Leading the Future of the Public Sector: The Third Transatlantic Dialogue
University of Delaware, Newark, Delaware, USA

May 31 – June 2, 2007

Workshop 4: Leading in a Multi-Sector Environment

Government Leadership in Multi-Sector IT-Enabled Networks: Lessons from the Response to the West Nile Virus Outbreak

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Abstract
Government leaders at all levels are realizing that sharing information across organizational boundaries is essential to effectively respond to the most pressing public problems facing governments. A public health crisis, such as the outbreak of the West Nile virus in the United States, represents one of these pressing public problems. Sharing information across organizational boundaries in support of a governmental response required intergovernmental and multi-sectoral collaboration and information sharing. Examining these efforts provides an opportunity to explore questions about various actors in such response efforts; in particular, executives and informal leaders. This paper, based on a comparative case analysis of the response to West Nile virus (WNV) in two US states, New York and Colorado, extends what is known about leadership by providing new understanding about the mechanisms through which executive involvement, and formal authority, informal leadership affect multi-sector collaborative information sharing. The case analysis contributes to current knowledge about government leadership in complex, multi-sectoral network environments such as a public health crisis. A set of propositions drawn from the analysis provide a preliminary model of the mechanisms through which leadership variables affect intergovernmental and multi-sector information sharing in crisis response. The findings provide new insight for practitioners about the mechanisms through which executives and informal leaders influence cross-boundary information sharing and ultimately the capability of government organizations to respond to complex public problems.

1. Introduction

In late summer and early fall of 1999 the United States experienced the first outbreak of West Nile virus (WNV) in the Western hemisphere. The first cases appeared in the New York City area. In 2002, as the outbreaks continued to move westward, the State of Colorado experienced its first case. As New York and Colorado worked to build response capacity, they turned to information sharing and inter-organizational collaboration as lead strategies. In both states the response required many new relationships to facilitate the sharing of required information; animal and human public health professionals unaccustomed to collaborating across traditional government boundaries came together with

a mix of other public and private sector organizations representing both human and animal healthcare facilities and providers.

Recent research highlights the level of changes required to create the kind of high-functioning, cross-boundary capability necessary in these response efforts as among the most complex, deep functional and institutional changes (Fountain, 2001; Cook, 2004). Previous studies have identified the challenges to efforts to create this capability as ranging from data and technical incompatibility to the lack of institutional incentives to collaborate and the power struggles around multi-organizational settings (Gil-Garcia & Pardo, 2005). Some of the challenges faced by response agencies were new. In particular, government leaders faced new challenges resulting from the nature of the threat and the complex requirements of an interorganizational response. They needed to find ways to facilitate and foster interorganizational collaboration and information sharing across organizations from multiple sectors and all three levels of government.

Two critical components of the response to this crisis in both states were the use of information and communication technologies to share relevant information and the development of networks of organizations. Although there were important differences, the responses in New York and Colorado shared several characteristics such as their dependence on information technology and multi-sector organizational networks. The organizations involved included federal and state agencies, local governments, and a mix of public and private human and animal healthcare facilities and providers to include hospitals, university labs, and veterinarian practices. The comparative analysis of these two cases focuses on the role of government executives, formal authority, and informal leadership in the networked response to the West Nile virus outbreak. The paper attempts to disentangle how these leadership factors affected the collaboration efforts and the necessary cross-boundary information sharing during the response. Therefore, it provides not only evidence of the importance of each of these variables, but also uncovers some of the mechanisms through which they have an impact on interorganizational information sharing. This paper contributes to our current knowledge by describing and explaining some of the mechanisms through which executive involvement, formal authority, and informal leadership influence cross-boundary collaboration and information sharing. The paper also provides some lessons on how to leverage executive involvement, formal authority, and informal leadership in highly complex networks enabled by information and communication technologies.

The paper is organized in five sections, including the foregoing introduction. Section two presents a review of previous studies that focus on the relationship between leadership and IT projects, with a particular emphasis on cross-boundary collaboration. It offers insights into how researches have thought about key leadership variables such as executive involvement, formal authority, and informal leadership. Section three explains the research methods used and provides a brief description of each of the cases. Section four presents the analysis and highlights our main findings. Finally, Section five provides some concluding remarks and suggests areas for future research.

2. Leadership, Information Technologies, and Cross-Boundary Collaboration

The delivery and management of public services increasingly relies on complex networks of interdependent organizations (O'Toole, 1997). Crosby and Bryson (2005, p.8) describe this setting as "no-one-in-charge, shared-power world", where a great number of organizations and groups have only partial responsibility to act on a public problem and share the power that is required to solve it. As a result, the need has been raised for a new type of leadership that crosses boundaries of departments, levels of government, and sectors. As Huxham and Vangen (2000) point out, two fundamental assumptions of traditional leadership literature do not apply to collaborative settings. First, a leader cannot exert formal authority based on hierarchical rank because the individuals involved are from different organizations.

Second, it is very difficult to agree upon a common goal because participating organizations have different and often conflicting goals.

Interorganizational, cross-boundary leadership has started to become an essential element of information systems (IS) management. In today's organizations the wall between traditional information technology (IT) departments and functional business units have been dismantled, and interorganizational networks and external alliances have become more common (Tapscott & Carston, 1993). Since information technology permeates all business functions of an organization, IS leadership requires a holistic cross-functional view of the organization, which poses unique challenges for many chief information officers (CIOs) (Karahanna & Watson, 2006). The following literature highlights the importance of three variables closely related to the concept of leadership—executive involvement, formal authority, and informal leadership—for the success of IT initiatives, with a particular emphasis on cross-boundary collaboration and information sharing. Although previous research has clearly established the importance of leadership, there is a lack of systematic studies about the mechanisms through which this factor affects interorganizational information sharing in multi-sector collaborative networks.

2.1. Executive Involvement

Since the advent of management information systems (MIS), executive support has long been regarded as a critical IT success factor. As early as 1963, for example, a McKinsey & Company survey of 27 companies with extensive computer systems experience concluded that "realization of computer systems potential basically requires that top management take the right action in respect to…specific factors--managerial, not technical, in nature—which principally determine computer systems results" (Garrity, 1963, p.7).

Jarvenpaa and Ives (1991) point out that the terms "executive involvement" and "executive participation" have been used interchangeably in IS literature and distinguish between "executive involvement", CEO's perception and attitude concerning IT as a critical element to the success of organization, and "executive participation", CEO's substantive personal interventions in IT-related matters. The authors of that study analyzed survey data collected from CEOs in 83 firms and found that executive involvement is more strongly associated with the progressive use of IT in the firms than executive participation. Previous empirical studies also have found that the involvement of senior management has a positive effect on the success and effectiveness of information systems (Schuman & Rohrbaugh, 1991; Earl, 1993; Cerpa & Verner, 1998; Basu, Hartono, Lederer, & Sethy, 2002; Gil-Garcia & Pardo, 2005).

The importance of executive support for IT success applies to the public sector as well. Previous researchers have found that support and buy-in from top-level executive leaders was critical for the success of IT initiatives such as IT governance in state governments (Anderson, Bikson, Lewis, Moini, & Strauss, 2003), integration of criminal justice information (Cresswell & Connelly, 1999; Bellamy, 2000; Gil-Garcia et al., 2005), government data warehouse (Zheng, 2000), and state digital archives (Cresswell and Burke, 2006). A recent case study of public sector knowledge networks by Eglene, Dawes, and Schneider (2007) finds an explicit link between the success of IT initiatives and the support of a chief elected official, which is especially useful in "negotiating powerful bureaucratic processes such as budget formulation" (p.105) and augments legal basis for the projects. Support from elected officials and policy makers is also found essential for expanding an agency-level, single problem-focused initiative to enterprise-wide, sustainable information integration in government (Pardo, Gil-Garcia, & Burke, in press).

