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ABSTRACT

Emergency Response Information Systems are not widely adopted in small municipalities. Such communities typically rely on face-to-face meetings of stakeholders, informal discussions among first responders, and tabletop exercises with multiple parties in order to become and remain prepared. We draw on the network paradigm of organizational research to describe two communities in Central Pennsylvania and their approaches toward planning, response, recovery, and mitigation with respect to Tropical Storm Ivan (in 2004). Each case study demonstrates the importance of social capital as the communities coped with both immediate and future needs in a flood situation. Analyzing these examples highlights key design implications for emergency response information systems, namely, that individuals and personal relationships play a critical role in effective emergency management.

Keywords

Social Capital, Emergency Response, Emergency Planning, Community Informatics

INTRODUCTION

Why do some communities perform better in crisis situations than other communities?

During the past five years especially, there has been a broad rethinking, and a considerable amount of second-guessing, about emergency management preparedness in the United States. This has focused on many aspects of emergency management - national, regional and local planning, inter-agency communication and coordination, as well as better technology to support rapid and effective response. One thing made obvious by this increased attention to emergency management is that the problem is enormous and multifaceted. For example, although planning is critical, it is evident that no entity can plan out its entire space of emergency risks, and moreover, that in emergency management events, plans will typically serve as resources for improvising effective courses of action, and not as scripts for action.

Problems of emergency management are especially challenging at the local level (Schafer et al., submitted). Small communities often rely on face-to-face meetings, personal relationships, and volunteer support. Moreover, they need to coordinate across various agencies, such as police, fire, EMS (emergency medical service), security personnel, and with other levels of government, such as county, state and federal. However, each community has its own special vulnerabilities and concerns, and these need to be addressed in a specialized planning process, and perhaps by specialized equipment or other technology. Yet local communities typically have limited resources to direct to emergency management planning, and in particular, lack the infrastructure, technology readiness (i.e., skills and abilities), and resources to adopt leading edge technologies.

When approached from the network paradigm of organizational research, emergency response communities can be analyzed from the lens of social capital. Adler and Kwon (2002) define social capital as "the goodwill available to individuals or

groups. Its sources lie in the structure and content of the actor's social relations. Its effects flow from the information, influence, and solidarity it makes available to the actor" (p. 23). This particular approach to social capital is precise as the researchers differentiate the structure of the social network (bonding or bridging), the resources that flow though the social network (tie content), and the effects of social capital. The theoretical underpinnings of bonding social capital is derived from *closure* (Coleman, 1988), conversely the bridging view is built from structural hole theory (Burt, 1992, Burt, 2000). Two particular types of social network ties are expressive and instrumental ties (Lincoln and Miller, 1979). Instrumental ties convey work related information and knowledge related to the task at hand (Ibarra, 1993), whereas expressive ties are affect-laden conduits for social support and values (Ibarra, 1993, Lincoln and Miller, 1979).

In this study, the response to Tropical Storm Ivan by two communities is qualitatively analyzed as social capital. Linkages are identified between both bonding and bridging forms of social capital and their subsequent implications for the design of information systems.

METHODOLOGY

Our approach is to establish partnerships with emergency managers in order to gain a better understanding of their work practices (Carroll et al., 2000, Merkel et al., 2004). We have paired up with two emergency managers in the areas where we, the researchers, work. Our methodology is to engage these managers in long-term discussions in order to get a better sense of emergency management. We are interested in the activities of emergency management and the decisions surrounding their work. Similarly, we are interested in their use of technology to accomplish emergency management work.

