

# Strategies for Network Research in Organizations

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*This paper describes three sets of strategies for the analysis of transactional networks, with an emphasis on their application to both intraorganizational and interorganizational research. Three strategies are contrasted. Their strengths and weaknesses are discussed, and suggestions are made as to how organizational research might benefit from an application of these network strategies.*

A substantial body of work has accumulated that devotes considerable attention to the analysis of networks in and between individuals, groups, and organizations. Unfortunately, the state of the art in network conceptualization can best be characterized as pluralistic. Two factors help account for the eclectic nature of the field:

- (1) A diversity of disciplines continues to contribute to the conceptual development of a network perspective. These include sociology, anthropology, political science, and organization theory (Tichy & Fombrun, 1979).
- (2) Sophisticated analytical methodologies are surfacing that offer researchers feasible strategies for data handling of large networks (Burt, 1980a).

This paper focuses on the second factor and sets out to describe the alternative network strategies available to researchers interested in adopting a network "Weltanschauung" for the study of organizations.

Network analysis is a powerful means of describing and analyzing sets of units by focusing explicitly on their interrelationships. The units or nodes of the networks can be individuals or virtually any aggregation of individuals such as a group, an organization, a community, or even a nation-state. As such, a network strategy is a feasible option for both organizational and interorganization research. At the organizational level, the unit of analysis can be the individual, department or project within the organization. The network describes the interpersonal or intergroup relations within the organization. At the interorganizational level of analysis,

the unit is the single organization or industry classification set. The network maps out the flows between organizations.

Any set of individuals, groups, or organizations is tied together by different relationships. Boissevain (1974) refers to this as multiplex bonds. The aggregate network can be viewed as an overlapping set of networks of different transactional content. The only conceptually meaningful strategy of analysis is to distinguish each network by its content, analyze it as a separate network, and look at the interrelationships among the different networks. For instance, Homans (1950), in his now famous group theory, links the networks of affect, interaction, and activities by clear theoretical propositions that can be tested through observation of the dynamic changes in all three networks.

Two kinds of networks can be distinguished from the start: attribute networks and transactional networks. Attribute networks link individuals who share a commonality (such as similarity of attributes, goals, sex, status). Transactional networks, on the other hand, focus on the exchanges that occur among a set of individuals. These two networks define two initial strategies. If one begins with attribute networks, exchanges are seen as dependent characteristics or *consequences* of the attribute network pattern. If, instead, one begins with the transactional network, individual attributes become the *explanans* or *causes* of the transactional configuration. The assumption, of course, is that the two strategies are "duals" in the programming

sense. The preferred strategy of organizational research is the initial focus on transactional (or exchange) networks, with a subsequent search for suitable explanatory attributes. This partly reflects paradigmatic preference. Pragmatically, however, there probably are more possible causal attributes than there are types of exchange networks. Therefore, this paper focuses on exchange relations.

Exchange networks can be categorized according to their transactional content (Mitchell, 1969). Following Kadushin (1978), four networks can be distinguished in which the flow through the network is primarily expressive (affect), instrumental (power), cognitive (information), or objective (goods). For purposes of analysis, the first step of the network researcher is to distinguish clearly among these networks. Each has a dynamic of its own. Once these four networks are identified, a variety of options are open for analysis of each relational set. Inevitably, the option taken reflects the biases and perspectives of the user.

The basic purpose of this paper is to encourage network research in organizations. Organization theory has yet to tap the richness of thought and the applied potential of a network perspective. Unfortunately, a significant barrier to a network approach lies in the plethora of methodologies that some see as characteristic of the network school. It has given network research an overly "techniques" aura that overshadows its potential contributions to organization theory.

This paper attempts to sort out the tangled web of methodologies for the prospective network researcher and stresses the tradeoffs among alternative strategies. Although a major source of confusion is in the diversity of computer algorithms available for the analysis of network data, this paper does not delve into the computing problems that face the prospective network researcher. The fundamental point this paper tries to make is that network strategies will achieve their potential in organizational research only if one goes beyond the technical jungle networkers themselves have created.

