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Informal Leadership and Networks: Lessons from the Response to the West Nile Virus Outbreak

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Abstract: Sharing information across organizational boundaries in support of a governmental response to crises requires intergovernmental collaboration and information sharing. Examining these efforts provides an opportunity to explore questions about the role of various actors in such response efforts; in particular, 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 how informal leadership affects collaborative information sharing. The case analysis contributes to current knowledge about government leadership in complex networked environments such as a public health crisis. A set of propositions drawn from the analysis provides a preliminary model of the mechanisms through which informal leadership affects intergovernmental information sharing in crisis response. The findings also provide lessons about the role informal leaders play in cross-boundary information sharing and, consequently, in generating government capacity to respond to complex public problems as well as the foundation for a set of recommendations for practitioners.

1. Introduction[i]

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 interorganizational 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, for example, were unaccustomed to collaborating across professional as well as agency boundaries but had to come together in the response 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 et al., 2004; Gil-Garcia et al., 2005). Previous studies have identified challenges to the creation of 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; Pardo, Gil-Garcia & Burke, 2006; Pardo, Gil-Garcia & Burke, In Press). Some of the challenges faced by response agencies in the cases were new. In particular, government leaders faced new challenges resulting from the nature of the threat and the complex requirements of an interorganizational response. The West Nile virus cases illustrate how informal leaders found ways to facilitate and foster interorganizational collaboration and information sharing across organizations from multiple sectors and all three levels of government. This paper focuses the role these leaders played in the networked response to the West Nile virus outbreak. It attempts to disentangle how they affected the collaboration efforts and the necessary cross-boundary information sharing during the response and to draw lessons for use in guiding practitioners.

The paper contributes to current knowledge by describing and explaining some of the mechanisms through which informal leadership influences cross-boundary collaboration and information sharing. 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 information technology (IT) projects, with a particular emphasis on informal leadership and cross-boundary collaboration. 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 lessons on how to leverage informal leadership in highly complex organizational networks and uses these lessons as the foundation for a set of recommendations for practitioners as they seek to share information across organizational boundaries in times of crisis as well as in normal times.

2. Informal Leadership, IT 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. 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 information system (IS) project teams under conditions of high team expertise and high task uncertainty, which are characteristics of most interorganizational, cross-boundary IT projects.

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 an 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 informal leadership as an influence of information technology initiatives in general and information sharing in particular (see Figure 1). However, this literature does not closely and systematically analyze the mechanisms through which this variable affects interorganizational information sharing and collaboration. The present study shows the effects of informal leadership and explains some of the causal mechanisms involved in this complex phenomenon by disentangling some of these relationships through careful qualitative analysis. 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 Case Descriptions

This research is based on a study conducted by the Center for Technology in Government at the University at Albany.[ii] 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. 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 levels. 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. Regular bi-weekly meetings were used to discuss and decide on 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. For this paper the team focused on a subset of variables related to informal leadership. Propositions about how informal leadership affects cross-boundary information sharing were generated and refined through multiple iterations of qualitative data analysis. For this paper, we discuss this factor 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 statewide 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).

Using 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. However, the West Nile virus outbreak made it necessary to break down these professional and organizational boundaries.

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 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. 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.

4. Analysis and Findings

As shown above previous research has established the importance of informal leadership in interorganizational settings. This paper extends this research by systematically analyzing the mechanisms through which informal leadership influences 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 informal leadership. Below we present the mechanisms found in the cases and the corresponding propositions and causal relationships.

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."*

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 that 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…"

P1: 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."

P2: Informal leaders have an influence on cross-boundary information sharing initiatives through their ability to create and 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 happen, 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 was 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…"

P3: 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.

P4: 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 stemming from a lack of a clear hierarchical structure and cross-boundary governance and invested 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 …"

P5: Informal leaders have an influence on cross-boundary information sharing initiatives through their ability to clarify roles and responsibilities.