We have conducted several informal interviews with Alan Knoche, the emergency management coordinator of Lower Swatara Township. These interviews were conducted onsite over a three month period. Each interview was kept to a maximum of one hour to minimize attrition (Cook and Campbell, 1976). Likewise, we met with Steve Abrams, the emergency management coordinator of the Centre Region over a nine month period. We discussed emergency management and observed planning meetings at the local and regional government level, at the local airport, and at the local University, logging over 40 hours in the field. We recorded notes for each of the meetings, but did not record or transcribe the conversations in order to develop a mutual partnership and not treat them as subjects. These notes were then content analyzed to identify the structure of the network. Communication between actors that were part of the local emergency management community was considered instances of bonding social capital. Those instances in which local actors reached out into the external community were considered a form of bridging social capital. In addition, we identified the resources (e.g. information, knowledge, political support, etc.) that flowed through the network that was vital to effective response.

The Setting

Our research setting consisted of two communities: the township of Lower Swatara and the Centre Region, which consists of six neighboring townships. Lower Swatara has a population of 8,100 and is located along the Susquehanna River, which is a major river in the state of Pennsylvania. Also, a local stream, called Swatara Creek, runs along the eastside of the township. The township has one police department, one volunteer fire department, and an EMS service that is contracted through Penn State University – Milton S. Hershey EMS.

Alan Knoche is a 55-year-old Caucasian male. He retired from Three Mile Island while serving in the capacity of senior emergency planner in the emergency preparedness department. According to Knoche, working in the TMI Emergency Preparedness Department was a source of unbeatable experience with a structured program, and it provided excellent contacts with individuals at all levels of the emergency response spectrum. Moreover, Knoche is a U.S. Navy Veteran with six years of advanced training in the Navy Nuclear Power Program.

Centre Region is an area in Central Pennsylvania, and is made up of six townships. These townships have established a regional government system to share in public services, such as a parks and recreation program, a common library, and a common emergency management coordinator. The total population of the townships is approximately 80,000 and five of the six townships border a large university campus with about 40,000 students.

This coordinator, Steve Abrams, is a middle-aged man and is also a U.S. Navy veteran. Prior to coming to Centre Region, he spent over ten years in Florida as an emergency manager, and he is especially experienced in dealing with hurricanes and their effects.

Centre Region is physically situated within a valley of surrounding hills. It has a few local streams that have the potential to overflow their banks during heavy rainfall. Most of the residents do not live adjacent to these streams, however. The region has a karst geology, meaning that the landscape is formed by soluble limestone rock. This presents a different threat, sinkhole collapses, which are sunken holes in the ground's surface due to dissolved rock.

Unlike Lower Swatara Township, there are multiple first response agencies within Centre Region. There are four fire departments and four police departments, each covering different areas. There is also a hazardous material unit and two EMS units.

In the next section, we provide a descriptive account of how the two communities responded to emergencies and made actual rescues during Tropical Storm Ivan. This provides an example of how the two communities leveraged social capital in emergency management work.

THE INCIDENT

Initially, Tropical Storm Ivan was a hurricane. It made landfall along the Gulf Coast in the State of Alabama on September 16, 2004. The storm weakened as it continued inland up through the states of Tennessee and Virginia, eventually returning to the Atlantic Ocean. The storm produced heavy rainfall in Central Pennsylvania and was more severe than expected. A major disaster declaration was issued by President Bush for Tropical Depression Ivan, and the state of Pennsylvania received over $29 million in public assistance funds as a result.

Centre Region Planning

The emergency management coordinator for Centre Region regularly receives warnings about upcoming storms from the state-level emergency management agency, PEMA. These messages include details about flood watches and warnings in effect, current and anticipated rainfall, current and anticipated flooding, rivers of concern, and current and anticipated severe weather. Upon receipt of such messages, the emergency management coordinator passes the information along to a list of stakeholders.

These stakeholders were first identified in the fall of 2003, when Tropical Storm Isabel threatened the area. A year prior to Tropical Storm Ivan, the emergency management coordinator convened a meeting of the local emergency management community. He invited the managers and the public works directors for each of the townships, the local area police chiefs, the emergency coordinator for the local school board, and representatives from the local fire and EMS units. This was the first time such a group was assembled to discuss emergency procedures in advance of a storm. The goal of the meeting was to provide a venue for the various organizations to share their plans, intentions, and current activities related to the storm.