The strength of the network approach is its focus on the relationships *among* individuals in the organization. Unlike distributional analysis and classic multivariate analysis, network analysis leads to an analytical emphasis on the nature of emergent subgroups in organizations. Thus, the network

perspective forces a systemic approach to organizational behavior. As Coleman put it, "in usual survey research and statistical analysis, [an] interview is regarded as *independent* of others...[whereas in network analysis] an individual interview is seen as *part* of some larger structure in which the respondent finds himself...his network.... Thus...the individual is not tested independently" (1958, p. 29). He is seen as *embedded* in a context that both constrains and liberates.

Most organizational research today results in correlational analysis. Network strategies offer a useful complement by adding a specifically relational dimension to survey data. The subgroupings defined by network analysis are less artificial than those that result from the formal partitioning of survey data by seniority, status, sex, or department. The researcher is forced to consider the relationships and emergent groupings in the organization.

## Typology of Network Strategies

Three sets of methodologies can be distinguished that decompose the original network into either (1) its individual nodes (NODAL), or (2) all possible pairwise combinations of the nodes (DYADIC), or (3) an inventory of all possible triads of nodes (TRIADIC). Although higher order inventories are theoretically possible, computational costs limit their usefulness in such a dramatic fashion that the only available algorithms use one of these three strategies. Table 1 charts the basic strategies available to the network analyst.

### Nodal Strategies

Nodal approaches are grounded in the cross-sectional comparison of the set of individuals on a variety of network indices. The total network is summarized by a typical measure such as network visibility (the number of network links to others in the network). Visibility, in turn, is related to properties of the individual or the situation he is in.

**Table 1**  
**Strategies of Network Research**

Nodal	Decomposition of network into component nodes Focus is on network as seen by node occupant.
Dyadic	Decomposition of network into nodal pairs. Focus is on the relationship among pairs
Triadic	Inventory of all possible triads in the network. Focus is on the composition of these triads in terms of the relationships linking the three nodes.

Typical research in this area has focused on the nature of special roles in the network, in particular the boundary-spanner and the isolate (Roberts & O'Reilly, 1979; Tushman, 1977b). In social anthropology, Boissevain (1974) distinguishes urban and rural dwellers in terms of their network visibility and multiplexity. In their sociological study of Manhattanites, Srole, Langner, Michael, Opler, & Rennie (1962) relate network isolation to suicide and mental illness.

### Dyadic Strategies

Dyadic approaches are grounded in information about the whole network summarized in terms of pair distances. Proximities are derived for every pair of individuals in the network using any of a number of techniques. Alba and Kadushin (1976) suggest a measure based on overlapping social circles, that is, common relations. Chain measures of pair proximity grounded in graph theory take into account the number of possible paths through the network between any two individuals and weight them according to length (Luce, 1950). Row and column correlations of the relational matrix are feasible proximity measures as well (Sailer, 1978; White, Boorman, & Breiger, 1976).

At a dyadic level of analysis, three strategies can be used. In the first instance, properties of the pair are related to the network proximity in search of causes and consequences at the pair level that could explain their closeness or distance. Typical hypotheses involve similarity or complementarity of attitudes, positions, or preferences as causes or consequences of network proximity.

In an early analysis, Bott (1955) described the networks of conjugal partners in terms of their overlap and its consequence for role differentiation between the spouses. In the community power literature, Laumann, Pappi, & Verbrugge (1974) develop a causal model relating dyadic proximities (derived from a communication network) to other attributes of the pairs such as similarity of interests, political affiliation, religion, and values.

The only dyadic correlational strategy used in an organizational context was the recent study of five professional organizations by Lincoln and Miller (1979). Their purpose was to explain the origins of instrumental and primary network relations on the basis of formal and demographic similarity between employee pairs. Similar analytic strategies could be

used to investigate other important organizational phenomena like superior-subordinate conflict or the nature of the mentoring relation.

A different direction can be taken that is grounded in knowledge of the dyadic structure of the network. Rather than a concern for the causal relationship between network proximity and other pair properties, these dyads can be used either (1) to construct a spatial representation of the network as a whole or (2) to describe the aggregate network via summary structural parameters that depict the dense regions (cluster or cliques) in the network.

