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CONTENTS

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William T. Jackson, Editor
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Manuscripts

THE NETWORK PERSPECTIVE IN ORGANIZATION STUDIES: NETWORK ORGANIZATIONS OR NETWORK ANALYSIS?

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ABSTRACT

The 'Network Perspective' has emerged as an important influence in organization and management research over the last few decades. The network perspective in this context has no specific definition; instead it generally encompasses the notion of networks and the techniques of network analysis, both of which have long histories in sociology. In this paper we examine empirical articles which use a network perspective in organization studies to see how the use of network analysis and how the concept of 'network organizations' is addressed. It is argued that the use of network analysis and the concept of 'network organizations' have little overlap in the literature. The findings show that the use of network analysis techniques is firmly established, however it is not used in investigating network organizations. The literature addressing network organizations is largely theoretical with only a few qualitative empirical studies. Several reasons for the lack of empirical research on network organizations are proposed.

INTRODUCTION

The notion of a network and the use of network analysis have a long and established history in sociology and have been adapted and adopted by other disciplines. In the last few decades many scholars studying organizations and management have used a network perspective in their research. We consider the 'network perspective' as investigating network organizations and/or using network analysis. In this paper we will examine the use of a network perspective in organization and management research.

Background information on network analysis is presented first. This includes a brief discussions about the basic concepts, history and types of network analysis. In the next section two aspects of the network perspective in organization and management research are explored. Specifically the use of network analysis and the concept of a 'network organization' are addressed. Next a structured review of the literature is presented in order to examine the use of a network perspective in organization research. The conclusion drawn from this review is that the prevalent

aspects of a network perspective, network analysis and the 'network organization', are virtually mutually exclusive in the literature. The paper concludes with a discussion of this issue and some possible explanations.

NETWORK ANALYSIS

Network Analysis (NA) can most generally be construed as an approach to the study of social structure. As such, it seeks primarily to describe concrete relations and patterns of relations among social actors - where "actors" can mean individuals or groups of individuals. It is secondarily (and more ambitiously) concerned with describing the behavioral effects of such patterns of relations (Galaskiewicz & Wasserman, 1994). The origins of contemporary NA are in the fields of sociology, anthropology, and graph theory (Holland & Leinhardt, 1979). It is a relatively new area (late 50's) with much activity since the mid 70's. Indeed its adherents now regard it as a "paradigm". However, the conceptual roots of a "network" can be traced quite far back to Simmel's conception of a "formal" sociology (Simmel, 1950), Durkheims "social morphology", and more recently to Moreno's "sociometry", as well as others (Turner, 1991).

Much criticism has been leveled at Network Analysis (see Mizruchi, 1994 for a brief review). Chief among these criticisms is that NA is long on mathematics and methods, but short on theory and substance. However this has not stemmed the volume and range of work utilizing the network approach. Studies of social systems as "networks" are growing rapidly in many areas in social science. Indeed NA's empirical emphasis and use of sophisticated mathematics gives it a kind of rigorous grip on social structure (and hence a legitimacy) that is absent in much social theory. But it also may be true that these same qualities make it unattractive to many in the field.

TYPES OF NETWORK ANALYSIS

Network analysis involves a great many techniques and uses. In his review of network analysis Alba (1982) comments on the "burgeoning number of methods available for analyzing network data." He considered two broad approaches, positional and relational as suggested by Burt (1978). Positional approaches center on the relations of agents to others and the similarities between such relations. Relational approaches are concerned with the direct and indirect relationships between agents. Fulk and Boyd (1991) use the categories of relational, structural and a third category called 'network concepts only' to list network studies by conceptual approach. Fulk and Boyd's structural approach is equivalent to Alba and Burt's positional approach. 'Network concepts only' refers to properties of links, roles, position, content and properties of the networks themselves. Lincoln (1982) uses three levels of analysis - dyad, network and node and listed properties at each level such as structural equivalence as a dyadic property, density as a network property and centrality as a property of individual nodes. Gerlach & Lincoln (1992) group network data analysis

into descriptive network statistics and measurement and analysis of dyadic ties. They further divide the measurement and analysis of dyadic ties into measuring dyadic relations, dyad analysis, cluster analysis and network regression models. Borch and Arthur (1995) use a division between objectivist (quantitative), subjectivist (qualitative) and rapprochment (qualitative with quantitative elements) methodologies.