At the meeting, the participants went around the room so that each agency could brief the group. Each organization described its anticipated actions and their typical response during a storm with heavy rainfall. This created an environment for sharing and discussion as the emergency management coordinator often probed the participants for more details. For instance, at the meeting two police departments came to an agreement about how to cover multiple road intersections along their jurisdiction boundary. This meeting was viewed as a success by many, and the feedback was positive. The different stakeholders were able to meet face-to-face and get to know their counterparts in the neighboring townships.

When the PEMA message about Tropical Storm Ivan arrived, the emergency management coordinator contacted each of the stakeholders who attended the previous Isabel meeting. Hearing back from the different organizations, it was decided that the group did not to meet again, but that the necessary organizations would continue to communicate on their own. The participants felt that their responses would be similar and that the group as a whole was prepared based on the previous meeting.

Centre Region Response

When Tropical Storm Ivan occurred, it brought more rainfall than anticipated. In the local emergency management coordinator's original notice from PEMA, rainfall amounts of 3-5 inches were forecast, and yet some areas received up to 9 inches of rain in Pennsylvania. This led to flooding in low-lying areas near the streams, washed out culverts, and sinkhole collapses. A couple of sinkholes opened in one township. As a result, the public works crew was sent out to survey the extent of the damage and set up barricades.

The local emergency management coordinator ended up spending the night of the storm in his office, unexpectedly. He needed to be available to the local townships and he needed to stay abreast of the situation. He answered the phone throughout the night, receiving updates from the different organizations and relaying messages between them. The Emergency Operations Center was not activated because the emergency management coordinator felt that they did not reach a critical situation, where their capabilities were overwhelmed. The response was never out of control nor frantic. The townships and first responders were able to deal with various incidents of downed power lines, fallen trees in the road, and reports of sinkholes.

During this time, the emergency management coordinator was also in constant contact with the county-level emergency management agency. Through phone calls, the coordinator updated the county emergency manager on the local response efforts and, in return, learned of their status. This contact with county was very important. The emergency management coordinator anticipates emergency requests from the county one day in the future. The county might need a piece of heavy machinery owned by the local university, for example. The storm-related interactions between the region and county increased their awareness of one another's capabilities. The emergency management coordinator characterizes this as a "maturing relationship."

As the storm was moving on and the county had declared a disaster emergency, the emergency management coordinator encouraged each of the townships to issue a similar declaration. This administrative measure allowed each of the townships to be eligible for federal and state disaster funds.

Centre Region Recovery and Mitigation

The recovery efforts for Tropical Storm Ivan in Centre Region were fairly minimal. About a week after the storm, the townships were able to get access to the private properties containing sinkholes. These sinkholes were filled with concrete to level the terrain and prevent further collapse. Also, the culverts damaged by the excess water were repaired in another township.

There have been no direct mitigation efforts as result of the storm. The county-level emergency management agency has established a mitigation plan since Tropical Storm Ivan, however. This plan was written in part by the Centre Region emergency management coordinator. It documents the local areas that are susceptible to high winds and heavy rainfall, including many of the problematic locations of Centre Region.

Lower Swatara Township Planning

Lower Swatara EMA became aware of the potential threat from Hurricane Ivan through normal weather monitoring plus special notifications from the Dauphin County Emergency Management Agency following their briefings with the National Weather Service. As the probability of the storm path affecting the Township increased, additional vigilance to weather forecasting and storm path prediction was undertaken. It eventually became clear from storm path predictions that impact from the remnants of the hurricane was highly likely. The extent of the impact could not be known until storm's arrival.

A meeting, chaired by the Emergency Management Coordinator, was held in the Emergency Operations Center to plan for storm response. Attendees included the Fire Chief and line officers, Police Chief, Fire Police Captain, EMS Crew Chief, and Public Works Director. Actions to be taken prior to storm arrival, response capabilities, and communications protocols were identified, and additional assistance and unmet needs were discussed.

