



Journal of Economics and Financial Analysis

Type: Double Blind Peer Reviewed Scientific Journal
Printed ISSN: 2521-6627 | Online ISSN: 2521-6619
Publisher: Tripal Publishing House | DOI:10.1991/jefa.v2i1.a13

Journal homepage: www.ojs.tripaledu.com/jefa



Nonprofit Organizations in Disaster Response and Management: A Network Analysis

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Abstract

This paper tracks changes in the national disaster management system with regard to the nonprofit sector by looking at the roles ascribed to nonprofit organizations in the Federal Response Plan (FRP), National Response Plan (NRP), and National Response Framework (NRF). Additionally, the data collected from news reports and organizational after action reports about the inter-organizational interactions of emergency management agencies during the September 11th attacks and Hurricane Katrina are analyzed by using network analysis tools. The findings of the study indicate that there has been an increase in the interactions of the National Voluntary Organizations Active in Disasters (NVOAD) network member organizations on par with policy changes in the NRP to involve nonprofit organizations in the national disaster planning process. In addition, those organizations close to the center of the network experienced enhanced communication and resource acquisition allowing them to successfully accomplish their missions, a finding that supports the development of strong network connections.

Keywords: NVOAD; Disaster Response; Non-profit Organizations; Networks; Resource Dependency.

JEL Classification: L10, L25, L30, H12, H84.

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1. Introduction

As the 21st century began with its unique challenges and complexities, there emerged a necessity for the integration of actions of response organizations across political jurisdictions and organizational sectors under the umbrella of a unified national disaster system. Throughout American history, charitable nonprofit organizations have had important roles and responsibilities in disaster relief. In the past, nonprofit organizations, such as the American Red Cross, were the primary first responders to disasters when government actors were not carrying the burden of saving citizen lives and properties. Governments started getting involved in disaster response in the early 20th century, and the role of the federal government in disaster management has expanded steadily since due to the increasing scope and impact of natural and manmade disasters. During this time the United States Congress chartered the American Red Cross to assume a major role in national emergency relief planning and response. After the September 11th attacks, the Federal Response Plan (FRP) was revised, and the role of nonprofit organizations expanded and became more formalized and the National Voluntary Organizations Active in Disaster (NVOAD) came to occupy an important role in the coordination of nonprofit organizations in the National Response Plan¹.

NVOAD is a platform for nonprofit organizations to coordinate their activities and share information and resources in helping (potential and actual) disaster victims throughout the preparedness, response, and recovery phases of emergency management². NVOAD was founded in 1970 after Hurricane Camille to avoid service duplication, share information among nonprofit organizations, and to communicate with the public in a more effective and coordinated manner through regular meetings among member agencies³. It has a growing pool of members including: 50 national nonprofit organizations, 55 state or territorial Voluntary Organizations Active in Disaster (VOADs), and partners, such as the Federal Emergency Management Agency (footnote 2). Due to a growing need for the contributions of nonprofit organizations in disaster relief and the increasing number, scope, and impact of disasters, NVOAD members have created standing

¹ Federal Emergency Management Agency (FEMA) report 1999: Federal Response Plan.
<http://www.fema.gov/rrr/frp/>

Federal Emergency Management Agency (FEMA) report 2008: National Response Framework.
<http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf>

² NVOAD, 2008: About US. www.nvoad.org.

³ React Online. NVOAD: National Volunteer Organizations Active in Disaster.
<http://www.reactintl.org/nvoad.htm>

committees to address issues in a more specialized and continual manner⁴. This increased coordination of nonprofit organizations in disaster response offers a unique opportunity to study the effect of these service delivery networks in disaster response.

The paper proposes several functional arguments to explain why nonprofit organizations coordinate services, share information and resources, and how rational and social choice theories offer some additional insights into understanding ongoing response behaviors. At the intersection point of both theories, resource dependency theory argues that organizations formulate their internal and external strategies to maintain independence, and at the same time, attempt to survive (Aldrich and Pfeffer, 1976; as cited in Hill and Lynn, 2003). To examine the nonprofit collaboration a network perspective and analysis is used, which is a process that has gained significant interest among scholars of public and nonprofit management (Guo and Acar, 2005; O'Toole, 1997; Provan, Veazie, Staten, and Teufel-Shone, 2005; Rethemeyer and Hatmaker, 2008; Robinson, 2006). Mizruchi and Galaskiewicz (1994) highlight the contributions of network analysis to inter-organizational analysis and organizational theory. This study goes beyond thinking of 'network' as a metaphor and develops an empirical examination of networks. This type of network analysis constitutes a field of substantial interest and importance to democratic societies that are seeking to manage problems of public service delivery with innovative means at a reasonable cost.

This article examines the following questions: What is the role of NVOAD in national disaster response? What were the structural positions of NVOAD member organizations in the disaster response networks of 9/11 and Hurricane Katrina? How has the role of NVOAD evolved in national response plans as well as actual disaster response networks? Network analysis tools are utilized to analyze data collected from newspapers and FEMA situation reports using content analysis during both the September 11th attacks and Hurricane Katrina. An analysis of the development of NVOAD's role in the United States' national disaster response is conducted by comparing the ways in which member nonprofit organizations responded differently during the attacks on September 11th, 2001 as opposed to the response to Hurricane Katrina in 2005.

The National Response Framework (NRF) includes NVOAD as the organization responsible for coordinating the nonprofit sector organizations response, as opposed to both the Federal Response Plan and National Response Plan which did

⁴ Susan Kim, 2002, What is NVOAD? Disaster News Network.
<http://www.disasternews.net/news/article.php?articleid=2948>

not include NVOAD. Empirical evidence of how NVOAD members have actually responded to disasters is useful in evaluating whether the NRF has worked effectively or not. Rather than focusing on hypothesis testing, this study uses network analysis to examine the role of nonprofit organizations in disaster response and provides policy recommendations to improve emergency and disaster response through more effective involvement of the nonprofit sector.