In his book on social network analysis, Scott (1991) identifies the two principal types of data as 'attribute data' and 'relational data'. The type of analysis is dictated by the nature of the data and the phenomenon being investigated. Attribute data is described as relating to "the attitudes, opinions and behaviour of agents, in so far as these are regarded as the properties, qualities or characteristics which belong to them as individuals or groups." Relational data is described as being the "contacts, ties and connections, the group attachments and meetings, which relate one agent to another and so cannot be reduced to the properties of the individual agents themselves." When measured as values of particular variables, variable analysis methods can be used for attribute data. Network analysis is appropriate for relational data, which deal with the linkages between agents. Scott considers network analysis to be a "body of qualitative measures of network structure." Unlike Gerlach & Lincoln (1992) he does not consider descriptive network statistics a network analysis technique. Scott separates network analysis into five groups - lines, direction and density, centrality and centralization, components, cores and cliques, positions, roles and clusters, and dimensions and displays.

Within each researcher's general categories are many types of techniques and measures. We will present some of the more common techniques and measures using Scott's grouping of network analysis. The general concepts of graph theory are used in analyzing lines, direction and density. Sociograms are graphs of networks with points representing agents and lines representing relationships. The lines may or may not have a direction associated with them. Path distance is the distance between two points. Indegree and outdegree refer to the number of lines directed in towards or away from a point, respectively. Density is the number of lines in a graph as a proportion of the total number of lines possible. Ego-centric refers to relationships around a specific agent whereas socio-centric refers to all of the relationships in the network as a whole.

Centrality generally refers to the relative centrality of points in a graph. Centrality can be local or global. The three most commonly used measures of centrality are degree, closeness and betweenness (Brass & Burkhardt, 1993; Krackhardt, 1990; Freeman, 1979). Centrality has also been defined as aggregate prominence (Ibarra, 1993; Knoke, 1983).

The basic idea behind components, cores and cliques is the identification of sub-groups. Identification of strong and weak components, cycles, k-cores, m-cores, strong and weak cliques, n-cliques, n-clans, k-plexes and intersecting circles are all approaches to the analysis of components and their cores.

Types of relationships, categories of actors and the concept of structural equivalence are central to positions, roles and clusters. Two social positions are structurally equivalent if they have

the same relational ties and the agents occupying them are interchangeable. The key technique used to identify structurally equivalent positions is the block modeling approach to cluster analysis.

Dimensions and displays refers to representations of network relationships. The sociogram is the basic form of network diagram. Variations and extensions of sociograms include hub and spoke diagrams to illustrate ego-centric networks and circle diagrams to illustrate socio-centric networks. The unmanageable number of connections possible in relatively small networks and the uninformative arbitrary positioning of points limit the usefulness of sociograms. Multidimensional scaling (MDS) is often used to avoid these problems. Metric MDS translates graph measures into metric measures and plots them on a graph. Principal component analysis (PCA), a technique similar to factor analysis, can be used to discover a set of axes that can be plotted. Non-metric MDS such as smallest space analysis can be used when relational data are in binary form.

Network analysis software is widely available. Scott (1991) discusses three, GRADAP, STRUCTURE and UCINET in the Appendix of his book on social network analysis. Other packages mentioned in the literature are BLOCKER, CONCOR, CALCOPT, CANDECOMP, DIGRAPH, SOCK and NEGOPY for social network analysis, PRELIS and LISREL for estimating equations and confirmatory factor analysis and SPSS for exploratory factor analysis and principal component analysis.

In addition to formal network analysis, network descriptive statistics as well as various forms of correlation and regression analyses of network, dyadic and individual characteristics are frequently used. Some examples are test-retest simultaneous equations modeling (Mariolis & Jones, 1982) and Spearman Rank Correlations (Hagedoorn, 1995). These additional methods are often used in conjunction with the previously mentioned network analysis methods. For example, various measures of network centrality are used as variables along with other individual agent characteristics in regression equations. Some researchers develop their own measures of network phenomenon such as Salancik's index of subgroup influence (Johnson & Podsakoff, 1994; Salancik, 1986). Additional methods and perspectives have been suggested such as Bayesian analysis (Gelman, Carlin, Stern, & Rubin, 1995) the modern science of complexity, including chaos theory (Stacey, 1995; Levy, 1994) and analysis of cause maps (Eden, Ackermann & Cropper, 1992).