Elected officials were notified of the preparations and plans, and emergency declarations and notifications were drafted if needed. Plans and checklists were reviewed. Communications equipment was tested and emergency equipment checked for operability. All emergency and Township vehicles were prepared for the storm in the form of equipment checks, topping off fuel, and loading/supplementing supplies. Traffic barricades were pre-staged in areas known to flood in the past. Additional staffing needs for fire-rescue, police, public works and EMA personnel were calculated and affected individuals notified.

Once preparations were completed, the Lower Swatara Township emergency response community took the approach, "Hope for the best. Expect the worst." Storm impact was somewhere in between.

Lower Swatara Township Response

The response by Lower Swatara Township represents three specific events ordered in time. Tropical Storm Ivan occurred on September 18, 2004. It was no secret that the storm was coming. Officials went to bed on Friday night before the storm hoping for the best but expecting the worst. About 2:00 a.m. Knoche received a call from the police indicating significant flooding in the Jednota Flats area.

Jednota Flats Flood

The Jednota Flats area in the southern section of the township experienced heavy surface run-off from torrential rains, but most of the flooding occurred from overflow of Stoner Run. The normal drainage pathway was overwhelmed resulting in water flooding the Flats and filling and overflowing Lisa Lake. Houses and trailers located in the area suffered significant flooding.

When Knoche arrived at the scene, he witnessed four firefighters wading in waist-deep water, carrying an elderly person in a basket on their shoulders. After taking the person to the rescue truck, the firefighters disappeared back into the dark, wading in the water to make more rescues. It became obvious to Knoche at this point, that this would be a rather long-term event.

One particular person who was rescued was on home oxygen. This particular scenario was not in the plan. Therefore, a request was made to the county for an unmet need. Within a timely manner, the county responded by providing home oxygen. Another rescued evacuee required the assistance of a walker. Knoche contacted the Red Cross, which responded by providing a walker. Both of these scenarios provide concrete examples of situations which require emergency management agency (EMA) officials to perform without a script. It is in these situations that first responders are required to improvise.

At the same time, there was significant flooding near the Air National Guard facility that is located at Harrisburg International Airport. This flooding had the potential to damage millions of dollar's worth of equipment, which would have Homeland Security implications. To alleviate further damage to the facility, airport officials closed the flood gates. This had the immediate result of forcing water back into the township. EMA officials encountered an element of surprise as water was not able to flow out of the Jednota Flats. Given the wealth of accumulated social capital, a state lawmaker dropped by the EOC in order to offer assistance. At this point, the state lawmaker was briefed on the situation with the airport and the critical need to open the flood gate in order to prevent further damage to homes within the township. The state lawmaker was able to use his influence to persuade airport authorities to reopen the flood gates so that water from the township could be routed to the Susquehanna River.

Swatara Park Flood

Within hours of the Jednota Flats flood, a call was received that there was significant flooding in the Swatara Park area. Swatara Park is located along the Swatara Creek, on the east side of the township. EMA officials had to re-direct resources to this area. A report came in that a disabled vehicle was parked near a culvert and was blocking a drainage path. Through the police department's normal contact with towing companies, they were able to have the car towed. Again, the scenario of a disabled vehicle blocking a culvert was not in the plan. EMA officials were able to draw on strong ties in the community in order to address the situation at hand.

Both flood zones required the evacuation of residents. Initially, the evacuees were taken to the Lower Swatara Fire Station social hall. The fire station social hall is usually the facility of first choice and has been used during floods and blizzards. Once the Red Cross shelter was up and running at the MCSO building in Middletown, all evacuees were relocated by bus to that facility. This freed up the fire station for extended disaster operations. Later, Knoche and staff identified restrictions and requested people to remain out of the flooded areas.

In response to both flooded areas, EMA officials experienced communications problems. First, the ambulance assigned to the township did not have a mobile radio capable of communicating on the township radio frequency. Communication between the township and EMS occurred through Dauphin County Dispatch. A hand-held radio was later provided by Lower Swatara EMA to the EMS Crew Chief. This allowed direct communication. Second, in order to minimize radio traffic, EMA officials extensively used Nextel cellular phones in order to reach each other.