2.2. Formal Authority

Although the focus of interorganizational, cross-boundary leadership literature has been on the informal aspects of leadership as discussed above, formal authority is still important for successful implementation of interorganizational IT projects, particularly in governmental settings. This is because organizational networks in the public sector are governed by legally constrained politico-administrative processes (e.g., staffing, budgeting, procurement, and oversight) and often established by specific legal requirements (Eglene et al., 2007). As Dawes and Préfontaine (2003) point out, multiorganizational collaboration in the public sector needs institutional legitimacy, which commonly begins with law or regulation and is strengthened by the sponsorship of recognized authority or formal relationships among participants, in order to come through political transitions and changes.

Based on the findings of their case study, Eglene et al. (2007) suggest that knowledge network initiatives in the public sector benefit from legal authority, although the particular structure of formal authority relationships does not significantly affect their success. Also, a recent case study by Pardo, Gil-Garcia, and Burke (2006) finds that the thoughtful exercise of formal authority can provide a foundation for a collaborative effort and help build trust among participants in information sharing initiatives in governments.

2.3. Informal Leadership

As IT projects in organizations become more complex, require more interdependent tasks, and rely more on distributed expertise, traditional directive leadership based on hierarchical control and formal authority—chief programmer approach—is being replaced by decentralized, collaborative, and empowering leadership style—egoless development approach (Faraj & Sambamurthy, 2006). A recent empirical study by Faraj and Sambamurthy (2006) finds that empowering leadership has a significantly positive effect on the performance of IS project teams under conditions of high team expertise and high task uncertainty, which are characteristics of most interorganizational, cross-boundary IT projects.

According to Brown and McLean (1996), the trend toward sharing the ownership and management of systems projects with line management began as early as the 1980s, and such partnerships are expanding both within and outside of organizations due to increased outsourcing, interorganizational systems, and strategic vendor alliances. Since a majority of IS activities in contemporary organizations are not under the direct control of the CIO with the movement from mainframe to distributed computing, the only way for IS executives to achieve IT success is to build cooperative relationships outside of traditional hierarchical arrangements and interorganizational contractual agreements (Brown & McLean, 1996).

Klenke (1997) maintains that the need for formal leadership decreases in multi- and cross-functional IS teams that are composed of members with high experience and training and professional orientation. According to the author, leadership for such work units is distributed among different members and requires technical expertise, interpersonal skills for negotiating, networking, and creating a culture for high performance, and conceptual abilities such as analytical thinking, concept formation, and idea generation instead of formal authority. Leaders in cross-boundary and interorganizational settings need to focus less on traditional command-and-control and more on facilitation and coordination. Several authors suggest sets of tasks for such leaders. For example, Hales (2002) comments that leaders in network forms of organization engage in team leadership, negotiating integrated efforts across boundaries, inspiring and promoting organizational learning, and conceiving and facilitating change. Agranoff and McGuire (2001) suggest new managerial tasks for public networks as follows: First, activating is the process of identifying participants and stakeholders in the network. Second, framing establishes and influences the operating rules of the network. Third, mobilizing induces individuals to make a commitment to the network. Fourth, synthesizing is the enhancement of conditions for favorable, productive interaction among network participants.

Similarly, Luke (1998) identifies four tasks for public leadership in interconnected world, namely, focusing public attention on the issue, engaging people in the effort to address the issue, stimulating multiple strategies and options for action, and sustaining action and maintaining momentum by managing the interconnections. A recent case study by the RAND Corporation on IT governance in state governments (Anderson et al, 2003) finds that some successful central IT offices rely not on formal authority, which is distributed among multiple agencies, but on close collaborative relationship among stakeholders, which is cultivated by mutual respect and frequent and open communication, acting as a collaborative leader or advocator.

Clearly, recent literature highlights the importance of leadership as an influence of information technology initiatives in general and information sharing in particular. These studies also acknowledge the differentiated impact of executive involvement, exercise of formal authority, and informal leadership as manifestations of a more general leadership concept (see Figure 1). However, this literature does not closely and systematically analyze the mechanisms through which these three variables affect interorganizational information sharing and multi-sectoral collaboration. The present study shows the effects of these important variables and explains some of the causal mechanisms involved in this complex phenomenon by disentangling some of these relationships through careful qualitative analysis. In doing so, this study extends this basic framework to incorporate other variables and their corresponding effects and clarifies why these factors are important for cross-boundary collaboration and information sharing. We now briefly describe the cases and research methods and then present our analysis and main findings.
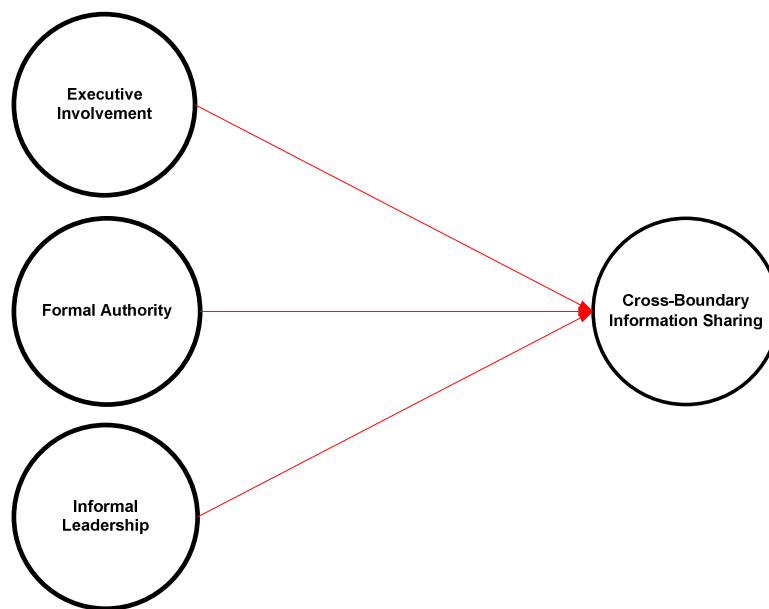

Figure 1. Influences of Leadership Variables on Cross-Boundary Information Sharing

3. Research Methods and Description of the Cases

This research is based on a study conducted by the Center for Technology in Government at the University at Albany and supported by a grant from the National Science Foundation. The research included eight in-depth case studies of state-level efforts to create the ground work for sharing information across agencies and across government levels in two policy domains: public health and criminal justice. Within the criminal justice arena, we used an action research framework with facilitation,

observations, interviews, and document analysis. The public health domain was studied through a retrospective analysis of the state and county public-health response to West Nile virus, using interviews and document analysis.

Approximately 70 facilitations and semi-structured interviews were conducted with public managers and other actors involved in criminal justice and public health information sharing initiatives at the state and local level. As mentioned before, the public health cases were focused on the response to or preparation for the West Nile virus outbreak in Colorado, Oregon, Connecticut, and New York. The criminal justice cases included interorganizational information integration initiatives in the states of New York, North Carolina, and Colorado, as well as in New York City.

