Interagency Communication Networks During Emergencies: Boundary Spanners in Multiagency Coordination

Naim Kapucu

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What is This?
Interagency Communication Networks During Emergencies

Boundary Spanners in Multiagency Coordination

Naim Kapucu
University of Central Florida

This article examines the problem of effective interagency communication among organizations and the role of information technologies to achieve effective communication and decision-making goals in emergencies. It explores what factors contribute to effective interorganizational communication and decision making and what factors inhibit their development. The theoretical framework draws on the literature of emergency communication and social capital, with a particular focus on communication and decision making under conditions of uncertainty. The study applies this framework to study the relationships that emerged among public, private, and nonprofit organizations following the World Trade Center disaster on September 11, 2001, in New York City. The article indicates the importance of developing a strong communication system with other organizations before a disaster occurs to establish appropriate communication in which effective interagency coordination will take place at the time of a disaster.

Keywords: interorganizational communication; emergency communication; social capital; boundary spanners; network organizations; crisis and emergency management

It has long been recognized that disasters represent occasions in which the boundaries between organizational and collective behavior are blurred. An important lesson from the World Trade Center (WTC) disaster is that although the response activities undertaken by official emergency agencies were crucial, those activities constituted only part of the picture. Equally significant was the manner in which those agencies interacted with and obtained support from nonemergency organizations. This study examines these issues in the context of interorganizational communication and decision making in emergencies. Specifically, this

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research examines the interactions among public, private, and nonprofit organizations that evolved in response to the September 11, 2001, terrorist attacks on the WTC in New York City. The research uses a theoretical framework primarily drawn from the emergency communication and coordination literature (Brown & Miller, 2000; Comfort, 1999; Dynes & Quarantelli, 1977; Kettl, 2004; Knuth, 1999; Quarantelli, 1997) and from social capital theory (Agranoff & McGuire, 1998; Axelrod & Cohen, 1999; Coleman, 1990; Nohria & Eccles, 1992; Scott, 2000; Wasserman & Faust, 1994). This research also explores the potential contribution of information technologies to interorganizational communication and possible improvements in information sharing to facilitate collective action in emergencies. The intent of the study is to use September 11 response operations as a case study to understand interorganizational communication and decision making in a dynamic environment.

To act effectively in disaster situations requires sharing and using information effectively: collecting, collating, analyzing, and then deploying it promptly and in a useful form. Although considerable resources go into all these tasks today, serious pitfalls still remain. Massive collection can be of little value until the data are shared in a usable way. Likewise, widely shared raw data will be of little use until collated and combined meaningfully. One important element of this study is that communication and decision making are viewed in an environment that is uncertain. In this context of uncertainty, organizations must still communicate efficiently to make critical decisions in their allocation of scarce resources.

Valid and timely information sharing is also critical in emergency response operations. Hierarchical networks can work efficiently during routine operations, but they function very poorly in dynamic environments of emergencies. In the aftermath of any extreme event or disaster, the required rate of problem solving and information sharing dramatically increases. The key to surviving a disaster in the short term is for the network to retain its connectivity while not incurring any failure. Hierarchies generally perform badly in emergencies, because if any of a hierarchy’s top nodes fail, they isolate large networks from each other. Flexible and redundant modes of connectivity can distribute the information congestion associated with problem solving across the system and minimize the possibility of failure, which is very fundamental for resiliency of the community under uncertain emergency conditions.

On September 11, 2001, two planes were hijacked by terrorists and were crashed into the Twin Towers of the WTC complex in New York City. The incident resulted in numerous fatalities (2,824 people) and injuries. At the WTC, the physical devastation was catastrophic. The attacks caused not only the collapse of the 110-story towers, with an estimated 20,000 people in the buildings at the time of the attacks, but also the complete or partial loss of five smaller buildings in the immediate area and heavy damage to other buildings in the area. In addition, the electrical power generation and distribution system for lower Manhattan was destroyed; the water distribution system, dependent on electricity for pumping water, was disabled; gas pipelines were heavily damaged; and the telephone and telecommunications services were seriously disrupted (Federal Emergency Management Agency [FEMA], 2001). The technical infrastructure that enabled people to live and work in this densely populated, interdependent urban environment was decimated. One of the interview respondents who was heavily involved in the response and recovery since September 12 stated that “the event was so catastrophic and also different and more terrifying than anything our local organizations had faced before” (New York City Partnership and Chamber of Commerce official,
personal communication, November 21, 2002). Immediately after the attack, an intensive coordinated effort was begun by federal, state, and city government, along with volunteer private nonprofit agencies, in the search, rescue, recovery, and identification of the victims.