2. Literature Review and Background Information

Nonprofit organizations play important roles in solving social problems and responding to the needs in the community (Gronbjerg and Paarlberg, 2001). The effectiveness of nonprofit organizations in a community depends on the resource sharing of nonprofit organizations among themselves and among other sectors (Agranoff 2005; Paarlberg and Varda, 2009; Salamon, 1987). Nonprofit organizations' involvement in disaster response requires the collaborative capacity of multiple sectors and jurisdictions. Collaborative capacity building is a difficult task for public and nonprofit managers. Capacity building and effective performance requires fostering relationships and forming creative teams and networks (Galaskiewicz and Rauschenbach, 1988; Kapucu and Van Wart, 2006; Keifer and Montjoy, 2006; Kenis and Provan 2009; Senge et al., 2008). Collaborative and network perspectives using network analysis techniques can help public and nonprofit managers improve the effectiveness of their services (intra-organizational or interorganizational levels) in the following ways: identify points of misalignment and accelerate collaboration in the right places; determine whether certain organizations and functions are achieving the connectivity required for desired results and to identify and track intervention strategies; and identify high performers in a network and determine the reasons for success, and in turn, replicating that success with low performing actors in the network (Cross and Thomas, 2009; Gray, 1989; Provan, Veazie, Staten, and Teufel-Shone, 2005).

In responding to a disaster of extreme magnitude, nonprofit organizations usually have to deal with *"the challenge of channeling the desire to help to the right place at the right time"* (Miller, Jensen, and Moore, 2005, p. 2). First, the pre-disaster training of workers becomes difficult during extreme events, and the amount of unsolicited donations coupled with the number of unaffiliated volunteers pose important challenges for nonprofit organizations in effectively organizing their response to disasters (Miller, Jensen, and Moore, 2005). Pre-disaster training in the effective management of public information, in setting up a Voluntary Coordination Team and Reception Center in collaborating with the Public Information Office of a local Emergency Operation Center, and in maintaining a database of volunteers can help nonprofit organizations better

organize and coordinate their response to emergencies (Miller, Jensen, and Moore, 2005; Zakour and Gillespie, 1998).

In dealing with these problems, nonprofit organizations are increasingly partnering within and across organizational sectors. “[T]he creation of synergy through partnership produces results that partners could not obtain without collaboration” (Brown, 1990; as cited in Lister, 2000, p. 4). Nonprofit collaborations usually operate at the interpersonal level, and these personal relationships are frequently minimized in management theory (Lister, 2000). If one of the goals in disaster management is the incorporation of community-based groups, then interpersonal relationships take on added importance in decision making and in the sharing and maximization of social capital resources and expertise (Wachtendorf and Kendra, 2004).

To understand nonprofit collaboration and partnerships, it is useful to take a look at some definitions and conceptual developments in several theories. “Partnership refers to any intentionally collaborative relationship between two or more organizations from multiple sectors (public, private and nonprofit) which joins resources to identify, and subsequently pursue, a joint approach to solving multiple common problems” (Kapucu, 2006, p. 207). The need for complementary resources is one of the key drivers of inter-organizational cooperation in dynamic environments of disasters. Organizations with responsibilities in disaster response and recovery, that have strong working relationships on a daily basis, will function better in the dynamic environment of disaster. The pervasive threats of man-made and natural disasters create a situation of ‘shared risk’ for the entire society (Grunder, 2004; Kapucu, 2006; Zakour and Gillespie, 1998). The unprecedented demand to respond quickly to disasters and to be part of a recovery effort requires two basic management skills from every organization – collaboration and adaptation to change.

Nonprofit partnerships include operations at three levels: administrative, policy, and institutional. The partnership process encourages collective action and capacity building, more effective decision making and implementation, and more community involvement and commitment to the success of the policies and programs (Gazley and Brudney, 2007; Kenis and Provan 2009). Designing inter-organizational coordination and informed collective action in response to disasters can better serve the immediate need in the society (Hossain and Kuti, 2009; Kapucu, 2006).

In order for the partnerships to be effective, there needs to be viable communication, the capacity for partnering, and a commitment to collaborate. Kapucu (2007) found that there was a need to have previously established

patterns of communication between the disaster response team and local nonprofit organizations. In addition, there needed to be a commitment to supporting and building the organizational capacity of these nonprofits enabling them to successfully partner in the response and recovery process.

In addition to functional and operational arguments for nonprofit partnerships and collaboration, some theoretical arguments exist. Both social choice theory and resource dependence theory posit that organizations, when interacting with the environment, respond to both the opportunities and challenges found there. For example, in a study analyzing emergency managers' strategies in terms of resource and funding provision, McGehee and Andrew (2009) found that managers strive to form strategic and key professional ties with those who have access to, information about, and granting power for the funding sources provided by state or federal governments. Provan and Milward (1991) argue that inter-organizational relations are basically due to the need to reduce environmental uncertainty and increase access to scarce resources. Shen and Shaw (2004) classify such dependencies in three categories: sharing, flow and fit. Accordingly, "*[s]haring dependency occurs when multiple activities need to use the same resources. Flow dependency appears when the output of one activity is the input of another. Finally, fit dependency arises as the outputs of multiple activities need to fit into a single product (resource)*" (Shen and Shaw, 2004, p. 2114). However, not all responses are determined by a rational goalbased assessment of the situation (Aldrich and Pfeffer, 1976; as cited in Hill and Lynn, 2003). Some organizations might be more motivated to seek collaboration with resource-rich organizations during emergencies due to resource dependency. According to Monge and Contractor (2003), both exchange and dependency theories have a role in the study of inter-organizational networks, and several studies utilizing resource dependency theory include an organization's network centrality as part of their assessment (Mizruchi and Galaskiewicz, 1994). These theories then provide the basis for examining an organization's centrality with a specific network and the degree of collaboration that occurs in response to a disaster. In the following section the value of partnerships in response to disasters is expanded.

