline and clean up the process of information

recording and conveying information to the appropriate personnel. The issues she outlined for me were problems related to untrained volunteers and the flow of information. She indicated that my assignment would be 90 percent information management and delivering that information to the individuals who would need to know. I was to assess the situation and quickly create a framework to mitigate the problems. I was then to report to her to discuss the situation and request additional assistance, if needed. She indicated I was to supervise the center until further notice. I was informed that the role of the call center is a one-stop shop for any information to the public.

Monday March 23, 8:00 am: I arrived at the public safety building where the call center is located. The call center is co-located with the county and city emergency operations centers for Cass County and the City of Fargo respectively. This was also the office location for Cass-Fargo Emergency Management.

The call center [is] in a warehouse like room and crudely organized – set up with mobile IT capabilities [a phone system that can be set up in any room of any building with basic phone lines]. It was noisy and there were approximately 16 call takers and phones in the room. [The volunteers answering the phones ranged from a businessman in a suit to college students off of school.] There were posters with updated information written on them attached to three main walls – this information was available for call takers to read and use. Individuals who called in requesting help were listed on the wall and then when callers would call to offer help, call takers would send people to the locations listed on the wall that needed help. The initial function of the call takers was also volunteer management.

> By 8:30 am I came up with a system to streamline one aspect of the operations. We would enter the requests for help into a spreadsheet and the call takers would not be responsible for allocating volunteers. Those who called in offering help [referring to large groups of volunteers with their own transportation] were also recorded on a spreadsheet. We also decided to reorganize the room to make it more efficient and remove the tripping hazard of the main bundle of phone cords running through the middle of the room. The new arrangement maximized space and allowed for approximately six more phones to be set up along the north wall of the room. This took quite a long time because operations could not be interrupted. By the end of the day, the room was efficiently arranged and the spreadsheets were active and functioning as intended. We agreed to send out the spreadsheets of volunteers needed [the list of those who had called requesting assistance to help sandbag] to the EOCs every 20 minutes to one hour.

This environment set the stage for the next several days of the call center's activation and my involvement in the operations.

Upon our initial assessment of the call center, my colleagues and I noted that the call center supervisor expressed particular difficulty with managing information and personnel over the weekend of the March 21. Significant challenges were noted with recording and organizing incoming information. There were a large number of calls coming into the call center from citizens requesting assistance from volunteers to help them sandbag near their homes. Several days later I was able to obtain call data from the City of Fargo Information Technology staff. Little did I know during my first day at the call center, that over the next six days of call center operations, running 24 hours a day, the center

would log over 36,000 incoming calls and the operators would spend almost 1,000 hours on phone lines with callers. Like the calls requesting assistance, there were equally as many calls coming in from citizens offering to volunteer themselves, resources, or equipment.

Because of the high volume of calls and the rapidly changing events during the flood there were several struggles initially cited by the call takers and the call center supervisor. First, the call takers and supervisor stated they had difficulty recording and organizing call information. While they were recording call information on individual sheets, the call takers had particular challenges organizing those who requested assistance onto one list. Likewise, they also stated that they had trouble matching those who had called to offer assistance with the needs list. They had attempted to organize this information by listing it on poster paper on the walls. When a call taker would see that an individual requested, for example, ten volunteers, that call taker would send the next group of ten volunteers who called to the listed location. However, no one person in particular was responsible for allocating volunteer groups. To make matters worse, the call center was getting such a large volume of calls, of both types, that they did not seem to be able to keep the lists on the wall up to date. The lists were also difficult to read because of the constant changes and updates being made to them. Below (Figure 3) is a picture illustrating handwritten wall posters with information for call takers.

Call takers were not being adequately informed of changes in the status of the flood and management of up-to-date information was ad hoc. Situation information changed at a rapid pace. For example, during the flood there were multiple volunteer reception sites stationed at various facilities around the cities of Fargo and Moorhead. Those reception centers would check in volunteers and load them onto busses and they would be

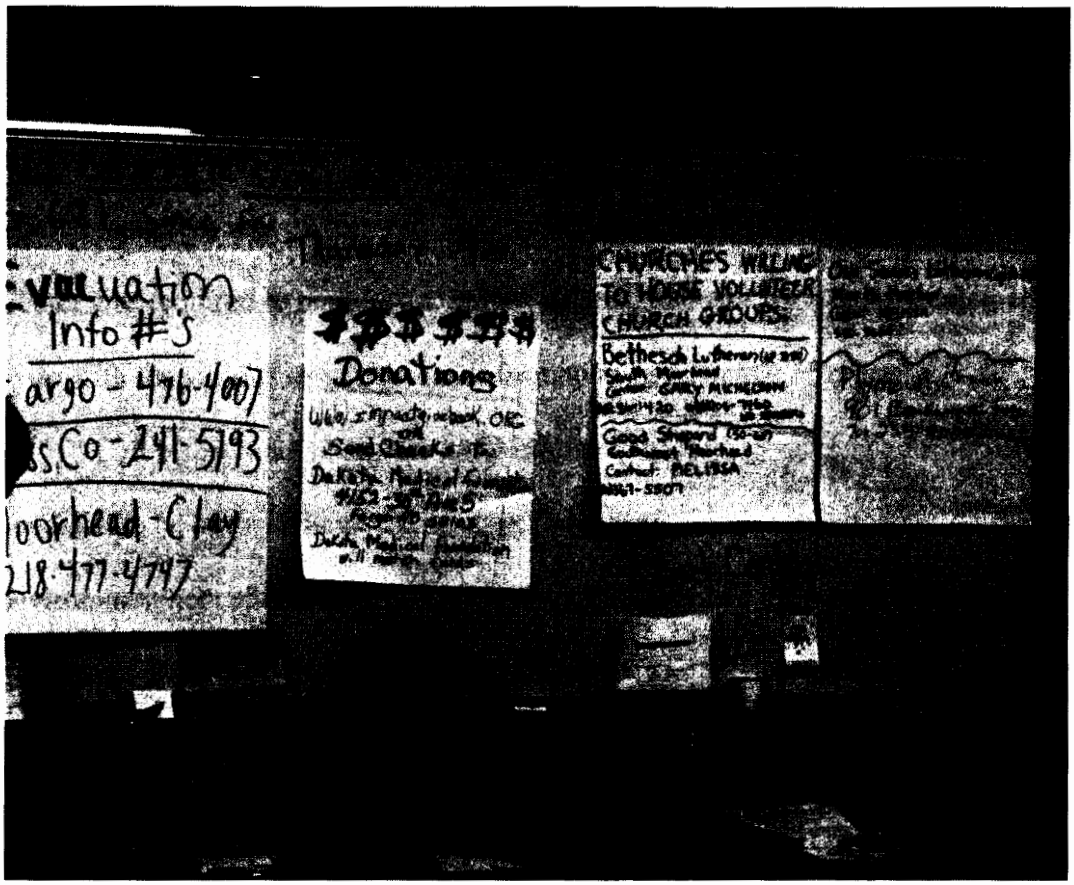


Figure 3. An illustration of the posters and whiteboard at the front of the call center on Thursday March 26, 2011.

transported to areas along the river where the officials had indicated a need for volunteers on the sandbag lines. Individuals who were willing to volunteer called the call center asking the location of these centers. At any given time, certain volunteer reception centers would be looking for more volunteers and other reception centers would close to volunteers at periodic intervals based on the transportation they had at hand. Since the status of the reception center changed so frequently, the call center staff had a difficult time understanding which centers were open and which were not. Because of this difficulty, the call takers were challenged to provide the most current information to callers.

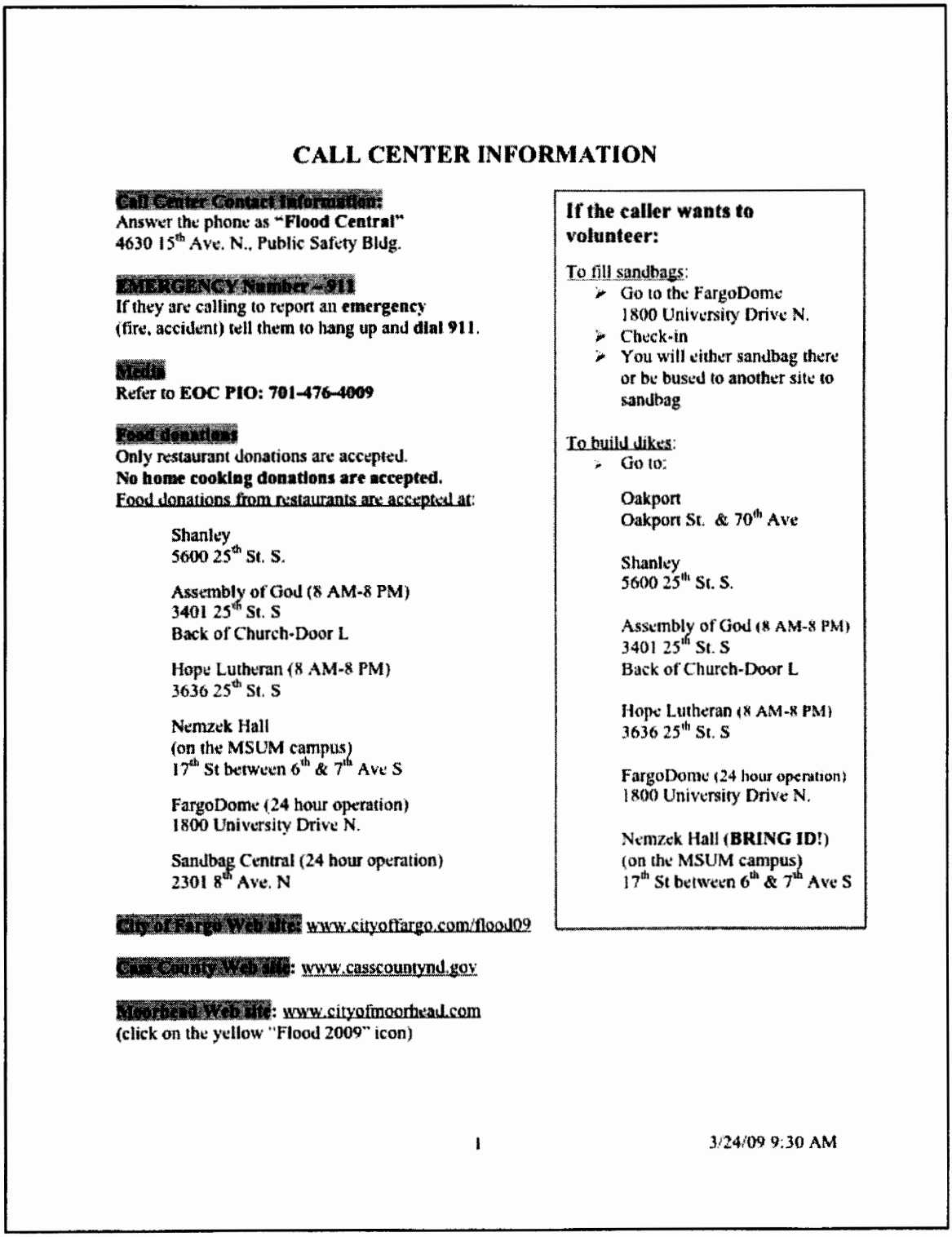
To make matters more complex, as the flood situation evolved and worsened, the officials put more capacities in place such as a system to record individuals who offered

resources like trucks, forklifts, and machine operators. Eventually, the City of Fargo developed an online system where they could record the aforementioned information allowing the call takers to refer callers to the site. However, the method for recording offered resources was different in Moorhead, Cass County, and Clay County. The Call Center was required to maintain a current understanding of what each municipality wanted to do with the various resources and information callers were offering.

Call takers were using a printed information sheet to reference for information. It appeared to be quite difficult to maintain the accuracy of this information, as the external environment kept changing. I noticed many call takers had information crossed off and notes hand-written on their information sheets. Below (Figure 4 through Figure 7) is the first permutation of the call taker information sheet recorded on March 24, 2009, at 9:30am.

In Figure 7, I have illustrated the information flow among people and entities as it existed when I arrived in the morning of March 23. The arrows represent information flow. In this diagram, the timeliness (and therefore the accuracy) of the information is questionable given the inability of the call center to maintain current event information. Note the lack of relationship between the various EOCs and the distance between the volunteer reception centers and the call center supervisor. The single direction arrows above some of the call takers illustrate deficiencies in two-way information exchange between call takers and the call center supervisor. In Figure 7, "Agency Representatives" are individuals representing the following organizations: the American Red Cross, the Salvation Army, the Federal Emergency Management Agency (FEMA), U.S. Health and

Human Services, U.S. Coast Guard, U.S. Boarder Protection, and the National Weather Service.



CALL CENTER INFORMATION

Call Center Contact Information:
Answer the phone as **"Flood Central"**
4630 15th Ave. N., Public Safety Bldg.

EMERGENCY Number – 911
If they are calling to report an **emergency** (fire, accident) tell them to hang up and **dial 911**.

Media
Refer to **EOC PIO: 701-476-4009**

Food donations
Only restaurant donations are accepted.
No home cooking donations are accepted.
Food donations from restaurants are accepted at:

Shanley
5600 25th St. S.

Assembly of God (8 AM-8 PM)
3401 25th St. S
Back of Church-Door L

Hope Lutheran (8 AM-8 PM)
3636 25th St. S

Nemzek Hall
(on the MSUM campus)
17th St between 6th & 7th Ave S

FargoDome (24 hour operation)
1800 University Drive N.

Sandbag Central (24 hour operation)
2301 8th Ave. N

City of Fargo Web site: www.cityoffargo.com/flood09

Cass County Web site: www.casscountynd.gov

Moorhead Web site: www.cityofmoorhead.com
(click on the yellow "Flood 2009" icon)

If the caller wants to volunteer:

To fill sandbags:
- Go to the FargoDome 1800 University Drive N.
- Check-in
- You will either sandbag there or be bused to another site to sandbag

To build dikes:
- Go to:

Oakport
Oakport St. & 70th Ave

Shanley
5600 25th St. S.

Assembly of God (8 AM-8 PM)
3401 25th St. S
Back of Church-Door L

Hope Lutheran (8 AM-8 PM)
3636 25th St. S

FargoDome (24 hour operation)
1800 University Drive N.

