

Role of Informal Networks in Information Flow: Story of a City Public Health Division in Pursuit of Excellence

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December 2007

Introductions and Intent for Research

“The most difficult challenge state and local public health agencies face in developing the capacity to respond to terrorist events, emerging infectious diseases, and other public health threats and emergencies is assuring a qualified workforce is available to carry out these functions. If current workforce demographic trends are left unchecked, they will have an adverse affect on the capacity of state health agencies to carry out their mission; including responsibilities that have continued to expand since the events of September 11, 2001, and the ensuing anthrax attacks.”

Excerpt from the Executive Summary of State Public Health Employee Workers Shortage Report (Council on State Governments, 2004)

Nearly 76 million baby boomers, or those born between 1946 and 1964, are set to retire in large numbers by 2010. Currently, boomers make up about one-third of the U.S. workforce, and there aren't enough younger workers to replace them. State and local public health agencies are exceedingly vulnerable to this impending aging workforce crisis because of chronic shortages in professional areas, high turnover rates and severe budget cuts. Recent key findings from the Association of State and Territorial Health Officials (ASTHO) and Council of State Governments (CSG) survey highlight that in public health, average age of the workforce is about 47 years; retirement rates can be as high as 50 percent over the next 5 years; current vacancies rates are up to 20 percent in some states; and turnover rates are as high as almost 14

percent in some parts of the country (Council on State Governments, 2004). A telling statistic includes the rate of public health workers declining to 158 workers per 100,000 Americans in 2000, as compared to 220 workers per 100,000 Americans in 1980 (Merril, Btoush, Gupta, & Gebbie, 2003). To add insult to injury, those retiring or leaving will take more than decades of know-what or explicit knowledge with them. In fact, they will depart with more valuable assets – *know-how* and *know-who*. Another way to say it is that public health organizations will be expected to create value and perform in the near future with only half of their tacit knowledge or know-how and half of the trusting relationships or know-who. That's a tall order even for a discipline that has often thought outside the box and has taken on insurmountable challenges¹ with modest resources.

People's departure, especially the ones with 20, 30 or more years of experience, will create a gaping hole and disruptions not only in the official vacancies, structure or charts, but also in the informal, unspoken or unwritten ways in which the public health workforce achieves its mission. These unwritten ways may manifest in having insight perhaps about the person next door and what they know or do, or about the engaging friend or the trusting colleague who plays a substantive role in keeping people connected and facilitating an uninhibited flow of relevant and timely information, or about an enervating co-worker who creates bottlenecks in the web of relations. Therefore, it will be the informal networks functioning by the unspoken and unwritten guidelines which will be significantly impacted as the retiring workforce graciously departs and as the networks suffer these losses, the organic organization may become inefficient in getting the right information to the right person at the right time.

Why does it matter? Public health has become a victim of its own success, where significant reductions in disease morbidity and mortality over the last decades have led to perceived irrelevance, lack of urgency and funding cuts, manifesting in gradual reductions of human capital investment. However, timing of this emergence in professional workforce shortage and training and its inevitable reflection in the informal networks of organizations could not be worse as public health is taking on more responsibility in addition to its ongoing role of preventing disease and promoting health. For example, public health workforce is expected to be fully prepared for new and emerging health problems and large-scale public health emergencies, ranging from pandemic influenza to emergency preparedness. More than any other time in the history of public health, today, in the rapidly evolving knowledge and global

¹ Its impressive portfolio includes the eradication of Small Pox and reduction of polio cases to about 1000 annually.

economy, its workforce needs to be highly trained professionals with unobstructed access to relevant and timely information to make decisions, take actions and deliver results.