Figure 1 provides a diagram that explains the ways in which nonprofit partnerships make the disaster response more effective through networks and collaboration. In the pre-disaster phase the clarification of roles is critical along with capacity and network building to establish social capital and commitment to share information and resources during a disaster response. Establishing a local-level database, including information about the suppliers of physical, informational, and human resources, can be useful to increase the collaborative

capacity as well as the awareness and resilience of the community (Gazley and Brudney, 2007; Graddy and Wang, 2009; Troy, Carson, Vanderbeek, and Hutton, 2007). During the disaster response communication, collaboration, coordination, and cooperation are important in the delivery of services and in the recovery phase (see footnote 4). In addition, the sharing of resources and risk are critical to effective response and successful collaboration. This model of partnerships provides benchmarks for assessing the quality of collaborative disaster response.

The next section of the paper discusses the attempt by the National Voluntary Organizations in Disaster (NVOAD) to formalize the networking and collaborative efforts.

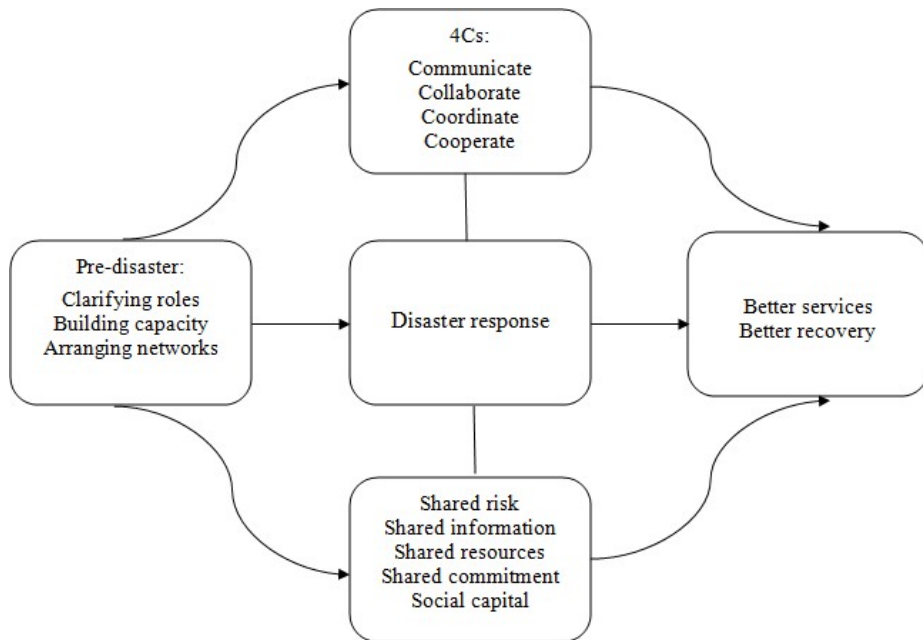


Figure 1. Disaster response diagram of nonprofit partnerships

Notes: 4Cs are coming from the VOAD mission (see footnote 4).

3. Nonprofit Organizations in Disaster Management

Emergency managers need to have clear working relationships with nonprofit organizations involved in disaster management (Sylves, 2009). The leading single

nonprofit organization involved in disaster management is the American Red Cross (ARC). Since its inception, ARC has focused on assisting individuals in times of crisis and in Federal Response Plan functions as a "*federal agency*" helping to coordinate mass care resources in presidentially declared disasters or emergencies. The American Red Cross, as a representative of nonprofit organizations in the Federal Response Plan, provides support in the coordination of disaster management services. These services include providing the disaster-affected population shelter, food, first aid, the distribution of emergency relief items, disaster welfare information, and family reunification services (see footnote 1, p. 102).

Many other smaller nonprofit organizations provide services to disaster-affected populations as part of their mission. However, their roles have been less prominent than the American Red Cross. Many nonprofit organizations have joined the National Voluntary Organizations Active in Disaster (NVOAD), and as stated earlier, it was founded in order to avoid service duplication by sharing information among nonprofit organizations and communicating with the public in a more effective and coordinated manner through regular meetings with the member agencies (footnote 3, Sylves, 2008). In other words, NVOAD is a coalition that provides a platform for its 105 member organizations to communicate, collaborate, coordinate, and cooperate, with the actual services being provided by the member organizations. Because of the increasing need for the contributions of nonprofit organizations in disaster relief, and the growing number, scope and impact of disasters, NVOAD Standing Committees were set up to better deal with issues in a more specialized and continual way (see footnote 4). Some of the topics addressed by these committees are disaster case management, disaster recovery, emotional and spiritual cares, mass care, and volunteer management.

NVOAD's mission to coordinate nonprofit activities has taken on new importance after the failures of inter-organizational communication and coordination in the deadly attacks of September 11th because timely and coordinated action is not only important for fire and police departments but also for nonprofit organizations that fill in the gaps in disaster response. The goals of NVOAD focus on the development of the capacity and competencies of state and local Voluntary Organizations Active in Disaster (VOADs) to make sure that they are well prepared and sufficiently equipped to fulfill their disaster mitigation, response and recovery missions effectively (see footnote 4, Sylves, 2008). NVOAD has several membership criteria including transparency and accountability; the type of service provided, participation requirements, and standards of conduct and service delivery. Moreover, there are some requirements based on the size of

budget, number of staff and volunteers, and years of experience depending on which one of the two tiers the member will operate (see footnote 2).