Nemzek Hall (**BRING ID!**)
(on the MSUM campus)
17th St between 6th & 7th Ave S

1 3/24/09 9:30 AM

Figure 4. Page one of the call taker information sheet from March 24, 2011.

If the caller has a small group or busload of people ready to volunteer:

- **Notify a Call Center supervisor who will take the call.**

If the caller is from Fargo and needs help:

- If the caller needs **sandbags** have them **call 701-241-1545**

  The call for sandbags automatically puts Fargo residents on the list for sandbag volunteers. They do not need to call anywhere else.

  Flood stage questions: City of Fargo Engineering: 701-241-1545

  Fargo Cass Public Health: 701-241-1360
  Questions such as: Do I need tetanus shot? Is my water safe to drink? Is my good safe to eat? What about the mold? How do I clean up after my home is flooded? Can I use my generator in the house?

If the caller is from Cass County:

- Residents who need **sandbags** call 701-298-2370

- If **volunteers are needed**:
  Fill out white sheets, get as much information as possible to include – **name, telephone number and address.**

If the caller is from Clay County:

- Residents who need **empty sandbags** call 218-299-7768 or 218-299-7769 **FOR SAND YOU MUST LOCAL SAND CONTRACTORS IN LOCAL PHONEBOOK.**

- If **volunteers are needed**:
  Fill out white sheets, get as much information as possible to include – **name, telephone number and address.**

  Clay County Public Health: 218-299-5002
  Questions such as: Do I need tetanus shot? Is my water safe to drink? Is my good safe to eat? What about the mold? How do I clean up after my home is flooded? Can I use my generator in the house?

If the caller is from Moorhead:

Figure 5. Page two of the call taker information sheet from March 24, 2011.

- If the caller needs **sandbag supplies** tell them to go to **one of the below locations** and **bring their own shovel**.

  Site #1: River Drive North and Miller Drive

  Site #2: 2600 Fairway Drive N

  Site #3: 9th St. N and 9th Ave

  Site #4: Elm St and 6th Ave S

  Site #5 River Drive South and 12th Ave

  Site #6: River Drive South and 14th Ave

  Site #7: Rivershore Drive S and 23rd ave

  Site #8: Rivershore Drive S and Brookdale Road

  Site #9: Rivershore Drive S and 32nd Ave

  Site #10: 5th Street and 37th Ave

  Site #11: Rivershore Drive S and 37th Ave

  If volunteers are needed:
  Fill out white sheets, get as much information as possible to include – **name, telephone number and address.**

  City of Moorhead Engineering: 218-299-5390 or 218-299-5330

If the caller is from Oakport Township:

Have them call 701-238-6548 only if they need volunteer help. **Sandbaggers should go to Oakport St. & 70th Ave.**

If the caller wants to volunteer in Richland:

Have them call 701-671-7940, 671-7942, 671-7930 or 671-7933.

Figure 6. Page three of the call taker information sheet from March 24, 2011.

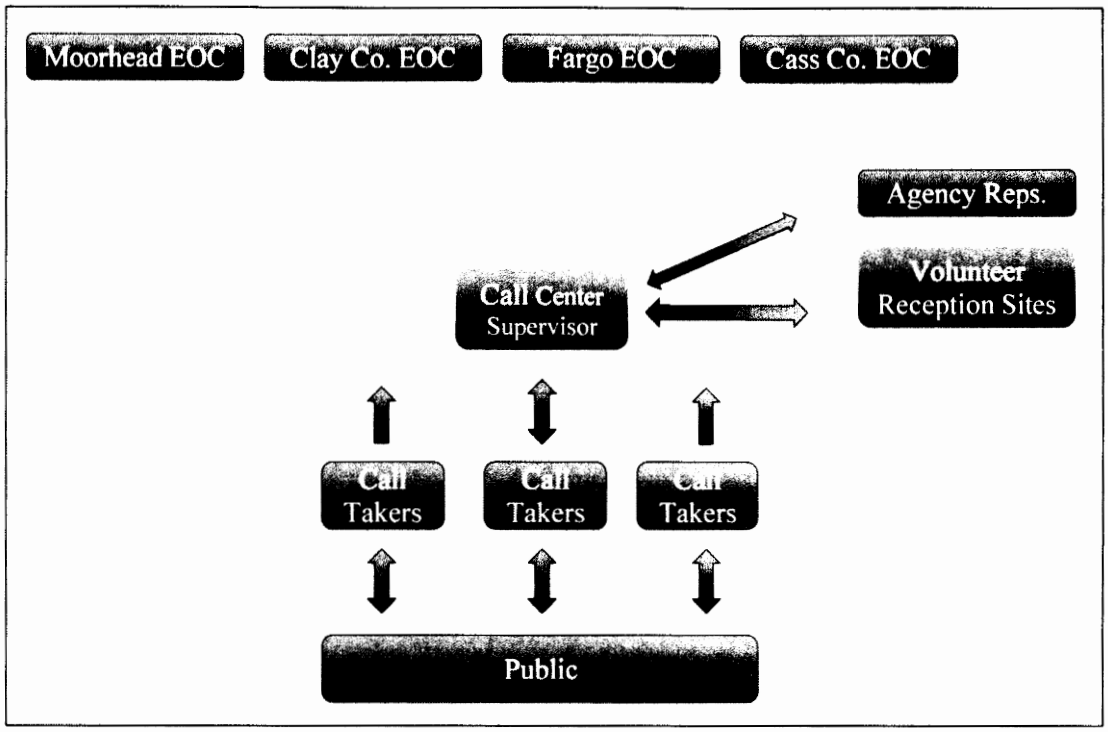


Figure 7. The organization of the call center March 23, 2009.

By virtue of the fact that the call center was one of the primary information connections between officials and the community, one of its duties was to inform the emergency operations centers (the operations centers for Cass County, Clay County, the City of Fargo, and the City of Moorhead) of the significant information being received by the call takers.

There was a clear need for the call center to be flexible in its information output capability. Each jurisdiction, Cass County, the City of Fargo, Clay County, and the City of Moorhead, had different ways in which they managed volunteers and resources. For example, the City of Moorhead allowed the call center to allocate large groups of volunteers who had their own transportation to various areas that were in need of human resource. These groups would go directly to a location to begin sandbagging as opposed to first checking in at a volunteer reception center. However, no other jurisdiction allowed the

call center to allocate volunteers. Therefore, large groups of volunteers were allocated to the particularly hard hit area of Oakport Township (in Minnesota) and all other individual volunteers or small groups were directed to go to the volunteer check-in sites.

To generate a capacity to record, communicate, and act upon the information that was flowing into and through the call center, I created and implemented the following system. Information received in the call center was recorded by each call taker on the same half page form they used previously then channeled into two databases: "Volunteers Requested" and "Volunteers Offered." Those databases recorded the vast majority of information from incoming calls. Outgoing information was not recorded and special or unique calls were handled on a case-by-base basis by a call center supervisor. The databases below (Figure 8) illustrate how the call information was recorded and coded (note: these data are fabricated for illustrative purposes due to the personal nature of the actual caller information).

For Oakport Township, the data in the "Volunteers Requested" database were stored and manually geo-coded and plotted to a Google image satellite map to determine the areas in greatest need of assistance. The "Volunteers Offered" database was referenced, and volunteers were allocated by matching three variables: 1) the number of volunteers, 2) the time that the volunteers were needed and were available, and 3) the type of tasks to be performed. This information was then either acted upon by matching volunteer groups to areas in need or communicated to the appropriate jurisdiction. Figure 9 illustrates this emergent process.

In Figure 9, the red lines represent calls coming into the call center from individuals who were requesting volunteers to assist them with sandbagging. Those calls were input to

Volunteers Requested

	City	Date Called	Street Name	Address	Contact Name	Contact Number	# of Vol Requested	Vol Sent (Y/N)	Status (# Sent/Time)	Ongoing/Completed
1	Moorhead	3/26	19th Ave North	1523	Bill Georgson	218-634-9873	10	Y	3/28	Ongoing
2	Moorhead	3/26	19th Ave North	1736	Rose Benning	218-634-9874	20	Y	3/28	Ongoing
3	Moorhead	3/26	19th Ave North	1739	Jim Jones	218-634-9875	50	Y	3/28	Ongoing
4	Moorhead	3/26	18th Ave North	1485	Janice Mitchel	218-634-9876	55	Y	3/28	Ongoing
5	Moorhead	3/26	18th Ave North	1555	Emma Thompson	218-634-9877	40	Y	3/28	Ongoing
6	Fargo	3/25	13h Ave North	705	Jill Burns	701-364-7366	50	N	N/A	N/A
7	Fargo	3/26	13th Ave North	650	Lawrence Hanners	701-364-7367	10	N	N/A	N/A
8	Fargo	3/27	12th Ave North	645	George Peters	701-364-7368	15	N	N/A	N/A
9	Fargo	3/26	12th Ave North	625	Newton Pearson	701-364-7369	10	N	N/A	N/A
10	Fargo	3/26	10th Ave North	600	Jeff Livingston	701-364-7370	20	N	N/A	N/A
11	Fargo	3/26	10th Ave North	575	Rene Osgood	701-364-7371	30	N	N/A	N/A
12	Fargo	3/28	8th Ave North	571	Alex Johnson	701-364-7372	25	N	N/A	N/A
13	Fargo	3/28	8th Ave North	544	Mary Oliver	701-364-7373	40	N	N/A	N/A
14	Fargo	3/28	8th Ave North	405	Jennifer Brown	701-364-7374	15	N	N/A	N/A
15	Fargo	3/28	7th Ave North	400	Mike Wallace	701-364-7375	10	N	N/A	N/A
16	Oakport	3/25	25th Ave North	1200	Ashley Jacobs	218-634-9873	100	Y	3/29	Ongoing
17	Oakport	3/25	25th Ave North	1205	Ryan Baldwin	218-634-9874	150	Y	3/29	Ongoing
18	Oakport	3/25	25th Ave North	1225	Dan Herzing	218-634-9875	100	Y	3/29	Ongoing
19	Oakport	3/25	27th Ave North	1100	John Ellison	218-634-9876	75	Y	3/29	Ongoing
20	Oakport	3/25	27th Ave North	1000	Linda Fischer	218-634-9877	100	Y	3/29	Ongoing
21	Oakport	3/26	27th Ave North	1543	Jake Richardson	218-634-9878	70	N	N/A	N/A
22	Oakport	3/27	3rd Street North	400	Jon Hanes	218-634-9879	30	N	N/A	N/A
23	Oakport	3/28	3rd Street North	405	Pat Thompson	218-634-9880	20	N	N/A	N/A

Volunteers Offered

	Name	Phone Number	Coming From	ETA/Availability	# of Volunteers	Type of Work	Sent (Y/N)	Notes:
1	Bill Jones	701-354-4927	Minneapolis	En route	30 to 50	Sandbagging	N	
2	Emma Fitzgerald	218-541-4733	Alexandria	Thursday	25	Sandbagging	N	
3	Jim O'Connell	218-541-4734	St. Cloud	Wednesday Early PM	45	Sandbagging	N	
4	Amy Jones	701-354-4927	Duluth	Will call back	15	Any Need	N	
5	Jeff Underwood	353-340-2930	Chicago	Anytime	75	Any Need	Y	
6	Mary Phillips	218-541-4737	Rochester	Thursday	100	Any Need	Y	
7	Anna Gary	353-340-2930	Devils Lake	Tuesday	25	Any Need	Y	
8	Helen Donnely	393-382-2826	Grand Forks	Early Afternoon	75 Students	Unknown	N	
9	Ben Johnson	493-935-2926	Grand Forks	10am Friday	300	Unknown	N	
10	Karen Andersen	218-541-4732	Eau Claire	Friday Night	100	Unknown	N	
11	Kevin Randolph	977-373-2728	Minneapolis	Wednesday Morning	35	Sandbagging	Y	
12	Michelle Weber	493-935-2926	Bemidji	ASAP	40	Sandbagging	Y	
13	Carol Lively	493-935-2926	Grand Forks	En route	10 to 20	Unknown	Y	
14	Jeff Conners	701-354-4927	Rochester	Early Tuesday AM	20	Unknown	N	
15	Bill Brown	218-541-4735	Minneapolis	Tuesday PM	45 to 55 Kids	Sandbagging	N	
16	Amanda Fletcher	353-340-2930	Alexandria	ASAP	15	Any Need	Y	
17	Katrina Kelley	393-382-2826	Grand Forks	Anytime	25	Unknown	Y	
18	Sara Weeks	493-935-2926	St. Cloud	Wednesday	50 to 60	Any Need	N	
19	Sally Robinson	353-340-2930	Devils Lake	Friday Mid-Day	50 Students	Sandbagging	Y	
20	Jennifer Sullivan	218-541-4736	Minneapolis	Monday PM	25 Kids	Any Need	N	
21	Fred Wilson	701-354-4927	Alexandria	Tuesday Afternoon	14	Unknown	Y	
22	Paula Andrews	393-382-2826	Duluth	Thursday	12	Unknown	N	
23	Mary Morgan	493-935-2926	Eau Claire	Wednesday PM	35	Any Need	N	

Figure 8. Fabricated data demonstrating the call information recorded in spreadsheets.

the database "Volunteers Requested" then compared to the database "Volunteers offered." If there was a group of volunteers or series of groups that matched the number of volunteers requested and the type (meaning the type of work willing to be performed) the volunteer groups were sent to the locations that requested assistance.

In order to illustrate the evolution of the call center and the information flow within it, I assembled Figure 10 to demonstrate the newly constructed information management system we created and implemented by the end of our first day on site.

