

Intraorganizational Networks

The Micro Side

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Thirteen years ago Tichy (1981) suggested that organizational research incorporate a network perspective. There has been a great deal of research on interorganizational networks, but to date relatively little has been done in the area of organizational behavior (OB) (House & Singh, 1987; Ilgen & Klein, 1989; O'Reilly, 1991; Staw, 1984). No doubt this is because macroresearch has been done primarily by sociologists while micro-OB is typically the domain of psychologists, who have been slower to adopt a network perspective in field studies. Our purpose is to outline some traditional micro-OB questions and suggest how network analysis has been used and can be used to enlighten and enliven answers to them.

As a departure point, we will use the five themes that O'Reilly (1991) found dominated the research agendas of micro-OB over the past decade: motivation, leadership, job design, turnover/absenteeism, and work attitudes. In addition, we will review one other area, power, which crosses the domains of micro- and macro-OB, often now called "meso" OB (Rosseau, 1985). To our knowledge, very little network analysis has been applied to the first three of these six areas. Therefore in these cases we will suggest how these areas could benefit by incorporating network theory. For the last three areas, we review the network literature as applied to them and suggest how this work may be expanded. We begin

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with the area of turnover and absenteeism, where some network research has revealed interesting findings.

Turnover and Absenteeism

Turnover and absenteeism are two distinct types of employee withdrawal, and they have separate causes and consequences (Mowday, Porter, & Steers, 1982). Despite researchers' call for considering them separately (Mobley, 1980), they are frequently discussed interchangeably under the same heading. But, from a networker's perspective, their distinctions become clear. First, we will discuss the emphasis that has been placed on turnover. Then we will suggest how network theory prompts us to change this emphasis and how absenteeism emerges with its own prediction.

Turnover has been the subject of study for many years (Mowday et al., 1982; Price, 1977). But, with few exceptions (e.g., Dalton & Tudor, 1979), the work has been dominated by a relatively narrow agenda: (a) assume turnover is detrimental to the organization and (b) treat turnover as a dependent variable. That is, the goal of this research, as O'Reilly (1991, p. 442) points out, has been to throw more and more independent and moderator variables into the already crowded models predicting turnover. Thus, he concludes, the most interesting developments in this literature have been methodological, demonstrating how survival and event history analysis can be used to deal with these data, which often do not conform to the underlying statistical assumptions in more traditional methods.

It is unlikely that turnover events are independent of one another (Krackhardt & Porter, 1986), a fact that draws into question the legitimacy of even the more sophisticated survival and event history models applauded by O'Reilly. Rather, as some people leave, the news of such events will likely influence others to consider leaving also. Moreover, there are likely to be social and attitudinal consequences for those who stay. Thus turnover could be a powerful independent variable, one that predicts both subsequent turnover events and consequences to those who remain.

Such effects are not uniformly distributed across all members of the organization. Not all members will be induced to reconsider their employment status because someone, somewhere, has left the organization. Not all stayers will be equally affected by the occasional departure

of another employee. It is in this thorny part of the problem that network theory provides a rich perspective.

A pair of articles by Krackhardt and Porter (1985, 1986) based on what later became known as the "MacDonald's Restaurant Studies" (Rogers, 1987, p. 289) provide some direction. In one study, Krackhardt and Porter (1986) found that turnover occurred in clusters, calling it a "snowball effect." These clusters were significantly related to people's roles in the organization. These roles, in turn, were derived not from their position in the organizational chart but from their position in the advice network. Krackhardt and Porter suggested that, if people see others leave who are in a similar network position (role) as themselves, then this is particularly relevant information about the nature of their jobs and about alternatives to working at that particular organization. Thus people in similar positions are induced also to consider leaving, resulting in clusters of leavers within these informal role types.

Absenteeism, on the other hand, implies continued membership in the organization and leads to different network predictions. One critical element of absenteeism is that it can be thought of as emanating from a set of values, work attitudes, and norms about what is appropriate behavior in the organization (Steers & Rhodes, 1978). Norms are often communicated, negotiated, and enforced through friendship ties (Krackhardt & Kilduff, 1990). Thus, while turnover clusters might be related to role similarity, absenteeism would be more related to direct friendship ties. In contrast to the Krackhardt-Porter result, then, we suggest the absenteeism rates will be clustered in friendship groups.