The role of nonprofit agencies in the National Response Plan (NRP) and National Response Framework (NRF) is to collaborate with first responders and all levels of government in providing disaster relief services that sustain life, address the physical and emotional distress of individuals, and promote the recovery of disaster victims when assistance is not available from other sources. The American Red Cross and NVOAD are the leading nonprofit organizations that respond to disasters by providing leadership in the coordination and integration of the overall Federal efforts in the areas of mass care, housing, and human services. *"For the purposes of the National Response Plan, the American Red Cross functions as an ESF primary organization in coordinating the use of Federal mass care resources in the context of Incidents of National Significance"* (see footnote 1, p. 20).

Although there has never been a study to verify their role in the emergency management process, the actual impact of the American Red Cross and the nonprofit members of NOVAD in coordinating and collaborating in disaster response and recovery has been implied. This study seeks to provide insight into the centrality of the roles played by nonprofit organizations in disaster response and recovery, and the methodology of the study will be covered in the next section of the paper.

4. Methodology

This research focuses on the September 11th, 2001 attacks on the World Trade Center in New York City and Hurricane Katrina in New Orleans in 2005. In order to evaluate the nonprofit organizations' response to these two catastrophic disasters within the Federal Response and the National Response Plan, the authors carefully reviewed several key documents studying the interactions of NVOAD member organizations and tracking changes in their connectivity. The two cases utilize the data from the content analyses of news reports in The New York Times and situation reports from FEMA. Content analyses were used to identify the major organizations that participated in the response operations and in the interactions between organizations in response operations for both of these events (Borgatti, Everett, and Freeman, 2002; Scott, 2000).

Content analysis is a useful method of listing both attribute and relational data regarding organizations that have participated in disaster response in the first three weeks after a disaster has occurred. The Lexis-Nexis program helps to identify newspaper and situation reports published on specific dates by using key

words like “September 11th attacks”, “9/11”, “Hurricane Katrina”, etc. Once the analyses are complete, a matrix of interactions among organizations is created to analyze the network of communications and interactions.

Archival data is preferred for the study for several reasons. First, it can provide network data that would otherwise not be available. Second, potential interviewees might refuse participation to the research. Third, organizations might dissolve or merge with others making them unavailable for study. Finally, archival data can be available for an extended period of time (Knoke and Kuklinski, 1982). This analysis illustrates the patterns of communication among organizations. Data collected from the content analysis was examined by using the UCINET Version 6.0 (Borgatti, Everett, and 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 regressions (Gould and Fernandez, 1989; Wasserman and Faust, 1994).

The September 11th content analysis data are collected from news reports in The New York Times between the dates of 09/12/2001 – 10/04/2001; and situation reports from the FEMA between the dates of 09/11/2001 – 10/04/2001. The Hurricane Katrina case utilizes the data from the content analyses of news reports in The New York Times between the dates of 08/29/2005 – 09/18/2005; and situation reports from the FEMA between the dates of 09/11/2005 – 10/04/2005. In addition, the following reports are also used: Florida State Emergency Response Team (SERT) Situation Reports; New Orleans City Situation Reports; Louisiana State Situation Reports; Mississippi State Situational Reports; The Federal Response to Hurricane Katrina: Lessons Learned (Townsend, 2006); Hurricane Katrina: A Nation Still Unprepared⁵; and the U.S. House of Representatives⁶ Select Bipartisan Committee to Investigate the Preparation for and Response to Katrina: A Failure of Initiative. Content analysis of the Hurricane Katrina case began with the June 1, 2005 reports because there were no reported storms in June or July of the 2005 hurricane season and ran through February 28, 2006.

⁵ U.S. Senate Committee of Homeland Security and Government Affairs. Report 2006. Hurricane Katrina: A National Still Unprepared. Washington D.C. Government Printing Office. http://hsgac.senate.gov/_files/Katrina/ExecSum.pdf

⁶ U.S. House of Representatives. report 2006. Select Bipartisan Committee to Investigate the Preparation for and Response to Katrina: A Failure of Initiative. Washington D.C.: Government Printing Office. http://katrina.house.gov/full_katrina_report.htm

5. Findings and Discussion

Centrality measures are used to indicate how central an organization's position is in the network (Durland and Fredericks, 2006; Kar and Hatmaker, 2008). There are three types of centrality measures in the tables below. First, degree centrality estimates the actor's centrality in the network in terms of their number of ties (Kapucu, 2006). Second, closeness centrality measures the centrality of network actors by determining how close each actor is to the other actors in terms of the shortest possible path. Third, betweenness centrality measures the position of an actor in the network with respect to its geodesic path between other actors, and it indicates the extent to which it is capable to act as a broker (Hanneman, 2001). Clique analysis demonstrates subgroups within a network in which all members of a subgroup are connected to one another (Belotti, 2009; Hossain and Kuti, 2009). In the section below a visual representation of the network analysis is presented along with several tables that cover all the centrality measures and clique analysis findings.

5.1. Nonprofit Organizations' Network in Response to September 11th Terrorist Attacks

Network analysis provides a visual representation of the interactions between organizations identifying those organizations central to the coordination of the response effort. Figure 2 is a network diagram that illustrates interactions among the various organizations involved in emergency response during and after the September 11th attacks.

involved in the emergency response, they did not reportedly interact with any other organization.

Table 1. Degree centrality measures of organizations in the network

	Organization name	Degree
1	Federal Emergency Management Agency	7.415
2	New York City Mayor	0.791
3	US Department of Health and Human Services	0.491
4	FEMA Disaster Field Office	0.47
5	US Army Corps of Engineers	0.47
...
93	McGuire AFB	0.043
94	Church World Services	0.043
95	New York State Senate	0.043
96	Nassau County Fire Department	0.021
97	US Marine Corps Chemical-Biological Response	0.021
...
177	Equal Rights Officer	0
178	New York State Crime Victims Board	0
179	US Department of State	0
180	United Parcel Service	0
181	US Armed Forces	0
Mean		0.118

In Table 2, the closeness centrality measures of the top, mid, and lowest five organizations in the 9/11 response network are shown. Closeness centrality measures the centrality of network actors by determining how close each actor is to the other actors in terms of the shortest possible path (Hanneman, 2001). Although FEMA has the greatest number of links in the network, it does not score the highest in terms of the closest path to every actor in the network. As seen in Figure 2 (above), some of the actors are scattered farther from the center (FEMA) to the peripheries. Again, there is not a NVOAD member in the top 5, though there are some VOADs in the mid 5 organizations of the analysis.