Spatial representation dates back to Moreno's (1934) representation of a network by a sociogram, a scatter of points linked by lines. The modern version attempts to map the social distance between individuals (as evidenced by their degree of interrelationship) onto physical space. Various algorithms are available that involve nonmetric multidimensional scaling of the network into an  $n$ -dimensional space of the user's choice (Alba & Guttman, 1974a, Kruskal, 1964; Shepard, 1962).

Structural approaches are more popular and look for means of describing the network by various indices. Two structural strategies dominate the field: the cohesiveness and the equivalence perspectives (Burt, 1978). The cohesiveness and equivalence perspectives both focus on the dyadic structure of the network.

The choice of either dyadic analysis falls back on a representation of the network as a matrix of all possible pairs. Matrix methods then are used to describe the network. A common concern of dyadic structuralists is the identification of dense regions (cliques, clusters, blocks) in the network. The original matrix permutation techniques suggested sets of individuals, clustered along the diagonal, who were more closely linked to one another than they were to individuals outside the set (Beum & Brundage, 1950; Forsythe & Katz, 1946; Spillerman, 1966; Weiss & Jacobson, 1955). White and his colleagues (White et al., 1976) more recently have developed methods that focus on rearranging the matrix to bring out as many "zero blocks" in the structure as are interpretable. From a theoretical standpoint, individuals within a block are said to be "structurally equivalent" in that they have substitutable relationships with one another, even though they may have no direct linkages (Lorraine & White, 1971). In correlating patterns of nomina-

tions, they essentially build on Bock and Hussain's (1950) approach to defining a group based on the homogeneity of the spanning space of the columns of the matrix, and their approach is representative of the equivalence dyadic structural strategy.

Another stream of dyadic structuralists is represented in the work of Luce and Perry (1949), Luce (1950) and more recently Alba (1973). Using the graph-theoretical concept of completeness or cohesiveness and focusing on the direct linkages between individuals, they describe the network in terms of maximally complete subgraphs or cliques consisting of individuals with a maximum number of interconnections.

### Triadic Strategies

Structuralists who rely on a description of the network in terms of its triad composition are theoretically grounded in the work of Heider (1946). They are interested in the degree of balance or transitivity in the network in terms of 16 indices representing the number of triads of each possible type evidenced in the structure (Davis & Leinhardt, 1972; Holland & Leinhardt, 1976). Their primary concern is with theoretical testing of generalizable propositions in terms of configurations of social relations, and most of their research has involved a testing of transitivity in affective networks across large social systems.

For instance, Holland and Leinhardt take a triadic strategy in order to test the hypothesis that: "Friends are likely to agree, and unlikely to disagree; close friends are very likely to agree, and very unlikely to disagree" (1976, p. 8). They relate the proposition to the kinds of triads they would expect to find in a directional network in which an unreciprocated link represents a "friend" and a

reciprocated link represents a "close friend."

Table 2 summarizes the three sets of strategies that a network analyst can choose to pursue. As the table points out, each has a well defined purpose, and a number of researchers have used networks to tackle problems of organization theory.

## Strengths and Weaknesses

Each methodological approach, as defined in Table 2, has particular strengths and weaknesses. Much of the current confusion and apparent enmity among network researchers revolves around the failure of "networkers" to specify the domains of applicability of the different methodologies. Each methodology is differentially suited to the analysis of particular networks, and to the solution of specific kinds of problems. There are principal strengths of each methodology and particular problems that might be investigated from each perspective in an organizational context.

### Nodal Strategies

Predicated on the "popularity contest" basis, nodal strategies are suitable for all network types. Their principal weakness is that nothing of the network pattern is reflected in the identification of influence stars or interaction isolates. Ease of derivation and suitability for multivariate analysis help explain its widespread use and are its principal strength. Typical research using nodal strategies has involved identifying a class of individuals in a network possessing a specific network property: for instance, the set of individuals with the highest number of nominations as influentials (so called "stars") or the set of individuals with the lowest volume of communication relations (the isolates).