In their second study, Krackhardt and Porter (1985) observed the effects of turnover on those who decided to remain. In this case, they looked at friends of those who left. Contrary to what one might expect, those who were friends of the leavers became significantly more satisfied and committed to the organization after their friends left than those who were not friends of the leavers. Krackhardt and Porter suggest a "rotten apple" theory to explain these results: People leave because they are unhappy with some aspect of the job (they dislike the supervisor, the work, and so on). Before they leave, they expend some energy complaining about the work. And to whom do they complain? Their friends. Thus, after these complainers leave, the surviving friends are relieved of the never-ending source of negative cues about the workplace, resulting in increasing satisfaction with the workplace.

Absenteeism, on the other hand, would have little in common with turnover in this model. Friends who are regularly absent due to disaf-

fection return to depress their colleagues again. Thus we would expect that being a friend of those who are absent frequently would in no way improve one's workplace attitudes following absentee behavior.

The work relating networks to turnover and absenteeism has begun. Rogers (1987, p. 289) referred to the network approach to turnover as a "turbocharger" in an area that had floundered recently. But there is much to do, both in extending this work to the area of absenteeism and in investigating further the relationship between turnover and informal structures.

Power

Although O'Reilly (1991) did not include the topic of power in his review of micro-OB, the concept is a central one in the field. A structural network perspective on power and influence has been the topic of much research. The finding that central network positions are associated with power has been reported in small, laboratory work groups (Shaw, 1964), interpersonal networks in organizations (Brass, 1984, 1985; Brass & Burkhardt, 1993; Burkhardt & Brass, 1990; Fombrun, 1983; Krackhardt, 1990; Tushman & Romanelli, 1983), organizational buying systems (Bristor, 1992; Ronchetto, Hutt, & Reingen, 1989), intergroup networks in organizations (Astley & Zajac, 1990; Hinings, Hickson, Pennings, & Schneck, 1974), interorganizational networks (Boje & Whetten, 1981; Galaskiewicz, 1979), professional communities (Breiger, 1976), and community elites (Laumann & Pappi, 1976).

Theoretically, actors in central network positions have greater access to, and potential control over, relevant resources, such as information in the case of a communication network. Actors who are able to control relevant resources, and thereby increase others' dependence on them, acquire power. In addition to increasing others' dependence on them, actors must also decrease their dependence on others. They must have access to relevant resources that is not controlled or mediated by others. Thus two measures of centrality, closeness (representing access) and betweenness (representing control) correspond to resource dependence notions (Brass, 1984, 1992). Both measures have been shown to contribute to the variance in reputational measures of power as well as promotions in organizations (Brass, 1984, 1985). In addition, simple degree centrality measures of the size of one's ego network have been associated with power (Brass & Burkhardt, 1992, 1993; Burkhardt & Brass, 1990).

As the above research indicates, there is a general agreement that centrality is related to power, and a variety of different measures of centrality have been used to establish the relationship. However, disagreement exists as to which measure best captures the concept. The three most commonly used graph-theory measures of centrality are degree, closeness, and betweenness (Freeman, 1979).

Although few studies have included more than one measure of centrality, all three measures have been shown to relate to power in different studies. Research including both the closeness and the betweenness measures of centrality (Brass, 1984, 1985) indicated that, while the two measures overlapped, both contributed unique variance in explaining promotions and perceptions of power. In a later reanalysis of this data (Brass & Burkhardt, 1992), the degree measure of centrality was included. Results showed that the degree measure explained as much variance as either the closeness or the betweenness measure. When controlling for degree, betweenness did not significantly increase the variance explained in reputational measures of power, while closeness slightly increased it. When controlling for either betweenness or closeness, the degree measure of centrality significantly increased the explained variance.

In addition to the measures of centrality, other issues revolving around social networks and power have been noted by Brass (1992). These include the direction of ties, the strength of ties, links, transaction content of the network, the unit of reference, and positively and negatively connected networks.