Table 2. Closeness centrality measures of organizations in the network

	Organization name	Closeness
1	New York State Department of Environmental Protection	0.718
2	New York Stock Exchange	0.718
3	New York State Department of Sanitation	0.717
4	New York City Office of Emergency Management	0.713
5	FEMA Disaster Field Office	0.708
...
93	Shomburg Black Museum	0.698
94	Voluntary Organizations Active in Disasters	0.698
95	National Geographic	0.698
96	Church of Bethlehem	0.698
97	Service Employees International Union	0.698
...
177	Equal Rights Officer	0.552
178	New York State Crime Victims Board	0.552
179	US Department of State	0.552
180	New Jersey Port Authority	0.552
181	The President Bush	0.552
Mean		0.671

Table 3 (above) shows betweenness centrality measures of the organizations in the 9/11 response network. Betweenness centrality measures the position of an actor in the network with respect to its geodesic path between other actors, and it indicates the extent to which it is capable of acting as a broker (Hanneman, 2001). The table shows that FEMA has the highest betweenness score meaning that it had played an important broker role. The American Red Cross, a NVOAD member organization, scored the third highest in its role as a bridge among several organizations in the network. Of course, the Red Cross is one of the approximately 100 congressionally-chartered organizations and the only nonprofit organization with a congressional mandate to provide disaster relief. It has built-in communication structures that enable the organization to frequently coordinate with government agencies that respond to disasters.

Table 3. Betweenness centrality measures of organizations in the network

	Organization name	Betweenness
1	Federal Emergency Management Agency	15.56
2	New York City Fire Department	2.389
3	American Red Cross	1.812
4	Environmental Protection Agency	1.588
5	New York City Mayor	1.521
...
93	Joint Information Center	0
94	Joint Regional Medical Planning Office	0
95	McGuire AFB	0
96	Department of Transportation	0
97	New York City Transit	0
...
177	Turner Construction	0
178	US News and World Report	0
179	Washington Post	0
180	Yomiuri Shimbun	0
181	Transcomm	0
Mean		0.173

In Table 4 the measures of degree, closeness, and betweenness centrality of NVOAD member organizations and some state and local VOADs in disaster response are presented. The American Red Cross has the highest score in degree and betweenness centrality, a high score in closeness, and it is the only organization that has played the role of being the bridge in interactions with other organizations in the network. Although the World Vision had the least amount of ties in the network, it had closer paths to every other actor in the network. This means that although the World Vision does not have many interactions with other organizations in the network, it is still at a good position to obtain information and resources from other actors in the network due to its proximity to other organizations with two or more paths.

Table 4. Centrality measures of NVOAD members in the 9/11 response network

Degree orders	Organization name	Degree	Closeness	Betweenness
10	American Red Cross	0.342	0.693	1.812
23	New York City VOAD	0.171	0.693	0
24	United Methodist Committee on Relief	0.15	0.698	0
54	Southern Baptist Convention	0.064	0.698	0
68	United Jewish Appeal	0.043	0.698	0
75	United Way	0.043	0.698	0
77	Salvation Army	0.043	0.698	0
83	Voluntary Organizations Active in Disasters	0.043	0.698	0
84	Church of Scientology	0.043	0.552	0
94	Church World Services	0.043	0.698	0
127	Church of the Brethren	0.021	0.697	0
131	Adventist Disaster Services	0.021	0.552	0
140	Southern Baptists Kitchens	0.021	0.552	0
145	New Jersey VOAD	0.021	0.698	0
163	World Vision	0.021	0.698	0

Table 5. Cliques in 9/11 response network with 4 members

1	Federal Emergency Management Agency, US Army Corps of Engineers, Deployable Tactical Operation Center, Environmental Protection Agency
2	Federal Emergency Management Agency, Center for Disease Control, Occupational Services and Health Administration, Environmental Protection Agency
3	Federal Emergency Management Agency, Center for Disease Control, Environmental Protection Agency, New York City Department of Health
4	Federal Emergency Management Agency, Center for Disease Control, US Department of Health and Human Services, New York City Department of Health
5	Federal Emergency Management Agency, US Department of Agriculture, New York City Emergency Operations Center, American Red Cross
6	Federal Emergency Management Agency, Federal Bureau of Investigation, National Communication Service, Verizon Communications
7	Federal Emergency Management Agency, Deployable Tactical Operation Center, National Communication Service, Verizon Communications

In table 5 (above), cliques of organizations in the 9/11 response network are shown. Clique analysis demonstrates subgroups within a network in which all members of a subgroup are connected to one another. There were seven core, overlapping cliques of four organizations in the network, and the only nonprofit organization found was the American Red Cross. Being part of a clique means that those specific organizations in a clique have mutual connections with one another and most of the cliques in the above table include FEMA – a central organization in the network. Therefore, it can be argued that most of the resources flow in those cliques, and there is a higher level of communication due to the interconnectedness of the organizations. Apart from the American Red Cross, no other nonprofit organization seems to take advantage of this level of connectedness.

The analysis of the case of September 11th in the previous section demonstrated the limited network centrality of nonprofit organizations in disaster response beyond that of the American Red Cross. However, the analysis of nonprofit organizations response to Hurricane Katrina in the following section may reveal a different network portrait.