Facilitations and interviews that comprised the project's data collection phase were transcribed and analyzed following an inductive logic approach and using grounded theory techniques (Strauss & Corbin, 1997; 1998). The research team used Atlas.ti, a qualitative analysis software tool, to support coding and analysis activities. First, based on a sample of interview transcripts, an initial coding scheme was developed by the research team. Second, using this coding scheme, researchers carefully read and coded the rest of the transcripts, always having coordination meetings to make additions and refinements to the initial list of codes. Third, the research team looked for concepts and categories that were well represented in the data as well as the relationships among them. Fourth, a preliminary theoretical model was developed and refined through several iterations to ensure that each variable and relationship was grounded in the interview data. Finally, a high-level conceptual model was developed and the research team derived specific propositions and hypotheses.

Following this systematic and rigorous process, the research team identified critical factors and processes involved in sharing information across levels and agencies in government and across organizations from different sectors. The research team also identified how those factors and processes varied for different types and degrees of information sharing. For this paper the team focused on the subset of variables related to leadership and authority: executive involvement, exercise of authority, and informal leadership. Propositions about how these three variables affect cross-boundary information sharing were generated and refined through multiple iterations of qualitative data analysis. For this paper, we discuss these factors and the propositions generated in the context of two of the public health cases: the West Nile virus responses in New York and Colorado. Each case is described briefly first as background for the analysis.

3.1. New York State's Response to the West Nile Virus Outbreak

In late summer and early fall of 1999, New York was the site for the first outbreak of West Nile virus (WNV) in the Western hemisphere. In preparation for a possible re-emergence of the disease in 2000, the New York State Department of Health led an effort to improve the state wide capacity to respond to another outbreak. A critical component of this response capacity was the development of a Web-based integrated information network. This network, the Health Information Network (HIN), was originally created to provide secure Web-based electronic health information exchange for a multi-sector group of organizations including state and local health departments, healthcare facilities, and healthcare providers (Eidson et al, 2001). Based on the existing infrastructure, the state health department worked with other state agencies and local health departments to develop and implement an integrated electronic system used to collect and provide access to West Nile virus related case data. The collecting and sharing of this information was critical to the state's ability to effectively respond to the initial virus outbreak and subsequent re-emergences over the years. The HIN became the platform for sharing data on mosquitoes, birds, mammals, and humans throughout a network of county health departments, state animal and human public health agencies, and healthcare facilities.

The creation of this network brought together animal and human public health professionals unaccustomed to collaborating across traditional government boundaries. These professionals were more accustomed to dealing with disease outbreaks restricted to either animal or human health domains, the West Nile virus outbreak shattered these professional and organizational boundaries because it was a disease affecting both humans and animals. Sharing information across these government boundaries was further complicated by the traditional ways in which state and local governments interact in the state. In New York, state and local governments share responsibility for public health; two cities and 33 of the 57 counties maintain full-time health agencies. While the state-level public and animal health agencies provide a number of regulatory and direct service functions to local governments in support of citizens, responding to a public health crisis, such as West Nile virus, ultimately is the responsibility of county health agencies. At the state-level, new relationships needed to be formed among multiple agencies with diverse expertise in human health, birds, mammals, and mosquitoes. Similar relationships needed to be formed at the local and federal levels and then across these levels of government and among organizations from different sectors such as healthcare facilities and providers.

3.2. The Response to West Nile Virus in Colorado

The first case of WNV in the state of Colorado occurred in Larimer County in 2002. In 2002, the virus was reported in only birds and horses. The first human cases were reported the following year in 2003. The county health department was responsible for coordinating the response to the initial outbreak and the subsequent annual re-emergence of the virus since then. This response capacity included a cross-boundary information sharing initiative that involved a wide range of Larimer County organizations as well as surrounding counties, the state, and federal government. Similar to New York, in Colorado, local government ultimately is responsible for providing public health services to its citizens. With over 2,800 local governments of various types, each having different kinds of statutorily defined authority and responsibility, coordinating West Nile virus response efforts between the state and local governments and even regional efforts among neighboring local governments was a complex task. The cross-boundary information sharing initiative among Larimer County, the state, and neighboring local governments reflecting this complexity and was characterized by an interorganizational process of collecting, disseminating, and analyzing information from a disparate group of information providers and users. An effective response capacity for West Nile virus depends on an accurate assessment of how the virus is spreading among the animal population to include birds, mosquitoes, and particularly in Colorado, horses. Tracking the number of West Nile virus cases within this network of animals provides a critical early warning for the possible spread of the virus to the human population. Therefore, the key information providers and users for a West Nile virus response included both animal and human public health agencies at the state, local, and federal levels as well as a mix of public and private sector human and animal healthcare facilities and providers such as hospitals and veterinarian practices.

Also, similar to the New York case, Colorado had a state-level system for collecting and disseminating WNV case information to relevant government organizations throughout the state and to the appropriate federal authorities such as the Centers for Disease Control and Prevention (CDC). However, at the local level, the coordination of response efforts relied heavily on a less formal or single system. This 'system of systems' was comprised of e-mail, phone, and fax communications as well as ad hoc databases and even geographic information system (GIS) applications. For interaction with the public, the county health department posted case data on the Web in addition to other public communications efforts such as press releases.

4. Analysis and Findings

Previous research has established the importance of leadership in interorganizational settings. This paper extends this research by systematically analyzing the mechanisms through which three leadership variables affected the effectiveness of cross-boundary collaboration and information sharing. This section presents our main findings and proposes a series of propositions about these relationships. The results clearly support a core set of mechanisms or intermediate variables that affect the relationships between cross-boundary information sharing and each of the three leadership variables identified: executive involvement, formal authority, and informal leadership. Below we present the different mechanisms found in the cases and the corresponding propositions and causal relationships.

4.1. Executive Involvement and Cross-Boundary Information Sharing

Executive support has been identified as important for IT projects in general and cross-boundary information sharing in particular. One of the ways executives were found to have a positive impact in the response to the West Nile virus outbreak cases studied was by supporting the actions of influential informal leaders. Informal leaders were found to be powerful actors in the interorganizational efforts. This power was, in part, influenced by the involvement and support of top executives such as agency commissioners. A state-level public health representative with IT responsibilities clearly explains this relationship,

> "…I really look at the people and see--if you got really good, strong people that work together, that'll make any project successful. And I look at Ivan getting us working on it and Deb, involved in negotiating with the counties and [the informal leader] taking the lead. I mean, these are some really good, strong people that made sure that this was successful. And all of it under the support of our commissioner, you know, which I think is--and she was definitely involved early on in establishing the way we were going to proceed and I think that just worked out well."

Although when involved in interorganizational initiatives executives have no formal authority over individuals from other organizations, they can still be very supportive of informal leaders within their own agencies and others. In Colorado, a county public health director was always willing to support the actions of an influential informal leader by supporting his participation in national disease surveillance initiatives and local regional collaborations. This informal leader, who is a county-level public health manager mentions,

> "…I think; she really has a great vision on where she thinks public health should be and how to improve that and is willing to fund that. Because sending me to conferences where we talk about this stuff or having me participate, unfortunately, which she will pay for me to participate in that one survey and flew me out to the meetings.... But that's kind of, that's the direction of the health director."

P1: Executive involvement has an influence on cross-boundary information sharing initiatives through executive efforts to support the actions of informal leaders.