Direction of Ties

Knoke and Burt (1983) have emphasized the distinction between symmetric and asymmetric ties, arguing that being the object of the relation rather than the source is an indication of superordination. They refer to measures that distinguish between source and object as measures of prestige. The difference between symmetric measures of centrality and asymmetric measures of prestige may be the difference between leaders and followers. Although their analyses showed the symmetric centrality measures to be highly correlated with the asymmetric prestige measures, Knoke and Burt (1983) found that only the prestige measure predicted early adoption of a medical innovation. Similarly, Burkhardt and Brass (1990) found that all employees increased their closeness centrality (symmetric measure) following the

introduction of new technology. However, the early adopters of the new technology increased their in-degree prestige and their power significantly more than the later adopters.

Transaction Content of Networks

Complex organizations contain a multitude of networks arising from a variety of relationships. As workers exchange inputs and outputs in an organizational work flow, the performance of the task, which continues the successful flow of work, may be a resource and potential source of power. Because the inputs and outputs for each task can be specified, it is possible to refine the degree and betweenness measures of centrality. Brass (1984) measured transaction alternatives by counting the number of alternative sources of inputs and the destinations for outputs for each task. Conversely, he also measured criticality, defined as the number of alternative paths through which the work may flow if the focal task position is removed. These two egocentric measures explained large amounts of variance in supervisors' and subordinates' perceptions of influence.

Just as the division of labor produces a horizontal work-flow network of task positions, it also produces a vertical network of task positions—the organization's hierarchy of authority. Although the hierarchy represents an easily obtainable network of relationships, it has seldom been used in this manner. Level in the hierarchy has been shown to be strongly related to perceptions of power in an organization (Brass & Burkhardt, 1993; Fombrun, 1983). However, Ibarra (1993) found that the informal structure (network centrality) was equally or more important than the formal structure (hierarchical rank) in predicting power as measured by involvement in technical and administrative innovations.

The communication network is typically described as an informal, emergent network, although many of the relationships shadow the prescribed work flow and hierarchy of authority. Centrality in the communication network has frequently been the focus of studies of power (Blau & Alba, 1982; Brass, 1984, 1985; Brass & Burkhardt, 1993; Burkhardt & Brass, 1990; Fombrun, 1983; Tushman & Romanelli, 1983). To the extent that information exchange is reflected in the advice network, betweenness centrality in the advice network has been related to power (Krackhardt, 1990).

Because almost all friends communicate with each other, Brass (1984, 1985) reported considerable overlap between communication and friend-

ship measures of centrality, with both relating to influence. For example, Krackhardt (1990) found that betweenness centrality in the friendship network related to perceptions of power even when controlling for centrality in the advice network.

In his study of a unionization vote in an organization, Krackhardt (1992) found that employees tended to rely on trusted friends in making their decisions. Based on this and previous research (Krackhardt & Stern, 1988), Krackhardt proposed that friendship links are particularly important when employees experience uncertainty. However, Burkhardt and Brass (1990) found that, rather than relying on established friends, employees changed their communication patterns when faced with the uncertainty of a technological change. These seemingly conflicting results may be reconciled by considering the type of uncertainty faced in each situation. In the unionization vote (Krackhardt, 1990), employees had enough information but were uncertain about how to vote. When encountering the change in technology (Burkhardt & Brass, 1990), employees lacked information about the new technology and sought out new contacts so as to learn the system.

Although the transaction content of network connections may overlap (for example, friends and work-flow connections may provide advice), the importance of content has been emphasized by Ibarra in her studies of men's and women's networks (Ibarra, 1992, 1993). Ibarra found that homophily (tendency to form same-sex network relationships) had differential effects for men and women in terms of acquiring power. While men formed homophilous ties across multiple networks, women experienced dual networks: social support and friendship from other women and instrumental ties (advice and communication) to men. Women in this advertising firm were constrained in their choices because men occupied the most powerful positions (Ibarra, 1992).