Boil Water Advisory

The third event occurred shortly after the flood. United Water's pumping stations along the Swatara Creek and Susquehanna River experienced problems during the storm. The protocol in place requires that United Water communicate any problems with the water to the county and it is the county's responsibility to communicate the problem to the local municipalities.

Boil water advisories typically occur when the turbidity level exceeds 1.0. At this point, federal and state regulations require that a boil water advisory be issued. After the boil water advisory was issued, a recorded message was available for concerned citizens who called in to the Township as well as signs on the door. In addition, the problem was communicated via press releases to the local radio and television stations. EMS staff and police department personnel then went door to door in affected areas that could be reached and handed out flyers. E-mail, website and cable were not used.

Lower Swatara Township did not have potable water. This was considered an unmet need and communicated to the county level. Just by coincidence, one of the county commissioners who was previously on the township board of commissioners stopped in to see if he could assist in some way. The commissioner used his contacts and political clout. Consequently, the township became a water distribution point. Pallets of water were trucked in from a local distribution center. Each citizen could drop by public works building and pick up one gallon of water per day. Once supplies were low, they called the county again for an unmet need and the supply was replenished. Overall, the supply was perfect.

In summary, Ivan caused major flooding in the area and water contamination. As this story played out, we can conclude that it was virtually impossible to plan for every situation that occurred during the response to Ivan. Certain actions that took place during the response primarily existed in community memory. These particular details are not codified in the written plans or protocols. Moreover, detailed planning in response to Ivan may have left little room for improvisation.

Lower Swatara Recovery and Mitigation

Following Ivan, a 2,200 gallon-per-minute pump ran for exactly one month, 24 hours a day. Given the extensive response and recovery effort, the community established a flood management taskforce. This taskforce includes representatives from multiple organizations. Their mission is to identify ways to reduce flooding in the community.

The two chronic flood planes in the township have existed for almost 100 years. Until Ivan, the community engaged solely in single-loop learning (Argyris and Schön, 1996). This consisted of going through the normal emergency management cycle. However, since Ivan, the township is taking a different approach. In order to minimize disruption, the township plans to purchase homes in the Jednota Flats areas. This would relieve some of the strain on the township during floods that occur from the Susquehanna River and the Swatara Creek. If successful, the homes would be leveled and the area turned into a park.

REVIEW OF THE LITERATURE ON SOCIAL CAPITAL

In the past, scholars have used organizational learning, improvisation and sensemaking models to analyze uncertain situations (Weick, 1993, Weick, 1998). For example, Weick (1993) examined the collapse of sensemaking in a smokejumper outfit, which is a team that responds to forest fires. Four possible sources of resistance to forestall the collapse of sensemaking were identified: improvisation, virtual role systems, the attitude of wisdom, and norms of respectful interaction (Weick, 1993). In this study, we leverage the recent work on social capital and suggest a possible explanation for the variance in performance among emergency response groups, in general.

The concept of social capital is one of the most popular recent exports from sociological theory (Portes, 1998). From a resource perspective, social capital represents the goodwill derived from the network of relations that can be mobilized to facilitate the pursuit of collective action (Adler and Kwon, 2002). From a structural perspective, social capital is defined as "the configuration of a group's members' social relationships within the social structure and the group itself, as well as in the broader social structure of the organization to which the group belongs, through which necessary resources for the group can be accessed" (Oh et al. 2004, p. 861).

Two patterns emerge in the treatments of social capital. First, the sociocentric (Sandefur and Laumann, 1998) and much of the whole network (Wellman, 1988) variants of sociology focuses on the positive network externalities that are derived from network closure (Coleman, 1988, Putnam, 2000), elsewhere referred to as internal, communal or bonding social capital (Adler and Kwon, 2002). This view is characterized by a high density network in which all members of the community are connected. Network density can be defined as the extent to which members are connected to each other in a network (Sparrowe et al., 2001) and is measured as the mean number of ties per group member. Bonding social capital is characterized by stronger reciprocity of norms and trust (Coleman, 1988), as well as bounded solidarity (Granovetter, 1983) which all facilitate a shared understanding.