There have been several research efforts on the September 11 terrorist attacks and response operations. Cohen, Eimicke, and Horan (2002), for example, provided a good rough analysis of the emergency response operations in response to the terrorist attacks. They found the following: emergency response planning is essential; emergency response institutions, procedures, and resources must be retained, even when threats seem distant; communications systems must be made more redundant; emergency response procedures must assume communication breakdowns and allow for decentralized decision making; and there is no substitute for leadership during a crisis. This article analyzes the WTC response operations with a special focus on interorganizational communication. The research addresses the following questions: To what extent did social networks that were developed before the disaster increase communication between public and nonprofit organizations during the response operations? How did social networks, at the level of individual managers within and across organizations, affect interorganizational communication and performance? What types of communication channels were used to form the networks in response to the September 11 terrorist attacks? What were the roles of information technology in facilitating the coordination among multisector organizations?

In the field of public administration, there have been significant theoretical discussions on policy networks, collaborative decision making, and network management (Agranoff and McGuire 2003; Berry et al., 2004; Kickert, Klijn, & Koopman, 1997; Mandell 2001). However, networks in public administration have been studied with traditional research methods and techniques. As Berry et al. (2004) suggested, we can utilize the well-developed social network analysis in studying the networks in public administration (Rethmeyer, 2005). This article uses social network analysis with UCINET (Borgatti, Everett, & Freeman, 2002), a well-known social network analysis software program, to study the interorganizational networks in response to the September 11 terrorist attacks in New York City.

Theoretical Background and Conceptual Framework

Central issues for organizations in emergencies are communication and coordination (Haddow & Bullock, 2003). Communication is a process through which an organization sends a message across a channel to another part of the organization (intraorganizational communication) or to another organization in the network (interorganizational communication). Coordination can be understood as the degree to which there are adequate networks among the organizational parts for intraorganizational communication or among the organizations for interorganizational communication to accomplish goals (Dynes & Quarantelli, 1977). In routine times, established and standardized procedures are followed. However, in emergencies, internal and/or external factors create enough stress so that it is possible to think of responding agencies as being in a state of crisis.

The effective flow of information across organizational boundaries is critical for an organization’s ability to remain effective in a dynamic disaster environment. If responders are not in contact with each other and if information does not flow properly, it is hard to envision successful crisis and disaster management. Communication of the current status of the community and of the actions of participating organizations allow them to make informed decisions
about how to proceed in concert with others in the networks to achieve the overall goals of protecting the community and of restoring its functionality (Comfort, 1999). Inadequate communication patterns, such as disjointed information flows, prohibit interorganizational communication and coordination. The massive disruption caused by disasters and extreme events often restructures preexisting coalitions and networks. Moreover, the role that such organizations play in responding to disasters is shaped, in part, by their access to varying amounts and types of social capital. Organizations vary considerably in organizational form, mission, and constituency in ways that affect the types of social capital available to them, which in turn can be expected to influence their capacity in emergency response operations.

Communities that have strong working relationships on a daily basis generally function better in emergency situations because of increased trust. Building trust among public, private, and nonprofit organizations can best be done prior to emergency situations. Sharing information, willingness to collaborate, and shared values are important factors for network formation. Operationally, because structured communication channels may not work in emergencies, boundary spanners can play a significant role in effective communications in emergency and crisis management.

Boundary spanners are organizational members who link their organization with the external environment (Burt, 1992; Williams, 2002). Boundary spanning primarily concerns the sharing and exchange of information. Thus, the fundamental task of boundary spanners is to make decisions concerning information gathered. From a network analysis perspective, knowing how an organization is embedded in the structure of a network is also important to understand its behavior in its network. For example, some organizations may act as bridges between groups (boundary spanners). Other organizations may have all of their relationships within a single clique (locals). Some actors may be part of a tightly connected group, whereas others are completely isolated from this group.