**Table 2**  
**Network Strategies in Organizations**

<i>Strategy</i>	<i>Focus</i>	<i>Analytical Emphasis</i>	<i>Examples of Authors in Organization Research</i>
Nodal	Unit node/roles	Multivariate analysis	Tushman (1977b) Roberts and O'Reilly (1979)
Dyadic			
(a) Correlational	Dyads	Multivariate analysis	Lincoln and Miller (1979)
(b) Spatial	Whole network	Visual representation	Tichy and Fombrun (1979)
(c) Structural			
•Equivalence	Whole network	Dense regions— equivalence relations	Van de Ven, Walker, and Liston (1979)
•Cohesiveness	Whole network	Dense regions— direct links	Tichy and Fombrun (1979)
Triadic	Triads	Testing of theoretical propositions involving network relations	None

The weakness of a nodal strategy is that it totally reduces the network context to the direct linkages between individuals and uses nothing of the network *pattern* in the analysis.

If the theoretical thrust of the research can safely rely on relational volume and on direct linkages only, then a nodal strategy is both appropriate and powerful. If action-at-a-distance is expected, it is inappropriate.

An exceptionally powerful nodal strategy is reflected in the work of Freeman (1979) and Fombrun (1980). The nodal property is the relative centrality or reachability of the node, a measure that includes systemic properties of the network pattern by stressing the alternative pathways through the network.

### **Dyadic Strategies**

In the determination of pair distances, the choice of proximity measure should vary by network type. For relations of power or influence, chain measures that take directionality into account are essential. Two individuals who both influence a third have no necessary commonality. Such a proximity measure can be derived from Taylor's (1969) work on influence structures, as well as Harary's (1959) notion of "contrastatus," thereby defining the felt influence of actor A from actor Z in the network.

For cognitive or objective networks, proximity measures that rely on nondirectional linkages between actors are sufficient. The use of either equivalence or cohesiveness measures of proximity is valid. However, propositions predicated on direct linkages (such as attitude similarity as an outcome of close proximity) are more consistent with cohesiveness measures. On the other hand, propositions involving objective similarities or differences (e.g., demographic or formal attributes) are more consistent with equivalence measures. This is particularly true in organizations—in which Burt's (1978) argument that cohesiveness strategies are a subset of equivalence strategies when relations outside the clusters are identical is not useful. In organizations it is to be expected that external linkages will differ by the very nature of compartmentalized formal structures.

A dyadic spatial approach, because of the difficulty in visualizing beyond two dimensional space, is inherently limited. As population size increases, too much information gets collapsed into two-

space, and the representation becomes uninterpretable. Laumann and Pappi (1976) use three-space in an attempt to represent two community elite interaction structures. Clearly, the use of higher order representations would be so confusing as to be futile. Although no systematic data are available, experience suggests that spatial representations should be attempted only with groups of size 80 or less.

One way of reducing network size in order to achieve a spatial representation is to collapse the network into groups. The groups become the nodes of the reduced network. The task then involves a plot of the considerably reduced network linking these groups. For instance, for large organizations, all interactions between individuals within a group (department, project) could be ignored, and only those between groups (departments, projects) monitored. The focus then becomes the nature of the intergroup network. Interactions within groups could subsequently be mapped individually.

In organizations a spatial approach seems particularly useful for questions of structure, design, and change. The representation is especially useful and meaningful for networks of interaction, information, and the flow of goods. Such networks then could be seen as the basic guideways channeling less tangible commodities such as power, influence, opportunities, and favors. A focus on expressive networks would provide data around the informal structure and raise questions about its degree of fit with the prescribed activities of the organization.

A spatial representation always should be used in conjunction with a structural scheme if the analyst is to capitalize on its strength as a visual aid and obtain the most suggestive results. This is particularly true because spatial representations will always suggest clusters, even if the individuals in those clusters are not strongly connected. This is because the representation is nonlinear and ordinal in its distance rankings (Shepard, 1974).