While most of the calls came from community members, many calls came in from individuals or groups from as far away as Chicago, Illinois and the Twin Cities of

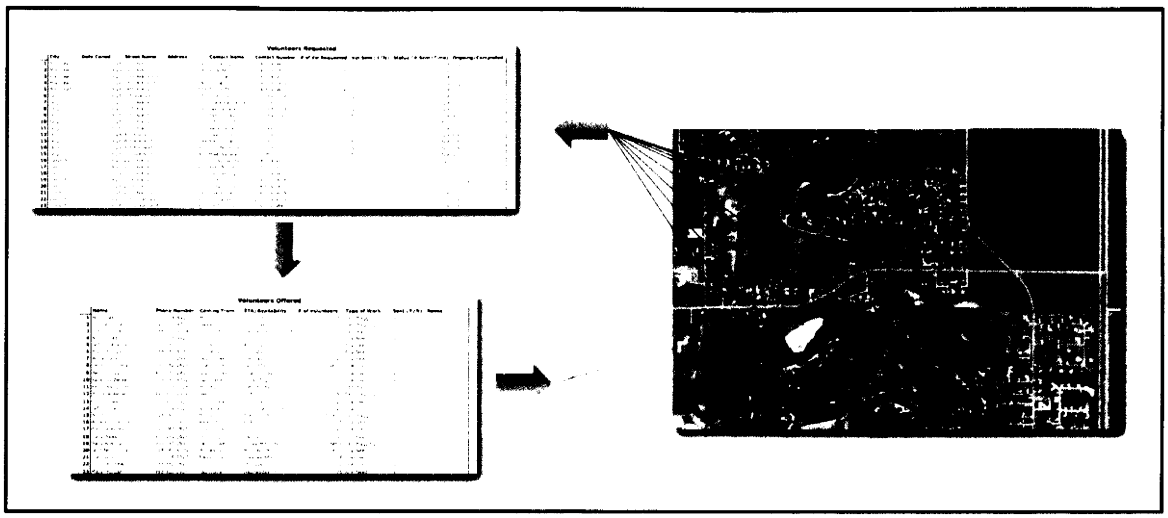


Figure 9. Illustration of the methods of volunteer deployment.

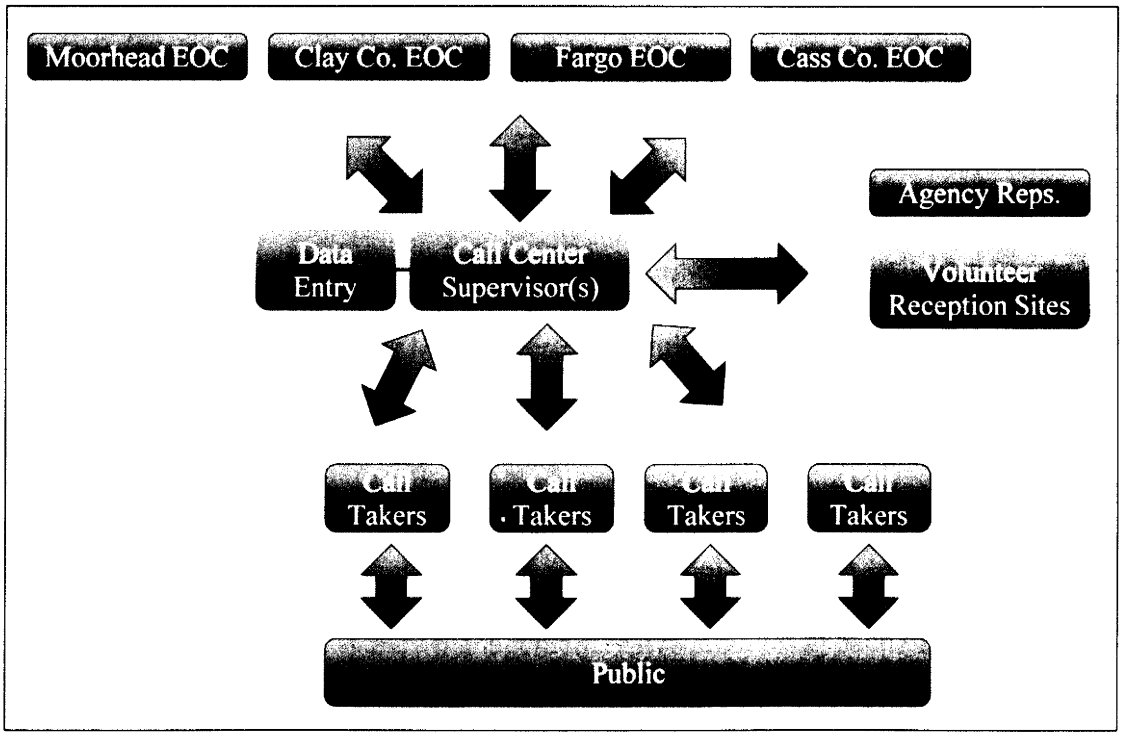


Figure 10. The organization of the call center by the end of the day March 23, 2009.

Minneapolis and St. Paul, Minnesota. At times, elected officials and government response personnel called into the call center requesting contact information for an individual or agency they were attempting to reach. News reporters called frequently and members of the volunteer management team would call to get situation updates and provide information.

It is important to pay particular attention to the changes in this diagram (relative to Figure 7) and several elements that were not present in the previous structure. First, notice the larger arrows between each entity. These arrows represent a large bandwidth of the transfer of information from one person or entity to another. This larger bandwidth was achieved through higher operating efficiency by the individuals who held each position. We achieved that efficiency by training volunteers in their roles prior to coming onto the floor. Two to three individuals (supervisors in this case), familiar with the system and how it should work, were stationed at the door of the call center. When new volunteers would arrive to work, the supervisors would train the soon-to-be call takers. They would discuss details such as how to answer the phones, how to check for up-to-date information, and what types of information should be recorded.

The ability to operate more efficiently was also impacted by the consolidation and simplification of roles and responsibilities. For example, individual call takers were no longer responsible for anything but answering phones, recording information, and staying up to date on the various updates supervisors were posting. They were not to participate in the volunteer management aspects of the call center. Also, the following positions were added to the structure: additional supervisors, additional call takers, computer data entry positions, and NDSU emergency management representatives at each of the volunteer reception sites throughout the city (ancillary to the call center). The layout of the room was also changed to be more conducive to supervisors moving about the room to assist call takers with special calls or information requests. In its final form, the call center floor layout was as shown below (Figure 11) (Each "X" represents a call taker).

These simple methods of organization and information management were

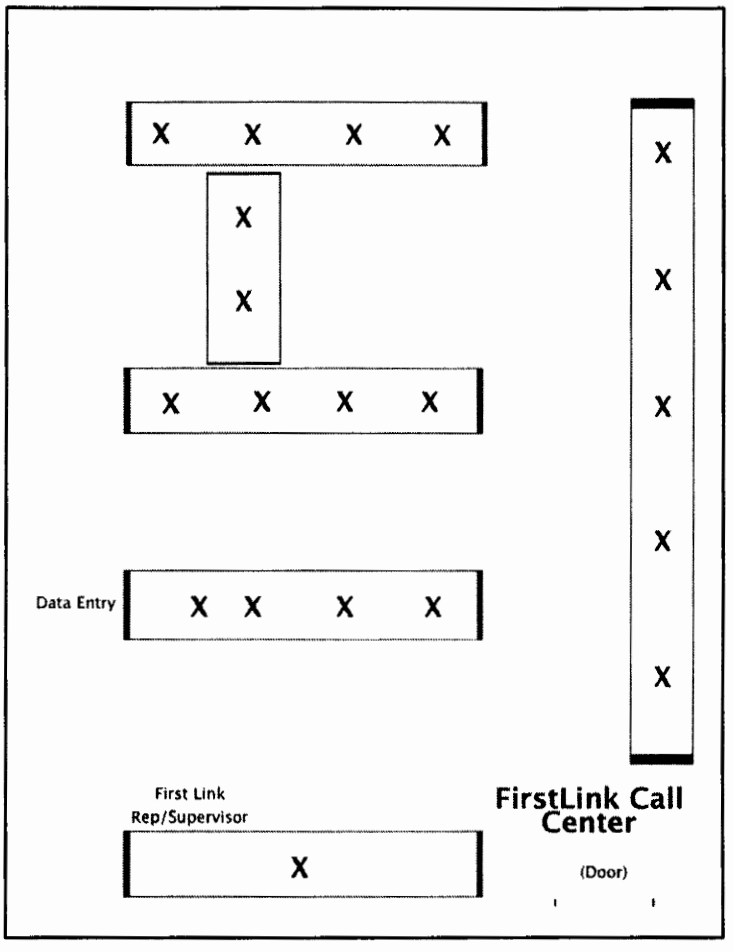


Figure 11. The location of call takers in the call center by the end of the day Monday March 23, 2011.

implemented to increase efficiency and information accuracy. I note, again, that information accuracy is directly dependent on information timeliness, as information changed so rapidly. The first method was developing a concise "Call Center Information" sheet for each of the call takers. Each of the call takers had this information at their stations, and it covered information that would not change. That information included the call center location and hours, the emergency number, directions to the FargoDome (one of the main sandbagging sites), the location of "Sandbag Central" for food donations, EOC Public Information Officer contact information for media, Fargo Engineering contact information, Fargo-Cass Public Health, Cass County contact information, Moorhead

Engineering contact information, Clay County Public Health phone numbers, the American Red Cross phone information, and the City of Fargo and Cass County Web addresses (Call Taker Information Sheet, 2009, p. 1). This form would be updated periodically, but it was found to be too difficult to update this printed form and the posters on the wall with the latest information because of the time necessary to print and re-write. Below is the last call taker information sheet permutation recorded (Figure 12 through Figure 16), last updated March 29, 2009, at 12:00pm:

FLOOD CENTRAL INFORMATION

Call Center Contact Information:
Answer the phone as **"Flood Central"**
4630 15th Ave. N., Public Safety Bldg.

EMERGENCY Number - 911
If they are calling to report an **emergency**
(fire, accident) tell them to hang up and **dial 911.**

Media
All issues related to misinformation and/or media requests for information.
Refer to **Public Information Officer: 701-476-4009**

Donation of Goods

We are in holding pattern until a location is found for folks to send donations.

Food donations

No Homemade Food Donations Needed at This Time.
They can contact local churches if they wish.
RESTAURANTS AND CATERING COMPANIES: Can bring food here to 15th Ave EOC or Fargodome (assuming open for sandbaggers)

Monetary Donations

Red Cross Website directly at www.redcross.org
or
www.impactgiveback.org
or
Send Checks To:
Dakota Medical Foundation
4152 30th Ave. S.
Fargo, ND 58103(THEY ARE MATCHING $ for $)

Red Cross
701-364-1800
2602 12th ST. N.
Fargo, ND
May provide: groceries, new clothes, rent, emergency home repairs, household items, tools or occupational supplies, transportation

If the caller wants to volunteer

Check the Projector Screen on the wall as priority changes frequently.

Make sure you keep track of and all updates on the loose leaf sheet attached to this packet.

Figure 12. Page one of the call taker information sheet from March 29, 2009.

Help: get in touch with community and government resources, help address disaster-caused and mental health needs
Takes: Doctors, RNs who say they are "spontaneous volunteers" Call Janice at 571-205-3322

If the caller is from **Fargo:**

If the caller needs **sandbags** or has **flood stage or evacuation questions**: City of Fargo Engineering, 701-241-1545

Special Needs Evacuation and Sheltering Questions: 701-241-5791

Homeowners that need services that **did not evacuate**: 701-241-5793

Unmet needs: Salvation Army 701-232-5565
TUNE INTO LOCAL NEWS for FEMA and Red Cross Announcements about Additional Aid....still in response mode and will announce when financial support information is available

Want to let people know where they are or that they evacuated: Register with Red Cross Safe and Well at 1-800-733-2767 or online at www.redcross.org

Pet Evacuation: For people needing pet evacuation information...

Shoelader Arena at Red River Fairgrounds: 701-281-1574
- Accepts Cats, Dogs & Small Animals (e.g. Rabbits, Mice, Hamsters, NOT lizards, fish, birds, exotic pets). Must bring their own food and supplies for their pets.

Red River Zoo: 701-277-9240
- Taking exotic pets (e.g. Birds, Reptiles, Snakes, Bugs, etc.)

Horse Farm: 701-281-1138
- Taking horses, call first.

Flood Information: Before, During, and After http://www. fema.gov/hazard/flood

Road Conditions: Dial 511 or North Dakota Department of Transportation at http://www.dot.nd.gov

Fargo Cass Public Health: 701-241-1360
Questions such as: Do I need tetanus shot? Is my water safe to drink? How do I clean up after my home is flooded? Can I use my generator in the house?

City of Fargo Web site: www.cityoffargo.com/flood09
(Equipment, Expertise Donations click on Donation Link)

Code Red: Citizens who need to get registered with Code Red, tell them to go to www.cityoffargo.com. Only call 701-476-4068 if they DON'T HAVE internet access.

Figure 13. Page two of the call taker information sheet from March 29, 2009.

If the caller is from **Cass County:**

Residents who need **sandbags** call 701-298-2370.

Evacuation Questions: 701-241-5793.

Special Needs Evacuation: 701-241-5791
Homeowners that **need services** that **did not evacuate**: Refer to EOC

Unmet needs: Salvation Army 701-232-5565
TUNE INTO LOCAL NEWS for FEMA and Red Cross Announcements about Additional Aid....still in response mode and will announce when financial support information is available

Want to let people know where they are or that they evacuated: Register with Red Cross Safe and Well at 1-800-733-2767 or online at www.redcross.org

Flood Information: Before, During, and After http://www. fema.gov/hazard/flood

Road Conditions: 511 or http://www.dot.nd.gov/roadreport/roadreport/roadreport.asp

Cass County Web site: www.casscountynd.gov

Cass County Emergency Operations Center (EOC) at 701-241-5793.

Figure 14. Page three of the call taker information sheet from March 29, 2009.

If the caller is from **Clay County:**

Residents who need **empty sandbags** call 218-299-7768 or 218-299-7769 **FOR SAND YOU MUST CALL LOCAL SAND CONTRACTORS IN LOCAL PHONEBOOK.**

Evacuation Questions (including pet evacuation): 218-477-4747
Residents needing transportation from their homes can call 218-284-1400.

They will need to answer the following questions:
1. Do they need wheelchair access or a normal bus?
2. How many people need transportation?
3. What is their address, street name, and city.

