

Integrating Crisis into the Organizational Lifecycle through Transitional Networks

Lisa V. Chewning, Ph.D

Pennsylvania State University – Abington
1600 Woodland Rd., Abington PA, 19001
USA

Marya L. Doerfel, Ph.D

School of Communication and Information
Rutgers University
4 Huntington St., New Brunswick
NJ 08901 USA

Abstract

The focus of this paper is on how business leaders use communication to build transitional networks in order to successfully evolve through crisis. Chaos theory and network theory are employed as complementary bases for understanding communication and the resulting social ordering following crisis. These theories are applied on a variety of levels (network, individual, and link), broadening the scope and explanatory power of transitional networks. A review of existing literature on temporary networks is used to tie the ideas of transitional networks and network theory and frames the development of theoretical propositions for use in future research. This paper posits crisis as an opportunity for a turning point in the organizational lifecycle, and builds understanding of how the relationships that organizational leaders forge before, during, and after a crisis affect an organization's ability to successfully evolve, thus recasting the concept of crisis management to one of crisis integration. Crisis communication, network organizing, chaos theory

1. Introduction

A bounty of literature has identified crisis as a time of unique informational needs (Vandeford, Nastoff, Telfer, & Bonzo, 2007); amplified need for access to resources (Runyan, 2006); and new or novel communication partnerships (Sellnow, Seeger, & Ulmer, 2002). For organizations, this often means shifting communication and business practices to accommodate the situation at hand. While traditional crisis management literature posits crisis as an “aberration” that organizations must manage or resolve, there is a growing body of literature that considers how crisis fits into the lifecycle of the organization (Doerfel, Chewning, & Lai, 2013; Doerfel, Lai, & Chewning, 2010, Ruox-Dufort, 2007, Seeger, Sellnow & Ulmer, 2003). This paper extends that body of literature by introducing the idea of the transitional network, or the web of relationships that an organization weaves in order to transition between enactments of social structure, and eventually evolve to a post-crisis organizing routine.

The theoretical basis for understanding transitional networks is by viewing such processes as a networked form of organizing. Networked forms refers to a research paradigm that considers social structure in terms of the emergent patterns of communication among actors within a population, as opposed to hierarchies, which are planned, designed and prescribed authority structures. Chaos theory, which posits that complex systems must go through periods of disorder in order to survive (Seeger, Sellnow, & Ulmer, 2003), is introduced as a complementary theory to contextualize the way in which crisis can act as a breaking point from one enactment of social structure and the beginning of another. Such a joint perspective is well suited to exploring organizational recovery following crisis, as it guides researchers to examine social ordering with a focus on the reciprocal interplay between individual enactments of larger, often structural, issues, and how these enactments then support or reform the structure. Whereas chaos theory offers loosely related principals to understand how systems reorganize following a break in pattern (Salem, 2008) considering a networked form of organizing offers more specific mechanisms through which systems build social structures.

Network theory and research that considers the dynamic evolution of a system has focused on organizational change and transition (e.g., Barley, 1990; Corman, 1996). Such work has sought to explain the theoretical mechanisms of social networks but rarely considers the triggering events often associated with crisis (for an overview of work on theories of network evolution, see Monge & Contractor, 2000). Work that has considered such interruptions (e.g., Topper & Carley, 1999, Bigley & Roberts, 2001; Sellnow, Seeger, & Ulmer, 2002) has done so from the point of view of organizational forms whose purpose is to aid in crisis recovery. These studies, offer limited insight into how “indigenous” business and organizations use network communication following crisis. Understanding how indigenous businesses reorganize following crisis is an important piece of the recovery puzzle. Indigenous businesses are an important part of the regional infrastructure, as they provide employment and financial stability to inhabitants. Arguably, a community cannot recover if its businesses do not recover.

While research on post crisis transitory networks does exist, many questions about such networks remain both unasked and unanswered. For example, what are the characteristics that mark the time surrounding crisis as something set apart from a “normal” time? How do organizations use or alter their existing business networks to bridge this time? In what way is communication distinct from “normal” business communication? Building on a rich body of organizational literature, this paper lays out theoretically derived propositions exploring the communication mechanisms underlying transitional networks. Together, this paper’s propositions offer a basis for building a post-crisis puzzle that extends networked forms of organizing as a communication-driven dynamic process. The theoretical frame is also discussed as a communication-centered strategy that lays the groundwork for organizational leaders to integrate networked forms of organizing into their point of view and their organization’s lifecycle, broadening the concept of crisis management to one of crisis integration.

2. Crisis as Impetus for Transitional Networks

Crisis has been defined as a time of “high consequence, low probability, ambiguity, and decision-making time pressure” (Runyan, 2006, p. 13). For organizations, crisis “represents a fundamental threat to the very stability of a system, a questioning of core assumptions and beliefs, and risk to high priority goals, including organizational image, legitimacy, profitability, and ultimately, survival” (Seeger & Ulmer, 2002, p. 126). Organizational crises can vary among several dimensions, including: predictability, intentionality, violence, and whether they are natural or manufactured (Shauf, Ahmadun, & Said, 2003), and can refer to accidents, a dormant but dangerous threat, recurring dangers, or a “unique cataclysm” (Dynes, 1970, p. 50). A meta-analysis of crisis and crisis-related literature identified crisis and disaster as “related events where the crisis is more comprehensive than the disaster” (Shauf, Ahmadun, & Said, 2003, p.31). Therefore, in adopting the term *crisis* for consistency, this paper refers to the comprehensive events and processes that can disrupt and challenge an organizational system.

Organizations suffer challenges created by crisis, including physical damage to people and buildings, dislocation from physical space, loss of contacts including suppliers and clients; misinformation, and lack of capital and other tangible resources (Doerfel et al. 2010; Dynes, 1970; Runyan, 2006, Vandeford et al. 2007). These challenges can be physical, emotional, social, and functional for organizations. They can also range from short-term to long-term impact on various aspects of organizing. For example, during the Man Gulch fire, members of a first response organization lost their sense making ability, undermining their ability to do their jobs and ultimately leading to loss of life in the crisis (Weick, 1993). On a larger scale, following natural disasters such as the Red River Valley Floods and Hurricane Katrina, individuals and business were forced to evacuate entire regions (e.g., the entire city of New Orleans) due to heightened personal danger and sweeping physical damage. Such large-scale disasters incurred exorbitant costs in terms of rebuilding, loss of business, and displaced networks (Procopio & Procopio, 2007; Sellnow, Seeger, & Ulmer, 2002).