5.2. Nonprofit Organizations Networks in Response to Hurricane Katrina in 2005

Below, Figure 3 depicts the network analysis of the emergency responders' network identified by the data in response to Hurricane Katrina in 2005. The tables in this section provide the results of the analysis of the degree, closeness, and betweenness centrality measures of actors in the Hurricane Katrina response network, the centrality measures of NVOAD members in the network, and the cliques of members.

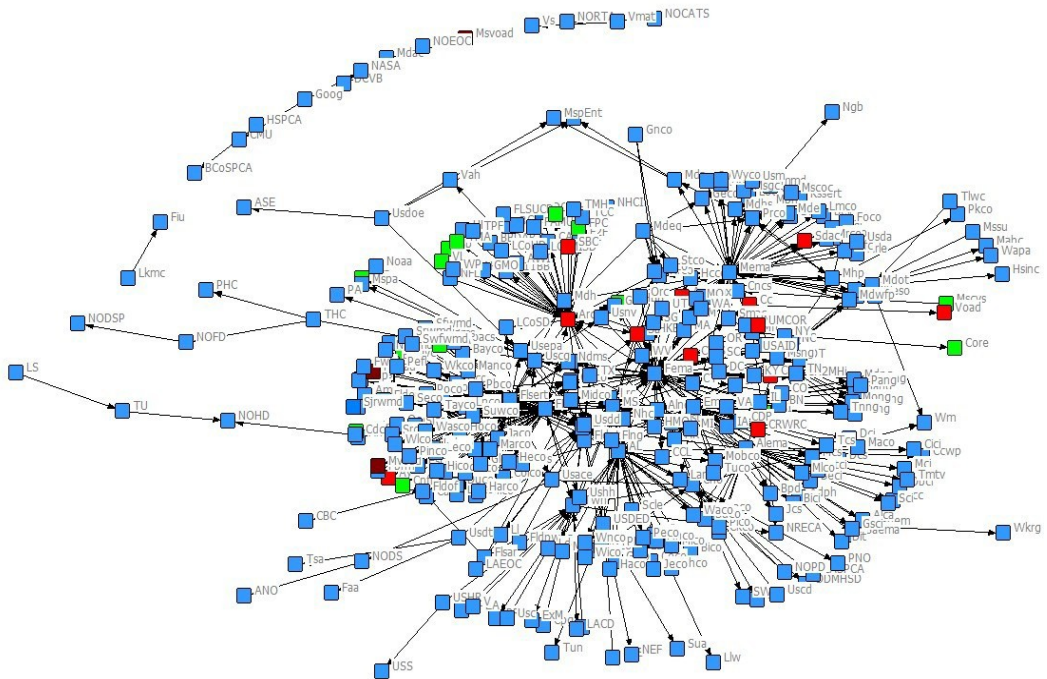


Figure 3. Map of NVOADs and other nonprofit organizations in Hurricane Katrina Emergency Response Network

Legends: Red Squares (NVOAD members), Green Squares (Other Non-profit Organizations), Dark Red Squares (Other VOADs), Blue Squares (Other Organizations)

The above figure illustrates interactions amongst various organizations involved in emergency response during and after Hurricane Katrina. Isolates, meaning organizations that have no reported interaction with others, are not shown in the figure. The network is less dense in the center compared to the 9/11 network and has more and larger cliques across the network. However, NVOAD member organizations (red) occupy positions in several parts of the network, while other VOADs (brown) and nonprofit organizations (green) are similarly located.

Table 6. Degree centrality measures of organizations in the Hurricane Katrina response network

	Organization name	Degree
1	Florida Special Emergency Response Team	14.483
2	Federal Emergency Management Agency	11.552
3	Mississippi Emergency Management Agency	8.793
4	Florida	8.276
5	American Red Cross	7.069
...
293	Gulf Shores City	0.172
294	Local Law Enforcement Agencies (FL)	0.172
295	New Orleans Capital Area Transit System	0.172
296	Mississippi Chamber of Commerce	0.172
297	Perry County (AL)	0.172
...
577	Warren county (MS)	0
578	Lawrence County (MS)	0
579	Wyoming	0
580	Oxfam America	0
581	Yazoo County (MS)	0
Mean		0.314

Table 6 (above) shows the top 5, mid 5, and lowest 5 organizations ordered according to their degree centrality measures. Because the number of organizations in the network is very large, and most of them are public or for-profit organizations, the authors decided to only present the upper, middle, and lower five scores in each network. Degree centrality estimates the actor’s centrality in the network in terms of their number of ties. Here, the Florida State Emergency Response Team (FL SERT) and FEMA scored highest in terms of the number of interactions they had during emergency response. The American Red Cross is the number five organization in the network in terms of its number of ties, which is consistent with the September 11th response analysis. Although samples of the mid and lowest 5 organizations indicate that not one is a NVOAD member, however Table 7 below shows that there are several NVOAD members in the mid and low level centrality measures.

Table 7. Closeness centrality measures of organizations in the Hurricane Katrina response network

	Organization name	Closeness
1	New Orleans Health Department	0.2
2	Hancock County (MS)	0.2
3	Pearl River County (MS)	0.2
4	Forrest County (MS)	0.2
5	Mallette Brothers Construction	0.2
...
293	Veterinary Services	0.172
294	Florida International University	0.172
295	Federal Aviation Administration	0.172
296	Transportation Security Administration	0.172
297	Private Helicopter Companies	0.172
...
577	Warren county (MS)	0.172
578	Lawrence County (MS)	0.172
579	Wyoming	0.172
580	Oxfam America	0.172
581	Yazoo County (MS)	0.172
Mean		0.185

In Table 7 (above), the closeness centrality measures for the top, mid, and lowest five organizations in the Hurricane Katrina response network are presented. Closeness centrality measures the centrality of network actors by determining how close each actor is to the other actors in terms of the shortest possible path (Hanneman, 2001). Although the Florida State Emergency Response Team and FEMA have the greatest number of links in the network (degree of centrality), they do not score highest in terms of the closest path to every actor in the network, because, as it can be seen in Figure 3 (above), some actors are scattered farther from the center to the peripheries in the response to Hurricane Katrina. The New Orleans Health Department and Hancock County (MS) had the closest path to every other actor in the network. Again, there is not a NVOAD member in the top 5, though there are some VOADs in the mid 5 and lowest 5 levels.