Homeowners that **need services** that **did not evacuate**: Refer to EOC

Unmet needs: Salvation Army 701-232-5565
TUNE INTO LOCAL NEWS for FEMA and Red Cross Announcements about Additional Aid....still in response mode and will announce when financial support information is available

Want to let people know where they are or that they evacuated: Register with Red Cross Safe and Well at 1-800-733-2767 or online at www.redcross.org

Road Condition Information Statewide MN: call 1-800-542-0220 or dial 511

Flood Information: Before, During, and After http://www. fema.gov/hazard/flood

Clay County Public Health: 218-299-5002
Questions such as: Do I need tetanus shot? Is my water safe to drink? How do I clean up after my home is flooded? Can I use my generator in the house?

Clay County Emergency Operations Center (EOC) at 218-299-7768, or 218-299-7769.

4 3/29/09 12:00PM

Figure 15. Page four of the call taker information sheet from March 29, 2009.

If the caller is from Moorhead:

- If the caller needs **sandbag supplies** or has **flood stage questions**, tell them to call the City of Moorhead Engineering:
  218-299-5390

Evacuation Questions: 218-477-4747
Residents needing transportation from their homes can call 218-284-1400.
They will need to answer the following questions:

1. Do they need wheelchair access or a normal bus?
2. How many people need transportation?
3. What is their address, street name, and city.

Homeowners that **need services** that **did not evacuate**: Refer to EOC

Unmet needs: Salvation Army 701-232-5565
TUNE INTO LOCAL NEWS for FEMA and Red Cross Announcements about Additional Aid....still in response mode and will announce when financial support information is available
Want to let people know where they are: Register with Red Cross Safe and Well at 1-800-733-2767 or online at www.redcross.org

Moorhead Web site: www.cityofmoorhead.com
(Click on the yellow "Flood 2009" icon)

Road Condition Information Statewide MN: 1-800-542-0220 or 511

Flood Information: Before, During, and After http://www. fema.gov/hazard/flood

Code Red: Citizens who need to get registered with Code Red, tell them to go to www.cityofmoorhead.com.

5 3/29/09 12:00PM

Figure 16. Page five of the call taker information sheet from March 29, 2009.

In order to keep the most timely information readily available to call takers we used a computer projector with a Microsoft Word document displaying information at the front of the room. The supervisors in the room then kept recent information and significant events listed as a log with a time stamp on the projector listed in large print. This allowed the call takers to immediately see a road closure, for example, or the change in status at a volunteer reception center. The image below (Figure 17) shows this function:

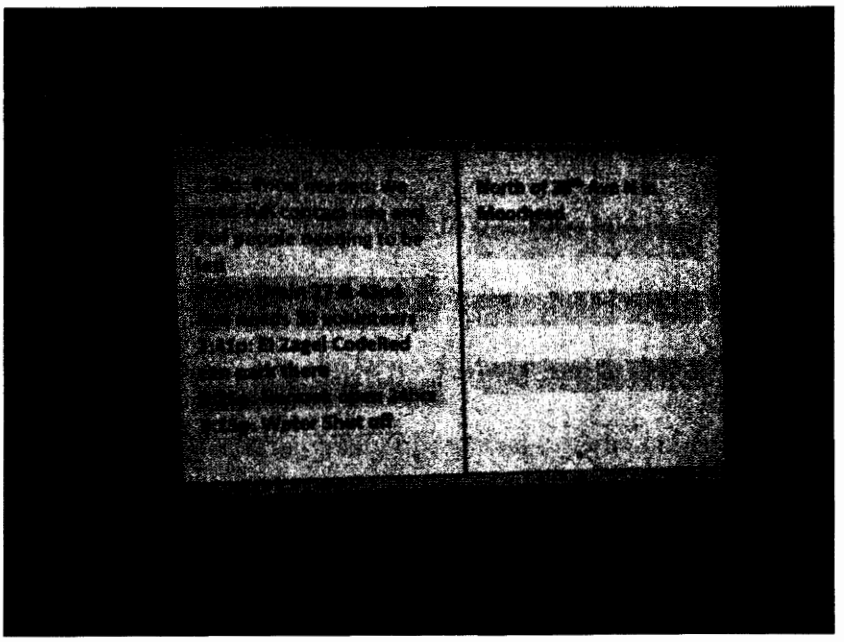


Figure 17. An image of the projector display with situation updates.

The new structure of the call center allowed for greater flexibility for a number of reasons. First, by increasing the number of supervisors, it allowed those supervisors to deal with special situations that needed extra attention. In some cases, calls that the call takers did not know how to handle were referred to supervisors who knew more about the functions and operations of other agencies and could better determine what type of attention or action a unique call warranted. For example, one call was received by a resident who relied on medical equipment to breath. He requested assistance to sandbag around his generator in his backyard so the water did not impact the generator, and in turn,

his medical equipment. A call taker, being cognizant of the special nature of this call, requested assistance. I indicated this call was an emergency call and should be referred to the police and fire departments down the hall in the emergency operations center. I asked a colleague to speak with the police and fire representatives and report to me when they dispatched appropriate emergency personnel. The police and fire officers took the information the call center collected and responded to this individual's home to evacuate him.

This example demonstrated the call center's newly realized capability to adapt quickly and appropriately to the seriousness of the external environment. This example also highlights the call center's revised ability to interface and share information with other responding agencies. Because there were multiple supervisors who were not assigned to phones, they were able to walk down the hallway had to deliver or receive information from other agencies in the emergency operations centers and give special attention to challenging situations. As a result of this flexibility, those supervisors were better able to strategically address necessary changes in the call center structure and information management system to constantly adapt.

Last, as I mentioned before, allocating one or two supervisors to training new volunteers alleviated that duty from those supervisors who were assisting call takers. As supervisors became more accustomed to their roles, those supervisors learned to monitor weather and news sites for information updates. They would then verify information being broadcast through various media and would check it for accuracy. If there was published information about the volunteer reception sites that was not accurate, a supervisor would call the media outlet to request a change.

Challenges and Gaps in Information Management

There were a myriad of challenges I observed in the call center's ability to manage information. I have already discussed many of the barriers to effective information management in the original/emergent structure of the call center, in this section I will discuss the challenges present in the new call center structure.

It is clear that the new structure was not without significant gaps in its ability to manage information. One of the first obstacles that presented itself was the use of technology. We had significant difficulties finding individuals who were knowledgeable in computers and Microsoft Excel to enter data. Even when we found individuals willing to take the data entry position, it was difficult to train them in the basic functions of the software, switching between spreadsheets, and coding/sorting the information. I found that, many times, I would have to work to fix data entered incorrectly or fix other problems due to operator errors in the program. This challenge was expected given the older age demographic that was attracted to call center work. The younger individuals, also being the most computer literate, were attracted to the physical work of filling and laying sandbags. The demographic working in the call center was, however, highly proficient at using the phone system and comforting distressed individuals on the phones. However, the ability for the call takers to handle that distress had its limits. Several days into the incident, when the water reached its crest, call takers began to show signs of emotional duress, some leaving at times, unable to fulfill their duties.

One particular challenge was the need to constantly update the printed call taker information sheet. This proved to be quite cumbersome. While the information written on

the sheets was intended to be the information that would likely not change, it became quite lengthy, at five pages, and still needed to be frequently updated.

It was also burdensome to have the call takers record call information and then have a separate individual enter that data into the computers. This multiplied the amount of human resource hours it took to get information into the manageable platform (on the computer). Confusion about how the data entry system was set up plagued the early days of the system. Different supervisors had to be trained in how the system was set up and, over time, the system would be changed and the need to re-train supervisors was apparent.

A particularly frustrating problem was that those in the call center had no idea if the spreadsheets, and the information within them, were being received by the jurisdictions they were being emailed to. The email procedure in and of itself was a challenge. Instead of sharing an electronic platform with the emergency operations centers down the hallway, the call center's computer connection with the response officials consisted of email or physically walking files to the next room.

As stated earlier, the call center's service area mainly consisted of four different jurisdictions. With each of those jurisdictions having different protocols for what to do with resources, human or otherwise, it lead to confusion over what information to provide callers. The first question for callers offering assistance or requesting assistance became, "where are you calling from?" which prompted the call takers to look at jurisdiction-specific information to provide to the caller.

Additionally, situation briefings between the two primary supervisors (myself during the daytime hours and my colleague during the nighttime hours) were useful, however, no hourly situation briefings were implemented making information sharing

between supervisors difficult. Often times, supervisors would spend large amounts of time tracking down other supervisors to either deliver or request information in the rather large building where the call center was set up.

Responding to a Request for a Call Center Structure

Early in 2010, well before the completion of this study, I received a request for how to set up a call center to respond to a flood. The Cities of Fargo and Moorhead expected another large flood nearly a year after the 2009 event and were anticipating the activation of a call center. Without having any formal conclusions, I wrote the following recommendations (Figure 18 through Figure 20) with input only from my initial data collection in March and April of 2009. It is reasonable to conclude that this is a summarized presentation of call center structure data collected in 2009 and is a valuable artifact for summarizing how my complete participant observations informed the structure of the call center with the available resources.

Qualitative Interview Data

Qualitative data were collected to both verify and challenge various elements of the complete participant and ethnographic observations identified on the preceding pages. The three interview participants, who had of various roles in the call center, generally agreed on the physical set up and organizational structure of the call center with several specific critiques of the changes throughout the incident. The interview participants were able to give more specific information about the types of calls the center was receiving and nuances of their interactions with callers or individuals they interacted with on behalf of the center. Most importantly, the participants identified several factors that helped and hindered the call center's ability to function and manage information.

Fargo Call Center Structure and Capacity Recommendations

Equipment:

21 phones
22 chairs
12 tables
3 extension chords
3 surge protectors
2 laptop computers (minimum) with Microsoft Excel and Word with Internet connection
One computer projector
Access to photocopier and laser printer
Printer paper
Call record forms
Pens, dry erase markers, scratch paper

Special Note: 20 phones should be arranged for call takers all of which should be able to receive incoming calls. One primary phone should be available that does not receive incoming calls. Without a phone that does not accept incoming calls, high call volume will prevent anyone in the call center from making outgoing calls.

Phone System:

The phone system should have the capacity to playback a recording for those who are on hold. Those recordings should be kept up to date with answers to frequently asked questions. Those individuals on hold or in queue will be able to hear the recording while they wait. Data suggests that 60 percent of the callers will receive answers to their questions through that recording reducing call volume.

Personnel:

2 supervisors (7am to 7pm) and 1 supervisor (7pm to 7am)

Supervisors should be familiar with call center operations, EOC coordination, and volunteer management. The supervisor should also possess strong computer knowledge in Microsoft word and Excel.

1 volunteer for data entry

This volunteer is responsible for inputting the call information into applicable spreadsheets. He or she should be highly comfortable with computers and have a strong knowledge of Microsoft Excel.

20 volunteer call takers (7am to 7pm) and 5 volunteer call takers (7pm to 7am)

Note: All volunteers should be badged while working in the call center.

Volunteer Training:

Call takers should learn to identify frequently asked questions and the call center supervisor should collect those questions and derive answers that should be included on the call waiting recording and the call takers' information sheets. Call takers should also be able to identify and record questions they do not have answers to so frequently

Figure 18. Page one of call center recommendations.

unanswered questions can be investigated to provide better public information on these issues.

Call takers should be trained to recognize what constitutes an emergency that would warrant a call to 911.

Call takers should be able to handle routine calls that include providing information, recording information and referring the call for further follow up, scheduling volunteers for the call center via phone, and recognizing special cases that must be referred to the supervisor.

Volunteer call takers should be required to sign a written set of instructions that details their responsibilities and that they are not to offer personal opinions to advise callers. Those forms should be filed and kept.

Supervisor Responsibilities:

The supervisor is responsible for:

- Communicating and coordinating with relevant EOCs
- Insuring just in time training for volunteers
- Keeping a sign in and sign out log of volunteers
- Keeping a schedule of volunteers recorded and up to date
- Insure close coordination with public information officers and report any media contact to applicable public information officer
- Attend EOC briefings
- Updating announcement board on the computer projector and the call takers' information sheets
- Quality control of service to callers

Volunteer Management:

In the event a certain jurisdiction gives explicit permission for the call center to send volunteers to effected areas, the call center should institute a volunteer management position. This individual should use data analysis to discern geographic patterns from the areas requesting volunteers. This individual should plot the coordinates of the requests, and coordinate with available volunteers to work at those identified locations.

Call Takers' Information Sheets:

Each caller station should have an information sheet with the following information:

- The call center contact information
- Emergency contact number(s)
- Locations/addresses of volunteer centers
- Public Information Officer contact information
- City of Fargo Engineering contact information (for both phone contact and registration of resources which was done via the city's Web site).
- City of Moorhead contact information
- City Web addresses
- Contact information for the American Red Cross and Salvation Army

Figure 19. Page two of call center recommendations.

Answers to frequently asked questions

The information available to call takers should also include pandemic information:
- Relevant health information provided by Public Health
- Vaccine availability
- Priority groups/groups most at risk
- General education information

Information Collection and Sharing:

Within the call center, information should be conveyed primarily through two mechanisms: One, the call takers' information sheet, and two, the computer projector. The computer projector should have a list of recent developments and significant events. It is the responsibility of the supervisor to coordinate the use of the call takers' information sheets and the overhead announcement board.

Externally, the call center supervisor should communicate information learned in the call center to the city EOCs. To do this, the call center must maintain two computer databases of volunteers/resources offered and volunteers requested. The information collected by the call takers should be inputted into the databases. Those databases should be routinely provided to Emergency Management staff.

Lastly, the call center supervisors, data entry volunteer, and volunteer manager (if applicable) should meet at intervals of no more than one hour (every hour) to briefly share information. Frequent meetings of less than five minutes will vastly improve coordination and communication.

Call Volume:

Call volume will correlate to the media cycle. Expect greater call volumes immediately after morning, afternoon, and evening broadcasts.

Figure 20. Page three of call center recommendations.

Information – The Nature of Organizational Interaction

While agreeing with the general description of the organization of the call center outlined above, one participant more clearly defined the nature of the interaction between the call center and external entities that delivered information to the center. She stated:

> The cities, counties, the, primarily the emergency managers, would relay either to me and then I would give it [information/updates] to the call center or they'd go right to the call center, they could either walk there or call there. Um, and then any, really anyone can call in with information but we, it was mainly the, either the emergency managers or the PIOs [Public Information Officers] from each of the cities and counties.