Another important way executives influenced the cross-boundary information sharing initiatives in the cases was to demonstrate and ensure the respect for the autonomy of participating organizations. In the case of New York, this was demonstrated through the willingness to consider the concerns of peer county commissioners about information disclosure. With the help of an influential informal leader, the group was able to establish a rule that allowed county commissioners to be notified about West Nile virus cases

in their respective counties 24 hours before this information was released to the rest of the state and potentially to the press. A state public health representative remembers some details about this situation,

> "The counties were really concerned because I guess they didn't want--we want, when we develop applications, we want to make the data available to everyone, O.K.? And the counties were concerned that if a West Nile bird showed up in their county, the other counties would see it and that maybe they could release to the press this information immediately. And so the press would be notified of a problem before the county commissioner was notified--which happens all the time. I mean, sometimes it's in the newspaper and the commissioners are reading about it before they're notified about it. They were really concerned about a system that we had set up so that the lab results would immediately go in and become available to everyone. And that was like a deal-breaker to them in some ways. I don't really--I think that we should always make the data available. But they were really concerned about that. That's a valid point. They needed time to react and marshal their resources."

In contrast, there were other situations in which the lack of respect for the autonomy of participating organizations negatively affected the willingness to participate and consequently the effectiveness of the cross-boundary information sharing effort. The involvement of top executives can mitigate or exacerbate these tensions and promote or detract rules and mechanisms that ensure a certain degree of autonomy for participating organizations. In Colorado, tensions were created when the state took an authoritative position in its relationship with the counties. State executives did not demonstrate respect for the autonomy of county governments and this resulted in a conflict between these two entities. A county-level public health IT manager describes the situation,

> "The state decided you are going to now use our system. We said "no" because we've already got something we're using. How about we just share data? And there was a big fight--no, you work for us. And we're saying, no, you get our data and it's our data, not yours and there was a big fight. Well, after the fight had ended, we all sat down and got together and said… You know what? What we're getting right now is, here's my system, here's what you will use if you want to do collaboration. Well, that's not collaboration; that's you dictating a system to me and that's different."

In the end, the county managers accepted the state system, but they also kept their own. The use of parallel systems was considered by participants to result in a less than ideal situation; creating issues in the timeliness and accuracy of the information shared with the state and reported to the public.

P2: Executive involvement has an influence on cross-boundary information sharing initiatives through executive demonstration of respect for the autonomy of participating organizations.

The cases provided evidence that executives have the ability to affect willingness to participate either from members of their own organizations through traditional organizational incentives or from members of other organizations through their negotiation capacity. In New York, the commissioner of the state department of health played a critical role in promoting collaboration across divisions (human, mosquito, bird, mammal) of the department and other state agencies to respond to the West Nile virus outbreak. A state senior public health manager identifies her as a very important actor,

> "I think you really want to trace it all the way back; you can almost start with our state health department commissioner, you know. She pretty much said we're going do this; we gotta get it done; we don't have much time and we're going to all work; we're going to all cooperate, you know. And I think it was understood by everyone that we were going to work together and we were going to get it to work, at least within this department of health."

In some policy areas such as public health, the professional background of the top executives is also considered an important factor for people to willingly accept their decisions and promote a collaborative environment. In Colorado, several previous health commissioners did not have public health backgrounds and some individuals at the county level noted that this hurt relationships between the state and the county health departments due to a lack of professional respect for these political appointees. This and a lack of a common professional identify was also found to influence willingness to collaborate. A county public health manager highlights the importance of this aspect of the relationship between state executives and counties,

> "Governors moved away from appointing a health officer, state health officer, who's got public health training to basically a political appointment. And so I would say nobody has much professional respect for the state health officer. It's not like when we had physician health officers trained in public health. They've appointed people as state health officers with no public health training. It's, I think, very negatively impacted the state health department. And then when you take the money away too, it strains relations [with the counties]."

In the case of West Nile virus, the degree of involvement of and support from executives was affected by the severity of the problem and the potential catastrophic effects in terms of losing human lives. The nature of the event directly influenced the willingness to participate of many individuals, but also had an impact on how executives promoted participation. A state senior public health manager in New York explains the role of executives in increasing the participation in the interorganizational response,

> "I think because the top administrators, particularly in Health, saw that there was a real health threat--people were dying in New York City and elsewhere from West Nile. And it was a new disease to the hemisphere, lack of experience and skills with dealing with this disease. We had to come up to speed, define controls and education right off the bat and study it and see just where it was going to go. They made a high priority of doing just that. And therefore, epidemiologists and virologists and all these people came online to work on it. And the information services had to be part of that and it was a statewide program. You had birds coming in from Massena, all over Long Island and it just had to be done."

P3: Executive involvement has an influence on cross-boundary information sharing initiatives through executive ability to affect the willingness of key actors to participate.

The case analysis also shows how executives can use formal authority in making resources available or in some cases unavailable for the cross-boundary information sharing initiative. In New York, the State Health Commissioner was instrumental in making resources available and encouraging collaboration. A state senior public manager describes how she was really involved in the response,

> "The then state health department commissioner was at a meeting and I think she was a key also in calling for everybody coming together, get the resources, do something about this risk. It was sickening and killing people in New York and elsewhere. So she was a key in bringing people together."

Decisions made by executives can also have significant negative impacts on the availability of financial resources and consequently on the capacity to develop effective cross-boundary information sharing. In Colorado, resources were very limited and individuals needed to find creative ways to participate in the collaborative efforts. A county-level public health manager describes how they started collaborating with the cities due to a lack of financial and human resources,

> "We had had a big financial hit in the summer of 2002. The governor basically eliminated all infrastructure funding for local health departments and so that was a huge hit to us. And the Board

of Health prioritized some services and the mosquito monitoring actually wasn't even on the list at that time 'cause we had, were basically not doing it. So we knew we weren't going to have a lot of additional money for 2002. So we figured that the best role that we could do is to be educators and facilitate getting the cities to step up to the plate."

P4: Executive involvement has an influence on cross-boundary information sharing initiatives through executive ability to make financial resources available.
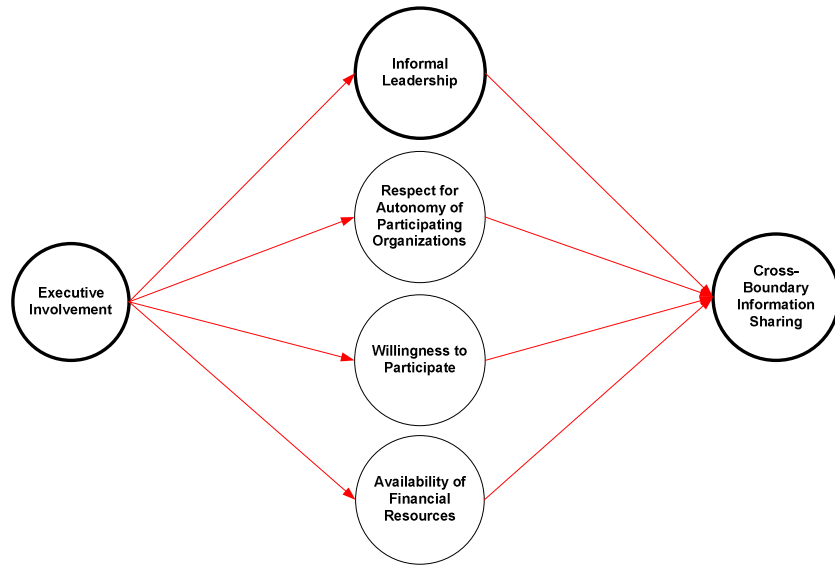

Figure 2. Influences of Executive Involvement on Cross-Boundary Information Sharing

The cases provide new understanding of the specific mechanisms through which executive involvement influences cross-boundary information sharing. The actions of executives in the cases served to highlight the role executives can play in enhancing the capability of informal leaders to affect change in the many organizations involved in a response efforts. These actions also served often to positively influenced willingness to participate; while other actions, in particular, those communicating a lack of respect for the autonomous nature of some organizations, negatively influenced this willingness. The ability of executives to apply or in some cases, withhold, influenced the cross-boundary information sharing efforts in the responses.