Systems theory suggests that an organization is an open system interacting with its environment. Organizational theory posits that the interaction between organizations and their environments is crucial in shaping organizations and defining their boundaries. Contingency theory (Scott, 2001; Thompson, 1967) asserts that different environments place differing requirements on organizations. Specifically, environments characterized by uncertainty and rapid change present different constraints and opportunities on organizations than do stagnant and stable environments. An extreme event or a disaster challenges the capabilities of routine communication systems whose natural constraints may be acceptable in “normal” times. “However, when multiple actors in dispersed locations must have immediate access to each other, as during a crisis, they must overcome these traditional communication constraints” (Rice, 1990, p. 99). Success of a communication system in emergencies is determined by its effectiveness in gathering and using available sources, knowledge, and technology. Dynamic networks are underpinned by reciprocity and mutual trust, which allow members to share information, risks, and opportunities with greater ease (Carley, 1999; Comfort, 1999; Hardin, 1982). These links are vital, because they not only connect organizations to one another but also give organizations access to the larger world outside their circle through a chain of affiliations (Granovetter, 1973).

Organizational communication and decision making in emergencies have some distinguishing characteristics and require special attention. Emergencies create a high level of uncertainty and a need for timely and accurate information sharing. The rate of decision making increases, particularly at the lower levels of organizations (Dynes & Qurantelli, 1977;
Waugh, 2000). Fewer consultations occur among organizational members. Such individual autonomy leads to quick commitment of organizational personnel and resources.

Crisis situations produce conditions of greater uncertainty, greater diversity, decreased formalizations, and decreased centralization. Increased complexity of organizations and the non-routine nature of crisis tasks move all organizations toward coordination by feedback. . . . Such movement runs counter to usual normative perceptions which orient most emergency planning to emphasize coordination by plan. A more effective direction might be to plan to facilitate coordination by feedback in organization in crisis. (Dynes & Qurentelli, 1977, p. 25)

During crises, when communications are inadequate, personnel and resources are inefficiently used and activities are duplicated (Adams, 1969). Interorganizational interactions do not occur only among the top officials of the organizations. Managers, directors, or staff in the lower levels of the organizations contribute to interorganizational communications, as well. Figure 1 demonstrates the interorganizational interactions among different levels of representatives of the organizations. This study assumes that extreme events will lead to greater density of communication and to less centralized networks. As a result of this process, a well-coordinated interorganizational network will serve the betterment of individuals, organizations, and society in emergencies.

Creating an effective communication network for emergencies is another challenge, because it may conflict with the organizational structure developed during routine times. When the information is simple, a bureaucratic system functions better. Most of the time,

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**Figure 1**

*Multilevel Interorganizational Interaction in Emergencies*

Note: I acknowledge the assistance of Susan Finger and Halil Erhan, from Carnegie Mellon University, in designing the graph.
information in emergencies is complex. Complex information makes bureaucratic communication dysfunctional (Brown & Miller, 2000). People who share similar tasks and have similar knowledge typically get together and develop formalized networks in nonemergency times. However, these routine structures and boundaries may hinder information sharing in crisis situations (Rice, 1990). Social networks developed before disasters would not only tie together responding organizations but also be less constrained by cross-sectoral boundaries during emergency response operations. “From the boundary spanning perspective, crises have the potential to disrupt an organization by limiting its access to essential resources” (Seeger, Sellow, & Ulmer, 2003, p. 69). Therefore, organizations should develop and maintain effective partnerships with other sector organizations prior to emergencies (See Figure 2).

Use of information and communication technologies in emergency responses is a persistent challenge that requires constant attention (Knuth, 1999; Quarantelli, 1997). The rapid advancement of information and communication technologies that has occurred during the last decade has changed the way emergency communications are performed. As an outcome of such experiences, an increasing number of Web-based databases and satellite systems are being built for emergency communications. Implementation of the new technologies in emergency management will improve the speed and the quality of communication and coordination in the response operations (Comfort, 1999; Comfort & Kapucu, in press; Quarantelli, 1997). New information technologies are currently producing substantial changes in communication-related structures and functions. These changes in communication structures affect primarily problems posed to public organizations by hierarchy and centralization (Fountain, 2001). Flattening hierarchies has been a major consequence of information technology. James Q. Wilson (1989) recommends placing the authority in public services at the lowest level at which essential information for sound decisions is available. A robust information network distributes the produced information and spreads the burden of information redistribution as evenly as possible, thus maximizing the amount of information that can be processed without suffering collapses (Graber, 2003).
Much of what was observed on September 11 and in the days and weeks that followed in New York City’s massive destruction and social disruption was a complex network response. Assisted by emergency workers, occupants of the WTC and people in the surrounding area helped one another to safety, even at great risk to themselves. Prior experience with the 1993 WTC bombing had led to significant learning among organizational tenants and occupants of the Twin Towers, and planning and training contributed to their ability to respond in an adaptive fashion to highly ambiguous and threatening conditions (New York and New Jersey Port Authority personnel, personal communication, November 28, 2003).