Another respondent, describing herself as a "floater" in the call center, specifically addressed the internal communication and management of information in the center. She described:

> There was kind of like the call center manager all the time. And, they would take information from the public information officers, they were the ones bringing in information into, into the call center. If it was some new information that was confirmed, um it would go up on a white piece of paper, I believe it was, we used pieces of paper then. Um, to, and then that new information maybe it would be put up on the wall so that, so it was always nice and big and then the people answering the calls would be able to look up and find the answer. And if it wasn't up there then they [the call takers] would have to grab one of the people floating around and ask.

The respondents were clear to state that the operations of the call center were driven by information and the nature of that information coming in and going out of the call center. One respondent recalled that the center received calls offering donations of equipment and supplies and the center had no way to deal with that type of information. She stated that some capacities eventually emerged or were developed like, organizing food donations to be taken to various volunteer sites throughout the counties. The respondents were consistent in their description that the vast majority of calls were from individuals either requesting volunteers or offering to volunteer and inquiring where they should go to help. Another respondent stated the center took calls from individuals seeking shelter or a safe place to take their animals. One respondent stated, "so that information was always pretty uh, sought after, and the correct information was always sought after because it seemed like it changed by the minute, which it very well could have been changing by the minute."

Organized Chaos

That high demand for information, rapidly changing situation, and emerging structure of the call center caused the two respondents who worked during the day shift to describe the call center as "organized chaos" at times. One respondent said:

> It was really a matter of just kind of implementing stuff as, as we needed and it was, it was organized chaos. Uh, at sometimes it wasn't that organized but um, it was a matter of training the call takers and then when, when the information or when things got tough when people called crying, it was a matter of getting them the training that they needed to handle those calls and we had some volunteers leave because it was just too much for them to take.

Similarly, the other respondent who worked during the day stated:

> Well, because 2009 [the flood] happened so quickly, um, I don't believe it was managed extremely well at first uh, just because it was such a quick um, melt and such a quick, it rose so quickly, um, it you know, I felt it was organized chaos whenever I was in there. It felt chaotic it was always busy and loud because the phones were constantly ringing, everybody's on the phone all the time and yeah, I just felt like it was organized chaos for the most part.

The respondents indicated that this chaos allowed information to fall through the cracks and get lost in the system and for other matters to get overlooked leading to an urgent and demanding need for individuals in the call center to improvise and articulate processes or develop a better way of handling a situation.

Rumor control contributed to the chaos and was of particular concern to two of the respondents. One respondent recalled:

> The news and the radio were always saying things and then people would call and say – oh, is this true? And it was not true and so really keeping up with things, keeping up with where they were getting their information versus where we were and sometimes it wasn't always the same but, we figured it out eventually.

Assumption of Collective Intelligence

The respondents attributed some of the challenges with verifying or dispelling rumors with what can be described as an assumption of collective intelligence between the EOCs and the call center. In other words, the respondents indicated that the EOCs assumed the call center and its staff were informed of information the call center did not have. One respondent described situations where the call center received information from callers that it should have been able to verify:

> There were certain times when we'd get information, and or we'd get information from callers and then it was, it was like, well? So then we'd go in and double check and make sure that that was accurate information with the PIO and they would double check and, yes, that's accurate. Okay, well, it would be nice if we, you gotta run down the hall and tell us that then.

Organizational Evolution and Role Familiarity

Despite the challenges, the respondents indicated that there was improvement over the course of the call center's operations. Curiously, when asked directly if there was an evolution or change in the call center structure, all three respondents denied any change. However, throughout the course of the interviews, the respondents indicated key improvements in call center operations. One respondent stated, "Just like in every incident, things are going to evolve over time so, we had a better system as everything, as the incident, and the flood went on." Another respondent described the call center as disorganized at first, but processes fell into place as the event progressed. The respondents indicated that an important piece of the call center's ability to give out accurate information was the information packet at each call takers' phone stating that the information packet developed and grew over time with information pertinent information describing it as "a script" of sorts for call takers.

While my complete participant ethnography detailed structural and organizational changes in the call center over time, all three respondents attributed the improvements to individuals' familiarity with their roles and the EOCs' understanding of the call center's role. The respondents said that the need to train new individuals was difficult and that new call takers coming in later in the event, who weren't familiar with the call center and the

processes, not only put a demand on the staff to train new call takers, but also made call center operations more difficult as compared to operating with mainly "experienced" volunteers. One participant said, "As we had the same group of individuals there each night, it made things go more smoothly because you had that information from the previous days, um, that started resonating within them so they'd understand the process and everything in there." Interview participants indicated that the role familiarity was not limited to individual call takers knowing what their role was individually, but everyone understanding others' roles, who to ask certain questions, and where to go for certain information inquiries.

External to the call center, the respondents stated that, once the PIOs for the cities and counties learned what information the call center was responsible for, the interface between the call center and EOCs was much more efficient and less confusing, stating that understanding these roles was "a little bit of a learning process." The three respondents clearly indicated that role familiarity helped the call center function both, in and of itself, and interface with agencies and other organizations in its information management capacity.

CHAPTER FIVE. DISCUSSION

The call center's management of information will be discussed from a larger structural perspective using Comfort's (2008) frameworks and my participant observations. Then, the data from the qualitative interviews will be addressed identifying areas that are not explained in the existing literature. Finally potential contributions of this study adding additional characteristics to Comfort's (2008) characteristics of complex systems at various stages of organizational evolution.

I did not begin with Comfort's (2008) theory in mind nor was I aware of complex systems theory when I was working in the call center. Only upon conducting a literature review on information management did I discover Comfort's (2008) theory appealed to me as a possible fit for what I saw evolve in the call center. This comparison between my observations and this complex systems framework provides a foundation for understanding the information management capacities within the call center.

The first framework Comfort (2008) presents is the eight conditions that lead to self-organization of a nonlinear system. Those conditions are:

1) A community's capacity for collective action is dependent on awareness, ability, resource accessibility, and committed and informed action
2) Random events adversely impact the capacity of a response system
3) Communities retain memory of a spontaneous event impacting future decision-making processes
4) Information is transmitted in patterns of communication that allow learning, control, and adaptation assuring the operation of dynamic systems

5) Dependency relationships emerge through constraints actors create causing emergence of variant action
6) Self-organization realizes a shift where the system accepts input from multiple sources
7) Unpredictable social actions are the result of a shift in the decision making process of community organizations
8) Recurring communication and coordination patterns allow systems to reproduce (Comfort, p. 8-9).

Based on Comfort's (2008) classification of self-organization of nonlinear systems, above, it is possible to classify the call center as such. First, the community understood the need for collective action. It was clear by the time the call center was activated, that the community faced a growing crisis. The existing relationship and pre-arranged agreement between the call center and the local government produced the first criteria of Comfort's (2008) classification. The call center organizers clearly had the ability to activate the necessary resources. The second criterion, the adverse impact of random events, was evident in the call center's inability to capture and manage certain types of information. While, following the institution of structure, the call center was able collect information, it was still not capable of managing any and all information that came into the center. Consistent with Comfort's (2008) second criterion, seemingly random information inputted into the call center identified a lack of capacity to deal with that information. Also, the constantly changing and dynamic environment of the flood's impact on the community interfered with the call center's capacity to communicate accurate and up-to-date information to the public. The third criterion, collective memory of an event and its

influence on the decision-making process, was a guiding framework for the evolution of the call center. Each time an unplanned event occurred, be that a determination from the government officials or the decision to open or close a volunteer reception center, the call center operations were adjusted to further deal with fluctuations in the environment. Since the conditions of the community were constantly changing throughout the duration of the event, the call center had to evolve to reflect those conditions in order to remain effective in its role. Any structural or organizational change in the call center impacted volunteer roles and the call center workers' familiarity with how the various information management processes functioned.

The fourth criterion was essential for the call center to operate within the multi-organizational and inter-jurisdictional nature of the emergency management response framework. Because every aspect of the call center's integration was not outlined previous to the flood, different systems of inter-organizational communication and coordination had to develop and evolve. Communication in a predictable fashion and through expected channels (i.e. through the same people in organizations and via the same method of email or person to person contact) had to solidify in order for the call center, as a dynamic system, to survive.

Likewise, the fifth criterion is equally necessary for the call center's function. The call center did not operate as a single entity, with a single purpose, with a single impact. It relied on the relationships that emerged as a result of its operation and function within the response systems at large. Following the creation of these dependency relationships the capacity for the dynamic system (again referring to the call center) to accept inputs from multiple diverse sources and perspectives developed.

Finally, the last two structures link to the final element of reproduction of the system. The recurring communication and coordination allow the call center to reproduce its operations during the days it was active. It is also likely, that given the collective memory condition of this model, that future activation of the call center in a similar capacity may rely and take advantage of residual communication and coordination channels and functions.

Ultimately, Comfort (2008) adds one final contribution to this model when she states, "The process involved in voluntary collective action to reduce shared risk, which include communication, selection, feedback, and self-organization, depend upon information" (Comfort p. 10). This statement is vital to the applicability of information management related theories and the call center. By applying the above model, it is evident that the operations of the call center are dependent on the information that flows in, out, and around the call center to its various connections. The call center's function is communication, however, more specifically at the foundations of its operations and emergence, is information.

Furthermore, Comfort (2008) presents five characterizations of problem-solving processes for shared risk events. Those characterizations are:

1) Within these systems, there are different participants who have different conceptions of time
2) The system must accept both negative and positive feedback for effective refocusing of the system's goals
3) The system must have the capacity to hold and exchange information

4) These systems deal with nonlinear problems of shared risk, the system must have the capacity to develop large-scale solutions from micro-level information input
5) The systems dealing with shared risk must have the capacity to develop short and long-term solutions (Comfort, p. 10-11).

This model fits well in identifying the call center structure and its attempt to solve problems presented by the shared risk, flooding event. First, the call center existed within a complex web of organizations and jurisdictions each attempting to play a part in the flood response. The call center was under, what Comfort (2008) describes as "a continuous process of learning and integration" (Comfort, p. 10). It is fair to say, that the organizations involved in the response were also under a continuous state of learning given the dynamic nature of the flood. But the disparity in the time it takes for the different organizations to learn and gain information is key to this element of Comfort's (2008) model. Given the different roles of different organizations, or individual citizens for that matter, the system had to acknowledge that those different entities have different rates of information uptake. In a sense, one of the goals of the call center was to reduce this disparity in that one of its main goals was to answer questions from the public. The data collected from the qualitative interviews, discussed later, reflects the interaction between the call center and other response entities.

The second characteristic, the incorporation of positive and negative feedback was an important element to the call center structure. Through testing system capacities and capabilities and the observation of the success and failure of these capacities, the call center was able to refocus its tactics to become a more efficient system. Due to the high call

volume coming into the call center I had to constantly assess how well information was being organized in order for the call center to continue functioning at an efficient level.

This incorporation of feedback linked well with the third characteristic of the system's capacity to hold and exchange information. Initially, the call center system was able to hold and exchange information, but further into the incident, as it incorporated the positive and negative feedback, it was a matter of increasing the capacity to hold and coordinate information. The effectiveness of the call center, and indeed its community impact, is therefore dependent on the efficiency of the aforementioned capacity development.

The fourth characteristic also links to the previous two. The evolution of the system in the incorporation of positive and negative feedback helped develop the capacity to develop large-scale solutions from micro-level information inputs. If the call center system did not have the capacity to receive a singular input, the lack of capacity (or negative feedback) was identified and reported to the call center supervisor. The supervisor would then take that information and work to develop a capacity within the call center system that could make a macro impact on information management.

Like the capacity to translate micro-level input shortcomings into over all system capacity gains, the call center system needed to have the capacity to create short and long-term solutions. Since the event lasted several days, and during the event it was uncertain how long the call center would be active, the solutions developed had to withstand long-term wear. The implementation of a call center supervisor insured the continuity of any long-term solutions proposed because the supervisors were scheduled to shifts to return

every day the call center operated. Given the duration of the flood event, it was a given that the resilience of proposed solutions must have been high.

Comfort's next set of criteria discuss the requirements of transition in complex systems. The call center activation for the Fargo flood can be viewed as a significant transition in that it moved from its normal operating capacity and function to a heightened level of operations due to the flood. According to Comfort (2008), in order for the call center to go through such a transition as a complex system, it must have moved through the following stages:

1) "The 'discovery' of a common threat" (Comfort, p. 31)
2) "Common understanding among the affected group of both the problem confronting the community and the goal for action" (Comfort, p. 31)
3) "Mechanisms of information exchange and feedback that support learning among the participating members" (Comfort, p. 31)
4) "Means of integrating incoming information with existing knowledge to create a timely, informed basis for action at each operating node in the emerging response system" (Comfort, p. 31)
5) "Means of evaluating performance and incorporating this information into a common knowledge base that informs the next decision in the evolving process" (Comfort, p. 31)

To begin with, the discovery of the common threat was relatively straightforward; the city knew it was facing the threat of significant flooding. For the second requirement, it can be argued that there was little disagreement that there was a threat of flooding (the variance stood with the severity of the flooding throughout the incident) and the goal for action, in

this case, was to begin building sandbag walls and levees to protect the cities. The call center's role is defined as ancillary to the goal of erecting flood barriers, but no less important to the overall goal as it was a supporting function to the means of accomplishing the ultimate goal of protecting the cities. Third, the mechanism for information exchange and feedback was integrated into the contractual activation mechanism of the contract between the government and the call center. The fifth requirement of evaluating performance for informing decision-making is evident in the singular event of the call center activation. The conditions were such that they were appropriate to activate the call center. That activation was the root to further evolution of dynamic response systems in which the call center played as significant role.