These challenges exist on the organizational level, and more broadly at the macro level of the communities or industries to which an organization belongs. For example, following Hurricane Katrina, one small business owner reported not being able to obtain funds because there was no functional mail for invoicing, and another business owner reported being ready to get back to business, but not being able to because suppliers had no electricity (Runyan, 2006). Similarly, following 9/11, communication infrastructures were damaged as both landlines and mobile calling were temporarily unavailable, making work in areas of lower Manhattan impossible until technological capabilities could be restored (Carey, 2003; Katz & Rice, 2002). Alternately, crises for which the organization is at fault, such as the BP oil spill, can damage the geography, technological infrastructure, as well as community and stakeholder relationships.

We thus argue that crisis interrupts the flow of business, and becomes part of a redirected flow of business, creating a new communication space involving multiple partners, networks, communication strategies, and information and tangible resources. Rather than aberrance in the lifecycle of an organization, a crisis might be more usefully considered a “process of transformation induced by a major disruption that forces the restructuring of social, human, and natural systems” (Ruox-Dufort, 2000). Crisis sheds light on the “origins, adaptive capacities, and survival” of social order (Kreps, 1984, p. 310). Assessing such situations offers a glimpse into the full lifecycle of social ordering, from the end of one type of order through the beginning and maintenance stages of another. It also illustrates how entities use social ordering mechanisms (e.g., communication) to adapt to, survive, and change their new environment.

Thinking of crisis as a turning point in the system is in line with chaos theory, which argues that organizational systems are in a constant of fluctuation, drawing on inputs from their environments and adapting accordingly. Chaos is seen as a necessary step in the evolution of a system, and can be kicked off by a bifurcation point, or a “sudden change in the system’s direction or structure that is followed by the system rearranging itself” (Freimuth, 2006, p. 145). A bifurcation points can be likened to a triggering event, or the occurrence that begins a period of crisis. Once the bifurcation point occurs, the system rearranges itself through inner guidelines that act as “islands of stability” within the chaos (Freimuth, 2006, Thietart&Forgues, 1995, p. 26). Known as “strange attractors,” these guidelines represent the deep structure that underlies a system (Seeger, Sellnow& Ulmer, 2003). Attractors come to represent a fractal form, or layers of similar patterns and configurations at various system levels, in which each level is based on the order of the previous level (Thietart&Forgues, 1995). Thus, every instance of organizing creates the basis for the next instance of organizing. Crisis can accelerate this process because initial conditions are changing and there is too much positive feedback coming from the environment. Coupling chaos theory with social network theory to study transitional networks provides a framework for understanding crisis as a natural part of organizational reordering.

Taken together, crisis literature and a network point of view establishes a basis for the first proposition:

P1: The time following a triggering event will be marked by a damaged macrostructure that alters the composition of interorganizational networks (IOs).

To further explore the interplay between environment, communication, and social structure, we next unpack the tenets of a networked form of organizing as a base for the creation of transitional networks.

3. Networked Forms of Organizing

The idea of networks has been applied as theory, method, and even as a paradigm (Burt, 1982; Castells, 2000; Doerfel, 2008; Rice 1993). In fact, some scholars have noted the fact that the term “networks” is so widely used that it is losing its original meaning (Ebers, 1997). The idea of networks is broadly seen in scholarship with several overlapping themes as summarized in Table 1. Castells (2000) put forth the idea of a network society, which he defined as a form of social structure, or “organizational arrangement of humans in relationships of production/consumption, experience, and power, as expressed in meaningful interaction framed by culture” (p. 5). Key to the enactment of this social structure is information, connectivity, and flexibility. This enactment can be defined as a set of recurring ties among a set of nodes (Ebers, 1997, p. 15). Network ideas can be applied on both an interpersonal level (studying the interaction of people and resulting social order independent of organizations) and in an organizational context. Organizationally, networks can be studied within a single organization, or across organizational boundaries, coming to encompass a number of organizations that collaborate or form alliances in one or more facets of their businesses.

Studying organizations in this context, it can be said that they are situated in a network setting. Thus, utilizing network theory inherently acknowledges networks as structure. That is, the process of studying organizations in terms of their connections illuminates the *nature* and *consequences* of their connections. Thus, network theory assumes *a priori* the existence of networks, and the existence of networks makes possible the use of network theory. Within networks, individuals exist in relation to other individuals (Powell, 1990), and accordingly, organizations exist in relation to other organizations. Individuals do not exist apart from the other employees in their organization, just as organizations do not exist separate from other entities. Rather, they are part of an organizational network in which success has to do with building reciprocal relationships, often based upon an expectation of future interactions. These social relations are particularistic, as opposed to universal, as they are built on repeated communication between and among entities within the same network.

Organizational and interorganizational networks are versions of complex systems. The building blocks of a complex system are agents, attributes, and rules of interaction (Monge & Contractor, 2003). Agents are the individual-level actors involved in a system. The network is the “relations among the agents from which...other agents learn and to which agents can transfer new information and improvements” (Monge & Contractor, 2003, p. 84). Thus, networks are the context of connections among agents. For example, an interorganizational network can be composed of all of the agents (other organizations) that interact with a focal organization in order to conduct business. They are situated within an environment, examples of which can be their geographic communities or industries. Attributes are traits of the agents, such as organizational type. Finally, rules of interaction are the prescriptions for interaction that underlie behavior in a system. Rules can be explicit or implicit, and applied on the individual, dyadic, triadic, or whole-network level. Further, metarules may dictate the context in which certain rules should or should not be followed (Monge, & Contractor, 2003).

During crisis, a system’s openness to its environment will influence the presence or absence of agents, the salience of their attributes to maintenance of the system, as well as interaction rules. The environment changes, and therefore the components of a given system are also likely to undergo change. Membership can fluctuate, as some agents become unavailable or irrelevant. Attributes that were formerly secondary may become more salient. Most important, rules of interaction may need to change in order to make sense in the new environment. As chaos theory implies, these rules of interaction can serve as attractors that help create order out of the chaotic state. Attractors represent not only the basic organizing principles of a system, but also the fundamental social assumptions and values of a systems. How these attractors develop is a result of communication among affected parties, and holds implications for the goals that organizations have for moving through crisis, which in turn affects with whom organizations will communicate, and what they will communicate about.