The alternative model is the egocentric variant of network analysis. This approach focuses on the positive externalities that are derived from bridging (linking) or external social capital (Burt, 1992). This view is characterized by structural holes in groups. This becomes important as groups tap into the expertise, resources and knowledge of other groups in the broader context. Researchers have chosen to utilize social capital to address the network structure-performance relationship primarily because social capital explains variation in performance as a function of network structure (Borgatti and Foster, 2003) as well as the effects of the type of tie and resources that flow through the tie (Adler and Kwon, 2002).

Given that performance is indeed a function of both internal and external social capital, scholars are beginning to recognize that social capital needs to be considered from an optimal configuration perspective (Oh et al., 2004). From this perspective, there is a positive relationship between a moderate level of bonding and bridging social capital, and performance. The implied performance criterion associated with this view is that effective teams are those that maximize both bonding and bridging social capital in order to achieve positive outcomes.

IMPLICATIONS FOR THE DESIGN OF EMERGENCY RESPONSE INFORMATION SYSTEMS

This research adopts a community informatics approach, exploring information and communication technologies to support community emergency management (Gurstein, 2002). It focuses on the interactions that occur in a geographic community with respect to emergency management. Likewise, our implications for the design for emergency systems are based on community descriptions. These implications are not system-specific, but rather highlight our findings about the importance of social capital in emergency management.

Previously, the IISIS (interactive, intelligent, spatial information system) prototype investigated increasing a community's capacity to respond. This work showed how diverse agencies within a community can pool their knowledge in a database application and be more organized in emergency management (Comfort, 1999). Our work extends this notion to look specifically at supporting bridging and bonding social capital. It recognizes prior work on designing emergency response systems (Turoff et al., 2004) and concentrates on the personal relationships inherent in social capital.

Bonding Social Capital Requirements

Bonding social capital refers to the internal cohesion of a community. In both recounts of events from Tropical Storm Ivan, there were emergency management communities. The attendees at the Centre Region emergency planning meeting is an example. These participants came together, forming a community of responders. Likewise, in Lower Swatara there is a group of people who commonly respond to emergencies together. This includes the firemen, the police, and even the local tow truck company. Supporting the bonding social capital within these emergency management communities is important. At the planning meetings in both communities, this was facilitated by bringing the various stakeholders together in a face-to-face setting to get to know one another.

Emergency response systems design also need to encourage this form of social capital. The systems need to enable sharing resources, such as the Lower Swatara emergency management coordinator working with the Red Cross to acquire a walker for a rescued person. Other research has already realized this need. Both the design of the IISIS and the Dynamic Emergency Response Management Information System (DERMIS), describe equipment databases (Comfort, 1999, Turoff et al., 2004)

Additionally, emergency systems need to take into consideration issues of trust and reciprocity. In our observations, the Lower Swatara police communicated with the local tow-truck company and relied on them to remove a disabled vehicle. Also, the police forces of Centre Region coordinated in terms of traffic intersections. They mutually agreed to divide their responsibilities. Both examples point to the importance of emergency agency relationship building. Likewise, emergency system designs should not alienate agencies, but foster communication, cooperation, and coordination. It is clear that different agencies have different roles in emergency management, but their need to act as a cohesive group is undervalued. Systems need to encourage not only information sharing and resource sharing across emergency agencies, but consensus building and trust.

Bridging Social Capital Requirements

Another key aspect of the community's response was their ability to leverage bridging social capital. Through Alan's extensive contacts, he had the ability to tap into other groups and agencies. The story illustrates two concrete examples of how the community leveraged its bridging social capital. First, the state lawmaker assisted the community in their efforts to persuade Airport authorities to re-open the flood gates. Second, the County commissioner was instrumental in leveraging his political clout to address the unmet need for potable water. Other examples of bridging social capital were the home oxygen and the walker, as well as, long-term shelter provided by the American Red Cross. From this perspective, systems should be designed to support communication and collaboration that expands the boundary of the geographic community.