Comfort (2008) provides classifications for five types of systems that are essential to dissecting the phases through which the call center evolved including the three I mentioned above. They are nonlinear systems, dynamic response systems, non-adaptive systems, emergent adaptive systems, and operative adaptive systems (Comfort, p. 57, 33-35, 70, 72). To begin with, Comfort (2008) discusses nonlinear systems as the fundamental premise of social systems (Comfort, p. 38). She states, "Measurement of nonlinear systems needs to account for random events and their potential influence on the direction and performance of existing systems" (Comfort, p. 39). One key element in the classification of nonlinear systems is the concept of process. Comfort (2008) states,

> Incorporating the concept of process into a working model of nonlinear system acknowledges an evolving exchange of energy and information between the system and its environment that transforms prior relationships. A nonlinear system reflects

> change, not necessarily progress, but at least the possibility of producing better performance toward an evolving goal. (Comfort, p. 39-40)

This identification of process is imperative in the understanding of the construction of nonlinear systems. This is key to the dynamic nature of these nonlinear systems. In order for nonlinear systems to thrive, then, the ongoing evolution and change of that system must be recognized in its given capacity to flex to variation. A call center, in its ideal state will be nonlinear because the ability of the call center to function and its effectiveness will be determined by its ability to adapt to changing environmental conditions in a disaster and also changes in the highly dynamic information coming into its systems.

Next, Comfort (2008) defines a dynamic response system beginning with six primary characteristics. The primary characteristics exist within the preliminary model of dynamic disaster response systems (Comfort, p. 34). The first of the six characteristics is organization. The various types of organizations (public, private, non-profit) have different levels of authority, capabilities, and resources (Comfort, p. 33). These elements do not define, however, the interactions among the participating organizations (Comfort, p. 33). Instead, "organizations involved in a given event are governed by the local conditions and generate a disaster response system specific to that event" (Comfort, p. 33). The second characteristic is that the disaster response systems are based on a set of relationships between various jurisdictions and organizations (Comfort, p. 33). The third characteristic is defined by an articulated communication process that aids in effective coordination amongst response agencies (Comfort, p. 33). Fourth, the timeliness, accuracy, and validity of information are directly related to the efficacy of communication (Comfort, p. 33). Fifth, the disaster response system is dependent on a structured information and communication

process (Comfort, p. 33). And, finally, individual and organizational learning is generated based on the communication and information systems and processes (Comfort, p. 33).

Classifying the call center as a dynamic response system can aid in the understanding of its operations. First, there is a significant variance in the authorities and resources of the different response organizations. The call center's authority was governed by the contract established with the local government authorities. The scope of the call center function and authority was presumably created to fit within the existing response structure. Regardless of those prearranged agreements and organizational structure, the interactions between the response entities, as outlined by Comfort (2008), were largely dependent on the events of the flood event. Next, the call center certainly fits into Comfort's (2008) definition of a disaster response system in that the participating response organizations, like local emergency management offices and city emergency services to name a few, were related to each other through coordination with the purpose of serving the affected populations of the residents in Fargo, Moorhead, and the surrounding rural areas. Also, an articulated communication system was established for all response entities involved in the flood. That communication system involved normal communication infrastructure (like, for example, emergency dispatch services and structures) for response organizations, however, part of the communications system for citizen responders was the very use of the call center to receive current information on what actions they should take. The number to the call center was highly publicized and high numbers of citizens used the call center as a form of verification for volunteer reception locations and to communicate areas in need of volunteers. Next, one of the main goals of the call center was communication of timely and accurate information. This goal fits the fourth characteristic

of the dynamic response system. Also, the communication in and around the call center was structured such that it informed action on the part of the citizens, consistent with the fifth characteristic of dynamic response systems. Finally, as discussed at length in the previous pages, the call center's systems and capacity to learn and adapt to changing inputs and external conditions supported its classification as a dynamic response system. The mere evolution of the call center's operations is a testament to its dynamic nature that attempted to mirror the constantly fluctuating external conditions.

Moreover, in Comfort's (2008) discussion of three additional types of systems, non-adaptive systems, emergent adaptive systems, and operative adaptive systems, it is clear how the various levels of functionality and capacity can classify the call center into each of these categories. These categories can also assist in indentifying the various stages of evolution and growth the call center experienced. Comfort (2008) defines non-adaptive systems as, "those that are low on technical structure, low on organizational flexibility, and, for the most part, also low on cultural openness" (Comfort, p. 68). She continues, "Such systems have particular difficulty in accessing, storing, and communicating information to support interorganizational decision processes under the urgent, stressful conditions of disaster operations" (Comfort, p. 81).

At the onset of the initiation of the call center, it could be classified as a non-adaptive system. The demand on the call center was significant given the high volume of citizen calls. I observed that, throughout most points of the day, no outgoing calls could be made because there were so many calls coming into the system. The call center's system was not able to efficiently record and organize information coming in as stated by the first call center supervisors. Information management was low in technical structure (i.e.

information was hand recorded and written on posters on the walls of the call center room). The tedious methods for information records and management made the call center incapable of flexing and adapting to changing external conditions, especially as the flood levels increased and the community desperation grew. Additionally, like Comfort's (2008) description of non-adaptive systems, the call center had difficulty communicating information so it could be effectively used in decision-making processes. Because the information was being written down by hand on paper at the call takers' phones and on the walls, the information could not easily be copied or shared within the room much less with other emergency response entities housed in the emergency operations centers down the hall from the call center.

In contrast, Comfort (2008) defines emergent adaptive systems as, "those characterized by low technical structure, medium organizational flexibility, and emerging openness to new cultural meanings of [risk] in their respective communities" (Comfort, p. 70). The classification of emergent adaptive systems describes the call center in its state of transition from its initial structure as a non-adaptive system, to its ultimate and ideal form as an operative adaptive system. The call center grew increasingly capable of systematic flexibility as it opened itself to becoming more dynamic as external conditions changed. This was achieved by implementing a system that was scalable to the information demands. The databases created and the electronic update board at the head of the room were effective at any rate of information flow. As the flood event worsened, and the center received more calls at more hours of the day, the system was able to withstand significant information inflow.

At this point, the system easily transitioned to, what Comfort (2008) defines as an operative adaptive system. Operative adaptive systems are "those in which the technical structure, organizational flexibility and cultural openness to new methods of perceiving and responding to risk are approximately medium" (Comfort, 72). Comfort (2008) adds that these systems, despite their effectiveness, are "primarily reactive" (Comfort, p. 159) and, "emerge in response to particular events, and function effectively in specific communities" (Comfort, p. 159). The call center, at its largest growth state can be considered as striving for operative adaptive systems status given its ability to evolve based on conditions. Its enhanced function emerged based on external events, in this case more intensive flooding reaching greater populations to a greater degree of severity. The implementation of databases to record incoming information and the computerized announcement board were clear attempts at higher technical performance and utilization allowing rapid expansion of the call center capacities.

While the technical aspects of the call center fit Comfort's (2008) classification, the pre-existing structures of the call center fall short to complete its classification as an operative adaptive system. On this note, Comfort states (2008),

> Operative adaptive systems have clear technical requirements to support the rapidly evolving expansion of organizational actors and functions in disaster operations. A basic information infrastructure needs to be in place prior to the disaster event, with personnel who have the training and capacity to use it, as well as a shared goal to protect life and property of their community. (Comfort, p. 160)

Therefore, there is a clear need for operative adaptive systems to achieve a balance of proactive action and reactivity. The call center could more cleanly be classified as an

operative adaptive system if it had taken the following actions: First, it could have established an expandable and scalable information management system prior to the flood event so it would not have to be constructed after the incident was initiated and the disaster call center was activated. And second, it could have trained volunteers as call takers prior to the flood event so they were familiar in that information management system and all of its technical capabilities and requirements.

The following chart (Figure 21) summarizes the evolution from non-adaptive to operative adaptive systems:

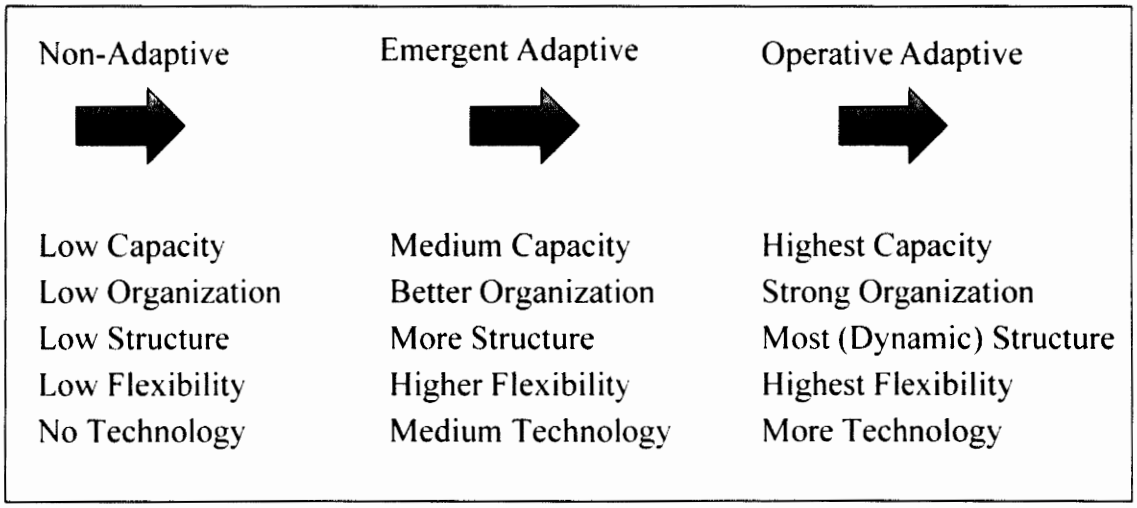


Figure 21. System evolution from non-adaptive to operative adaptive system and characteristics of each level system (same as Figure 2).

At a more individual level, the qualitative interview data provide input on two primary areas that impacted the call center's ability to management information: 1) the assumption of collective intelligence and 2) role familiarity. The existing theory discusses how collective intelligence allows for effective and informed decision-making, however, it does not seem to comment adequately on the *assumption* of collective intelligence and how to address challenges as a result of this phenomenon. In order for an organization to implement technological systems to manage information and create a collective knowledge

base to form decisions from, it must recognize the need for collective intelligence (to the extent possible) and the need for information sharing between and within levels of operations and agencies or organizations. From the interview responses, it is clear that collective intelligence and role familiarity are not necessarily mutually exclusive. Role familiarity of those within the call center and those from external agencies who needed to understand the call center's role helped contribute to the greater sense that information should be more readily shared. As suggested by the interview responses, once the PIOs and EOCs understood the value of the call center, information was made more readily available.

I do not claim that these data collected for this study are generalizable by any means, however, these results do support the notion that improved role familiarity produced a greater state of collective intelligence therefore improving some aspects of the call center's ability to manage information. Again, while not generalizable, for this case, the data suggest the following diagram (Figure 22) may be applicable to the call center:

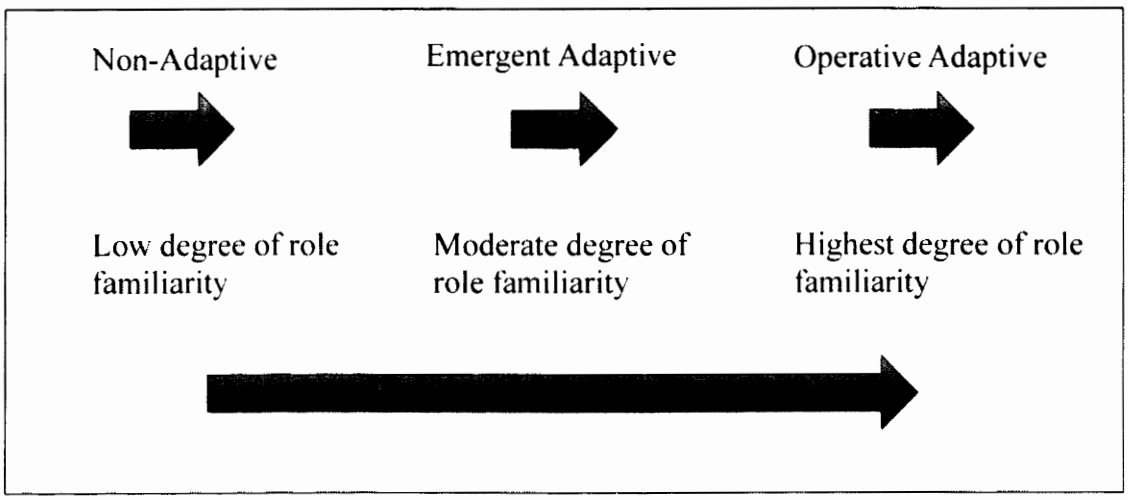


Figure 22. System evolution including role familiarity and the continuum of collective intelligence.

In this figure (Figure 22), the most primitive form of evolution of the call center exhibited a low degree of role familiarity. This classification accounts for the difficulties the interview participants noted with new volunteers coming in and presenting the need to be trained and the information sharing difficulty between the PIOs and the call center. As the respondents suggested, there appears to be a continuum of development of collective intelligence throughout the evolution of the call center. The most primitive state of the call center, of course, having a low amount of collective intelligence and, if the call center were striving toward the operative adaptive level of a complex system, it would achieve a high amount of collective intelligence.

The interview respondents suggested that various pre-planning efforts and pre training of volunteers would greatly improve the functions of the call center, but, specifically, they suggest, pre planning would help reduce the assumptions of what various organizations are responsible for and clearly articulating organization and point of contact roles prior to a disaster response.

On a final note, it is necessary to understand that the call center had a significant information collection role also. But, neither were my observations nor were the interview responses sufficient to critique the effectiveness of the decisions based on information coming out of the call center going to individuals in the community or other response entities. It is only possible to generally postulate that, according to existing theories, better information management capacities may lead to more informed and effective decision-making in a disaster response.

CHAPTER SIX. CONCLUSION

Understanding organizations in disasters is critical to research in emergency management, but understanding specific aspects of organizations' information management capabilities, as discussed here, is paramount to understanding challenges in disaster response. While Comfort (2008) and a variety of other authors provide insight into how information is managed in organizations during disasters, the concept of role familiarity and the impacts of the assumption of collective intelligence should be reviewed further. This study suggests that role familiarity has a direct relationship with how information was managed in the call center while responding to the 2009 flood. These data support the notion that Comfort's (2008) theory of complex systems is consistent with many of the activities observed in the call center, especially those activities and events contributing to an organizational evolution. These data do not support generalizable conclusions about role familiarity's impact on call centers or organization in other events but these results can provide the foundation to create the hypothesis that role familiarity directly impacts an organization's ability to manage information. Further research should focus on *how* and *to what extent* role familiarity acts as a variable impacting information management in a disaster response organization.