3.1. Communication and the Relational Nature of Networked Forms

Social network theory posits patterns of interaction among people as the building blocks of networks (Blau, 1977; Burt, 1982, Granovetter, 1985). In this sense, interaction implies communication. In fact, communication has been defined as a “process by which individuals interact and influence each other” (Craig, 1999, p. 143). In network studies, this process is often examined in terms of the patterns of contact that underlie relationships. Variation of the patterns, or changes in to whom one is linked in the network, can directly and/or indirectly affect the experiences and outcomes of network members or more general societal contexts.

A communication perspective moves beyond simple contact and encompasses the creation of shared meaning. A constitutive point of view posits that communication involves the creation of meaning between; and the relationships, identities, and social realities of; the communicating parties (Craig, 1999). Thus, engaging in a communication network involves creating a series of connections with others through which shared meaning is negotiated. Aakhus (2007) asserts that communication can have both constitutive and instrumental possibilities. Communication can be mutually created, but it can also be intentionally directed. Much of this work is done naturally, as people rely on mutually shared language, context, and values.

Looking at the building of transitional networks from a communication perspective on relationships, then, encompasses an examination of the connections made--as well as their content--and how these relationships serve to help or hinder the process of network reconstruction. Specifically, in order to understand how organizations get back into communities of relationships (i.e., interorganizational networks), it is important to consider what they talk about and how they enact this communication. This includes assigning agreed upon value to tangible resources, deciding the shared relevance of information, and devising methods and messages that leverage available resources. Thus, it is not elements of structure or information alone that equal network communication, but also how these elements were created and recreated by individuals in order to establish the shared values of an operational network.

Considering the interplay between structure, system components, and communication, we propose:

P2: During crisis, the communication that binds the networks agents will change, leading to the creation of transitional networks in which agents evolve through the crisis.

Employing complementary theories of network development and structure, the following sections detail the mechanisms that organizations use to create these networks.

3.2. Network Development

Several schools of thought have been identified as relevant to understanding network development and membership. Among those are theories of social capital, theories of mutual self-interest and collective action, and exchange and dependency theories (Monge & Contractor, 2000). Each of these theories examines a motivation for actors to engage in a network. It can be argued that engaging in communication with any business partners is enacted in hopes of garnering resources necessary for survival. Such a notion establishes the idea of dependency. Resource dependency and exchange theories are rooted in the idea of exchanging valuable or needed resources, and posit that people will seek out and interact with others who have resources that they need. Such coupling leads to interorganizational linkages and coordination by networks (Monge & Contractor, 2000). The variety of ties with which one engages, then, provides opportunities for access to different resources, as well as opportunities to increase one's power or initiate trust between formerly non-connected or indirectly connected parties.

Powell (1990) identifies as the basic assumption of network relations the idea that "one party is dependent on resources controlled by another, and that there are gains to be made by the pooling of resources" (p. 303). This dependency enters parties in a series of "reciprocal, preferential, [and] mutually supportive" interactions by which they are able to accomplish their own goals without sacrificing the goals of network partners (Powell, 1990, p. 303). Such resource sharing and information transfer, in turn, leads directly to the flexibility that is prevalent in network forms. The links that create access can be seen as individual level network constructs as described in Table 2. Being embedded, having greater centrality, and the nature of connections in terms of roles are all related to resource access and exchange.

Embeddedness rests upon the idea that social influence, rather than being external and finite, is ongoing and socially (re)constructed during each interaction (Granovetter, 1985). Embeddedness guards against opportunism by building relationships based upon trust and reciprocity, as well a general knowledge of what one can expect from another partner. Heimer (1992) points to the tension created by networks, which are inherently particularistic, embedded within the universalistic organization or community. Particularism emphasizes a return to specific persons for repeated interactions, whereas a universalistic context emphasizes seeking out the most beneficial contact for each interaction, regardless of past acquaintance or history. Particularism is inherent to networks, Heimer (1992) argues, because existence in networks necessarily entails obligations to concrete others. Once reciprocity and familiarity become the basis for repeated relationships, future action is often fueled, at least in part, by the information that these actors share because of joint history, rather than based upon an abstract set of rules of transaction.

Dynes (1970) conceptualizes organizations as embedded in interorganizational networks in terms of input and output sets. An organization relies on its input set for resources necessary to function, such as personnel, material, and capital (p. 186). Similarly, it produces outputs, such as products, personnel, or capital, for other members of the IO network. However, sometimes the networks within which organizations are embedded are missing or irrelevant following a crisis. For example, during the mandatory evacuation following Hurricane Katrina, some organizations were completely inoperable, while others were forced to work from remote locations. Communication, and therefore business operations, with both input and output sets, was hampered by lack of opportunity for face to face meeting, inoperable communication technology, and the fact that many organizations did not have alternative contact information for organizations in their networks. Dynes (1970) argues that when this happens, organizations engage in behavior to manage these sets. Essentially, organizations aim their communication at restoring balance to their input and output sets.

Following a crisis, organizations are bound with other organizations in what Dynes (1970) calls the disaster environment. Theories of mutual self-interest and collective action consider the possible benefits that can be achieved in such an environment by acquiring and sharing resources through coordinated action. The premise of collective action states that the extent to which people are interconnected in communication networks increases their willingness to support the collective good (Monge & Contractor, 2000). Theories of collective action, therefore, "seek to explain the conditions under which actors will be sufficiently mobilized to contribute to a collective public good" (Monge & Contractor, 2003, p. 171). Granovetter (1978) asserts that the precipitating condition for collective action occurs when the benefits to the actor (individual or organization) outweigh the costs, a point in time that he termed *threshold*.

Although each actor has a threshold, it is likely that other members of their network will influence their threshold, and subsequently affect their decision to participate in collective action. For example, network size, density, centrality, homogeneity, and interdependence have been shown to influence the decision to participate in collective action (Granovetter, 1978; Marwell, Oliver, & Prael, 1988).