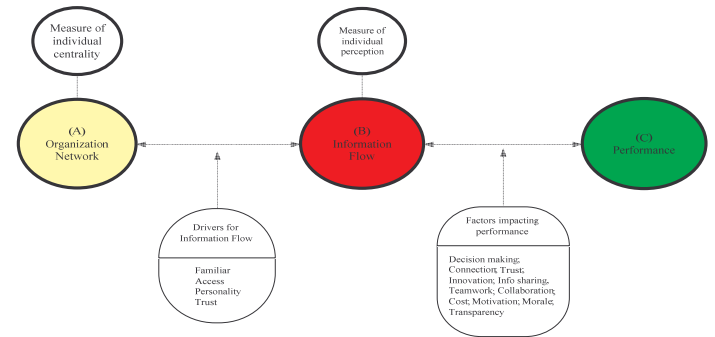
A consideration for public health agencies in anticipation of these challenges, therefore, is how to deliberately maximize appropriate levels of connectivity amongst its existing employees to ensure ease of information flow, transfer of knowledge and critical and timely decision making. Network research indicates that the extent to which a given individual is connected to others in a network, or their *centrality*, is most often associated with instrumental outcomes, including access to private and important information, performance, power, influence in decision-making and innovation (Brass, 1984; Friedkin, 1993; Ibarra, 1993; Sparrowe, Liden, Wayne, & Kraimer, 2001). More specifically, in an organization network, defined by dynamics of people and relationships, ease of information flow is related to several key drivers, including, familiarity with what people do or know; timely access to ask work-related questions; approachable personalities; and trust. Absence of any of these drivers associated with disruptions to an individual’s connectivity or centrality can influence perceptions and inevitably behaviors related to sharing and seeking information. Consequently, dire effects on performance-related promoters, such as decision-making, morale, trust, innovation, learning, teamwork and collaboration, may be unavoidable.

In light of ominous consequences of an aging workforce manifested by palpable disruptions in organization network and information flow, I contemplated on the following research question: ***How does an employee’s position reflected in their degree centrality within organization information networks associate with their perceptions of information flow?*** Application of the Network Analysis technique can provide insight into this core question by mapping the current informal, invisible relations and information flow paths, as well as identify key characteristics or properties of the network, such as structural position. Although this study is not about offering insight into the inevitable losses in human capital, its recommendations may help mitigate the consequences of the imminent brain drains and relationship gaps awaiting public health agencies. By fostering an understanding of the key nodes and relationships and proactively managing or leveraging these dynamics, organizations can deliberately increase connectivity; improve perceptions of information flow; modify information seeking and sharing behaviors; and ultimately enhance service delivery performance.

Conceptual Framework

The following conceptual framework depicts the relationship amongst organization network, information flow and performance. It displays the research design focusing on the structural position of individuals in information networks and its impact on their perceptions related to information flow.

Figure 1: Model relating Organization Network, Information Flow and Performance

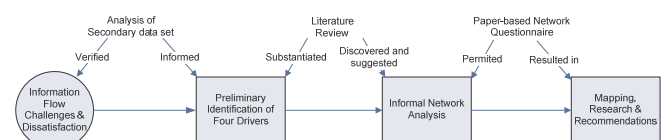


Research Approach

Study design

This study consisted of three research methods: Analysis of secondary data set, Literature review and Paper-based network questionnaire. The secondary data set came from an organization-wide employee satisfaction survey conducted in 2005-06. Preliminary analysis of the data verified “Internal Communication” (hereafter, “information flow”) as the top challenge and source of dissatisfaction amongst the employees. I reviewed this secondary data set to learn and identify the main drivers for information flow problems in the organization. A general overview of the research project, followed by more description of the process, is displayed below.

Figure 2: General steps and tools used in the research project



Through extensive literature review, I substantiated the four identified drivers and further discovered that informal network analysis can be an effective technique in diagnosing the drivers, visualizing the networks and offering concrete solutions in improving information flow. In order to do Network Analysis, I designed a paper-based network questionnaire which was intended to diagnose and map two of the four drivers. For this research study, I primarily focused on the

following drivers, Awareness and Access, and treated them as separate relationships between network nodes. However, eventually I analyzed one additional relationship which derived from the combination of the abovementioned drivers. These relationship data were analyzed to create a network map and measure individual centrality. Furthermore, I used the network questionnaire to collect data on network nodes' perceptions related to flow of information and performance in the Division. I was motivated to research the potential associations between the individual's network centrality and their perceptions.