As identified in this study, as the call center adapted, it increased its use of technology, which Comfort (2008), K.J.E. Von Lubits et. al (2008), and Militello et. al (2007) state improve information management capacity and inform decision-making. There are a number of businesses that have developed software and computer systems that aim to create a unified operating picture and support multiple computer users and portals to allow for easy information input, retrieval, and interpretation. But, with increased technology

comes an increased need to train individuals on that technology. As the respondents noted, training volunteers on basic call center processes was difficult and the call center staff had difficulty finding volunteers sufficiently computer literate to enter calls into simple spreadsheets, much less complex computer programs or web-based portals.

Understanding the organizational variables that make an institution adept at managing information is central to effective decision-making on the part of disaster responders and the outcomes of disaster operations. Greater knowledge of information management capacities within emergency management organizations will contribute to both theoretical and tangible recommendations that create more intelligent disaster responses.

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APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVAL

NDSU NORTH DAKOTA STATE UNIVERSITY

Institutional Review Board
Office of the Vice President for Research, Creative Activities and Technology Transfer
NDSU Dept. 4000
1735 NDSU Research Park Drive
Research 1, P.O. Box 6050
Fargo, ND 58108-6050

701.231.8995
Fax 701.231.8098

Federalwide Assurance #FWA00002439
Expires April 24, 2011

April 9, 2009

Dr. Daniel Klenow
Dept. of Sociology, Anthropology & Emergency Management
402C Minard Hall

Re: IRB Certification of Human Research Project: **"Organizational Features of a Call Center for Flooding Response"**
Protocol #: **HS09220**

Co-investigator(s) and research team: **Carol Cwiak**

Study site(s): **NDSU** Funding: **n/a**

It has been determined that this human subjects research project qualifies for exempt status (category # 2b) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*). This determination is based on the protocol form received 3/24/09 and consent/information sheet received 4/9/09.

Please also note the following:

- This determination of exemption expires 3 years from this date. If you wish to continue the research after 4/8/2012, submit a new protocol several weeks prior to this date.
- The project must be conducted as described in the approved protocol. If you wish to make changes, pre-approval is to be obtained from the IRB, unless the changes are necessary to eliminate an apparent immediate hazard to subjects. A *Protocol Amendment Request Form* is available on the IRB website.
- Prompt, written notification must be made to the IRB of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Any significant new findings that may affect the risks and benefits to participation will be reported in writing to the participants and the IRB.
- Research records may be subject to a random or directed audit at any time to verify compliance with IRB policies.

Thank you for complying with NDSU IRB procedures; best wishes for success with your project.

Sincerely,

Teryl Grosz, MS, CIP
HRPP Manager

Institutional Review Board ...for the protection of human participants in research

North Dakota State University
Sponsored Programs Administration
1735 NDSU Research Park Drive
NDSU Dept #4000
PO Box 6050
Fargo, ND 58108-6050 231-8995(ph) 231-8098(fax)

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MAR 24 2009
Office of Sponsored Programs Administration

IRB Protocol #: HS09220

IRB PROTOCOL FORM: Exempt Categories

Application to Conduct Research Involving Human Participants

1.Title of Project: **Organizational Features of a Call Center for Flooding Response**

2. Principal Investigator: **Daniel J. Klenow, Ph.D.** Dept. name: **Sociology, Anthropology, and Emergency Management**
(PI must be an NDSU faculty or staff member; graduate students must list their advisor as PI)

Campus address/phone: **402C Minard/1-8925** Email address: **daniel.klenow@ndsu.edu**

Role in this research: **direct/supervise research**

3. Co-Investigator: Dept. name:

Campus address/phone: Email address:

Role in this research: **other:**

4. Research team: *List all other individuals who will assist in the project (recruiting participants, obtaining informed consent, intervening or interacting with participants to obtain information/data, and/or handling identifiable information for research purposes). May provide as a separate attachment.*

Name, dept. or affiliation:	Role in research:
Carol Cwiak, JD	**collect data**

Note: *Investigators and all members of the research team are required to complete a course in the protection of human research participants prior to protocol review. This training must be current (within the last 3 years). Refer to the 'Training' menu item on the IRB webpage for information and links to online sessions.*

5. Project dates: indicate the anticipated beginning date *(could state 'after IRB approval')* and ending dates for research procedures involving human subjects: *(Note that beginning date should allow sufficient time for IRB review and approval; no research procedures involving human participants may begin prior to obtaining notification of IRB approval.)*

Beginning date: 03/30/09 **Anticipated end date: 06/30/09**

Exemption Screening Questions

A 'yes' response to any of the questions below indicates the project is not eligible for a claim of exemption, and requires either expedited or full board review.

1. ☐ Yes ☒ No Will the research specifically recruit pregnant women, fetuses, prisoners, cognitively impaired individuals, or economically or educationally disadvantaged individuals?
2. ☐ Yes ☒ No Will the research involve survey or interview procedures with children (under 18 yrs of age)?
3. ☐ Yes ☒ No Will the research involve the observation of children in settings where the investigator will participate in the activities being observed?
4. ☐ Yes ☒ No Will the research involve an intervention, an attempt to influence or change participants' behavior, perception, or cognition?
5. ☐ Yes ☒ No Will a drug, biological product, medical device, or other product regulated by the FDA be used in this project?
6. ☐ Yes ☒ No Will the project purposely withhold some or all information about the research from participants, or involve deception?
7. ☐ Yes ☒ No Will data collection include sensitive information (illegal activities, or sensitive themes such as sexual orientation, or behavior, undesirable work behavior, or other data that may be painful or very embarrassing to reveal)?

Project Description

Use plain language, avoiding technical terms or jargon, unless explained. The description should be understandable to any person unfamiliar with the area of research.

1. Purpose and goals of the research:

The goal of this study is to gather data on the types of information needed by individuals who use a flood call center. The data will be used to design forms and procedures that will result in a pre-established template for future flood related call center forms, procedures, and structures.

2. Method and procedures: *Explain in detail what subjects will be asked to do or what information will be collected about them, and when or how often research procedures will be conducted. Provide a timeline or schedule of events, if applicable. May be provided as a separate attachment, with numbered pages.*

Data will be gathered from individuals who supervise the call center workers. The call center workers take calls from individuals who need assistance with impacts from the flood (sandbags, volunteer assistance, etc). The supervisors are knowledgeable of the processes that lead to efficient call center organization and their responses will be an important part of the study. In addition, selected call center phone workers will also be interviewed so as to create a complete inventory of the types of calls that come into the center. It is expected that 10-15 call center interviewers will provide data through an open-ended interview.

3. Performance site(s): *Indicate the location(s) where research procedures will be conducted*.*

Data will be gathered from the supervisors of the call center at NDSU. Most of them are graduate students at NDSU. In addition, supervisors from Firstlink - a call center staffing organization will also be interviewed. It is expected that two interviews will be completed with Firstlink supervisors. Those interviews may be completed at the Firstlink office. The call center workers who take incoming phone calls will be interviewed by phone after the flood efforts have been completed.

** if research will be conducted at non-NDSU sites or locations other than a public venue, forward a letter of cooperation/permission from each site(s), once received.*

Exemption Categories

Federal regulations define 6 categories of exemptions. A research project may qualify if all parts of the research fall within 1 or more of these categories. NDSU policy requires the IRB to determine all exemptions prior to conducting the research, and will make the final determination as to level of review in order to protect the rights and welfare of subjects.

Check all that apply, and answer applicable questions:

☐ **Exemption category #1: Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:**

☐ **research on regular and special educational instructional strategies, or**

☐ **research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.**

1a. Describe the established or commonly accepted educational setting of the research:

1b. Describe the normal educational practices to be used:

Note:

- *This category may include children under 18yrs of age (attach the Child Participant Attachment form)*
- *If students' academic records will be used for research, the investigator is responsible for compliance with FERPA. Use of academic records for research generally requires a signature from the student (or parent, if student is a minor). More information at: http://www.ndsu.edu/general_counsel/ferpa.htm*
- *If minors under the age of 18 will participate, also complete the 'Child Participant Attachment' form.*

☒ **Exemption category #2: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior for which subjects cannot be identified directly or through coded identifiers, or, if they can be identified, disclosure of their information/responses outside of the research project would not reasonably place the subjects at risk of criminal or civil liability, or be damaging to their financial standing, employability, or reputation.**
(Mark as applicable):

☐ **a. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement) for which the subjects cannot be identified, or release of the information would not be harmful to the subject.** *(This category **may** include children; attach the Child Participant attachment form.)*

☒ **b. Research involving the use of survey procedures or interview procedures or observation of public behavior for which subjects cannot be identified, or release of the information would not be harmful to the subject.** *(This category is **not** applicable to children, except for observation of public behavior where the researcher does not take part in the activities being observed.)*

2a. Will data collection include any direct or indirect identifiable information, including codes or links to identifiers? ☒ No ~~☒ Yes*~~ tg, per DK.

NOTE:

- *Even if names will not be collected, it may be possible to identify an individual simply by collecting certain demographic or other unique information about them that would allow their identity to be deduced, especially within a small sample size, or specific group of individuals.*
- *Check 'yes' if a coded link will be held by any party, at any point in the research, even temporarily)*

*If Yes, is there any potential for harm to participants if confidentiality were to be breached? *(*Harm means any disclosure (intentional or unintentional) of the subject's responses outside the research could reasonably place the subjects at risk of criminal or civil liability or can be damaging to the subjects' financial standing, employability, or reputation.)*

☒ No ☐ Yes* *(if 'yes', project is not eligible for exemption under this category)*

☐ **Exemption category #3: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b2) of this section if:**

☐ **a. the human subjects are elected or appointed public officials or candidates for public office; or**
☐ **b. federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.**

☐ **Exemption category #4: Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if:**

☐ **these sources are publicly available, or**
☐ **the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or indirectly through identifiers linked to the subjects.** *(This category may include children.)*

To qualify under this category, all of the following must apply:

- *all records/data/specimens currently existed (were 'on the shelf') before this research was proposed*
- *the research will not involve prospective collections (use of 'left-over' or 'extra' specimens, or information that will be added to a record or dataset)*
- *materials are publicly available; or investigators will not record or retain access to identifiers*

4a. Are the data, documents, records or specimens to be used freely available to the general public?
☐ No
☐ Yes - describe location, including web address, if applicable *(skip the remaining questions in this section)*:

4b. Provide a complete description of the specific data, documents, records or specimens to be studied; indicate how individual records will be chosen or selected *(may use an attachment)*:

▮ Attach a data collection sheet listing column headings, if applicable.

4c. Will members of the research team record or retain (even if temporarily) any information that could potentially identify an individual with the data, documents, records or specimens? *(Includes both direct identifiers - ie, names, address, personal ID #s; as well as indirect identifiers – ie, demographic information within a small and/or well defined population sample, or other information that could be used to deduce the identity of an individual)*
☐ No ☐ Yes *(project not eligible for exemption; expedited or full review is required)*

4d. Will a link or code to identifiers be retained by anyone at any time in the course of the research?
☐ No
☐ Yes: Will members of the research team have access to the link or code at any time?
☐ No – provide documentation to verify that researchers will not be allowed access to the code
☐ Yes *(project not eligible for exemption; expedited or full review is required)*

4e. Indicate the source, original purpose, and date(s) of collection of the data, documents, records or specimens, if known:

Attach documented permission from the owner(s) allowing their use for this research.

4f. Indicate what individuals were originally told regarding the use and confidentiality of their information, records or specimens *(provide original consent form, contract/agreement, or letter, as applicable)*: ☐ Unknown

**Note: If proposed secondary use is inconsistent with the original agreement with individuals, the IRB may require expedited or full review, as well as informed consent.*

4g. Were the data, documents, records or specimens collected as part of research previously approved by another IRB?

☐ No

☐ Yes: Indicate IRB*:

Attach documented approval for this secondary use from the reviewing IRB, who is responsible for ensuring that the proposed secondary use is consistent with the conditions promised to participants in the original informed consent document.

Note:

** Access to some types of data or records may be restricted (ie, medical records) by additional laws to protect an individual's privacy. Contact the NDSU HIPAA Security Officer if research will involve access to individuals' private health information (PHI) held by NDSU.*

**Handling of human blood/tissues/specimens by NDSU employees or students requires participation in the Bloodborne Pathogen Program; contact the University Police and Safety Office for more information.*

****If research is limited to use of existing data, documents, records, or specimens, skip to the 'Privacy and Confidentiality' section to complete this form.**

☐ **Exemption category #5: Research and demonstration projects that are conducted by or subject to the approval of Department or Agency heads, and which are designed to study or evaluate public benefits or services. (ie, evaluation of public benefits programs: Medicare, Public Assistance).** *(Note that this category may only be used with projects conducted under federal authority, and usually does not apply to academic research projects. See OHRP guidance for more information on applicability: http://www.hhs.gov/ohrp/humansubjects/guidance/exmpt-pb.htm)*

☐ **Exemption category #6: Taste and food quality evaluation and consumer acceptance studies i) if wholesome foods without additives are consumed, or ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the food Safety and Inspection Service of the US Dept. of Agriculture.** *(This category may include children under 18 yrs of age; attach the Child Participant Attachment form.)*

6a. Describe the samples to be used in the research, and explain how they meet the criteria above:

Proposed Participants, Recruitment and Informed Consent

Potential subjects must be provided with complete and understandable information about the study, informed of the voluntary nature of their choice, and given sufficient opportunity to consider participation under circumstances that minimize the possibility of coercion or undue influence. Participants cannot be made to waive any of their rights or release the investigators, sponsors or institution from responsibility for any research-related harms.

1. Describe proposed participants *(approximate #, any relevant characteristics, including how they will be selected, contacted, recruited, or identified)*:

1. The first group includes call center supervisors. I expect that there will be about 4-6 of these individuals. Most are graduate students in emergency management at NDSU and will be contacted after the call center completes its work.
2. The second group includes intake callers in the call center. We expect to contact about 10-15 of these individuals. The call center has a list of callers and we plan to contact callers from that list.

- Attach a copy of any oral script, advertisement, announcement or preliminary invitation that will be used. If study information will be presented online, include a copy of what participants will see.