**Method**

This study utilizes data from the content analysis of news reports in *The New York Times* (*NYT*) between September 12 and October 18, 2001; situation reports from FEMA between September 13 and October 4, 2001; situation reports from the Department of Health and Human Services (HHS) between September 13 and October 4, 2001; and interviews conducted in late 2002 and early 2003 with selected public and nonprofit managers and staff involved in response to September 11. In addition to the primary data sources, observational data and document analysis were also used. First, the content analyses of *NYT* news reports and of FEMA situation reports were conducted to identify the organizations responding to the attacks. Content analyses were carefully documented and recorded. Second, 43 semistructured interviews with public and nonprofit managers, directors, and staff of the participant organizations were conducted. Through content analyses, the major organizations that participated in the response operations and in the interactions between organizations in response operations were identified (Everett & Borgatti, 1999; Scott, 2000). This analysis illustrated the patterns of communication among organizations.

Data collected from the interviews were analyzed using the UCINET (Version 6.0; Borgatti, Everett, & Freeman, 2002) social network analysis program. UCINET is a comprehensive program for the analysis of social networks. The program contains several network analytic routines (e.g., centrality measures, dyadic cohesion measures, positional analysis algorithms, clique measures, etc.) and general statistical and multivariate analysis tools, such as multidimensional scaling, correspondence analysis, factor analysis, cluster analysis, and multiple regression.

**Findings**

A total of 1,607 organizations were identified in the content analysis of the FEMA situation reports, news stories reported in the *NYT* for 21 days following the attacks, HHS reports, the New York State Office of Attorney General’s Charitable Organizations Report, and the interviews. Subtracting the 77 public and private international organizations from this number leaves 1,530 domestic organizations that engaged in the response system. Notable in these findings is the large number of nonprofit organizations (1,176) and private domestic organizations (149) that were involved in response operations. Significant also is the number of federal organizations (73) that were involved in the response operations (Kapucu, 2003).
Interorganizational communication in emergencies. Interoperability is an important term for interorganizational communication in disaster response operations. It is critical for first responders to have a way to communicate with each other during an emergency. It means having an appropriate structure and technology that allow agencies to communicate using a common language and system. Extreme events require flexible patterns of communication and coordination, but rigid bureaucracies hinder that development in emergency response operations. In response to September 11, the New York Police Department (NYPD) and the Fire Department, City of New York (FDNY), failed to communicate with each other (Kettl, 2004). The fire department still used old analog radios that had failed during the first WTC bombing in 1993. Also, the radio system was not compatible with the police radio system.

One interview question was asked to determine whether the organizations were currently cooperating or have cooperated with other organizations (public and nonprofit) in the past. The majority of the respondent organizations (71%) indicated that they have worked with other organizations in the past to a great extent. The most important reason for cooperation at present and in the past was common mission (51%). Service and program duplication was the second most important reason for partnerships (23%). The majority of the organizations (76%) answered that the information exchange among organizations was frequent (more than once per day) during the September 11 response and recovery operations. Seventy-four percent of the respondents stated that cooperating with other organizations helps their organization to serve the community in emergencies to a great extent. They also see partnering with other organizations as an essential way of providing services to the community in emergencies (61%).

A majority of the respondents acknowledge (34% to great extent and 33% to some extent) differences among public, private, and nonprofit organizations in terms of their consideration of partnerships. Twenty-eight percent of the respondents do not consider differences among organizations when considering partnerships. Nonprofit organizations were recognized as being more concerned with maintaining effective partnership practices in emergencies (53%), followed by public organizations (33%). Private organizations were rated low in terms of maintaining effective partnerships (14%).

Questions were asked about the perception of relationships, information flow, organizational flexibility, and technical structure in the organizations. The respondents believed that effective relationships existed between staff and leaders in their organizations during response operations (67% to a great extent and 28% to some extent). They also believed that effective information flow existed between staff and leaders (30% to a great extent and 63% to some extent). Most of the respondents believed (70% to a great extent and 30% to some extent) that they had the information they needed to do a good job.