Study participants

I approached one of the largest Divisions, in terms of staff members and budget, in a local public health agency as a potential participant for this network analysis study. I chose to work with this Division because I felt that in many respects it was a microcosm of the agency – serving the myriad important public health functions, such as Assessment, Policy Development and Assurance, for its clients. Additionally, I had a trusting and transparent relationship with its leaders, and I intended to demonstrate quick success by applying the Network Analysis technique in this highly professional and progressive Division to pave the way for future actions at the organization level. The final number of eligible participants was set at 169, of whom 151 or 89.3% completed the survey.

Network questionnaire

I used a paper-based network questionnaire to collect data on general demographics; network relationships – Familiarity, Access; and employee perceptions related to information flow. This questionnaire adapted and built on existing research and already-tested questionnaire tools. I have included a summary of the questions related to network relationships and employee perceptions.

Network relationships – Familiarity and Access

The respondents were given a list of their colleagues in the Division and asked that beside each name, they mark the appropriate response to the below questions:

Are you familiar with what this person's work-related knowledge or what they do at work?		
Yes	No	
Do you feel you have timely access to this person to ask work-related questions?		
Yes	No	Not Applicable

Employee Perceptions – Familiarity and Access

The respondents were requested to consider the overall communication within the entire Division and circle only one response:

In the STD/HIV/AIDS Division, in general ...			
I am familiar with what my colleagues do at work or with their work-related knowledge			
Strongly Agree	Agree	Disagree	Strongly Disagree
I have timely access (i.e., face-to-face, telephone, email, etc) to my colleagues to ask work-related questions			
Strongly Agree	Agree	Disagree	Strongly Disagree

The perception variables – Familiar and Access – were constructed on a “Strongly Agree – Agree to Disagree – Strongly Disagree” scale. These 4 options were dichotomized into “Agree” and “Disagree” and converted into a binary variable with numerical values of 1 (Agree) and 0 (Disagree).

Key Findings

In the following table, I summarized the three relationships regressed against their designated perception. In short, we observed significant associations or positive impacts demonstrated through the analysis of coefficients, t-test and P-values. All analyses defined “unit” as one degree, or one tie, and the p-value to determine significance was set at <5%. Specifically, the network relationships of Familiarity, Access and Combined were categorized into in- and out-degree centrality to avoid losing data complexity and confounding our findings.

Table 1: Summary Logit Regression Coefficient Outputs

		Relationships					
		Familiarity		Access		Combined	
		In-degree	Out-degree	In-degree	Out-degree	In-degree	Out-degree
Perceptions	Familiarity	3.55% (2.968**)	3.45% (3.675**)				
	Access			3.22% (1.964*)	2.76% (2.64**)		
	Combined					3.63% (2.995**)	2.57% (3.204**)

* P-value<5%
** P-value<1%

Hypothesis I: A Division employee's perception of Familiarity is positively affected by both their in- and out-degree centrality in Familiarity information network.

Results: Since the p-values < 1%, I reject the null hypothesis and prove that their perceptions are positively affected by both in- and out-degree centrality of individuals.

The results demonstrated that there were significant associations (p-values < 1%) between Familiarity Perception and both Familiarity Out- and In-Degree Networks. In other words, individual perception of familiarity is positively affected by both the number of ties coming in and links being sent out. The Familiarity Out-Degree coefficient is 3.4% and In-Degree is 3.5%. Coefficients are interpreted in relation to log odds ratio, so in the example, how much more likely it is there is a positive attitude versus negative. The results showed that for one unit In-Degree or Out-Degree increase, the odds that the respondent "Agreed or Strongly Agreed" with the Familiarity Perception statement increased 3.4 to 3.5%, respectively. Another way to state the in-degree relationship as an example is that one additional nomination (i.e. tie) by a colleague increased the odds by 3.5% that the respondent "Agreed or Strongly Agreed" (as opposed to "Disagreed or Strongly Disagreed") with the Familiarity Perception statement.

Hypothesis II: A Division employee's perception of Access is positively affected by both their in-and out-degree centrality in Access information network.

Results: Since the p-values < 5%, I reject the null hypothesis and prove that their perceptions are positively affected by both in- and out-degree centrality of individuals.