USES OF NETWORK ANALYSIS

Mizruchi (1994) points out that network analysis can in theory be applied to almost any substantive topic area. He identified three areas that have received particular attention - network and actor centrality, network subgroups and interorganizational relations. In Wasserman and Galaskiewicz's (1994) "Advances in Social Network Analysis" Krackhardt and Brass review the network literature in (micro) organizational behavior and Mizruchi and Galaskiewicz review the network literature in interorganizational relations. Krackhardt and Brass divide the (micro) organizational behavior research into seven topic areas as follows: turnover/absenteeism,

power/influence, cognition, coalitions, work attitudes, job satisfaction, leadership. One conclusion drawn by the authors is that compared to interorganizational network analysis, there is a relative paucity of micro oriented network analytic work. They suggest that this may reflect OB researchers typical psychology background, versus the sociology background characteristic of interorganizational researchers.

Mizruchi and Galaskiewicz try to show how the various studies in interorganizational relations fit into some typical organization theory models. They use the resource dependence, social class, and institutional models, although with this approach there is considerable overlap. The authors restrict their review to quantitative works. Fulk and Boyd (1991) also provide a listing of representative network studies covering many topic areas. They separate the studies by level, either intra- or inter- organizational and by conceptual approach, as mentioned earlier.

NETWORK ORGANIZATIONS

The terms "network organization" and "networked organization" have appeared for some time in the organization management literature. Organization researchers point out an evolution from vertical hierarchies to network forms of organization (Black, 2000; Daboub, 2002; Hesterly & Borgatti, 1997). There is some variety in how researchers use the terms and exactly what the terms mean (Sonnentag, 2000). Salancik (1995) states that "a network theory of organization should do either of two things: It should propose how adding or subtracting a particular interaction in an organizational network will change coordination among actors in the network; or it should propose how a network structure enables and disables the interactions between two parties.

Thorelli (1984) placed networks between markets and hierarchies. He claims that the "network paradigm is not to be viewed as a substitute for any theory of the firm, of markets, or industrial organization but rather as a supplement, a viewpoint with both normative and positive implications. Powell (1990) however does consider network forms of organization as alternatives to markets and hierarchies as a governance structure. He maintains that the reciprocal patterns of communication and exchange between agents typified in the network organization represent a "viable pattern of economic organization." Powell's network forms of organization are an extension of Ochi's (1980) clans. Ouchi considers clans an alternative to markets and bureaucracies as a mode of control. Relational contracting (Zaheer & Venkatramen, 1995; Bolton, Malmrose, and Ouchi, 1994) and hybrid organizations (Williamson, 1991) have also been proposed as an intermediate forms of governance between markets and hierarchies.

Relational contracting is characterized by long-term relationships between agents possessing assets specific to the relationships and a high degree of trust between agents. A hybrid governance structure differs from markets and a hierarchy in that it uses contracts mediated by elastic control mechanisms, and has adaptability characteristics and an incentive intensity between the other forms. Provan (1993) lists five alternative forms of governance - market, hierarchy, clan, relational

contracting and network. In a table (p. 845) comparing the five forms it is apparent that the network form has characteristics in common with both the clan and relational contracting forms. Moderate to high asset specificity and exit costs are common to relational contracting and networks. Clans and networks both have low information impactedness and a network exchange perspective. Several other characteristics, such as a long time horizon for returns, cooperation and low to moderate uncertainty are common to all three forms.

Researchers have proposed that there are both interorganizational and intraorganizational networks (Lincoln, 1982). An interorganizational network organization is a large organization made up of a network of smaller organizations. An intraorganizational network organization is a single organization that has a network structure internally. Nohria (1992) in the introduction to "Networks and Organizations" suggests five basic premises that underlie a network perspective on organizations. The first two are "All organizations are in important respects social networks and need to be addressed and analyzed as such" and "An organization's environment is properly seen as a network of other organizations." These two assumptions certainly support the existence of interorganizational and intraorganizational networks.