The following channels and vehicles of communications were used in communicating with other organizations: e-mail (23%), in-person contact (22%), phone (22%), face-to-face group meetings (21%), teleconferencing, of which use increased significantly after the attack (9%) (New York State Emergency Management Office [NYSEMO] official, personal communication, October 13, 2002), and other ways, including Web postings, listservs, and workshops (3%). The means recommended by the respondents for increasing the capacity of the communication systems to meet the demands of networks in emergencies are the following: establishment of interorganizational communication (31%), utilization of information technologies (IT; 30%), a computerized network (24.5%), and some others, including attitudes and willingness to communicate (10%). Laws and regulations were
occasionally mentioned as restricting interorganizational communication instead of increasing it (5%). According to the respondents, the organizations currently use IT to improve interorganizational communication in supporting the goals of coordinating response operations. A majority of the respondents agreed that IT use improved interorganizational communication and coordination. Only 5% of respondents said that IT neither improves nor worsens communication.

The attack significantly increased organizational interactions, according to 70%, or 30 out of 43, respondents. The attack also impacted the missions, policies, and structures of the neighboring organizations in several ways. The most significant changes observed were in policies (25%), mission (21%), and organizational structure (16%). The other changes (9%) caused by the attacks included capability, sharing know-how among organizations, and use of IT, especially geographic information systems (GIS). Organizations learned from each other by communication in response operations (56% to a great extent and 39% to some extent).

Willingness to share (22%), proper training (22%), trust (20%), education (16%), human relations (12%), and willingness to create public value, experience, common interest, and communication skills (7%) are considered important skills, values, and attitudes that managers and staff must have to be successful in building communication networks in emergencies. The following factors hindered organizations from communications with other organizations: lack of prior communication (49%), lack of common priorities (13%), lack of trust (13%), lack of flexibility (11%), lack of technical structure (9%), and lack of leadership (6%).

Patterns of interorganizational communications. The size of the network is critical to the structure of interorganizational communications because of the limited resources and capacities that each organization has. As a network of organizations gets bigger, the proportion of all the ties that could be present (density) will fall and the more likely it is that differentiated and partitioned groups will emerge. The number of logically possible relationships then grows exponentially as the number of actors increases linearly. It follows from this that the range of logically possible social structures (complexity) increases exponentially with size. If the size of the network increases, the complexity of the relationships also increases.

FEMA has lead responsibility for disaster management, focusing first on lifesaving operations and second on assistance to the victims along with recovery and reconstruction of the community. Under the Federal Response Plan (FRP; FEMA, 1999), eight federal agencies, in addition to FEMA, play lead roles in disaster operations, with 25 federal agencies assigned responsibilities under 12 specified emergency support functions. The lead agencies include the Departments of Transportation, Defense, Agriculture (USDA), HHS, and Housing and Urban Development, the National Communications System, the Environmental Protection Agency, and the General Accounting Office. Two departments have dual emergency support functions. The USDA has the primary support function for firefighting, carried out by its subunit, the U.S. Forest Service, as well as for food. FEMA is responsible for information management as well as for urban search and rescue operations. The American Red Cross (ARC) is designated as the lead agency for mass care (see the appendix). The FRP was revised in 2003 and designated the Department of Homeland Security as the major responsible agency for emergency and crisis management. In November 2004, the FRP was replaced by the National Response Plan.
The New York City Office of Emergency Management (NYCOEM) activates its Emergency Operation Center (EOC) during large-scale emergencies, as it did in response to September 11. When the EOC is activated, senior officials from city agencies as well as from state, federal, and private entities come to the EOC, where they coordinate the response operations. NYCOEM maintains a close working relationship with state and federal agencies and offices, including the State Emergency Management Office, FEMA, the Department of Justice, the National Weather Service, and the Department of Energy, to share information vital to effective response operations, coordinate planning initiatives, and conduct training and exercises. NYCOEM works closely with the private sector and with nonprofit organizations to coordinate activities and ensure rapid recovery of the city from any emergency that may arise (Bloomberg & Bruno, n.d.).