The results indicated that there were significant associations (p-values < 5%) between Access Perception and Access In- and Out-Degree Networks. Another way to interpret is that individual perception of access is positively affected by both the number of ties coming and links being sent out. The Access Out-Degree coefficient is 2.8%, which means that for one unit In-Degree increase, the odds that the respondent "Agreed or Strongly Agreed" (as opposed to "Disagreed or Strongly Disagreed") with the Access Perception statement increased by 2.8%. The Access In-Degree coefficient, on the other hand, is 3.2%, specifying a similar positive relationship.

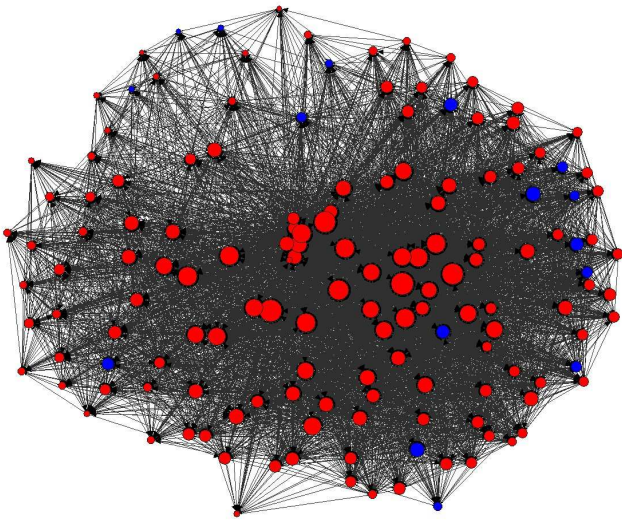
Hypothesis III: A Division employee's perception of Combined Familiarity and Access is positively affected by both their in- and out-degree centrality in Combined Familiarity and Access information network.

Results: Since the p-values < 1%, I reject the null hypothesis and prove that their perceptions are positively affected by both in- and out-degree centrality of individuals.

Table 1 showed that there were significant associations (p-values < 1%) between Combined Familiarity and Access Perception and Combined Familiarity and Access In- and Out-Degree Networks. In other words, individual perception of combined is positively affected by both the number of ties coming and links being sent out. The Combined In-Degree coefficient is 3.6%, which means that for one unit In-Degree increase, the odds that the respondent "Agreed or Strongly Agreed" (as opposed to "Disagreed or Strongly Disagreed") with the Combined Perception statement increased by 3.6%. Additionally the Combined Out-Degree coefficient is 2.6%, specifying that for one unit Out-Degree increase, the odds that the respondent "Agreed or Strongly Agreed" with the Combined Perception statement increased by 2.6%.

In summary, I found that the three network relationships demonstrated that an individual's perception was positively affected by the number ties which came in (in-degree) or links that were sent out (out-degree). In addition to analyzing the coefficients or log odds ratio of the network relationships and perceptions, I considered the visual or diagrammatic interpretation of the findings. Although definitive conclusions should be drawn with hesitation, I found that the diagrams were consistent with our quantitative analysis. I included one example of a diagram from this research study followed by brief description.

Figure 3: Diagram of Access In-Degree Network against the Access Perception



In this diagram, the circles depict nodes or individuals and the lines show the Access relationship. In this case, relationship is directional as the ties are coming into the circles (as opposed to ties being sent out of the circles or nodes). The reason that the circles or nodes are of different sizes is because the size is determined by their in-degree centrality. In other words, the larger circles or nodes have more lines coming into them. The red circles or nodes are those individuals who selected “Agree or Strongly Agree” for the Access Perception statement – *I have timely access (i.e., face-to-face, telephone, email, etc) to my colleagues to ask work-related questions.* The blue circles or nodes marked either “Disagree or Strongly Disagree” with the same statement. This layout was a function of the UCINET-6 tool, and it was based on the Gower Metric Scaling with node repulsion and equal edge length bias clustering formula. In other words, it clusters the nodes or individual who have ties to one another. In conclusion, the above diagram does illustrate consistency with the Access regression output in that the individuals with negative attitudes (blue circles) tend to be smaller in size (less central) and reside on the outer edges of the diagram (less clustered or connected with one another).