The two dyadic structural strategies of network analysis also are differentially suited to problems. In relying on direct linkages between individuals, clusters obtained from a cohesiveness standpoint represent sets of individuals with mutual awareness of one another. For certain types of analysis, some nominal level of commonality is a requisite if the cluster is to have any interpretative value. For instance, in the analysis of an interaction network, it

is meaningful to have as cluster members only those individuals with some minimum degree of interaction with others in the cluster. An equivalence strategy, on the other hand, clusters individuals on the basis of relational similarity. Individuals are said to be "structurally equivalent" if they have identical patterns of relationships with other network members (Lorraine & White, 1971). Because few, if any, individuals are wholly equivalent, the definition was relaxed to one of pattern similarity by Breiger, Boorman, and Arabie (1975). A more appropriate reformulation is Sailer's (1978) concept of "structural relatedness." Two individuals are said to be structurally related when they have similar relationships with structurally related individuals. Such equivalence definitions are especially useful in the context of sociological theories for which generalized role structures need to be devised (Nadel, 1957). The block, or set of equivalent individuals, moves analysis one step beyond the transitory network under consideration to the universalistic relations between categories of individuals.

In organizations, equivalence relations would cluster individuals in similar role systems. Thus the managers of two different product groups might be equivalent if their relational patterns are similar within each product group. Clearly, the analysis that follows such an observation is vastly different. The questions to be asked would revolve around the properties of organizational roles (e.g., managers as opposed to subordinates). As both internal and external stars, boundary spanners may belong to the

same communication role structure as a set of managers of subunits. The questions to ask would revolve around their similarities and differences in the context of that equivalence relation.

More fundamentally, a major problem with applying some of the cohesiveness and most of the equivalence strategies as clustering methodologies in organizations is that they elicit mutually exclusive clusters from the network. However, organizations are such that most members belong to multiple groups (Likert, 1961). Methodologies that provide overlapping clusters therefore are inherently more suitable for organizational analysis in cases in which liaison roles are important and prevalent. See, for instance, Alba (1973) and Arabie (1977).

The use of a cohesiveness strategy for instrumental relations would provide questionable results because the powerful individuals would be clustered along with the powerless who nominated them. A strong criterion would be to cluster only mutual influence relations, which form a conceptually meaningful set (Taylor, 1969). An equivalence strategy, on the other hand, would cluster individuals who share similar influence patterns with equivalent individuals, thereby describing a meaningful set of influence roles in the network.

### Triadic Strategies

Particularly suited to directional data, a triadic structural strategy is most appropriate to the analysis of networks of instrumental and affective relations in situations in which linkages are not

**Table 3**  
**Strengths and Weaknesses of Network Strategies**

<i>Strategy</i>	<i>Strengths</i>	<i>Weaknesses</i>	<i>Suitable Network Type</i>
Nodal	Suitable for multivariate analysis Includes directionality	Only direct linkages (except centrality measures)	All
Dyadic			
(a) Correlational	Suitable for multivariate analysis Includes network pattern	Nondirectional	Cognitive Objective
(b) Spatial	Visual	Configuration not unique Misleading clustering Only for size less than 80	Cognitive Objective Expressive
(c) Structural			
•Equivalence	Includes directionality Linkage intensity	Clusters can be misleading Nonoverlapping clusters	Cognitive Objective Expressive
•Cohesiveness	Well-defined clusters Overlapping clusters	Nondirectional No linkage intensity	Cognitive Objective Expressive
Triadic	Includes directionality Proposition testing	No linkage intensity	Expressive Instrumental

necessarily reciprocated and directionality is theoretically critical. In studies of power, the fact that A has power over B is conceptually very different from the notion that B has power over A, whereas a communication or interaction relation is less concerned with the direction of initiation. In that case, it is the presence or absence of the link that is generally the key concern.

Triadic strategies are inherently sociological in orientation. Their primary purpose is to build sociological theory by testing for the uniformity of a specified relationship across a social structure. Therefore, they are particularly useful in testing for transitivity or reciprocity across vast networks. Such a strategy may not be as useful in an organizational context, given the contextual theories that now dominate the field (Thompson, 1967). These theories emphasize the nonuniformity of organizational types and therefore the nonuniversality of relationships within organizations.