4.2. Exercise of Formal Authority and Cross-Boundary Information Sharing

The exercise of formal authority was found to facilitate cross-boundary information sharing by affecting the existence and nature of problems and the necessity of localized and episodic solutions for those problems. In some instances the exercise of formal authority was found to solve some of the existing problems; in others it produced new problems. The case analysis sheds light on how tensions created by the exercise of authority by states can influence the willingness of autonomous local governments to participate in collaborative information sharing. As mentioned before, in Colorado this lead to problems between the state and some of the counties. A county-level public health IT manager in Colorado commented on how the state attempted to force a system on them,

"[t]he state decided you are going to now use our system. We said "no" because we've already got something we're using. How about we just share data? And there was a big fight--no, you work for us. And we're saying, no, you get our data and it's our data, not yours and there was a big fight."

In a different context, formal authority can help to build agreement among multiple organizations, especially if the individuals involved in the discussions have enough authority to make decisions and solve common problems or concerns. As discussed in the previous section on executive involvement, in New York, the counties were concerned about information disclosure and therefore, the state needed to create some rules about this. With the help of an informal leader, the state health department came up with a rule stating "lab results would be delayed 24 hours for all the other counties to see… And actually the county could at any moment make it visible but it would be delayed for 24 hours before other counties could see it." This strategy was the result of the state health department thoughtfully exercising its formal authority as well as supporting an influential informal leader.

P5: The exercise of formal authority has an influence on cross-boundary information sharing initiatives by affecting the existence and nature of localized episodic problems.

The exercise of formal authority was found to be important to the crisis response efforts; in particular in due to the compressed timeframe and the importance of coordination. The exercise of formal authority influenced the development of appropriate and effective strategies for cross-boundary information sharing. In the cases organizations from multiple levels of government and multiple sectors needed to participate. The lack of traditional coordination mechanisms such as hierarchies and formal communication channels in these interorganizational settings increased the complexity of collaboration and information sharing. In fact, in New York the legal framework establishes autonomy of local governments and, therefore, promotes a decentralized response, thereby, limiting the likelihood that mechanisms for coordination already exist. In New York, authority for making decisions about a public health crisis such as the West Nile virus outbreak rests with the counties. A former county-level public health representative in New York explains this,

"They [state department of health] could suggest things but they couldn't say you had to do something. And from the county's perspective, it would have been a lot easier if the state could have just said, "You need to do this; you have to do this; you're mandated to do this" but that's not the way things happen. It's county rule in New York State and so leaving the decision up to the counties, each county could do different things. And with a disease like West Nile, it wasn't something that was going to stop at a county border. So that often made it very difficult if counties decided to do different things. And so I think that did make it difficult a lot of times because there were differences and opinions about what should be happening and what was in the best interest and what was in the best political interest."

Some government officials and public managers were found to influence the effectiveness of cross-boundary information sharing initiatives by exercising their formal authority within their own organizations and negotiating a shared vision with other organizations participating in the response. The data showed that public managers not only have the potential to positively affect these initiatives, but in many cases they were motivated to do so. For instance, in Colorado, a county-level public health IT manager mentions, "I wasn't hired here to maintain the status quo; I was hired here, in my mind, to enhance or improve the services and find ways of being efficient." In the case of the response to the West Nile virus, improved services were achieved by working collaboratively and finding better ways to share information on animal and human cases.

P6: The exercise of formal authority has an influence on cross-boundary information sharing initiatives through the development of appropriate and effective strategies.

The exercise of formal authority was also found to have a direct influence on the willingness of key actors to participate. As mentioned before, the relationship between the state and the county governments was necessary for an effective response. This relationship was affected by decisions taken at the state level that had implications for counties and their capacity to respond. In some cases, the exercise of authority by the state reduced the willingness of the counties to participate. One example of this was the creation of bioterrorism regions in Colorado. A county-level public health manager in Colorado remembers,

> "Well, just recently, with the state getting all the bioterrorism money, the state has basically forced people into regions, whether they make sense to be regions or not. I mean, we're in this region that goes from our county all the way to the Kansas-Nebraska border and to some counties that are along the Kansas-Nebraska border, as far south as Colorado Springs. Now if this makes any sense to you as being a region but, you know, that met their, they had some other thing divided up that way and so they said, these will be your bioterrorism regions. So, yes, we do have those. They're sort of state-imposed; they're not natural, people who naturally would necessarily be working together."

The analysis highlights the need for collaboration and information sharing between and among state and local governments as well as other organizations in the response efforts. The data also showed the need for each actor, states in particular, to be sensitive to the differentiated needs of local governments as well as their own needs in creating aggregate data. In New York, there was a tension between the state and New York City (NYC) regarding the development of the Health Information Network (HIN) for disease surveillance. The state was trying to use its authority to develop a single solution for all local governments, but initially did not take into consideration that NYC is much different from other local governments in the state. Early in the initiative, this affected NYC's willingness to participate. However, the state named a public health manager from NYC the co-chair of the data committee and that helped give NYC more influence and increased their willingness to participate. This Public Health Manager explains the situation,

> "I think there was a certain amount of state-city kind of issue. And I think it comes out with, around the state having the solution that works for forty-five other counties. And they say, well, why don't you just do what the forty-five other counties are doing? You know, we have a solution that works well for everybody and you have to, you know, you should adopt it. And that doesn't always work for New York City because New York City is in some ways, is as big as the rest of the state. And we have, we're pretty deep in certain areas and we have different needs in certain areas. And, you know, the fact that we are, we have this capacity in some ways, can introduce a situation where we're not going to just accept the state solution because it may not meet our needs. And maybe we've already developed a solution that works well for us. So that's when there needs to be this negotiated compromise that meets everybody's needs. And I think that was why it was probably helpful for me to be the data co-chair with Ivan on that work group."

P7: The exercise of formal authority has an influence on cross-boundary information sharing initiatives by affecting the willingness of key actors to participate.
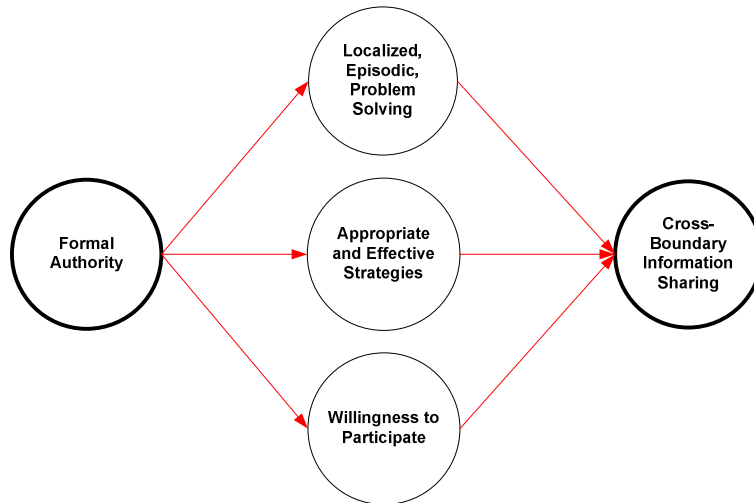
Figure 3. Influences of Formal Authority on Cross-Boundary Information Sharing

The cases provide illustrations of the influence of formal authority on cross-boundary information sharing. In particular, the mechanisms through which this influence was realized are made clear. Localized episodic problem solving is one mechanisms highlighted in the cases. Formal authority served to both exacerbate and mitigate localized episodic problems in the cross-boundary information sharing efforts. The creation of appropriate and effective strategies for cross-boundary information sharing was positively influenced in the cases through both direct authority being exercised within agencies and through support of informal leaders from across other organizations. The cases also provide insight into how formal authority influences information sharing by highlighting willingness to participate as a influence mechanism.