NYCOEM was established in 1996 as a mayoral office. In November 2001, NYCOEM became a permanent part of city government through a revision to the city charter. The mission of NYCOEM is to provide the highest level of emergency preparedness to the citizens of New York City. Working as interagency coordinators in partnership with local, state, federal, nonprofit, and private entities, it seeks to provide comprehensive emergency response, haz-
ard planning, and disaster mitigation to New York City (NYCOEM executive service official, personal communication, April 10, 2003). NYCOEM established relationships with most of the organizations required to create the infrastructure needed to quickly recreate the EOC from what formerly was housed at 7 WTC. In addition, the Human Resource Administration was able to provide around-the-clock technical assistance and equipment from its warehouse.

Any attempt to establish well-coordinated response operations in response to September 11 would have been frustrated by the lack of communication and coordination among responding agencies. The NYCOEM headquarters, which could have served as a focal point for information sharing, was evacuated. The destruction of the WTC complex in which NYCOEM was headquartered presented the agency with a series of challenges that, by virtue of their scale and severity, were virtually unparalleled in the history of emergency management. As the lead agency in the city’s rescue and recovery operations, NYCOEM was responsible for coordinating the efforts of more than 150 federal, state, and city agencies and private organizations, including FEMA, the NYSEMO, and the ARC (NYCOEM official, personal communication, April 10, 2003). In this capacity, NYCOEM provided operational coordination for everything from rescue and recovery to debris management to human services and community outreach efforts. Despite the destruction of the city’s EOC at the WTC, the agency was able to secure a new location and reconstitute the EOC in fewer than 48 hours.

In Figure 3 (derived from interviews), there are a limited number of actors (35), and all of them are connected in response to the attacks. But clearly not every possible connection is present. There appears to be some differences among the actors in how connected they are. In the figure, FEMA, ARC, and NYCOEM are in the center of the emergency response activities, as we would expect. On the other hand, it can be seen that some actors’ connections are more central and reciprocated in this network than others.
Effective Communication in Emergencies: Work Across Boundaries

In emergency response operations, leaders of responding agencies must provide effective operations across governmental units and other noncrisis organizations’ complex boundaries and problems. Boundary-spanning networks happen from multiple organizational and sectoral interactions to help victims of the tragic events that overlapped jurisdictional and sectoral borders. Although the WTC attacks demonstrated the need for interagency coordination in disasters, it took many days before effective communication channels were instituted. As Figure 4 demonstrates, the number of organizations coordinated in response operations increased significantly by the fifth day of the response operations, according to FEMA situation reports. In contrast, in the NYT data, a significant number of organizations were reported in the first few days of operations (Figure 5), with reportage declining thereafter. Most of the managers interviewed mentioned the serious need for previous communication with disaster response organizations and with significant local noncrisis organizations.

As demonstrated following September 11, timely and truthful communication on plans and actions is critical. Ongoing collaboration raises trust, and the broad collaboration among various governmental levels and between government, the nonprofit sector, and the public is very critical in emergencies. The effective flow of information across organizational boundaries is critical for an organization’s ability to remain effective in a dynamic environment. Communication can determine the success or failure of a disaster response (Agranoff & McGuire, 1998; Levinson & Granot, 2002). Communications that result in more accurate public perceptions of risk and in public behavior in proportion to the risk typically have been comprised of multiple communication channels, arranged in a programmatic format, that take a variety of communication variables or factors into account (Fitzpatrick & Mileti, 1994). If responders are not in contact with each other (as was the case between the fire and police departments in New York City) and if information (whether a report or instruction) does not flow properly, it is hard to envision a successful disaster response.
Several nonprofit and public managers and staff shared their experiences about how they responded to the events of September 11. What the study discovered was that in time of extreme crisis, internal and external communications take priority in emergencies. Whether natural or manmade, extreme events often disrupt the normal flow of communication. Disruption of the communication channels preventing interorganizational communication was one of the major problems in the response operations. “More networking in preparation for disasters is needed. The issue was not technology or policy; it was that many of us had not taken the time to get to know staff at key organizations” (New York City government service official, personal communication, December 15, 2003).

Although many organizations have crisis contingency plans and disaster recovery plans, few had been tested as rigorously as was needed to cope with September 11. Operations during a crisis should be decentralized but decision making should not be. Web-based communication and toll-free numbers helped people obtain information from a single authorized source.