Triadic strategies might be used in organizations in a definitional way, however. For instance, the distinction between mechanistic and organic organizations suggested by Burns and Stalker (1961) has been plagued with circularity from a definitional standpoint. If the mechanistic structure were defined from a network standpoint as one in which influence relations are nonreciprocal, then a triadic strategy would provide an index of reciprocity and significance tests against randomness.

With a triad inventory, propositions regarding the degree of mutual influence and the transitivity of influence relations can be tested systematically, and changes in the influence flows in the organization can be monitored.

The principal strength of a triadic strategy is its ability to test for the presence of a relational pattern against a random distribution. Its central weakness is that relations must be defined in binary terms, and the intensity of a link is not taken into account (except by subterfuge as in the example described briefly above). Table 3 summarizes the principal strengths and weaknesses of each of the network strategies.

## Organizational Research

Research in organization theory relies on two primary data strategies: (1) correlational analysis of behavioral, perceptual, and archival data, and

(2) descriptive situational reports of organizational behavior.

Network analysis represents a complementary outlook with ties to both statistical and contextual analysis. As such, it can enrich the present understanding of organizational phenomena. There is no contradiction among the network, survey research, or case analysis approaches. In particular, network analysis:

- (1) improves case methodology by providing a skeleton on which to hang the rich descriptive data,
- (2) complements survey data in its stress on the relational dimension of organizations,
- (3) needs both rich contextual data and survey data to help interpret the nature of the network pattern and its consequences for organization behavior. In other words, networks do not exist in a vacuum.

These three points suggest that there is a high potential for interplay among these strategies in future organizational research. In addition, there are substantive areas that could benefit from each of the network strategies.

### Nodal Strategies

*Power.* Reputational and decisional data can be used to create indices of relative power in the organization across domains. In order to circumvent the natural emergence of the visible authority group and in order to capitalize on the network approach, respondents should be asked to identify the individuals they have *directly* tried to influence. A visibility index then would measure the key interaction influentials and should be descriptive of an emergent power distribution (Tichy, Tushman, & Fombrun, 1979). Centrality indices also offer substantial promise as tools for measuring relative power grounded in network patterns.

*Job Satisfaction.* Theories of job design include components that tap the degree to which the job provides opportunity for social interaction (Hackman & Oldham, 1975). If these are valid, it should be possible to relate nodal indices of objective and expressive networks to measures of job satisfaction and alienation (Roberts & O'Reilly, 1979).

*Innovation.* Researchers interested in the innovation process have emphasized the importance of special roles such as stars and boundary spanners in the collection and dissemination of information across boundaries (Katz & Lazarsfeld, 1955; Tushman, 1977b). Identifying the different networks can assist in defining these roles and refining

the analysis to distinguish those who are stars in one network from those who are stars in other networks. Demographic, personality, and situational characteristics then can be used to differentiate them.

*Socialization.* Entry into and adaptation to the organization can be described as a network building process. Successful entry might be characterized by the formation of personal networks that are both task-functional and expressive. Organizational values are transmitted via the initial cognitive networks surrounding the individual. A nodal strategy would be appropriate and would consist of monitoring the changing composition of the nodal network in terms of both visibility and intensity.

### **Dyadic Strategies**

Some interesting problems could be researched using a dyadic strategy.

*Mentoring.* Considered an important phenomenon for organizational career success, the nature of the mentoring relation has been only clinically investigated. One of the interesting functions a mentor or sponsor may serve is to help the protege extend his or her network to include the powerful contacts and friends of the mentor. Such a brokerage function could be studied best by a dyadic structural or correlational approach grounded in an observation of the cognitive-interactional networks surrounding two individuals. Over time, the networks ought to be characterized by increasing overlap, much like Bott's (1955) analysis of role differentiation in marital couples.

*Superior-Subordinate Relations.* The quality of the relationship between a superior and a subordinate is likely to be influenced strongly by their respective networks. The greater the overlap in their networks, the less power the superior has because the subordinate is capable of direct interaction with higher levels than the superior himself. Here again, a dyadic correlational approach grounded in direct cognitive linkages is a promising tool for investigating this arena. The degree to which an expressive link develops between the pair may be a result of the power balance itself.