DISCUSSION

The objective of this research was to identify the relationship between social capital and performance of emergency management and their subsequent implications for the design of information systems. What we learned from this story is that both bonding and bridging social capital were important for effective response. To this end, we suggest that understanding the social capital within and between communities is critical to identifying the unique needs of different communities and translating these needs into a stable set of requirements for an emergency response information system.

A further insight gleaned from this study is the utility of taking a community-centered approach to emergency management. As such, there is a need to support and foster peer-to-peer learning within and across communities. Organizational theorists refer to this learning as inter- and intra organizational learning. In this approach communities can share best practices and lessons learned in order to enhance preparedness. Moreover, we learned that norms of generalized reciprocity and trust are critical to the maintenance and development of social capital.

REFERENCES

1. Adler, P. and Kwon, S. (2002) *Academy of Management Review,* 27, 17 - 40.

2. Argyris, C. and Schön, D. (1996) *Organizational Learning II: Theory, Method and Practice,* Addison-Wesley, Reading, MA.

3. Borgatti, S. and Foster, P. (2003) *Journal of Management,* 29, 991 - 1013.

4. Burt, R. (1992) *Structural holes: The social structures of competition,* Harvard University Press, Cambridge, MA.

5. Burt, R. (2000) *Research in Organizational Behavior,* 22, 345 - 423.

6. Carroll, J. M., Chin, G., Rosson, M. B. and Neale, D. C. (2000) In *Designing Interactive Systems*, pp. 239-251.

7. Coleman, J. (1988) *American Journal of Sociology,* 94, 95 - 120.

8. Comfort, L. (1999) In *The International Emergency Management Society Conference*Washington, D.C.

9. Cook, T. and Campbell, D. (1976) In *Handbook of industrial and organizational psychology*(Ed, Dunnette, M.) Rand-McNally, Chicago.

10. Granovetter, M. (1983) *Sociological Theory,* 1, 201 - 233.

11. Gurstein, M. (2002) In *Community Technology Review*, Vol. Winter-Spring 2002.

12. Ibarra, H. (1993) *Academy of Management Review,* 18, 56 - 87.

13. Lincoln, J. and Miller, J. (1979) *Administrative Science Quarterly,* 24, 181 - 199.

14. Merkel, C., Xiao, L., Farooq, U., Ganoe, C. H., Lee, R. L., Carroll, J. M. and Rosson, M. B. (2004) In *Proceedings of the Eighth Biennial Participatory Design Conference* Toronto, Canada.

15. Oh, H., Chung, M. and Labianca, G. (2004) *Academy of Management Journal,* 47, 860 - 875.

16. Portes, A. (1998) *Annual Review of Sociology,* 24, 1 - 24.

17. Putnam, R. (2000) *Bowling alone: The collapse and revival of American community,* Simon & Shuster, New York.

18. Sandefur, R. and Laumann, E. (1998) *Rationality and Society,* 10.

19. Schafer, W. A., Carroll, J. M., Haynes, S. R. and Abrams, S. (submitted) *Interacting with Computers.*

20. Sparrowe, R., Liden, R., Wayne, S. and Kraimer (2001) *Academy of Management Journal,* 44, 316 - 325.

21. Turoff, M., Chumer, M., Van de Walle, B. and Yao, X. (2004) *Journal of Information Technology Theory and Application (JITTA),* 5, 1 - 35.

22. Weick, K. (1993) *Administrative Science Quarterly,* 38, 628-652.

23. Weick, K. (1998) *Organization Science,* 9, 543 - 555.

24. Wellman, B. (1988) In *Social structures: A network approach* (Eds, B. Wellman and Berkowitz, S.) Cambridge University Press, New York, pp. 19 - 61.