At the Mayor’s Voluntary Action Center (MVAC) office, phones were down, the neighborhood was closed, and e-mail messaging and computers were not working. MVAC was relocated like many other city government agencies. The MVAC representative had to report to the NYCOEM, which had been relocated to Pier 92 following the collapse of 7 WTC. MVAC participated in Volunteer Organizations Active in Disasters (VOAD) meetings. It was assigned to the Human Resource section that included the Red Cross and the Salvation Army, New York Cares, City Harvest, Center for Animal Care Control, World Church Services, and numerous other nonprofit organizations. The center used the membership directories from the New York Association for Volunteer Administration and from the Greater New York Association of Directors of Volunteer Service in Healthcare to compile an e-mail list. MVAC identified the key professional leaders from the directories and any other possible sources. The center asked other organizations to share the disaster relief information that was being identified by NYCOEM, FEMA, NYSEMO, and VOAD. The center also invited the organizations to information sessions that were being convened by FEMA. MVAC provided volunteer referrals in all five city boroughs in New York through its database, which was not sufficient at the time of the attacks (New York City government official, personal communication, April 10, 2003).

Use of IT in Emergencies

Effective use of IT by first responders to extreme events is critical. The lack of functional handheld radio communications, which was the same problem 8 years previous at the same location with the same number of potential civilian casualties, was a fiasco. We should harness knowledge gained from September 11 to better use technology in emergency response operations in the future. In response to the immediate needs of September 11, the New York City health department created a wireless network and began registering and screening people within hours of the tragedy (National Research Council, 2002). When the first tower fell and the department had to relocate to another facility, officials quickly had the network up and running. The health department was initially called on to assist with worker safety at Ground Zero and to monitor environmental issues. For months after the attack on New York City, the Department of Information Technology and Telecommunication (DoITT) continued to operate in an emergency mode. The DoITT responded that “we need to make sure all
the agencies can do their jobs, so we have to do things like repair networks and replace workstations” (DoITT official, personal communication, February 14, 2003).

Electronic communication systems allow multiple users to communicate across geographical and sectoral boundaries. The Internet was, in fact, first designed to provide the U.S. military with a communications network that could survive the destruction of major communication points (Graber, 2003). The Internet often provides a more reliable means of communication, because traffic is designed to route itself intelligently around busy spots. Whereas landline phones must pass through a particular network and mobile phones have to communicate with a limited number of radio masts, Internet routers are more flexible. In some circumstances, thousands of routers based in many different countries could be involved in a local communication. The terrorist attacks on the WTC have demonstrated how important the Internet can be as a means of emergency communication. Many people relied on e-mail to make contact with friends and relatives, and “the [ARC] Web site has proven to be the organization’s main way of communicating with people” (ARC official, personal communication, November 2, 2002).

Both the Department of Health of New York City and the Office of the Chief Medical Examiner engaged in an aggressive public information campaign in response to September 11. To this purpose, both used New York City’s government Web site (http://www.nyc.gov) to provide updates regarding health and safety issues and available services, including an online hospital patient locator system, missing people information, DNA collection protocols, counseling information, anthrax information, and death certificate applications (Office of the Chief Medical Examiner, personal communication, March 18, 2003). NYCOEM now employs cutting-edge technology in its Emergency Management Online Locator System to enhance public safety before, during, and after an emergency.

GIS is a powerful mapping and analysis tool that allows NYCOEM to examine the potential effects of different hazards on various geographic areas. GIS was integral to NYCOEM’s planning efforts for natural and manmade disasters. An application that was developed prior to September 11 for notification about storms and weather emergencies proved its flexibility during response and recovery efforts. The GIS application showed available evacuation routes, emergency centers, and other information. “On September 11, DoITT used GIS applications. Later, that same application was used to monitor the anthrax threat” (DoITT official, personal communication, February 14, 2003). New York City had already been using GIS before September 11. In the aftermath and recovery efforts, GIS proved its worth as an irreplaceable emergency management tool. Maps of Ground Zero provided pictures that helped rescue crews, firefighters, and workers removing debris and city officials making critical decisions. It is interesting that the GIS applications that had the most profound effect in the city’s ability to respond to the challenges of September 11 were products of innovation under fire. The head of the DoITT at the time successfully used his previous network within the private IT companies to develop a state-of-the-art EOC in a short period of time. It was a collaborative effort to obtain information that had not previously been shared across agencies and was used to create the graphic representations that supported rescue and clean-up efforts.

**Conclusion**

This study examines the problem of effective interagency communication among organizations and the role of IT to achieve effective communication and decision-making goals in
emergencies. The study indicates the importance of establishing communications with other organizations before disasters occur to know proper contact points and to communicate effectively at the time of a disaster.