*Organization Design.* According to Thompson (1967), structures should reflect the nature of the task. Organizational units should bring together the most interdependent individuals. To the extent that

interdependence is reflected in the cognitive and objective networks in the organization, a dyadic structural strategy grounded in direct linkages (cohesiveness) would provide a direct means of testing propositions involving structural designs. Tichy and Fombrun (1979) contrast the networks of three organizations operating in different technologies with their formal structures. Similar approaches can help to develop theoretical models of structural design.

*Organizational Elites.* Decision making in organizations often is referred to as a political process characterized by bargaining and bribery (Tushman, 1977a). The aggregate distribution of power across the organization clearly is a determinant of the political activity that will be engaged in. For instance, a highly cohesive elite could dominate all decision making, or the organization could be characterized by plural elites in conflict (Bacharach & Lawler, 1980). In either case, the combination of a dyadic structural strategy for interactions and a nodal strategy for power can help understand the nature of the power distribution, who the participants are, and the kinds of processes that go on in the decision making arena (Fombrun, 1980).

*Organization Change.* To change is to upset the status quo. Organization development has been blamed for being apolitical and naive when it comes to the implementation of change (Tichy, 1979). A dyadic structural or spatial perspective can help focus attention on the the political consequences of particular change strategies. A structural change designed to modify the cognitive and objective networks may be resisted for its impact on the instrumental and expressive networks.

*Organization-Environment Linkages.* The importance of building extraorganizational relations has been stressed by researchers interested in how organizations monitor competition, reach collective agreements, and develop new products, all in an attempt to enhance survival. A nodal network strategy such as Evan's (1966) organization set concept forces specific attention and makes possible detailed testing of environmental effects on organizational parameters. On the other hand, a dyadic structural network strategy such as Levine's (1972) interorganizational network analysis stands to enrich studies of interorganizational cooptation that have focused almost exclusively on an analysis of board interlocks using a nodal strategy (Pennings, 1980).



## Triadic Strategies

No studies were found that used triadic strategies in an organizational context. Yet, a triadic approach would contribute to developing systematic theories of relationships between individuals in organizations. Some areas that could stand systematic investigation by a triadic approach include the following.

*Organization Design.* Contingency theories of structure suggest a number of implications for the reciprocity of instrumental relations (Tichy & Fombrun, 1979). The so-called organic organizations are characterized by greater reciprocity of influence than are their more mechanistic counterparts for which influence is strictly unidirectional and vertical. A triadic strategy could test the veracity of such a proposition against randomness and thereby could give an alternative definition of "organicity." The analysis could be extended to subunits to test the Lawrence and Lorsch (1967) results that suggest different structural configurations and therefore different relational patterns at the subunit level.

*Organizational Evolution.* As organizations grow, how do the relationships between individuals or positions evolve? Perhaps under certain conditions, the more successful organization is characterized by increasing reciprocity of certain triad configurations in its expressive, objective, and/or instrumental networks. Organizational failure perhaps could result from lack of patterned complexity in the triadic composition of the network.

*Innovation.* Cognitive and objective networks are known to have an impact on the innovation process, from idea generation to diffusion (Tushman, 1977b). Sampling across innovative and stagnating firms using a triadic network strategy provides a means for testing these ideas. Innovators may have significantly different triad indices than noninnovators.

## Interorganizational Research

Although the discussion in this paper has stressed the networks linking individuals within organizations, sets of organizations can be analyzed fruitfully by focusing on the relationships between them.

A problem peculiar to the interorganizational level of analysis is the lack of boundary specificity in defining a set. An industry group, a resource net-

work, a stakeholder set can all be used to define the organizations under study. Trist (1978) focuses on the transactional environment of the focal organization, a parallel to Evan's (1966) organization set concept. Aldrich (1979) generalizes it to a group of organizations he labels an action-set, or a group of interdependent organizations. Grounded in artificial boundaries, they all are unsatisfactory in that they leave out potentially important network linkages.