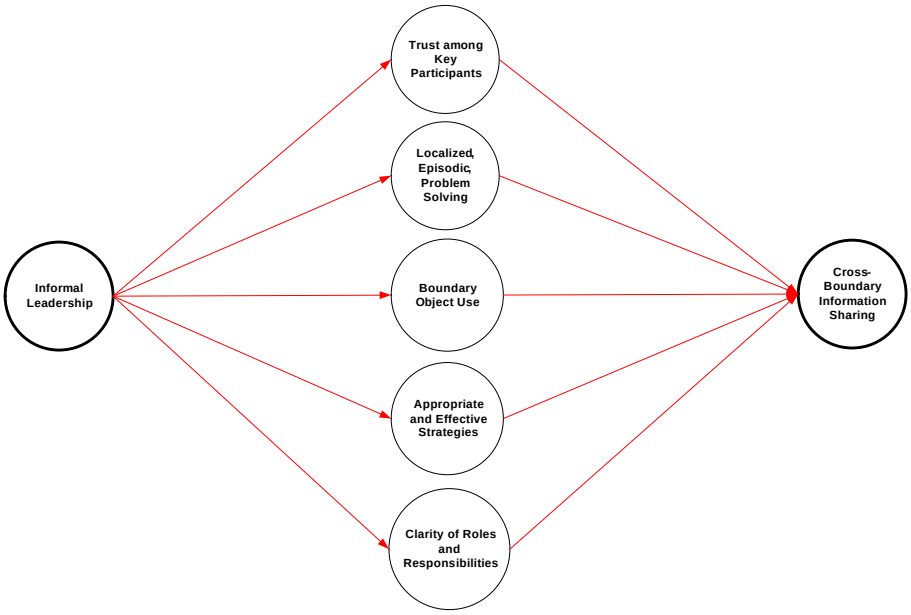

Figure 2. Informal Leadership influences on Cross-Boundary Information Sharing

The five propositions about the mechanisms through which informal leadership influences cross-boundary information sharing provide the foundation for a preliminary influence model (see Figure 2). Although the evidence of the critical role of informal leadership in these complex response initiatives 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.

5. Lessons and Recommendations for Practitioners

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 impact of informal leadership is acknowledged. However, as indicated above, research in this area does not systematically analyze the mechanisms through which this variable affects interorganizational information sharing and multi-sector collaboration.

The cases presented herein serve to illuminate the influence of informal leadership and the related causal mechanisms involved in 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.

The practical lessons drawn from each case provide the foundation for a set of recommendations for practitioners responding to public health crises and other public problems that require cross-boundary information sharing-based strategies.

Informal leaders, information sharing and public health crises	
Lesson learned from the cases	**Recommendation for practitioners**
Existing social networks are potential sources of informal leaders in multi-organizational problem solving efforts.	Look to existing social networks for individuals who have captured the respect of their colleagues as fair and effective problem solvers and find ways to engage them in some aspect of the cross-boundary effort.
Informal leaders, particularly when already active and trusted members of social networks, can be effective in leveraging existing trust relationships for the purposes of information sharing in crisis response.	Identify and engage existing informal leaders in a way that allows them to both bring their existing trust relationships to bear on the response coordination but also allows them to retain or even build those relationships.
Formal leaders of single organizations who possess facilitation and coordination skills can be effective as informal leaders in network organizations.	Look to the leaders of the organizations involved in the response effort for an individual with the necessary boundary-spanning skills and trust to informally lead the multi-organizational effort.
Informal leaders appear to use the process of creating clarity of role and responsibility (framing the operating rules of a network) as a strategy for motivating individuals to make a commitment to the network and establishing trust.	Invest in regular efforts within each organization and across the participating organizations to develop shared clarity of roles and responsibilities. Existing assignments for individuals are often irrelevant in cross-boundary efforts, in particular, those undertaken in response to a crisis.
The use of boundary objects such as prototypes are used by effective informal leaders in creating conditions the open and frequent communication necessary for the development of appropriate and effective strategies.	Invest in the development of communication strategies that work within the given context. Existing communication policies and practices are often irrelevant in cross-boundary efforts. New practices must often be created.

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