Previous research (Kapucu, 2003) presented the importance of networks on emerging relationships among government agencies at federal, state, and local levels and nonprofit and private organizations in the aftermath of the September 11, 2001, terrorist attack on the WTC in New York City. However, that research focused on an organizational level of analysis. This article contributes to the previous research by analyzing individual boundary-spanner networks in emergency response operations. To foster interorganizational communication and the trust that enables accelerating interorganizational network coordination in emergency management response operations, individual public emergency managers, nonprofit managers, and business sector managers should provide before-the-fact incentives and information to promote interorganizational networks. This research also reports on the daily organizational response level based on the content analysis of NYT and FEMA situation reports instead of reporting at the aggregate level.

Emergency management requires multiorganizational communication and coordination. Decisions in emergencies involve multiple actors. Information must be shared by the organizations, and activities must be coordinated within and across organizational boundaries. Effective decision making in response to the WTC terrorist attacks in New York City was hindered by limited coordination and interorganizational communications. The NYPD’s 9-1-1 operators and the FDNY dispatch were not adequately integrated into the emergency response. The same reason, inadequate communication, hindered the Port Authority’s response, as well. The lack of communication and an integrated system hindered agencies’ communication and decision making. In future disasters, it is critical to analyze how responding agencies, victims, and the public will get information and help. The problems of communication that occurred at the WTC disaster will likely recur in any extreme emergency of similar size if better communication systems are not developed in advance. In the future, it is important to enable responding agencies to share information in a well-coordinated way.

Fortunately, improving communication and information sharing across organizations, jurisdictions, and different sectors has been a priority for state and local governments since the September 11 WTC terrorist attacks. For example, a coalition of city governments has prepared to launch an Internet-based homeland security initiative in Kansas City to help emergency responders better respond to manmade or natural disasters (Peterson, 2003). The system will connect government agencies, such as fire departments, law enforcement agencies, and emergency management offices. Private and nonprofit institutions, such as hospitals, ambulance services, and relief organizations, will also be offered access to the system.
## Appendix
### Federal Response Plan

#### Emergency Support Function (ESF)

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Note: P = Primary agency (responsible for coordination of ESF. S = Support agency (responsible for supporting the primary agency).
Note

I wish to thank Dr. Louise K. Comfort for allowing me to use the findings from National Science Foundation Grant CMS0219953. I also wish to thank Dr. John R. Harrald and Julie Ryan, coprincipal investigators. This study uses the findings from research conducted under this grant. The content analyses were conducted under the direction of Louise K. Comfort for the study “Terrorism and Corporate Crisis Management: The Strategic Effect of the September 11 Attacks.” The author served as a graduate research assistant on this project and was granted permission by Dr. Comfort to use the reports for his dissertation research.

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Naim Kapucu is a faculty member in the Department of Public Administration at the University of Central Florida (UCF). He received his PhD in public and international affairs from the Graduate School of Public and International Affairs of the University of Pittsburgh, Pennsylvania, in 2003. Prior to that, he earned a Master of Public Management from H. John III School of Public Policy and Management, Carnegie Mellon University, Pittsburgh, Pennsylvania, in 1997. His main research interests are homeland security and crisis management, public-nonprofit partnerships in emergencies, complex adaptive systems, dynamic network analysis, computational policy analysis, decision making in complex environments, organizational learning and design, and academic service learning. His research seeks to understand how interorganizational networks, such as public-nonprofit partnerships, influence the public service delivery. In one of his current projects, he explores the problem of building cooperation among public and nonprofit organizations to achieve public service goals in emergencies, factors that
contribute to successful public-nonprofit partnerships, and factors that inhibit their development. Recent publications include “Public-Nonprofit Partnerships for Collective Action in Dynamic Context” and “Managing Public Nonprofit Partnerships in Emergencies: Role of Nonprofit Leadership.” He is a reviewer for the program committee of the Public and Nonprofit (PNP) Division of the Academy of Management. He is currently leading the UCF–Orange County Health Department Partnership Project. The project is hailed as a best-practice model and has significantly increased service capacity for the grassroots agencies participating in the project. He teaches public policy analysis, organization theory, strategic management, nonprofit management, research design, and analytic techniques for public administration. He taught at the University of Pittsburgh, Penn State University, and Robert Morris University before coming to UCF in 2003. He is also the recipient of the Teaching Faculty Leadership Award for the 2004 to 2005 academic year at UCF.