Miles and Snow (1992) consider a network form of organization to be an alternative to the traditional forms: functional, product, and matrix. They propose three network forms: stable, internal, and dynamic. Their description allows for both intraorganizational and interorganizational networks. The internal form is intraorganizational and the stable and dynamic forms are interorganizational. Miles (1989) considers the dynamic network form of organization as an industrial relations system. Other researchers have considered network organizations as primarily intraorganizational (Cravens, Shipp & Cravens, 1994; Pothukuchi, 1995; Dess, Rasheed, McLaughlin & Priem, 1995) but emphasize the role played by various forms of interorganizational alliances. The formation of intraorganizational network organizations has received some attention in the literature (Larson & Starr, 1993; Bovasso, 1992).

Jarillo (1988, 1990) conceptualizes networks as a "mode of organization that can be used by managers or entrepreneurs to position their firms in a stronger competitive stance." He uses the term "strategic networks" and is clearly referring to an interorganizational network. Reddy and Rao (1990) consider the industrial market itself as an interfirm organization. Ring & Van De Ven (1994) included network organizations as a form of interorganizational relationship in their research on developmental processes of cooperative interorganizational relationships.

NETWORK ANALYSIS AND THE NETWORK ORGANIZATION IN ORGANIZATION RESEARCH

The use of a network perspective and network analytical techniques has an established history in sociology and has permeated other fields in the last few decades. Our interest is in the topics addressed and techniques used in organization studies. A partial review of the literature was

employed in an attempt to gain insight into the distribution of works in the field. Articles for the review were selected from 4 leading journals (Academy of Management Journal, Administrative Science Quarterly, Journal of Management Studies, Strategic Management Journal) in the field of management and one edited volume (Nohria & Eccles, 1992). Each of the journals selected and the edited volume had several empirical articles that incorporated network concepts. The journal articles were published between January 1983 and October 2001.

Table 1: Studies Investigating Intraorganizational Networks using Quantitative Analysis

Researcher(s)	Topic(s) Investigated
Sparrowe, Liden, Wayne & Kraimer (2001)	Social networks, performance
Mehra, Kilduff & Brass (2001)	Self-monitoring
Tsai (2001)	Business unit level org learning
Salk & Brannen (2000)	National culture, team performance
Shah (2000)	Downsizing
Hansen (1999)	Weak ties, knowledge sharing
Shah (1998)	Social referents
Tsai & Ghoshal (1998)	Social capital
Baldwin, Bedell & Johnson (1997)	Team-based MBA program
Burt (1997)	Social capital
Ibarra (1995)	Race, network heterogeneity and advancement potential
Spreitzer (1995)	Psychological empowerment
Burkhardt (1994)	Effects of technological change on social interaction
Dyne, Graham, & Dienesch (1994)	Organizational citizenship
Ibarra (1993)	Attribution of power, network centrality vs. hierarchy of authority
Brass & Burkhardt (1993)	Interpersonal networks and power
Gargiulo (1993)	Constraint in organizational politics
Ibarra & Andrews (1993)	Power, social influence and sensemaking
Friedman & Podolny (1992)	Boundary spanning roles
Ibarra (1992)	Homophily and differential returns
Brass & Burkhardt (1992)	Centrality and power in organizations
Krackhardt (1992)	Strong ties
McKenney, Zack, & Doherty (1992)	Complementary communication media
Baker (1992)	Network organization
Griffin (1991)	Work redesign effects on perceptions, attitudes and behaviors
Stevenson & Gilly (1991)	Flow of information about organizational problems

Table 1: Studies Investigating Intraorganizational Networks using Quantitative Analysis	
Researcher(s)	Topic(s) Investigated
Rice & Aydin (1991)	Attitudes toward new technology
Krackhardt (1990)	Perceptions of vs actual networks and power
Burkhardt & Brass (1990)	Effects of changing technology on social network and power
Barley (1990)	Technology and structure
Nelson (1989)	Intergroup conflict
Brass (1985)	Men's and women's networks, influence and promotions
Walker (1985)	Cognition and goal achievement