4.3. Informal Leadership and Cross-Boundary Information Sharing

In both the New York and Colorado cases informal leadership played a critical role. One of the ways informal leaders were essential for the information sharing initiatives and, consequently for the response, was their ability to build trust and willingness to participate among individuals representing organizations from different levels of government and different sectors. Informal leaders worked with different groups of people, looked for solutions, and created a trust environment in which participants felt comfortable being part of the effort. As a county-level public health manager in New York mentioned referring to the role of a key informal leader in the response,

> "…and so she was very responsive and, as I said, I don't know if it affected [the results of the response] but I thought it was a good working relationship where she seemed very interested in input, to what the needs were and what would be helpful to people. And I think she really tried to get it done on the other side, what she thought would be helpful."

Informal leaders were able to build this trustworthy environment because they were already part of networks of professionals with similar responsibilities. The WNV outbreak was an unfortunate opportunity to activate some of these networks and start sharing other kinds of information. A state-level public health manager with the Colorado state department of health described this situation in the following way,

"And I worked with the same people on, you know, if you're doing encephalitis, mosquito-borne encephalitis work in your county, you're probably also doing plague work or rabies work or other kinds. So I, you know, and that's a fairly small circle of folks so most of these folks I know and have worked with for years."

In this multi-sector response, the trust building role of informal leaders was not unique to relationships among professional peers from similar organizations, but also among individuals from very different organizations, who were not used to collaborating or were not convinced of the plausibility of some ideas and joint strategies. A state-level public health representative with IT responsibilities in New York stated this in a very clear manner,

I think we did convince [him] [a state-level senior public health manager in New York State] eventually that this was something that was going to be helpful to him, you know, and [he] definitely bought in and there again, it comes down to [the informal leader]. You know, [he] was busy and it was tough at the beginning, it was tough to get time with him and I don't think he was really convinced at the beginning. But once [the informal leader] got to him and started talking to him, she's a great negotiator and she really--yeah, she was dealing with everyone in there."

Informal leaders used their knowledge and social networks to better respond to the complex situation. Frequently, they did not wait to receive directions; instead they took the initiative and started sharing information across organizational boundaries. A state-level public manager from Colorado explained how they started this process, "…and so it's not something, for instance, that high up in my agency [the state health department] or high up at CSU [Colorado State University] said, well, you guys need to get together and share this information. It was something that I knew about and I called the director of their diagnostic lab, who I know from other issues over the years…"

Informal leaders were able to talk to individuals participating in the response in their own words. In fact, some of them built trust among participants by playing the role of "brokers" between public health professionals and information technology (IT) staff. A state-level public health program manager with the New York State Department of Health explained how an informal leader talked to a senior public health manager in another state agency highlighting some aspects that were important for him in his own terms and, in that way, got his buy-in. "She persuaded him also on the importance of health… importance to the research to understand the transmission of the disease and they talked on that level…"

P8: Informal leaders have an influence on cross-boundary information sharing initiatives through their ability to build trust among key participants and leverage existing trust embedded in their professional networks.

Each response effort required a strategic vision to guide the cross-boundary information sharing efforts. However, to be successful, they also needed to find creative localized solutions to important problems. Informal leaders were found to play a very important role in this regard. They were negotiators of localized and episodic solutions that allowed the cross-boundary initiatives to happen and be more effective. A particular problem that required localized solutions was the disclosure of data. County officials were sensitive to the timing in the release of information about WNV in their own county. In New York, a very active informal leader was able to negotiate a solution that was acceptable for all counties and the state. A state-level public health representative with IT responsibilities recalls the process this way,

"So the rule we came up with--this was worked out through her [the informal leader] and it still continues to be used--is that lab results [confirming a case in one county] would be delayed 24 hours for all the other counties to see, O.K.? And actually the county could at any moment make

it visible but it would be delayed for 24 hours before the other counties would see it. The state could see it immediately; we could see it immediately 'cause we had to. But other counties couldn't see it immediately unless somebody there who had specific permission was to actually say, "Yes, I'm going to make this available to them". O.K.? And they still continued to use that."

In a similar way, but for different reasons, another informal leader in Colorado was able to provide a flexible information system that allowed information to be updated at any time. Initially this was not possible and it took the county one or two days to have their emergency page available in their Web site. An informal leader was essential in solving this problem and moving the initiative ahead by empowering the IT staff to develop and implement a technical solution that would enable the timely reporting to the public of important information related to the virus. A county-level public health IT manager in Colorado describes the effectiveness of the localized solution,

"[it] was dynamic; it's tied back to our server and it can be updated from anywhere in the world as long as you had Internet access. So if something came up at 3:00 a.m. and if she [the public health director] was at home, she could log into the system and update it and that would enter immediately on our Web page... So we're revising more our pages along those lines now and approaching it that way to say, you know, we really need that flexibility to add or remove stuff 'cause it took--when we declared our public health emergency, it took the county, let's say, twenty-four, forty-eight hours to get their public emergency page up and running."

Standardized information is always a challenge in cross-boundary information sharing initiatives. For New York, deciding which identifiers to use for tracking information about animals and humans was an issue, especially due to the large number of organizations involved and how different they were. Again, an informal leader was able to negotiate the use of certain standards, even with powerful actors. A public health representative from New York clearly explains this,

"You gotta go back to [the informal leader]. She really, you know, made it work. I don't know if you're familiar with [senior public health manager for different state agency]. But he's a very intelligent, interesting guy. He's always making his point. But he's got a very strong personality and he wants to make sure when he's dealing with the [state department of health] that it's going to be a benefit to him."

P9: Informal leaders have an influence on cross-boundary information sharing initiatives through their ability to apply localized and episodic solutions to complex problems.

Informal leaders' use of boundary objects to facilitate a conversation between individuals from different organizations and/or different professional backgrounds was found to play an important role in the development of the information systems used in the responses. In New York, an informal leader helped design the forms in the system and promoted a faster use of prototypes to negotiate with the counties. This was very important in the response due to the time pressure. A state-level public health representative with IT responsibilities describes the situation with details,

"…the design of the forms. One of the things that happens, I think, in a lot of systems is when it comes time to do the design, you break it out to this large group and then the discussions… and it goes on forever. Well, we didn't work that way; we didn't have the time to do that. So all the design of the form were done by basically [the informal leader]. [She] said, "I wanted a form that looks like this". She did all the design, did all the initial work. We did a prototype of that and then we showed the prototype to the counties and everyone else, O.K.? And they responded; we made modifications based on that. But it wasn't--we got something out fairly quickly to them because we had one person really doing the design and us quickly developing the prototype. And also, around here, we bring up demo systems very easily. Whenever we do a production system

we also do a demo system, which is the exact same code, just pointing to a different database. So immediately they could start using the system and they could try it out and even if it was a prototype and not all the stuff was there, we have enough there that they could play with it. And that made us get our screens set up pretty quickly and our business logic established pretty quickly. And also the use of the HIN, I think, to distribute the information. We were all on the Web; all the documentation was on the Web; all the minutes were on the Web; everything was on the Web. They could go to one spot and they could get to the system; they could view the documentation, the comments. Right, we had all of our data flow diagrams. Everything was on the Web and so that worked out well."