Table 8. Betweenness centrality measures of organizations in the Hurricane Katrina response network

	Organization name	Betweenness
1	Federal Emergency Management Agency	2.589
2	Florida Special Emergency Response Team	1.791
3	Mississippi Emergency Management Agency	1.358
4	American Red Cross	1.32
5	Emergency Management Assistance Compact	0.986
...
293	Gulf Shores City	0
294	Leon County Whole Child	0
295	Lake Charles Regional Airport	0
296	Lauderdale County (AL	0
297	Lee County (FL)	0
...
577	Warren county (MS)	0
578	World Vision	0
579	Wyoming	0
580	Wayne County	0
581	Yazoo County (MS)	0
Mean		0.023

The betweenness centrality measures of the organizations in the Hurricane Katrina response network are presented in Table 8. Betweenness centrality measures the position of an actor in the network with respect to its geodesic path between other actors, and it indicates the extent to which it is capable of acting as a broker (Hanneman, 2001). The table shows that FEMA and Florida State Emergency Response Team have the highest betweenness scores, meaning that they had played important broker role in the network. American Red Cross, a NVOAD member organization, has scored the fourth highest in its role acting as a bridge among several organizations in the network.

Table 9. Centrality measures of NVOAD members in the Hurricane Katrina response network

Degree order	Organization name	Degree	Closeness	Betweenness
5	American Red Cross	7.069	0.199	1.320
33	Salvation Army	0.69	0.199	0.008
38	Catholic Charities USA	0.69	0.199	0.024
55	Seventh Day Adventist Church	0.345	0.199	0
58	Miami VOAD	0.345	0.199	0
85	Adventist YES Corps	0.345	0.199	0
115	Adventist Community Services Disaster Response	0.345	0.199	0
155	Church World Service	0.172	0.199	0
161	Convoy of Hope	0.172	0.199	0
170	Florida VOAD	0.172	0.199	0
197	VOAD	0.172	0.199	0
202	Baptist Convention Disaster Relief	0.172	0.199	0
234	Mississippi VOAD	0.172	0.172	0
237	Christian Disaster Response	0.172	0.199	0
283	Southern Baptist Convention	0.172	0.172	0
306	Christian Reformed World Relief Committee	0.172	0.199	0
313	United Methodist Committee on Relief	0.172	0.199	0
337	Faith Presbyterian Church	0.172	0.199	0
465	Southern Baptist Disaster Relief Fund	0	0.172	0

The measures of degree, closeness, and betweenness centrality of NVOAD member organizations and some state and local VOADs are presented in table 9 (above). The American Red Cross has the highest score in all the centrality measures, and Catholic Charities USA is the only other organization that played the role of being a bridge in interactions of other organizations in the network. As a point of clarification, although the Southern Baptist Disaster Relief Fund has a 0.000 degree centrality score, it has a 0.172 betweenness score, which might not make sense. Although scores are normalized to the corresponding network, zero is not absolute.

Table 10. Cliques in Hurricane Katrina response network with 5 members

1	Emergency Management Assistance Compact, Federal Emergency Management Agency, Florida, Florida Special Emergency Response Team, Mississippi
2	American Red Cross, Federal Emergency Management Agency, Florida, Florida Special Emergency Response Team, Mississippi
3	Federal Emergency Management Agency, Florida, Florida Special Emergency Response Team, Mississippi, US Department of Defense
4	Alabama, American Red Cross, Federal Emergency Management Agency, Florida Special Emergency Response Team, Mississippi
5	Alabama, Emergency Management Assistance Compact, Federal Emergency Management Agency, Florida Special Emergency Response Team, Mississippi
6	Alabama, Federal Emergency Management Agency, Florida Special Emergency Response Team, Mississippi, US Department of Defense
7	American Red Cross, Federal Emergency Management Agency, Florida Special Emergency Response Team, Louisiana, Mississippi
8	Federal Emergency Management Agency, Florida Special Emergency Response Team, Louisiana, Mississippi, US Coast Guard
9	Federal Emergency Management Agency, Florida Special Emergency Response Team, Louisiana, Mississippi, US Department of Defense
10	Alabama, Alabama Emergency Management Agency, National Guard (AL), Emergency Management Assistance Compact, Mobile County (AL)
11	Alabama, Alabama Emergency Management Agency, National Guard (AL), Emergency Management Assistance Compact, Mississippi
12	Alabama, Alabama Emergency Management Agency, Emergency Management Assistance Compact, Federal Emergency Management Agency, Mississippi

Tables 10 and 11 (above) show the cliques of organizations in the Hurricane Katrina response network. Clique analysis demonstrates subgroups within a network in which all members of a subgroup are connected to one another. There were 12 core overlapping cliques of five organizations in the network, and the only nonprofit organization represented was the American Red Cross. Also, there were 15 core, overlapping cliques of four organizations in the network with Catholic Charities USA in one clique and the American Red Cross in four other cliques. This indicates that Catholic Charities USA and the American Red Cross have a mutual relationship with all members of the cliques they are involved in. This kind of clique membership is essential for sharing information, resources, and expertise.