Additionally, Gould (1993) proposed that actors choose among participation options in terms of “norms of fairness that encourage individuals to match the contributions of others, and the desire to avoid making contributions that will be wasted” (p. 183). Thus, structural and interpersonal factors can affect an actor’s decision to participate in collective action. Gould (1991) studied collective action and social networks in terms of mobilization of social movements and found that through the interaction of informal and formal structures, collective action in the form of mobilization “creates new social ties, even as it relies on pre-existing ties as a source of solidarity” (p. 728). Similarly, Dynes (1970) noted “cooperative relations in the emergency period are often an extension of pre-disaster patterns of interorganizational relationships” (p. 184). Thus, collective action during crisis might provide the opportunity for new and old, informal and formal contacts, to work together.

Individual network members can also glean ancillary benefits as a result of engaging in collective action networks. Benefits can range from material resources such as money or supplies to intangible resources such as information. Following crisis, there is a simultaneous need for resources on both a micro- and macro-structural level. Post-crisis organizational networks may develop under circumstances aimed towards the completion of common goals such as community level goals like having social order, organizational level goals like making payroll and reopening a business, and personal level goals like repairing a private residence or sending children back to school.

Given the findings of previous research on network development, we propose:

P3: The development of transitional networks will be driven by resource sharing.

P3a: Input/output interorganizational networks will blur as organizations manage resource needs in a transitional space.

P4: Network development in a post-crisis transitional space will include some partnerships that benefit the overall good with ancillary benefits to network members.

P4a: A more severely damaged macrostructure will lower an organization’s threshold, thus increasing the likelihood that it will participate in collective action.

P4b: Links activated for collective action will be part of existing IO networks to the greatest extent possible.

3.3. Network Membership

As organizations seek resources or engage in collective action, network membership will fluctuate and the network structure will be formed and reformed. There are two competing views on what type of network structure provides the most benefit. One point of view posits that homophilous networks provide advantage in time of turbulence. As homophilous ties are likely to hold the same attitudes, abilities, beliefs, and goals, it is likely that they will also hold similar resources. Network ties based on homophily can provide quick access to commonly used resources. Because we tend to trust similar others more readily than those who are different, it is possible that less relational work would have to be done to rapidly establish a relationship and thus access these resources.

To build transitional networks, then, it would make sense that organizations would turn to similar organizations for help. In fact, Hurlbert, Haines, and Beggs (2000) found that homophilous relationships are beneficial in times of structural turbulence, and that such ties become more important during times of crisis. Such networks also facilitate trust, cooperation, and easy exchange of resources. Supported by this sense of belongingness and cooperation, members are able to pursue individual interests. Information exchanged in these networks supports norms and reinforces network identity.

While this may not lead to greater innovation, it can lead to greater decision-making power, as well as an environment in which members share trust and are therefore more willing to take risks. It is also possible that homophilous and known partners act as attractors, in that they provide a familiar underlying structure for the system to return to.

Given the previously discussed importance of embeddedness, as well as the preference for organizations to work with similar and known others during crisis, we propose the following:

P5: Organizations will show a preference for creating homophilous transitional networks.

P6: Organizations will show a preference for maintaining pre-disaster links.

Returning to the idea that former contacts become inoperable or irrelevant following crisis, it could be argued that organizations are forced to open up their boundaries to include new contacts in their networks. That is, following crisis, organizations will be forced to add new and diverse links, regardless of preference for or levels of pre-crisis levels of diversity. Although research has shown that the most effective and cooperative relationships develop among similar and familiar organizations, organizations will also use the legitimacy of the person or organizations in order to determine if they should work together (Dynes, 1970, p. 192). Legitimacy can be determined by considering organizational goals, means, and leadership, and encompasses the values and means of the organization congruent to the situation at hand (Dynes, 1970). For example, following crisis, there is often a need for food and shelter. Since the Red Cross provides these items, they have legitimacy in this situation if they fulfill these duties (Dynes, 1970).

While much of the research that supports this idea is in regard to community or helping organizations (Dynes, 1970, Sellnow, Seeger, & Ulmer, 2002), the same idea can be applied to indigenous organizations. For example, following Hurricane Katrina, small businesses engaged with both FEMA and the Small Business Association (SBA) (Chewning, Lai, & Doerfel, 2010; Runyan, 2006). Similarly, existing links that are usually on an organization's network periphery, such as insurance companies, may take on increased importance and legitimacy during a crisis.

Organizations may also deem other affected organizations that share their same plight to be legitimate because of their shared circumstance and goals. Thus, although we propose that organizations will prefer to create homophilous networks containing pre-crisis links, we also propose the following about the inclusion of new and/or diverse links in transitional networks:

P7: New links added to transitional networks will be those that have crisis legitimacy.

P8: In transitional networks, existing links with crisis legitimacy will take on increased importance.

Due to the fact that both diverse and homophilous structures can provide advantages in times of crisis, it might be more beneficial to ask what types of relationships provide the most benefit for organizations in a crisis environment. Different types of networks offer accessibility to different types of resources. The content of links and the extent to which they are multiplex can vary. Networks can be classified as communication networks, information networks, problem-solving networks, knowledge networks, access networks, friendship networks, trust networks, and advice networks (Brass & Burkhardt, 1992; Cross, Borgati, & Parker, 2002; Krackhardt, 1992). Types of networks can be viewed in terms of formal and informal. Formal ties are considered position-centered, and rarely persist after an individual or business fills a specific role in the network (Podolny & Baron, 1997). Alternately, informal networks often involve links based on friendship, communication, and trust.

These are often multiplex because the link involves a variety of interactions and strongest because more time is dedicated to the relationship. Information in these networks can range from idle chatter to personal information to "delicate political [organizational] information" (Krackhardt & Hanson, 1993, p. 105). People in these networks are often privy to information they wouldn't gain through formal because of the open communication and personal trust inherent to these types of networks are not necessarily present in their formal counterparts.

Ties in friendship networks are considered more "portable," in that they are person -- rather than position -- centered, and often maintained even after one leaves a certain position in the company (Podolny & Baron, 1997). Additionally, people are more likely to support other members within their friendship or trust network than they are to support other types of network members.

Yet, crises yield unconventional and unanticipated partnerships (Kreps, 1984; Runyan, 2006). For example, following the Exxon Valdez oil spill, federal agencies, non-profit organizations, individual fishermen, scientists, Exxon, and other oil companies all worked together in the clean up effort (Topper & Carley, 1999).

Bridging the preference for homophilous networks with the need for diversity, we argue that transitional networks will utilize conventional (similar or familiar personal) ties for unconventional (business) purposes.