Informal leaders also played an important role in using reports and corroborating information using multiple channels. For instance, in Colorado an informal leader was using reports obtained from a survey to all providers in their area as a starting point. He then talked to the veterinarians and updated the report accordingly. This report became the source of highly accurate information for the response and people at the local level were sharing it with other organizations. A county-level public health IT manager talks about this,

"At that point we instituted our Health Alert Network broadcast fax system, which we basically sent out faxes to all the providers in our area. And that was a survey of, do you have any cases that meet the following high-level criteria and if you do, please fill out the following information on these cases. And so we were tracking things like the client's name, their address, contact information, recent activities, you know, were they in a common area, were they all out at Lake in Loveland or something, at a picnic or what is their contact with mosquitoes --we threw that question in there. What symptoms were being seen, what was the temperature rate, fever issues, things like that… When we directly called the vets, it was definitely a new. When we did a quick, you know, how many cases have you been seeing? They said well, gee, I've seen twelve and then we'd look at our reporting and we've had eight cases and they've seen twelve and this is one vet out of how many in our area…"

P10: Informal leaders have an influence on cross-boundary information sharing initiatives through the use of boundary objects such as prototypes, documents, plans, etc.

The cases illustrate the role of informal leaders in creating appropriate and effective strategies for developing cross-boundary information sharing. Creating these strategies required government agencies to work with other organizations in new ways. In the two cases, informal leaders helped develop these strategies by first envisioning the different organizations needing to be involved and the associated interorganizational business processes. Next, the informal leader negotiated new relationships among the network of key players turning vision into reality. In the New York WNV case, one of the key informal leaders at the state level demonstrated this capacity. According to a state-level public health representative, commenting on the informal leader,

"She took the lead in the whole thing and really, she was the one that did all the negotiating. She was at all the meetings. She really led the group in a way that was very, very efficient. She's a very capable person. She made the--the system was really broken down into three major systems-- birds, mosquitoes and humans. So she took the lead on that and kind of the mosquito group kind of followed along so, you know, and even the human stuff came in later. But she took the lead on that and really set the standards for everyone else."

Similar to New York, in Colorado, an informal leader at the county level played an important role in the public health department's efforts to develop effective and appropriate strategies for their WNV cross-boundary information sharing efforts. Informal leaders sometimes have formal authority that allows them to be at the same time supporting and leading initiatives. One public health manager with IT

responsibilities had this to say when asked about the foundation of his department's cross-boundary information sharing strategies, "[the public health director] primarily, I think; she really has a great vision on where she thinks public health should be and how to improve that and is willing to fund it... She wants to find better ways of using information technology." This individual played a dual role as a formal leader within her own agency and informal leader for the broader interorganizational initiative. The cases illustrate how informal leaders contributed to the development of appropriate and effective strategies by encouraging and supporting other individuals within their organizations to become more involved and knowledgeable of the interorganizational setting.

P11: Informal leaders have an influence on cross-boundary information sharing initiatives through their contribution to the development of appropriate and effective strategies.

Informal leaders were instrumental in the cases in drawing together people and organizations with little prior knowledge and little past experience working together. Informal leaders used a variety of techniques to clarify the roles and responsibilities of key individuals and the organizations in the response efforts. The analysis indicates the cross-boundary information sharing initiatives were highly positively influenced by this clarity of roles and responsibilities of key participants within the collaborative environment. According to a state-level public health manager who took the lead in developing the Health Information Network, a lack of clarity in this regard was one of the biggest challenges in the response coordination,

> "One of the big [challenges] for our program was the interagency issue because of the birds and mammals, because that does cross the multiple agencies. ....There had not been a disease that spread so quickly and affected so many different species where you had to have so many different agencies at all different levels involved. And how would you keep everybody involved and allow them to have input and knowledge all at the same time, as we said, protecting confidentiality and allowing local jurisdictions to handle things before it became public. .....And so all of the groups-- there was one on bird and mammal, one mosquito, one on public information--these groups had people from all the different agencies so universities, local health, other agencies. And so those were issues that crossed all of the applications. And so these interagency working groups were able to develop components for the 2000 West Nile plan."

In Colorado, clarity of roles and responsibilities was critical to the efforts of one informal leader to integrate a large and sprawling network of local governments into the cross-boundary information sharing initiative for the response to the WNV. Given that Colorado has close to 3,000 local government entities, the state health department needed a streamlined and efficient mechanism for sharing time sensitive information related to the virus throughout the state to local governments. The informal leader, a senior public health manager at the state level, identified single points of contact at each of the local governments who would be responsible for receiving and sharing relevant information related to the spread of the virus from the state with the rest of their local governments. The public health manager made it very clear that this information would be disseminated only to these identified individuals and it would be their responsibility to share with other constituents within their local government environments. However, this process was not easy to implement at the beginning and there were individuals attempting to redefine the initially established roles and responsibilities. Once accepted, the new arrangements in some cases were adopted for the long term as important channels of communications within the counties. According to this public health manager,

> "…each county had a single point of contact and that point of contact was their kind of inlet into that county. And so when I had to send something out, I sent it to that point of contact. And it was their job then to distribute that to all of the people within their agency but also all the other agencies within their county who may want to know about that information. And so it would

come out and it'd branch out and then there'd be more branches and more branches. But what that enabled is that this point up here didn't have to communicate with three hundred branches at the bottom of the tree; you had this kind of gradual. That took a little, at least initially; that was a little bit of a paradigm shift for some groups. Because I got I don't know how many calls about, you didn't send me this press release. Well, yeah, it was sent to your county point of contact. Well, I didn't get it and I want to get one. Well, then you need to call your county point of contact and make sure that you're on the loop for their distribution. Well, no, I want you to send it to me. Well, no, you need to get your county point of contact--which often was somebody in their own agency. Well, that's not, you know, that [is not] my responsibility. I can't be responsible for communication problems within your agency--that's your problem; that's your issue to resolve. And so we got a lot of that early on. Once I think those were set, we didn't hear that complaint and I think most people thought it worked pretty well. And again, it then allowed, with some of these counties, suddenly they had this regular communication link set up with their parks and recreation people, with their county commissioner office, with other agencies within their little county. Maybe they were sending it to their county extension agent and to their local wildlife manager and whoever. And it kind of created the need to establish those kinds of communication channels where in a lot of places they didn't exist before."

Individuals from other organizations recognized the challenges introduced due to a lack of a clear hierarchical structure and cross-boundary governance and investing in defining and negotiating roles and responsibilities. Achieving clarity of the roles and responsibilities of each participating organization was, they agreed, essential in these settings. A state-level senior public health manager in New York describes how at the beginning of the response the lack of clarity of roles and responsibilities was causing tensions among some participants and how several conversations with an influential informal leader helped to mitigate this situation and greatly improved the relationships for the long term,

> "The HIN [Health Information Network]--well, to some degree at the beginning there was probably some contentiousness and battling for turf between Health [state health department], DEC [Department of Environmental Conservation] and myself, my laboratory, and some others and fears of money and how the program was going to be carried out, my agency and others. But it was remarkable how quickly that changed. There were meetings--at first, [informal leader from different state agency] and I were kind of at odds, me thinking that I'd discovered the West Nile in the birds and was first to recognize it, which was true enough and getting ignored in the Health Department's news release…"