Discussion and Recommendations

From an earlier employee satisfaction survey, it was determined that ease of information flow at a large local public health agency was related at least to two key perceptions – *familiarity* with what people do or know and timely *access* to colleagues to ask work-related questions. This study took these qualitative results one step further in an attempt to understand the drivers and potential action areas, and demonstrated that employees of the Division occupying central network positions, in general, had favorable perceptions of

information flow (i.e. perceptions related to seeking and sharing of information). But, why is the linkage between network position and perceptions important? In other words, *so what?*

A growing body of evidence in the fields of psychology and organization development avers that perceptions drive behaviors; therefore, it is vital for organizations to manage perceptions, i.e. assess and identify, determine root causes, and improve and control, for the desired behaviors. Appropriate levels of information seeking and sharing behaviors in any agency, much less a public health agency, are crucial in meeting the evolving and unknown challenges of our contemporary flat (i.e. connected) world. In this complex era of forces and demands, perceptions and behaviors associated with information flow drive the speed and accuracy with which decisions get made, and thus, determine the quality of execution.

Moreover, it is exceptional nowadays that either quality decisions or execution, or especially both, can be made by any one individual. The reason is that in any setting, such as an organization, individuals rarely have the full set of knowledge, skills and authority to manage multidimensional efforts. Hence, knowledge workers frequently tap into their set of relationships or networks to access private information, diverse skill sets and informal power (Friedman, 2006; Krackhardt, 1990; Uzzi & Dunlap, 2005, 2007). In fact, as much as 70% of unstructured training and learning in the workplace occurs through informal interactions and relationships, by people sharing “stories, [telling] gossips, and watching one another work” (Benson, 1997). Additionally, people are approximately 5 times more likely to turn to friends or colleagues for answers than other sources of information such as a database or file cabinet (Allen, 1977). **So in response to “So What?,” people need people, amongst other reasons, as informal information sources to get their work done, and in reaching out to or sharing with colleagues work-related information, people generally require the prerequisite of positive attitudes or perceptions toward information flow.**

Consequently, in improving information flow organizations need to identify and understand these perceptions, and determine potential drivers which contribute to shaping them. A partial explanation for what drives or influences an individual’s perceptions is explained in where they are positioned in the organization’s informal networks. In other words, are individuals at the center of information flow with timely access to relevant and key information, or are they at the peripheries of the network with limited connectivity to others? Research validates that organizations which ask these types of questions and are vigilant about their informal

networks and proactive about nourishing them develop the culture and competence that promotes and celebrates “learning by doing, teaching and coaching and mentoring, sharing good ideas and spreading best practices, and cooperating and collaborating rather than competing with others” (Pfeffer & Sutton, 2000). So once more, why is understanding of networks and information flow important? Because we literally can’t afford not to! Understanding where and how individuals are situated in organization networks is crucial in having access to the right information at the right time for the right reason. Individuals occupying high centrality will sit at the intersection of innovation, ideas, and opportunities, make more informed decisions, and leverage their resources to perform effectively (Burt, 1992, 1997; Podolny & Baron, 1997). Research also verifies the direct association between job satisfaction, income and promotion to individuals’ relationship assets (i.e. social capital) (Burt, 1992, 1997; Douthit, 1999). Thus, the high-performing, learning organizations will be best prepared to seize the opportunities of the new millennium by recognizing the relationship between their employees’ informal network position and their perceptions, and proactively leverage their invisible relationships to gain competitive and strategic advantage. So, what did we *find*?

Consistent with the alternative hypotheses, the regression results demonstrated that there were indeed significant associations between an individual’s perceptions and their degree centrality in the three relationship networks. We confirmed our supposition that highly central people in a network generally manifest more positive attitude. However, it is appropriate to denote we can not discern cause-effect relationship from the results, as the statistical methodology utilized in this study only allows associative conclusions. Nevertheless, this chicken or egg enigma should not keep us from proposing interventions to improve the flow of information within this public health Division. As mentioned, individuals occupying high centrality will sit at the intersection of innovation, ideas, and opportunities; hence, they can make more informed decisions, and leverage their resources to perform effectively. We are after all ultimately trying to improve the performance of individuals and the agency. Current findings, albeit their limitations, were informative and reflective of the existing literature in network position, perceptions and performance. The question now is what *next*?