P9: Strong, multiplex links will be the first and most commonly activated links in transitional networks.

3.4. Temporality

The very idea of transition, or moving from one point in the organization's lifecycle to another, implies that certain elements of this process of change will be temporary. While scant, existing research on short-term networks makes reference to the idea of temporary networks. Conceptually similar to the idea of a transitional network, a temporary network is one that consists of "a set of diversely skilled people working together on a complex task over a limited period of time" (Goodman & Goodman, 1976). While the same definition could be applied to a transitional network, a temporary network may or may not be one in which members are trying to regroup or regain a sense of working order. Weick (1990) refers to temporary networks as being an "odd mix of the mechanistic and the organic" (p. 587). That is, it is likely that these networks will exist within a larger established structure, but need to operate in an extremely flexible way. These structures are formed for a limited purpose and include members who have not necessarily worked together before, and may not work together again. Additionally, members of these networks represent a large diversity of either functions or skills. They are formed when a task arises that is so complex that it cannot be accomplished either singularly or by many people working on individual aspects of it side by side; rather, people must work interdependently in order to get the task accomplished.

For example, Doerfel and Taylor (2009) showed how interorganizational networks evolved as a new democratic system emerged in Croatia. They argued that over time and once the greater community settled into a new state (a functioning democracy), an initially interconnected diverse network changed. Members no longer had an acute need to continue relationships that had been critical to the political transformation of the country. Once democracy was established, Doerfel and Taylor (2004, 2009) argued, new organizations were formed and new relationships with more similar alters were made (e.g., environmental NGOs did not pair with political NGOs but returned to their "go green" mission and linked with other like minded organizations). In other words, organizations with different missions and causes no longer needed each other in the same way. We argue that the networks in this line of research (Taylor & Doerfel, 2003; Doerfel & Taylor, 2004, 2009) were creating transitional networks. Six years after Croatia's first elections, the networks "returned" to a "new" state of normal.

Previous crisis research has conceptualized this type of evolution through conditions and partnerships in terms of phases or stages. Heifetz, Grashow, & Linsky (2009) proposed two phases of crisis leadership: an emergency phase and an adaptive phase. In the emergency phase, the leader assesses and adapts to the new reality created by the triggering event. The adaptive phase is a time when organizational leaders can revise or reimagine organizational operating rules and bring closure to the past. Doerfel et al. (2010) identified four sequential phases, including: (a) *personalemergency*, in which organizational leaders' communicate to secure resources necessary to personal survival and rely on personal contacts to do so; (b) *professional emergency phase*, in which leaders reach out to employees' to check on their safety and status; (c) *transitional phase*, which involves a move to organization-level communication with incoming and outgoing communication distinguished in terms of media and content; and (d) *rebuilding phase*, in which organizations resume their core work and focus on nurturing relationships (both old and new) that could aid in sustaining work. Conceptualizing transitional networks in terms of temporality implies that a) organizations adapt recovery tactics to the limitations and opportunities presented by the prevailing environmental conditions b) there may be communicative actions that need to be accomplished in order to lay the groundwork for future communicative actions, and c) organizations reach a point (be it a return to business or termination of the business) that marks an end to the crisis period and a beginning of a "new normal" where organizations draw on lessons learned, take stock of where they are, and modify their networks accordingly. Considering the temporality of transition, we propose:

P10: Membership in transitional networks will evolve as organizations move through phases of recovery.

P11: Membership in transitional networks will stabilize as communication and routines are established that facilitate full organizational functioning.

The preceding propositions have established the boundaries, temporality, communication in, and development, of transitional networks. The following discussion will elaborate on how these propositions fit together in order to advance research on network organization and crisis communication, as well as provide future directions for empirical testing.

4. Discussion

Numerous studies have examined the factors related to organizational recovery, including organizational size (Dahlhamer & Tierney, 1998), local, regional or national market levels (Runyan, 2006; Webb, Tierney, & Dahlhamer, 2002) and ownership type (e.g., part of a chain or a franchise, Aldrich & Auster, 1986; Tigges & Green, 1994). Moreover, while there is ample work on networks and crisis and communication and crisis (e.g., there is an entire special issue dedicated to the topic in the *Journal of Applied Communication Research* in February 2007), few have studied the lifecycle of a crisis from a communication network point of view. Of those studies that have taken a communication network point of view, even fewer have taken the point of view of indigenous, rather than community or helping, organizations. We seek to fill this gap. The concept of transitional networks, as proposed in this paper, integrates several network mechanisms (collective action, resource dependency, homophily, and diversity) on several levels (network, individual, and link), at several points in time (development, maintenance, and dissolution). By emphasizing communication over interaction, the idea of transitional networks also calls for attention to the detail and nuance that occur on the link level, which can be lost in studies that do not consider the nature and content of network communication. Thus, empirical testing of the propositions offered in this paper promises to make comprehensive contributions to the study of networked forms of organizing and crisis communication. As proposed here, the idea of transitional networks builds on a rich body of work from the field of sociology, considering how agents organize in relation to each other. By looking at the communication mechanisms through which they do so, this paper focuses on the enactment and consequences of communication in a crisis environment.

Additionally, considering crisis as a process, rather than an event, meets the call of scholars in crisis communication (Coombs, 2012; Roux-Dufort, 2007) to look at crisis as both a hindrance and an opportunity. According to Roux-Dufort (2007), crisis is more than the triggering event, but rather, is “the result of a degenerative organizational past evolution and a future of change” with the triggering event serving as a hinge between the two (p. 106). Just as chaos theory posits that complex systems will reestablish pattern, structure, and stability after a bifurcation, and that elements of the previous order serve as a reference point or components for a new order (Seeger, Sellnow, Ulmer, 2003), considering crisis in terms of a turning point acknowledges that it is “simultaneously in the before and in the after...it should be both the point of arrival of a period and the starting point of another” (Roux-Dufort, 2007, p.110).

The idea of transitional networks cracks open this turning point and explores the mechanisms that organizations enact to move through this point and begin a new phase of the organizational lifecycle. Chaos theory posits that strange attractors serve as a basic organizing principle or structure that the system refers to despite bifurcation; the propositions laid out in this paper attempt to define these strange attractors in a way that is both specific enough to have explanatory power, without being so restrictive that they are applicable to only a small subset of situations. Thus, the idea of transitional networks brings a new level of specificity when applying chaos theory to organizational recovery.