Table 2: Studies Investigating Interorganizational Networks using Quantitative Analysis	
Researcher(s)	Topic(s) Investigated
Carpenter & Westphal (2001)	Board of Director external ties
Schilling & Steensma (2001)	Test of network form
Human & Provan (2000)	Legitimacy of network form
Stevenson & Greenberg (2000)	Social movements
Peng & Luo (2000)	Managers ties outside of the org
Westphal & Milton (2000)	Board of Director demographics
Athanassiou & Nigh (1999)	Advice networks
McEvily & Zaheer (1999)	Acquiring competency capacity
Stuart, Hoang & Hybels (1999)	Resource acquisition
Haunschild & Beckman (1998)	Board of Directors
Kraatz (1998)	Adaptation to environmental change
Provan & Sebastian (1998)	Service link overlap
Human & Provan (1997)	Strategic manufacturing networks
Powell, Koput & KenSmith-Doerr (1996)	Biotech learning networks
Hagedoorn (1995)	Strategic technology partnering
Duysters & Hagedoorn (1995)	Strategic group formation
Provan & Milward (1995)	Interorganizational network effectiveness
Porac, et al. (1995)	Rivalry and organizational forms
Johnson & Podsakoff (1994)	Journal influence
Shan, Walker, & Kogut (1994)	Startup cooperation and organizational output
Bolton, Malmrose, & Ouchi (1994)	Organization of innovation in Japan and USA

Table 2: Studies Investigating Interorganizational Networks using Quantitative Analysis	
Researcher(s)	Topic(s) Investigated
Burns & Wholey (1993)	Effects of adoption and abandonment of matrix management on interorganizational networks
Wholey & Huonker (1993)	Effects of generalism and niche overlap on networks
Davis & Stout (1992)	Corporate control and takeovers
Barley, Freeman, & Hybels (1992)	Strategic alliances
Gerlach (1992)	Japanese Intercorporate networks
Kogut, Shan, & Walker (1992)	Make or cooperate decision in interorganizational network context
Powell & Brantley (1992)	Competitive cooperation, learning through networks
Galaskiewicz & Burt (1991)	Network contagion models
Nohria & Garcia-Pont (1991)	Global strategic linkages and industry structure
Davis (1991)	Adoption of poison pill
Salancik (1986)	Journal influence
Mariolis & Jones (1982)	Corporate interlocks

Table 3: Studies Investigating Intraorganizational Networks using Qualitative Analysis	
Researcher(s)	Topic(s) Investigated
Homburg, Workman & Jensen (2000)	Test of network form
Kahn (1993)	Organizational caregiving
Bouwen & Steyaert (1990)	Organizational development processes

Table 4: Studies Investigating Interorganizational Networks using Qualitative Analysis	
Researcher(s)	Topic(s) Investigated
Steier & Greenwood (1995)	Venture capital relationships
Garud & Kumaraswamy (1993)	Changing nature of competition in network industries, open systems strategy
Perry (1993)	Scientific communication, innovation networks and organizational structures
Knights, Murray, & Willmott (1993)	Strategic interorganizational development
Larson (1992)	Entrepreneurial network dyads
Nohria (1992)	Information and search in new business ventures
Wiewel & Hunter (1985)	Interorganizational network and organizational genesis

Each article was categorized according to level and conceptual approach and the basic topic area determined. Two levels were considered, intra-organizational and inter-organizational (Fulk & Boyd, 1991). The studies were further separated into qualitative and quantitative analytical approaches. Summaries of the studies using quantitative approaches are shown on tables 1,2. Studies using qualitative analysis are listed in table 3,4.

Overall, the seventy-six articles included in the structured review were split about evenly between the intraorganizational (thirty-six studies) and interorganizational (forty studies) levels. Both intraorganizational and interorganizational studies used a variety of network and variable analysis techniques, often in combination. Qualitative techniques were used primarily for interorganizational studies.