The Hurricane Katrina network analysis shows that the NVOAD structure of each network is different, and that NVOAD member organizations have participated in the network. However, except for the American Red Cross, they

scored low in terms of the number of collaborative interactions and brokerage relationships, which is similar to the majority of organizations in the network.

Table 11. Cliques in Hurricane Katrina response network with 4 members

1	Broward County (FL), Federal Emergency Management Agency, Florida, Florida Special Emergency Response Team
2	Federal Emergency Management Agency, Florida, Florida Special Emergency Response Team, Okeechobee County (FL)
3	Broward County (FL), Florida, Florida Special Emergency Response Team, Palm Beach County (FL)
4	US Department of Homeland Security, Florida Special Emergency Response Team, Louisiana, US Coast Guard
5	Alabama, Alabama Emergency Management Agency, National Guard (AL), Baldwin County (AL)
6	Alabama Emergency Management Agency, Federal Emergency Management Agency, Louisiana, Mississippi
7	Alabama Emergency Management Agency, National Guard (AL), Louisiana, Mississippi
8	Alabama Emergency Management Agency, Emergency Management Assistance Compact, Mississippi, National Guard (MS)
9	National Guard (AL), American Red Cross, Louisiana, Mississippi
10	Alabama, National Guard (AL), American Red Cross, Mississippi
11	State Troopers (AL), Emergency Management Assistance Compact, Federal Emergency Management Agency, Mississippi
12	Catholic Charities USA, Corporation for National and Community Services, Federal Emergency Management Agency, Mississippi Emergency Management Agency
13	Federal Emergency Management Agency, Houston Mayor, Texas, US Department of Defense
14	American Red Cross, Federal Emergency Management Agency, Louisiana, Texas
15	Federal Emergency Management Agency, Louisiana, Texas, US Department of Defense

Findings of the study indicate that nearly half of the NVOAD agencies interacted with others in the Emergency Management networks. The NVOAD members are relatively closer to the network center, especially the American Red Cross. In addition, most NVOAD agencies have relatively fewer connections in the network with less potential to bridge other actors and groups. It is believed that investments in developing formal and informal relationships with other actors in the network can help the NVOAD agencies have important collaborative links with regard to the flow of information and resources.

This article reiterates the importance of collaboration among nonprofit organizations and other organizations in the response network in terms of sharing resources, information, and risk. In order to achieve a higher level of collaborative capacity, the American Red Cross can be accepted as a role model in terms of its connectivity with other organizations in the network. It is recommended that NVOAD organizations set up teams and streamline their efforts at achieving connectivity according to the best practices and evaluate their collaborative capacity from time to time according to the benchmarking that the best practices provide. If successful NVOAD members will be better able to accomplish their mission of communication, coordination, collaboration, and cooperation.

There are several limitations for the findings of this paper. First, situation reports might be biased in terms of their interactions because most of these are self-reported. Because most situation reports are created by FEMA and ARC, those two organizations might appear over-represented in both networks. However, it is also expected that FEMA and ARC have important positions in networks because of their legal mandates. Second, the interactions of organizations recorded in news reports might be questionable in terms of their validity. However, they are important source of information with less cost and they do illustrate, albeit within media's perspective, how organizations have interacted during the time period of the study. Finally, social network analysis has inherent limitations too. It depicts relationships among organizations as ties among nodes, but it does not focus much on the attributes of individual organizations. However, the strength of this approach precisely lies in this and this paper have used it to understand how nonprofit organizations are structurally located in the response network and how that explains their effectiveness.

6. Conclusion

Nonprofit organizations have had important roles and responsibilities in disaster relief throughout American history. Nonprofit organizations were the primary first responders during the times when government actors did not carry the burden of saving citizen lives and properties. Governments started getting involved in early 20th century, and the 21st century ushered in unique challenges and complexities, which necessitated a need for the integration of actions of response organizations across political jurisdictions and organizational sectors under the umbrella of a unified national disaster policy. This paper tracks changes in the national disaster policy with regard to the nonprofit sector by looking at the roles ascribed to nonprofit organizations in the Federal Response Plan (FRP), the National Response Plan (NRP), and the National Response Framework (NRF). Also, data collected from major newspapers and organizational reports about inter-

organizational interactions of emergency management agencies during the September 11th attacks and Hurricane Katrina are analyzed by using social network analysis tools. The findings of the study indicate that there has been an increase in the interactions of National Voluntary Organizations Active in Disasters (NVOAD) network member organizations in keeping with changes in the National Response Plan to involve nonprofit organizations in the national disaster planning process.

Nearly half of the NVOAD agencies have reportedly interacted with others in the emergency management networks. Moreover, the NVOAD members relatively close to the network center in both of the cases studied experienced enhanced communication and the acquisition of necessary resources to achieve their missions. In contrast, the NVOAD agencies that had relatively few connections in the network experienced a limited ability to respond to the disaster. It is recommended that the organizations at the center of the network share their best practices of collaboration with the other NVOAD members. Investments by the NVOAD coalition in developing formal and informal relationships with other actors in the network can help NVOAD agencies have important collaborative links with regard to the flow of information and resources. The research can be furthered by surveying the perceptions of NVOAD members about their awareness of the network and their role in national disaster response, as well as the extent to which they are using the NVOAD coalition to coordinate their activities.

Network analysis offers a unique opportunity to study the complex nature of disaster response and the role of nonprofit organizations in the response effort. The next research step is to conduct an in-depth survey of NVOAD member organizations focusing on understanding disaster network formation and sustainability. It is possible that some of the smaller nonprofit organizations that belong to NVOAD are overlooked by the data sources, and researchers should look at these smaller organizations for case analysis. Lastly, future research should focus on conducting an in-depth analysis with some description of network positions and case analysis of the organizations with high scores and the ones with low centrality scores. This analysis would offer the opportunity to discover best practices used by nonprofit organizations to improve emergency management network performance and to identify barriers to enhanced network performance.

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