Finally, this study adds to the small body of literature that considers how organizations move through crisis longitudinally, by characterizing the temporality of crisis in terms of an evolving social structure, the evolution of which is accelerated and altered by the triggering event and ends when organizations have integrated the necessary components to return to functionality. We have termed this structure as transitional, as it demarcates a dimension in which organizations pass from one state to another. Although the structure that the organization evolves into is not the final state an organization will reach, as network theory posits that networks continuously change based on the needs of participants, the end of a transitional network is when the organization has returned to a sense of stability and is no longer reacting to the context created by the triggering event. In effect, they have entered a “new normal.”

While this paper does not propose that crisis integration is a linear process, it does propose that there are certain communication mechanisms that organizations will engage in as they transition through crisis. Understanding how organizations enact these mechanisms over time provides a richer understanding of how organizations and communities are affected by crisis.

5. Directions for Future Research

This paper offers several directions for future research. Eisenhardt (1989) highlights the use of case studies to derive and test theoretical propositions. While this paper outlines basic tenets of transitional networks, empirically linking these tenets to case study data would provide an excellent first step in refining and sharpening these ideas. As crises vary widely, such testing in a variety of settings would be especially useful in drawing out differences in structural and communication based responses to crisis within the same theoretical framework. Transitional networks can be studied both in terms of structure (i.e. what specific network members are most sought after, and which actually provide the most support), as well as, in terms of innovative communication practices employed in network building (e.g. adaptive use of technology). Understanding the role network members play in terms of trust, resource exchange, and communication can help both organizations and policy makers to effectively incorporate these organizations into pre-crisis organizational networks or crisis plans. Issues of collective action and coalition building can also be studied in terms of transitional networks, shedding light into what mechanisms drive collective action in crisis. Finally, understanding how and when organizations enter a phase of “new normal,” and how that resembles or differs from the pre-crisis normal, can highlight both the long- and short-term impact of crisis on organizations.

6. Conclusion

Transitional networks offer a way to conceptualize crisis recovery in terms of social reorganization. Whether a natural disaster or the fault of a single organization, crisis often affects both the organizational system and the larger structure within which the organization operates. Integrating chaos theory and a networked form of organizing offers direction for approaching crisis without deterministically prescribing a formula for crisis recovery. Future empirical testing of the theoretical propositions offered in this paper would yield further understandings of the lifecycle of organizational networks, as well as further network research in areas such as disaster recovery, organizational crisis, and temporary organizational alliances.

References

- Aakhus, M. (2007). Communication as design. *Communication Monographs*, 74(1), 112-117.
- Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, 45(3), 425-455.
- Aldrich, H., & Auster, E. R. (1986). Even dwarfs started small: liabilities of age and size and their strategic implications. In B.M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 8, pp. 165–198). Greenwich, CT: JAI Press.
- Barley, S. R. (1990). The alignment of technology and structure through roles and networks. *Administrative Science Quarterly*, 35, 61-103.
- Bigley, G. A., & Roberts, K. H. (2001). The incident command system: High-reliability organizing for complex and volatile task environments. *Academy of Management Journal*, 14(6), 1281-1299.
- Blau, P.M. (1977). A macrosocial theory of social structure. *American Journal of Sociology*, (83)1, 26-54.
- Bonacich P. (1972). Factoring and Weighting Approaches to status scores and clique identification. *Journal of Mathematical Sociology* 2, 113-120.
- Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *Ucinet 6 for Windows: Software for social network analysis*. Harvard: Analytic Technologies.
- Brass, D. J. & Burkhardt, M. E. (1992). Centrality and power in organizations. In N. Nohria & R. G. Eccles (Eds.), *Networks and organizations: Structure, form, and action* (pp. 191-215), Boston, MA: Harvard Business School Press.
- Burt, R. S. (1982). *Toward a structural theory of action: Network models of social structure, perception, and action*. Academic Press, NY.
- Carey, J. (2002). Media use during a crisis. *Prometheus*, 20(3), 202-207.
- Castells, M. (2000). Materials for an exploratory theory of the network society. *British Journal of Society*, 51(1), 5-24.
- Corman, S. R. (1996). Cellular automata as models of unintended consequences of organizational communication. In J. H. Watt & C. A. Vanlear (Eds.), *Dynamic patterns in communication processes*, (pp. 191-212). Newbury Park, CA: Sage
- Craig, R.T. (1999). Communication theory as a field. *Communication Theory*, 9(2), 119-161.
- Cross, R., Borgatti, S. P., & Parker, A. (2002). Making invisible work visible: Using social network analysis to support strategic collaboration. *California Management Review*, 44(2), 25-46.

