Multi-Organizational Networks and Community Resilience in Extreme Events: A Case Study of the September 11th World Trade Center Attacks

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ABSTRACT
This research uses the September 11th World Trade Center Disaster as a case study to explore the multi-organizational networks that emerge as organizations develop strategies to cope with various response functions during a large-scaled disaster events.

The data on which this research is based comes from systematic field observations in New York City for two month following the attacks; original documents, including reports prepared by responding organizations; other documentary material, including newspaper reports, other journalistic records, and after-action reports; as well as formal and informal interviews with key decision makers and responders from a broad range of organizations. The preliminary analysis for this presentation is part of the network analysis component of this study and is based on the first phase of coding; primarily federal documents in addition to a smaller grouping of city situation reports and newspaper documents.

Documents were coded for instances of organizational involvement. Using the data gleaned from the coding process, we constructed two database. The first database contains information about response-related actions and interactions, including organizations involved, facilities where actions took place, and functional activities in which organizations were engaged. The second database is in network analytic format and allows for a systematic analysis and a graphic visualization of the multi-organizational emergency response network.

By better understanding the form multi-organizational response networks took during World Trade Center disaster, findings can provide more general insights into how network structure impacts organizational and community resilience in other large-scaled disasters and near-catastrophic events.

BACKGROUND
By any standard, the September 11th attacks on the World Trade Center was one of the most significant disaster events in U.S. history. The attacks in New York City left estimated 2752 dead (second only to the Galveston hurricane of 1900 for loss of life). Economic losses are still to this day being calculated, but in a 2001 report by the New York Chamber of Commerce and The New York City Partnership, an estimated 83 billion dollars were lost in New York City's economy alone. This event was unprecedented in many ways: from the scope, to the severity, to the extreme and complex demands that it placed on the New York City Emergency management system. This response was compounded even further by the loss of response personnel in collapse of Towers 1 and 2, as well as the loss of the city's emergency operations center when 7 World Trade center collapsed in the wake of damage and fire from the two towers. In response to this event, organizations from both within and outside the response system converged on the site in what was arguably among the largest response efforts ever launched in a U.S. disaster.

OBJECTIVES
The objectives of this analysis is to better understand the emergence and operation of the complex multi-organizational response to the World Trade Center disaster and derive findings on how response organizations achieve resilience in the face of extreme events.

Although this disaster is unique in many ways, the impacts that were generated and the response related demands such as debris management, logistics, search and rescue, building assessment, and a host of others are very similar to those that we would expect to see other disasters including a near-catastrophic earthquake in an urban area.

Using state-of the art network analytic tools to study its immense WTC dataset, DRC is visualizing the response network, examining the forms of networks that emerged and evolved over time, and moving toward developing network characteristics based on elements such as functional activity, sector affiliation, and disruption to response plans.

METHODS

Data Collection
Data collection for network analysis component of the project was conducted in three phases: 1) observation field notes and formal documents collected during quick-response field research in New York City beginning two days after the attacks and continuing for two months at key response locations such as the EOC, Ground Zero, staging areas, and supply warehouses; 2) newspaper documents and reports related to response activities; and 3) in-depth formal interviews with over sixty key decision makers and responders in World Trade Center emergency response.

Data Analysis
Data preparation for the network analysis was also conducted in three phases: 1) document coding through content analysis; 2) creation of an archival database of organizational involvement in the response; and 3) creation of a network analytic database containing organizational interactions. To date we have coded, cleaned, and entered into our databases over 7600 response actions and interactions involving over 800 organizations in the first 12 days alone. Of those over 4600 constitute interactions between 529 different organizations. This latter group of interactions are the basis for the preliminary analysis presented here and in the formal presentation.

DRC used network analytic techniques to interpret data gleaned from content analysis. DRC used UCI.NET to create the database and will use this technology to subsequent analyses to produce index measures. DRC used NETDRAW to produce a visualization of the network and its function-based components based on mathematical algorithms, geospatial distribution, and graph theoretic methods.

RESULTS

This map is a representation of the entire emergency response network. Red circles represent the 529 organizations and the multi-colored lines represent the over 4600 interactions we catalogued and entered into the database. Each different color represents one of the 42 functional areas of the emergency response that we have coded for, examples of which include Search and Rescue, Emergency coordination, and Logistics. In addition to this full map, we can also present any one of these functional areas alone in its location within the entire system, as an independent network, or using several other analytic and visualization techniques.

CONCLUSIONS
This data set and the developing methodology it represents, present this field with many exciting new ways to understand, measure, and analyze emergency response networks. Potential insights include the development of an empirical measure of organizational resilience, as well as the ability to more systematically examine the nuances of emergency response organization. As computing power and software programs are updated and improved the empirical insights that this type of data can provide will become more complex and apparent.

This presentation provides a brief description of the analysis underway on this study and provides a preliminary visualization for the entire response network. As more detailed account will be provided in the formal presentations.

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