All of the research reviewed either incorporated network concepts in the theoretical base, used network analytical techniques or both. Baker (1992) points out that all organizations are networks or "patterns of roles and relationships". The presence of network ties therefore cannot be the distinguishing characteristic of network organizations. Apparently it is possible for researchers to investigate network ties or use network analysis techniques and not be concerned with a network form of organization. Of the fifty-one articles reviewed only six (Baker, 1992; Human & Provan, 2000; Homburg, Workman & Jensen, 2000; Murray, & Willmott, 1993; Larson, 1992; Schilling & Steensma, 2001) mention or discuss the network as a form of organization. Several others deal interorganizational networks, governance, exchange and strategic linkages (Nohria & Garcia-Pont, 1991; Gerlach, 1992; Porac, Thomas, Wilson, Paton, & Kanfer, 1995; Human & Provan, 1997; Powell, Koput & Smith-Doerr, 1996; Athanassiou & Nigh, 1999).

Clearly most of the research reviewed did not address the notion of a network organization. To verify this finding, the search was expanded with a specific focus on empirical research on network organizations. The search yielded research in areas peripheral to network organizations such as as building cooperation (Browning, Beyer, & Shetler, 1995), interlocking directorates (Carpenter & Westphal 2001; Westphal & Milton, 2000; Haunschild &Beckman, 1998; Zajac, 1988; Ornstein, 1984), individual attachments in interorganizational relationships (Seabright, Levinthal, and Fichman, 1988), interorganizational coordination (Van de Ven & Walker, 1984), trust and interpersonal cooperation (McAllister, 1995), trust and contractual choice (Gulati, 1995), creation of macro-culture (Abrahamson & Fombrun, 1992), and individual influence (Brass, 1984). Only two additional articles were found that dealt directly with forms of interorganizational governance separate from markets and hierarchies (Zaheer & Venkatraman, 1995; Osborn & Baughn, 1990) which have important similarities to what others have described as network organizations. This is also true of the studies included in previous reviews of network analysis in organization and management research.

CONCLUSION

A network perspective is clearly evident in the management literature. Two of the most prevalent aspects of a network perspective, network analysis and the 'network organization' are virtually mutually exclusive in the literature. Most of the research that used network analytical techniques were concerned with networks of individuals or organizations without considering the network specifically as a form of organization.

Although there is considerable written about the notion of a 'network organization', the vast majority of articles that addressed the notion of a 'network organization' are theoretical. Few empirical articles expressly dealt with a 'network organization'. Most of these empirical articles used qualitative techniques (Larson, 1992; Knights, Murray, & Willmott, 1993) and rarely were network analytical techniques used (Baker, 1992; Jones, & Hesterly. 1995). There may be several explanations for this. First, few of the conceptualizations of a 'network organization' are developed to the point where quantitatively testable hypotheses are presented. The notion of a 'network organization' is still developing does not yet have a clear, consistent and accepted meaning. Although consistency and acceptance between researchers is not necessary for quantitatively testable hypotheses to be formulated, it certainly facilitates the development of the theory necessary for such hypotheses. In contrast, network analysis is an established set of analytical techniques. Although there is constant refinement due to theoretical and technological advancements, the basic concepts such as centrality, distance, clusters, etc. remain the same.

A second possible reason for the scarcity of empirical research is that the scope of the organizational networks might make data gathering difficult. Gaining access to data across organizational lines, such as between departments, divisions or business units might be a problem to overcome. No one person may have the authority to grant such access and negotiating with several groups individually is not an easy task.

A third consideration is that sensitive issues might be involved. Organizations might be reluctant to allow researchers to investigate such topics as power and influence. This reluctance might be even greater when the investigating deals with power structures separate from and possibly threatening to the official organizational hierarchy.

A fourth possible explanation for the lack of empirical research on 'network organizations' is that it may require longitudinal research. To study the formation, development and dynamic features of such networks would necessitate gathering data over time. This type of investigation may take a long time if appropriate archival data is not available. Generally there is a reluctance among researchers to undertake longitudinal studies that involve data gathering over long periods of time.

None of the problems with empirical research into 'network organizations' is insurmountable. It is reasonable to assume as interest in 'network organizations' increases, the theoretical base will develop. With a clearer conceptualization and a critical mass of researchers, there will be more

incentive to overcome the difficulties of research design and data collection Once the research design and data collection issues are resolved, the tools of network analysis can be applied to empirical research into the network organization.

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