- Cross, R. Parker, A., & Sasson, L. (2003). *Networks in the knowledge economy*. New York, NY: Oxford University Press.
- Doerfel, M. L. (2008). "Interorganizational Communication." *The International Encyclopedia of Communication*. Donsbach, Wolfgang (Ed). Blackwell Publishing, 2008. Blackwell Reference Online. 05 June 2009 <http://www.communicationencyclopedia.com/subscriber/tocnode?id=g9781405131995_chunk_g978140513199514_ss76-1>
- Doerfel, M.L., Chewning, L.V., & Lai, C. (2013). The evolution of networks and the resilience of interorganizational relationships after disaster. *Communication Monographs*, 80(4), 533-559
- Doerfel, M.L., Lai, C., & Chewning, L.V. (2010). The Evolutionary Role of Interorganizational Communication: Modeling Social Capital in Crisis Contexts. *Human Communication Research*, 36, 125-162.
- Doerfel, M. L., & Taylor, M. (2004). Network dynamics of inter organizational cooperation: The Croatian civil society movement. *Communication Monographs*, 71, 373-394.
- Doerfel, M. L., & Taylor, M. (2009, May). *Network analysis as a tool to make sense of relationships and media use in conflict situations*. Paper presented at the annual meetings of the International Communication Association, Chicago, IL.
- Dahlhamer, J. M., & Tierney, K. J. (1998). Rebounding from disruptive events: business recovery following the Northridge earthquake. *Sociological Spectrum*, 18, 121-141.
- Dynes, R. R. (1970). *Organized behavior in disaster*. Lexington, MA: Heath Lexington Books.
- Ebers, M. (1997). Explaining inter-organizational network formation. In M. Ebers (Ed.) *The Formation of Inter-Organizational Networks* (pp. 3-40), New York, NY: Oxford University Press.
- Eisenhardt, K. M. (1989). Building theory from case study research. *Academy of Management Review*, 14, 532-550.
- Freeman, L.C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks*, 1, 215-239.
- Freimuth, V.S. (2006). Order out of chaos: The self-organization of communication following the anthrax attacks. *Health Communication*, 20(2), 141-148.
- Fulk, J., & DeSanctis, G. (1995). Electronic communication and changing organizational forms. *Organization Science*, 6(4), 337-349.
- Gargiulo, M., & Benassi, M. (2000). Trapped in your own net? Network cohesion, structural holes, and the adaptation of social capital. *Organization Science*, 11(2), 183-196.
- Goodman, R. A. & Goodman, L. P. (1976). Some management issues in temporary systems: A study of professional development and manpower - the theater case. *Administrative Science Quarterly*, 21, 494-501.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3), 481-510.
- Hanneman, R.A. & Riddle, M. (2005). Social network data. In *Introduction to Social Network Methods*. Retrieved 22 May, 2008, from http://faculty.ucr.edu/~hanneman/nettext/C1_Social_Network_Data.html.
- Heimer, C. A. (1992). Doing your job and helping your friends: Universalistic norms and obligations to particular others in networks. In N. Nohria & R.G. Eccles (Eds.), *Networks and organizations: Structure, form, and action* (pp. 143-164), Boston, MA: Harvard Business School Press.
- Heifetz, R., Grashow, A., & Linsky, M. (2009). Leadership in a (permanent) crisis. *Harvard Business Review*, 87(7/8), 62-69.
- Hurlbert, J., Haines, V., & Beggs, J. (2000). Core networks and tie activation: What kinds of routine networks allocate their resources in nonroutine situations? *American Sociological Review*, 65, 598-618.
- Katz, J. & Rice, R. (2002). The telephone as a medium of faith, hope, terror, and redemption: America, September 11. *Prometheus*, 20(3), 247-253.
- Krackhardt, D. (1992). The strength of strong ties. In N. Nohria & R.G. Eccles (Eds.), *Networks and organizations: Structure, form, and action* (pp. 216-239), Boston, MA: Harvard Business School Press.
- Krackhardt, D. & Hanson, J. (1993). Informal networks: The company. *Harvard Business Review*, 104-111.
- Kreps, G. A. (1984). Sociological inquiry and disaster research. *Annual Review of Sociology*, 10, 309-330.
- Kuhn, T. (2008). A communicative theory of the firm: Developing an alternative perspective on intra-organizational power and stakeholder relationships. *Organization Studies*, 29, 1197-1224.
- Lin, N. (1999). Social networks and status attainment. *Annual Review of Sociology*, 25, 467-487.
- Marwell, G., Oliver, P.E., Prahl, R. (1988). Social networks and collective action: A theory of critical mass. III. *American Journal of Sociology*, 94(3), 502-534.
- McDonald, M.L., & Westphal, J.D. (2003). Getting by with the advice of their friends: CEO's advice networks and firms' strategic responses to poor performance. *Administrative Science Quarterly*, 48, 1-32.
- Monge, P. R., & Contractor, N. S. (2000). Emergence of communication networks. In Fred Jablin and Linda Putnam (Eds.) *The New Handbook of Organizational Communication: Advances in Theory, Research, and Methods* (440-501), Thousand Oaks, CA: Sage Publications.

- Monge, P.R., & Contractor, N.S. (2003). *Theories of communication networks*. New York, NY: Oxford University Press.
- Monge, P.R., Fulk, J., Kalman, M.E., Flanagan, A.J., Parnassa, C., Rumsey, S. (1998). Production of collective action in alliance based interorganizational communication and information systems. *Organization Science*, 9(3), 411-433.
- Podolny, J. M., & Baron, J. N. (1997). Resources and relationships: Social networks and mobility in the workplace. *American Sociological Review*, 62, 673-693.
- Powell, W.W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*, 12, 295-336.
- Procopio, C. H., & Procopio, S. T. (2007). Do you know what it means to miss New Orleans? Internet communication, geographic community, and social capital in crisis. *Journal of Applied Communication Research*, 35(1), 67-87.
- Rice, R. E. (1993). Using network concepts to clarify sources and mechanisms of social influence. In W. D. Richards, Jr., & G. A. Barnett (Eds.), *Progress in Communication Sciences: Advances in communication network analysis*. (pp. 43-52). Norwood, NJ: Ablex.
- Rice, R.E., Collins-Jarvis, L. & Zydney-Walker, S. (1999). Individual and structural influences on information technology helping relationships. *Journal of Applied Communication Research*, 27(4), 285-303
- Rogers, E.M. & Kincaid, D.L. (1981). *Communication Networks: Toward a New Paradigm for Research*. New York: Free Press.
- Ruox-Dufort, C. (2000). Why organizations don't learn from crisis: The perverse power of normalization. *Review of Business*, 21(3), 25-30.
- Ruox-Dufort, C., & Metais, E. (1999). Building core competencies in crisis management through organizational learning: The case of the french nuclear power plant. *Technological Forecasting and Social Change*, 60(2), 113-127.
- Runyan, R. C. (2006). Small businesses in the face of crisis: Identifying barriers to recovery from a natural disaster. *Journal of Contingencies and Crisis Management*, 14(1), 12-26.
- Salem, P. (2008). *Complexity and human communication*. Creskill, NJ: Hampton Press.
- Sellnow T.L., Seeger, M.W., & Ulmer, R.R. (2002). Chaos theory, informational needs, and natural crisis. *Journal of Applied Communication Research*, 30(4), 269-292.
- Seeger, M.W., & Ulmer, R.R. (2002). A post-disaster discourse or renewal: the cases of Marden Mills and Cole Hardwoods. *Journal of Applied Communication Research*, 30(2), 126-142.
- Seeger, M.W., Sellnow, T.L. & Ulmer, R.R. (2003). *Communication and organizational crisis*. Westport, CT: Greenwood Publishing Group.
- Shaluf, I.M., Ahmadun, F., & Said, A.M. (2003). A review of disaster and crisis. *Disaster Prevention and Management*, 12(1), 24-32.
- Taylor, M. & Doerfel, M. L. (2003). Building interorganizational relationships that build nations. *Human Communication Research*, 29(2), 153-181.
- Thietart, R.A. & Forgues, B. (1995). Chaos theory and organization. *Organization Science*, 6(1), 19-31.
- Tigges, T. M., & Green, G. P. (1994). Small business success among men- and women-owned firms in rural areas. *Rural Sociology*, 59(2), 289-310.
- Topper, C. M. & Carley, K. M. (1999). A structural perspective on the emergence of network organizations. *Journal of Mathematical Sociology*, 24(1), 67-96.
- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42, 35-67.
- Vandeford, M.L.; Nastoff, T., Telfer, J.L. & Bonzo, S.E. (2007). Emergency Communication Challenges in Response to Hurricane Katrina: Lessons from the Centers for Disease Control and Preventions. *Journal of Applied Communication Research*, 35(1), 9-25.
- Webb, G. R., Tierney, K. T., & Dahlhamer, J. M. (2002). Predicting long-term business recovery from disaster: A comparison of the Loma Prieta earthquake and Hurricane Andrew. *Environmental Hazards*, 4(1), 45-58.
- Weick, K. E. (1990). The vulnerable system: An analysis of the Tenerife air disaster. *Journal of Management*, 16(3), 571-593.
- Weick, K. (1993). *The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster*, *Administrative Science Quarterly*, Vol. 38, 628-652.
- Wellman, Barry. (1999) *Networks in the global village: Life in contemporary communities*. Boulder, CO: Westview Press.