P12: Informal leaders have an influence on cross-boundary information sharing initiatives through their ability to clarify roles and responsibilities.
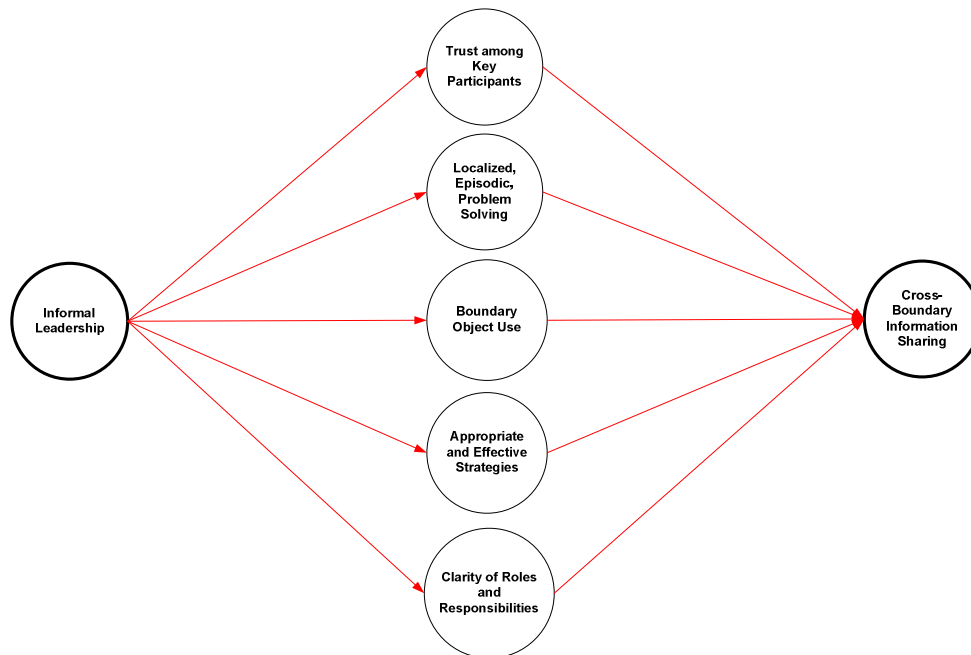
Figure 4. Informal Leadership influences on Cross-Boundary Information Sharing

The cases provide new insight into the mechanisms through which informal leaders influence cross-boundary information sharing. Informal leaders in the cases used their ability to build trust among participants and to engage in localized problem solving through the use of boundary objects to influence the cross-boundary information sharing efforts in the responses. Their ability to engage participants in effective strategy development can also be connected to the success of these leaders to create clarity around roles and responsibilities in these collaborative efforts.

5. Conclusions

Cross-boundary information sharing is essential to government efforts to respond to pressing public problems. In some response situations such as public health crises, information needs to be shared not only across levels of government, but also among public agencies, private companies, and non-profit organizations. The role of leadership in these multi-sector interorganizational networks is well-understood to be critical and, in particular, the differentiated impact of executive involvement, exercise of formal authority, and informal leadership is acknowledged. However, as indicated above, research in this area does not systematically analyze the mechanisms through which these three variables affect interorganizational information sharing and multi-sector collaboration. The cases presented herein serve to illuminate the influence of these important variables and the causal mechanisms involved in cross-boundary information sharing.

The cases served to unpack our understanding of executive involvement in cross-boundary information sharing initiatives. Executives in the cases exerted influence through their involvement; they could support or disapprove the actions of informal leaders, demonstrate and ensure respect for the autonomy of participating organizations or lack of respect, encourage or discourage individuals within their own organizations to participate, and increase or reduce the financial resources available for the response efforts. The exercise of formal authority also affected interorganizational collaboration and cross-boundary information sharing by producing or mitigating problems, enabling or hindering the

development of appropriate and effective strategies, and encouraging or discouraging individuals to participate in the initiative. Finally, informal leadership was also critical for these complex initiatives. Informal leaders built and held trust among participants, found creative localized solutions to problems, effectively used boundary objects to communicate ideas among individuals from different organizations and backgrounds, contributed to the development of appropriate and effective strategies, and helped to clarify roles and responsibilities. Although the evidence comes from two public health crisis response efforts the findings may apply to other situations in which interorganizational collaboration and information sharing is required. Future research should explore if the propositions suggested in this paper are applicable to other realities and social phenomena.

Overall, this paper provides further evidence of the importance of leadership and authority in cross-boundary information sharing among multiple organizations. In doing so, this study extends this basic framework to incorporate other variables and their corresponding effects and clarifies why these factors are important for cross-boundary collaboration and information sharing. Future testing of the extended theoretical framework (see Figure 5) will be undertaken to explore the generalizability of our findings. To do so the propositions will be integrated into a causal model and tested jointly using Structural Equation Modeling or similar statistical techniques. Therefore, the paper contributes both to our current understanding of interorganizational collaboration and cross-boundary information sharing by systematically analyzing the mechanisms through which executive involvement, formal authority, and informal leadership affect these initiatives. The paper also provides the foundation for future testing of an extended theoretical framework as a way to fill the gap in what is known generally about the mechanisms through which executive involvement, formal authority and informal leadership influence cross-boundary information sharing.
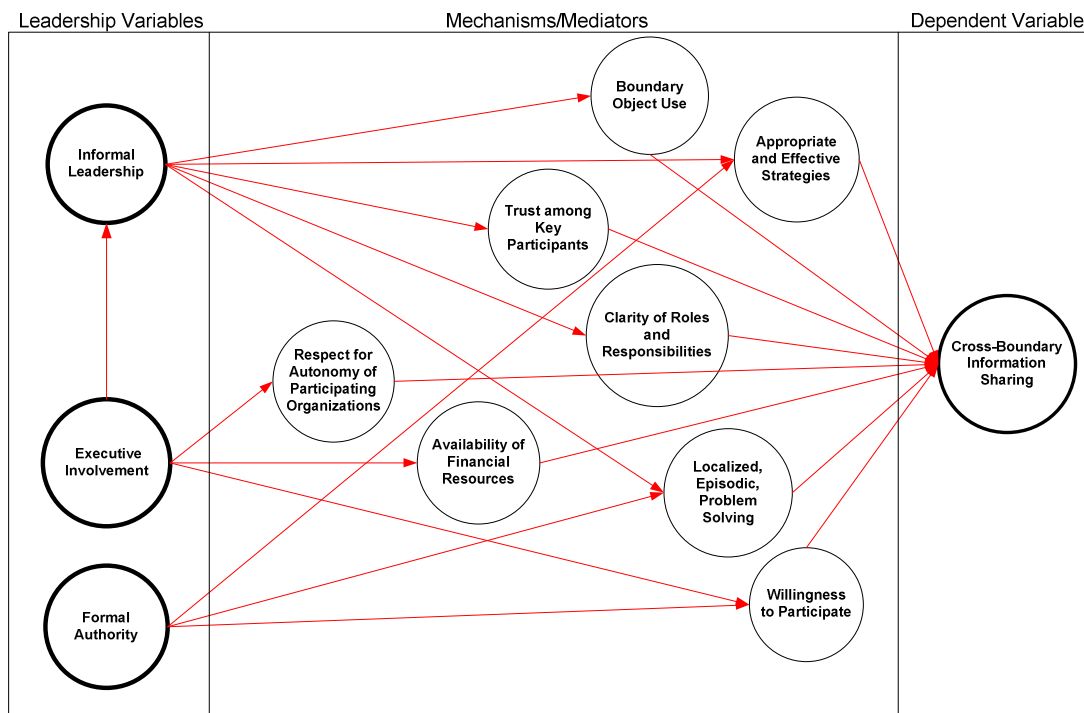

Figure 5. Influence of Leadership Variables on Cross-Boundary Information Sharing

Acknowledgements

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