Recommendations

As intimated earlier, the participating government agency faced communication challenges which went beyond basic flow of information. Rather, the concerns were premised on work-related advice or information seeking and sharing

behaviors. In other words, they were knowledge-based, and by definition required the human element as part of their remedy.

In proposing the below improvement options, I assumed that changing the network ties or relationships would influence the perceptions of individuals, and subsequently their behaviors. This assumption is consistent with the literature findings, and given the scope of this paper, I did not consider if/how changing perceptions would impact the network. Before reviewing the suggested recommendations, I draw our attention to a low hanging fruit, a simple starting point is presenting the findings to the study participants and asking them to spend a few minutes, either on their own or in small groups, to identify what they “see” in the network diagrams (hiding identifiable nodes), the structural issues impeding or facilitating information flow, and the performance implications is an extremely effective intervention. Anecdotal evidence suggests that simply viewing where one (individual, group or unit) sits in a network diagram can make an impact on their behaviors.

Below table contains the suggested recommendations, focusing on two levers – Technical and Social – with the purpose of increasing connectivity amongst nodes.

Table 2: Proposed Technical and Social Interventions

Relationships	Objectives	Technical interventions	Social interventions
Familiarity	Increase familiarity with people’s work-related knowledge or what they do at work	Expert locator system (skill profiling system or Division yellow pages)	Communities of practice Knowledge brokers (information coordinator) Knowledge fairs (brown bags)
Access	Improve accessibility as a critical behavior	Communication tools (email, cell phones, video conferencing)	Geographic relocations Field visits Peer feedback forums and review Periodic Network Analysis

Adapted from A Bird’s-eye View (Cross et al., 2002a)

Familiarity

Technical interventions

Expert locator system (e.g. skill profiling system or Division yellow pages): This tool lists staff members’ areas of expertise and experience along with their contact information in a print or online directory.

Social interventions

Communities of practice: A group of people who share a professional interest or area of expertise, exchange insights and experiences and learn from one another.

Knowledge brokers (information coordinator): Staff members who locate, organize and disseminate important information and/or direct people to key resources (e.g. colleagues) with relevant knowledge.

Knowledge fairs (brown bags): workshops or seminars for practitioners from different units to present and exchange know-how and experiences.

Access

Technical interventions

Communication tools (email, cell phones, video conferencing): Appropriate technologies to disseminate information to staff specially working in isolated locations.

Social interventions

Geographic relocations: when possible, relocating staff to work in geographic vicinity of one another.

Field visits: Division headquarters-located staff travel to and visit with various field sites

Peer feedback forums and review: incorporate behaviors related to accessibility (e.g. responding promptly to emails, voice messages, etc) as part of the peer and performance review

Periodic Network Analysis: continue mapping informal relationships to compare baselines and assess improvements

Conclusion

This study made two major contributions to the public health literature: 1) demonstrated significant association between information network position and perceptions, and 2) articulated the relevance of applying the Network Analysis technique in public sector. I believe that this technique has enormous potential for researchers, change agents and consultants in the public sector and, its recommendations may help allay the consequences of the imminent brain drains and relationship gaps awaiting public health agencies.

Acknowledgement

This work was only possible because of the trust and faith of the participating public health Division leaders and staff. It was through the vision of the leadership and the effort of the Division employees that we were able to achieve close to 90 percent survey completion rate. Additionally, I am deeply indebted to Ann McCranie, a doctoral student at Indiana University who provided much needed technical assistance,

insight and clarity into an otherwise complex world of Network Analysis and tools. Finally, a deep appreciation goes to my capstone advisor, Mindy Douthit and Northwestern Kellogg School of Management professors, Brian Uzzi and Karl Schemedders, for their patience and guidance.

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