Table 1: Network themes in empirical research and scholarship

Theme	Description	Resources (theory/theoretical paradigms used)
<u>Network Society</u>	People exist in relationships of production, consumption, power, experience communicated within cultural contexts. Enactment of such social structure is information, connectivity, flexibility	Castells, 2000 (Grounded Theory of Network Society) Flanagin et al. (Public goods) Wellman, 1999 (Global Community)
<u>Interpersonal relations</u>	People exist in networks of relationships. Their interactions create and are caused by interpersonal connections and networked contexts.	Krackhardt 1992 (Strength of strong ties) McDonald & Westphal 2003 (Homophily)
Tie Specificity	Social relations are built upon repeated communication, reciprocal relationships, and the expectation of future interactions, and are particularistic, as opposed to universal	Granovetter, 1985, (Embeddedness) Heimer, 1992 (Particularism)
<u>Intra-organizational relations</u>	Effects of people's relationships on organizational outcomes. Also includes discussions of opportunities/constraints that network configurations offer/impose.	Kuhn, 2008 (Communicative Theory of the Firm) Cross, Parker, & Sasson, 2003 (Networks as Organizational Assets) Burt, 1992; Lin, 1999 (Social Capital)
<u>Interorganizational relations</u>	Multiple organizations collaborate or form alliances in one or more facets of their businesses. Essentially, network forms organise and govern interactions among various individuals and organizations.	Powell, 1990 (Network Form) Ebers, 1997 (Networked Firm) Fulk & DeSanctis, 1995 (Interstitial Linkages) Doerfel & Taylor, 2004 (Cooperation and Competition)
<u>Network Analysis</u>	A methodological approach that studies the patterns of interaction among entities in terms of the resulting social structure.	Blau, 1977 (Positional Approach) Burt, 1982 (Structural Equivalence) Rogers & Kincaid, 1981 (Relational Approach)
<u>Structural Influence</u>	Effects of the network structure on the individual or collective choices of network members	Rice, Collins-Jarvis, Zydney-Walker, 1999 (Social Structural Factors) Brass & Burkhardt, 1992 (Centrality and Power)

Table 2: Network Constructs For Building A Communication Theory of Transitional Space

Level	Construct	Definition ⁱ	Relevance to building a theory of transitional space
Network	Density	% of links actualized in the network	Dense networks enable more opportunities for obtaining information
	Reachability	Extent to which any node <i>i</i> can reach another node <i>j</i> with minimal intermediaries needed	Helps identify the potential speed with which information flows through a system
	Size	Total number of members (nodes) in the network	How many organizations are affected by crisis
	Components	Subgroups within the system marked by connections within the group and few if any connections outside the group	Is there a main core group that garners advantages and/or better access to needed resources, while smaller unconnected subgroups lack such access?
Individual	Embeddedness	Extent to which node <i>i</i> has trusting and reciprocal relationships	To what organizations and others will an organization turn in crisis situations?
	Degree Centrality ⁱⁱ	Number of alters ego has. Can represent a simple report on the number of ties or the measure can also represent the strength of ties.	How many options does an organization have in terms of established relationships in a crisis? To what reaching out to already extent do strong and weak ties matter?
	Roles	<i>Liaison</i> - connects 2 groups that would otherwise not be connected. Not a member of either group; <i>Bridge</i> - is a member of a group but also has ties that connect to another group <i>Isolate</i> - relatively unconnected to any other node <i>Group member</i> - member of a cluster of nodes that are relatively separated from other network nodes <i>Star</i> - has relatively more connections in the network than other members	Does the disaster victim end up being both victim and critical source for others during crisis? Does the victim have a variety of options to which to turn or somewhat limited or none?
Link	Multiplex	Multiple reasons for a link between nodes exists (e.g., friendship, professional, familial)	Is knowing an alter in only one way v. multiple ways influential in terms of obtaining help in a crisis?
	Strength	Extent to which interaction is frequent and/or intimate	Does strength of weak ties hold up in transitional space? Are strong and/or weak ties mutually helpful?
	Symmetry	Extent to which both parties in a dyad perceive the relationship	Is there a transformation between asymmetric and symmetric ties in transitional space?
	Mode	The communication media through which links are made	How are face-to-face and communication info technologies (e.g., phone, email, texting) appropriated in transitional space
	History	The reputation of past interactions between nodes	Is 'all forgiven' in transitional space? To what extent are relationships in transitional space temporary, transformative, renewable, and/or created?

ⁱ Definitions are gleaned from a variety of sources including Borgatti, Everett, & Freeman (2002); Hanneman & Riddle (2005); Monge & Contractor (2000)

ⁱⁱ There are other types of centrality but the most commonly found in communication network research include betweenness, degree, closeness, and eigenvector centralities. For an extended discussion on betweenness, degree, and closeness, see Freeman (1979) and for eigenvector, see Bonacich (1972).