If there is no agreed on boundary to an interorganizational network, the choice of boundary should reflect the purposes of the researcher and the research hypotheses of the study. Conclusions drawn from the study must be carefully scrutinized for the possibility of alternative explanations grounded in the effects of untapped networks. Questions also are raised as to the impact of missing network nodes on properties of the aggregate network. Needed here are careful studies of marginals, akin to the sensitivity analyses of mathematical programming.

Studies of interorganizational networks focus either on the causes that might explain the emergence of a specific pattern or on the consequences the observed pattern has for various indicators of aggregate performance. Table 4 presents some of the principal studies done and the network strategies they pursued.

As with interpersonal networks, there are two types of interorganizational networks: attribute networks and transactional networks. Attribute networks link organizations by virtue of commonalities exclusive of interaction, such as output or input similarity (e.g., an industry group, or board directorates). Transaction networks, on the other hand, focus on the exchange processes that link different organizations. For instance, Baty, Evan, and Roghermel (1971) focus on the flow of personnel between organizations. These, like the interpersonal networks, can be catalogued by the primary content of the flow: objective, expressive, cognitive, or instrumental. Although a good deal of emphasis is placed on expressive networks within organizations, the interorganizational realm places stronger emphasis on objective and instrumental relations.

One cognitive relational network that has received considerable attention has been the interlocking directorates network among the *Fortune* 500 (Allen,

**Table 4**  
**Interorganizational Networks**

<i>Strategy</i>	<i>Causes</i>	<i>Consequences</i>	<i>Examples of Authors</i>
Nodal	Co-optation	Goal constraints Performance	Evan (1966) Allen (1974, Burt (1980b)
Dyadic			
(a) Correlational	Exchange Resource control	Power	Benson (1975) Blau (1964)
(b) Spatial	Dependence	Political/economic structure Innovation	Galaskiewicz (1979) Levine (1972) Czepiel (1974)
(c) Structural			
•Equivalence	Dependence		Van de Ven, Walker, and Liston (1979)
•Cohesiveness	Influence attempts	Power	Freeman (1968) Moore (1979)
Triadic	Transitivity	Prestige hierarchy	Sharp, Shin, and Smith (1977)

1974; Dooley, 1969; Fenema & Schijf, 1979; Pennings, 1980). The approaches taken to date, however, have relied on a nodal strategy, or at best follow a cross-sectional dyadic framework. For instance, Burt (1980b) looks at the cooptive relationships between 42 manufacturing firms from a nodal perspective, stressing the range and multiplexity of these linkages across corporate actor networks. The results are interesting, but they fail to address the critical concern of the concentration of power in society in a legitimate way. More appropriate would be the use of a cohesiveness structural strategy and the identification of an interlocked set that implicitly dominates organizational activity. An equivalence strategy, on the other hand, could prove useful in identifying firms occupying similar dominant or subservient positions in their respective networks.

The strengths and weaknesses of the different network strategies are also applicable to the analysis of interorganizational networks. Considerations of directionality, structural equivalence or direct linkages, and intensity have parallel applicability. As things stand, it appears that the interorganizational research agenda could benefit greatly from an application of more sophisticated network strategies. One classic response has been that the interorganizational adjacency matrix is too sparse. Alba and Kadushin (1976) and Moore (1979) specifically address this problem, the latter in a na-

tional elite network, and display the power of some network algorithms capable of dealing effectively with sparse data matrixes.

It is becoming increasingly evident that organizations pursue their self-serving ends through a host of complex activities at the interorganizational level that enable them to negotiate their environments (Aldrich, 1979). Viewing the organizational environments as a series of overlapping networks provides a mechanism for analyzing the nature of organizational action in terms of their impact on the emergent aggregate collective of organizations, and hence on performance. It also may make it possible to anchor more concretely such ecological constructs as a "niche," a "domain," and the "environment."

## Conclusion

This paper has attempted to lay out some of the key methodological strategies available to the researcher interested in pursuing a network approach to organizational analysis. The relative merits of alternative directions were assessed and some concrete research directions suggested that would benefit from a network perspective. Further work needs to be done in specifying the most rewarding approaches for investigating specific organizational problems if the network perspective is to bear fruit in research on organizations.

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