2. Explain procedures for obtaining consent* from participants *(who will seek consent, in what setting and time frame, etc)*:

Before the interview starts, all participants will be given an oral narrative explanation that particpation in the study is entirely voluntary and that they may withdraw at any time. They will be told that their names will not be used in the study and that the information will be used to create efficient call center procedures and forms.

**The informed consent process for 'exempt' projects will involve providing the required information to participants by use of an oral script, handout/information sheet, cover letter, or email; a signature is not usually required. Where applicable, prepare a consent/assent document for minors under age 18, as well as a parental permission form. Consult the sample template on the 'Forms' webpage for guidance..*

- Attach a copy of the consent document or oral script to be used.

3. If there is no plan to obtain participants' voluntary consent, provide justification*: ☒ N/A

Note:

- *This is considered to be a request for a waiver of informed consent, and may be justified only if ethically acceptable; typical instances may include public observation, or use of de-identified existing data, records, or specimens, where the investigator/research team does not, or did not previously have access to subject's names or identities.*
- *Research utilizing medical records may require a signed authorization from patients, and may not qualify for an exemption. The covered entity holding the records is responsible for securing compliance with HIPAA privacy rules.*

4. Compensation: Will participants, or others, be offered incentives for the research (ie, gifts, payment, reimbursement, services, extra course credit, or other forms of compensation)? *Compensating participants for their time and effort is appropriate, although the amount of compensation must not cause undue influence to participate in a study. Any compensation should also be pro-rated, rather than awarded only on completion. If research will involve compensating students with extra credit, specify the amount of extra credit, and what non-research alternatives (equal in time and effort) are available to the students for earning extra credit.*

☒ No
☐ Yes - provide details of the compensation scheme, including any alternatives, if applicable:

5. Alternatives to research participation: Describe any alternative procedures available to those who choose not to participate, if applicable. ☒ N/A

6. Dual relationships: Does the investigator, co-investigator, any member of the research team, or anyone else assisting with the research have an authority relationship (ie, instructor/student, employer or supervisor/employee, physician/patient, or other) with potential participants?

☐ No

☒ Yes* - describe the relationship, and indicate how the research will be conducted to avoid undue influence on participants:

The researchers are faculty in the program and some of the call center supervisors are graduate students in the NDSU program. Influence is not expected to be a factor in any way as the study is focusing on ways to make the intake of information better and this will be based on the experiences of the supervisors.

** The IRB discourages projects that involve an authority relationship with participants; research method/procedures should be designed to avoid potential undue influence.*

7. Will research be conducted in a classroom setting during class time?

☒ No

☐ Yes - describe what those who choose not to participate will be doing, and provide justification for use of class time for research (▮ attach course syllabus):

8. Will all participants *(including their parents/guardians, if applicable)* be fluent in English?

☒ Yes

☐ No - explain how informed consent will be obtained, and provide a copy of the translation to be used:

9. If research will be conducted at an international site, indicate the investigator's familiarity with the culture and cultural norms, and how the research may affect an individual's standing in their community: ☒ N/A

Instrument(s)

Provide the list of survey, interview or focus group questions, or oral history objective (may be provided as a separate attachment)

Open-ended question for supervisors:

Based on your experience in the call center how do you think the organization of the information intake process can be improved?

Are there specific information templates that can be build ahead of time to cover the main sources of information that callers would need regarding a flood situation?

Are there any other things that you would like to share that could help the call center process improve?

Open-ended question for center workers who take the incoming calls:

Based on your experience in the call center how do you think the organization of the information intake process can be improved?

Can you you tell me about the range of calls that you received in your work at the call center? I would like to develop a list of the types of information requests that you received.

Are there any other things that you would like to share that could help the call center process improve?

Privacy and Confidentiality

When appropriate, there must be adequate provisions to protect the privacy of subjects and maintain the confidentiality of data.

1. Confidentiality: Describe whether or not participants will be promised confidentiality of their responses or information, including who will have access to individual data, and how results will be reported:

Participants will be told that their names will not be used or recorded. All responses are confidential. The results will be put into a technical report and also published, if possible, in the Journal of Emergency Management or a similar publication.

2. Identifiable information: Will any information be collected (even temporarily) that could potentially identify an individual? *(This would include not only names, personal ID #s, address, video or audio recordings, or other direct identifiers, but also may include certain demographic or other unique information that could be used to deduce the identity of an individual.)*

☒ No
☐ Yes:

2a. Describe use of any identifying information, including codes, or linkages to identifiers; and indicate why these are necessary for the research:

2b. Indicate whether these identifiers, codes or linkages will be retained after data collection, and if they will be removed at some point:

** **Note** that expedited or full review will be required for research that has the potential to place participants at risk of criminal or civil liability or can be damaging to their financial standing, employability, or reputation.*

3. Video/audio tape recording*: Will participants be recorded (ie, audio, video)?

☒ No
☐ Yes - describe any recordings and specify how they will be used, stored/secured, and their final disposition *(also provide this information to participants on the consent document)*:

** Note that all recordings are considered individually identifiable.*

Other Information

1. Conflict of Interest: does the Principal Investigator, Co-Investigator, or other key personnel have a conflict of interest (financial or other conflict) in the results of this project? *Note: A significant conflict may require disclosure to participants in the informed consent form.*

☒ No
☐ Yes:

1a. Identify the individual and explain the nature of the potential conflict of interest:

1b. Explain how this potential conflict will be managed:

2. Funding: Will external funds be used for the project?

☒ No
☐ Yes*- indicate the name of the agency, title of proposal, and funding status:

Sponsor agency:
Proposal title:
Funding status:

*Note:

- **Attach a copy of the relevant portions** *(ie, cover/face page, NDSU PTF form, list of key personnel, materials and methods section, etc.)* **of the final grant application, agreement or contract with this application.**
- The IRB is required to review funding applications to federal agencies and must receive a copy of the final, relevant sections of the proposal in order to verify consistency between the IRB protocol and the federal grant application.
- If external funds will be used for the project, the Office of Sponsored Programs Administration requires internal approval of the proposal. Consult the OSPA website for more information.

3. Other institution(s): Will any entity outside of NDSU have some involvement in this research (ie, collaborate, assist with research procedures, provide information or access to participants, or allow use of their facilities)?

☒ No – *skip all remaining questions*
☐ Yes – name entity or institution, contact person(s), and describe their role in the research:

Name of outside entity or institution:
Contact person:
Their role in the research:

3a. Other IRB review: Has/will this project be submitted to another IRB for review?

☐ Yes* - name of IRB and status of the application; indicate which IRB will be primary:

*Attach a complete copy of the protocol reviewed and the IRB's determination. *(if not immediately available, may be forwarded upon receipt)*

☐ No: provide either:

- a letter of permission /support, describing collaborator's role, indicating agreement to collaborate or assist NDSU in the research, in accordance with the approved protocol *(must be on the entity's letterhead, signed by an administrator of the organization),* or
- a signed agreement/contract indicating the respective role(s) in the research

**NOTE: * If letter(s) or approval(s) from sites or collaborator(s) are not immediately available, the IRB may approve the protocol provided that: 1) all other requirements are met, and 2) the documentation from the site(s) will be forwarded to the IRB prior to initiating research at each site.*

Investigator's Assurance

The signature(s) below certify that:

- information provided in this application is complete and accurate*
- the principal investigator has the ultimate responsibility for the protection of the rights, safety and welfare of human subjects and the ethical conduct of this research
- each individual listed as principal, co-investigator, or research team member has received the required human research protections education
- each individual listed as an investigator or member of the research team possesses the necessary experience for conducting research activities in their assigned role, and is aware of and will abide by NDSU policies and procedures for the protection of research participants
- no research procedures with human subjects will be initiated until documented approval has been obtained from the IRB Office
- the research will be conducted according to the protocol approved by the IRB, in accordance with NDSU policies and procedures

Jamil J. Klewer 3/24/2009

Principal Investigator signature, date

Co-investigator(s) signature, date

As Department Head/Chair, College Dean, or Division Director, I acknowledge that this research is in keeping with the standards set by our department/unit.

Thos J. Riley 3/24/09

Chair, Dean or Director* signature, and date:

** If PI is Dept. Chair, College Dean must sign*

*** Carefully review the application to ensure it is complete, contains sufficiently detailed responses to all questions, and all attachments. Incomplete applications will be returned to without IRB review or approval, potentially delaying the research. Please contact the IRB Office for questions or assistance: 231-8908 or 231-8995.**

4/9/09

Organizational Features of a Call Center for Flood Response

My name is Dan Klenow and I am a faculty member in the Department of Sociology, Anthropology, and Emergency Management at North Dakota State University. I am conducting a research on how to best organize a call center for response to citizens experiencing flooding in their community. It is hoped that we will learn how to make call centers efficient in the provision of information to citizens based on results from this research.

You have been selected for this research because you have either served as a supervisor at the call center or worked as a receiver of incoming calls from citizens. Because of your experience you are being invited to take part in this project. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

There are no known risks to participating in this study. If you participate in future call center activities you may benefit from the results of this study which is designed to learn how efficiencies could be incorporated into call center operations. Your responses to the interview questions in this research are confidential. Respondent names will not be recorded or attached to our data.

This interview should take about 15 to 20 minutes of your time to answer three to four open-ended questions about your experience.

If you have any questions about this study or about your rights as a research participant, or have a problem or complaints to report, you can contact the NDSU IRB Office at 701-231-8908 or online at ndsu.irb@ndsu.edu. If you have questions for the principal investigator, Dr. Daniel J. Klenow, you can contact him at 701-231-8925 (Daniel.klenow@ndsu.edu).

Version 4/09/2009a

Institutional Review Board

...for the protection of human participants in research

North Dakota State University
Sponsored Programs Administration
1735 NDSU Research Park Drive
NDSU Dept #4000
PO Box 6050
Fargo, ND 58108-6050 231-8995(ph) 231-8098(fax)

Protocol Amendment Request Form

Changes to approved research may not be initiated without prior IRB review and approval, except where necessary to eliminate apparent immediate hazards to participants. Reference: SOP 7.5 Protocol Amendments.

Examples of changes requiring IRB review include, but are not limited to changes in: investigators or research team members, purpose/scope of research, recruitment procedures, compensation scheme, participant population, research setting, interventions involving participants, data collection procedures, or surveys, measures or other data forms.

Protocol Information:

Protocol #: Title: **Organizational Features of a Call Center for Flooding Response**

Review category: ☒ Exempt ☐ Expedited ☐ Full board

Principal investigator: **Dr. Daniel Klenow** Email address: **daniel.klenow@ndsu.edu**
Dept:

Co-investigator: **Marc Khatchadourian** Email address: **marc.khatchadourian@ndsu.edu**
Dept:

Principal investigator signature, Date: Daniel J. Klenow 12/17/2010

Description of proposed changes:

1. Date of proposed implementation of change(s)*: **December 17, 2010**
   ** Cannot be implemented prior to IRB approval unless the IRB Chair has determined that the change is necessary to eliminate apparent immediate hazards to participants.*

2. Describe proposed change(s), including justification:
   The first change to this study is the addition of a co-investigator. The new co-investigator will be conducting the qualitative interviews within the scope of the original IRB. The co-investigator will include his observations and experiences from the call center in the study write-up. In order to include the observations and experience of the co-investigator, who was not a researcher at the time of the event, this ammendment seeks to add a category 4 exemption in addition to the original category 2 exemption.

3. Will the change involve a change in principal or co- investigator?
   ☐ No

☒ Yes: *Include an Investigator's Assurance (last page of protocol form), signed by the new PI or co-investigator.*

Note: If the change is limited to addition/change in research team members, skip the rest of this form.

4. Will the change(s) increase any risks, or present new risks *(physical, economic, psychological, or sociological)* to participants?
   ☒ No
   ☐ Yes: *In the appropriate section of the protocol form, describe new or altered risks and how they will be minimized.*

5. Does the proposed change involve the addition of a vulnerable group of participants?
   Children: ☒ no ☐ yes – include the *Children in Research* attachment form
   Prisoners: ☒ no ☐ yes – include the *Prisoners in Research* attachment form
   Cognitively impaired individuals: ☐ no ☐ yes*
   Economically or educationally disadvantaged individuals: ☒ no ☐ yes*

   **Provide additional information where applicable in the revised protocol form.*

6. Does the proposed change involve a request to waive some or all the elements of informed consent or documentation of consent?
   ☒ no
   ☐ yes – include the *Informed Consent Waiver or Alteration Request* attachment form

7. Does the proposed change involve a new research site?
   ☒ no
   ☐ yes – include a letter of permission/cooperation, IRB approval, or grant application or contract

Attach a copy of the approved protocol, with highlighted change(s) incorporated within the relevant section(s).

Impact for Participants (future, current, or prior):

1. Will the change(s) alter information on previously approved versions of the recruitment materials, informed consent, or other documents, or require new documents?
   ☒ No
   ☐ Yes - attach revised/new document(s)

2. Could the change(s) affect the willingness of *currently* enrolled participants to continue in the research?
   ☒ No
   ☐ Yes - describe procedures that will be used to inform current participants, and re-consent, if necessary:

3. Will the change(s) have any impact to *previously* enrolled participants?
   ☒ No

☐ Yes - describe impact, and any procedures that will be taken to protect the rights and welfare of participants:

- - - - - - - - - - - FOR IRB OFFICE USE ONLY - - - - - - - - -

Request is: ☒ **Approved** ☐ **Not Approved**	
Review: ☒ **Exempt, category#:** 4 ☐ **Expedited method, category #** ____ ☐ **Convened meeting, date:** ____	
IRB Signature: Kristy Shirley	**Date:** 12/20/10
Comments:	

Protocols previously declared exempt: (Allow 5 working days) If the proposed change does not alter the exemption status, the change may be administratively reviewed by qualified IRB staff, chair, or designee. If the change(s) would alter this status, Expedited or Full Board review will be required.

Protocols previously reviewed by the expedited method: (Allow 10 working days) Most changes may also be reviewed by the expedited method, unless the change would increase risks to more than minimal, and/or alter the eligibility of the project for expedited review.

Protocols previously reviewed by the full board: Minor changes (not involving more than minimal risks, or not significantly altering the research goals or design) may be reviewed by the expedited method (allow 10 working days). Those changes determined by the IRB to be more than minor will require review by the full board (due 10 working days prior to next scheduled meeting).