Brass (1985) found similar results in his study of men's and women's networks and differential connections to the dominant coalition. Studying an interpersonal network of nonsupervisory employees, closeness to the dominant coalition in the organization was strongly related to power and promotions. The dominant coalition was identified by a cohesive subset analysis of the interaction patterns of the top executives in the company. Brass (1985) also found that men were more closely linked to the dominant coalition (composed of four men) and were perceived as more influential than women. Assuming that power positions in most organizations are dominated by men, women may be forced to forgo any preference for homophily in order to build connec-

tions with the dominant coalition. Thus the organizational context places constraints on preferences for homophily, especially for women and minorities (Ibarra, 1993).

Units of Reference

Individuals in organizations are embedded within work groups, work groups are embedded within departments, and departments are embedded within divisions or entire organizations. Thus determining the appropriate unit of reference, the boundaries of the appropriate network, can affect the relationship between network position and power. For example, in comparing centrality within a work group (employees with the same immediate supervisor), within a department (formal organizational designations), and within the entire organization, Brass and Burkhardt (1992) found that centrality (degree, closeness, and betweenness) within an employee's department explained the most unique variance in perceptions of power and subsequent promotions.

Theory and the choice of research questions may designate some units of reference as more appropriate than others. However, the possibility of multiple sources of power in organizations suggests that multiple units of reference may be an appropriate strategy for both employees and researchers. Additionally, research has found that membership in departments is related to individual power (Blau & Alba, 1982; Brass, 1984; Ibarra, 1992, 1993). This raises the possibility that departmental centrality may interact with individual centrality within departments to further explain perceptions of power.

Cognitive Maps

In other applications of social networks, Krackhardt (1990) found that the accuracy of individual cognitive maps of the social network in an organization was related to perceptions of influence. That is, power was related to the degree to which an individual's perception of the interaction network matched the "actual" social network. In a case analysis, Krackhardt (1992) also demonstrated how a lack of knowledge of the social networks in a firm prevented a union from successfully organizing employees.

Coalitions

The relation between networks and coalitions in organizations has also been the focus of several authors (Bacharach & Lawler, 1980; Murnighan & Brass, 1991; Stevenson, Pearce, & Porter, 1985; Thurman, 1979). Murnighan and Brass (1991) demonstrated how coalitions are formed one actor at a time, and require the founder to have an extensive ego network of weak ties. Thurman (1979) described how leveling countercoalitions are formed through existing social network ties.

Work Attitudes

As O'Reilly has noted, work-related attitudes are the subject of numerous publications in micro-OB. Work-related attitudes, such as job satisfaction, are affective evaluations about aspects of one's work environment (O'Reilly, 1991, p. 435). Just as similar people prefer to interact, theory and research have also noted that those who interact become more similar (Carley, 1991; Kaufer & Carley, 1993). Employees may adopt similar attitudes to those with whom they interact or those who occupy similar positions in the social network. Thus most social network studies have focused on attitude similarity.

Erickson (1988) provides the theory and research concerning the "relational basis of attitudes." She argues that people are not born with their attitudes, nor do they develop them in isolation. Attitude formation and change occur primarily through social interaction. As people attempt to make sense of reality, they compare their own perceptions with those of others—in particular, similar others. For example, Kilduff (1990) found that MBA students made decisions similar to their perceived friends regarding job interviews with organizations.

Following Erickson (1988), Rice and Aydin (1991) investigated the effects of relational, positional, and spatial proximity on attitude similarity. They found that employees' attitudes about new technology were similar to attitudes of those with whom employees communicated frequently and their immediate supervisors. However, one interesting finding was that estimates of others' attitudes were not correlated with others' actual (reported) attitudes. Two explanations are possible for this finding. One is social projection—individuals project their own attitudes onto others. Rice and Aydin (1991) found a positive relation-

ship between an individual's attitudes and that individual's estimate of others' attitudes. The second explanation is the possibility that employees politely agree with expressed opinions, even if those opinions are counter to their own true feelings.

In another study, Rentsch (1990) found that members of an accounting firm who interacted with each other had similar interpretations of organizational events and that these meanings differed qualitatively across different interaction groups. Krackhardt and Kilduff (1990) found that friends had similar perceptions of others in the organization, even when controlling for demographic and positional similarities. Danowski (1980) got mixed results on the relationship between connectivity and attitude uniformity. Innovation groups displayed homogeneity in attitudes, but production groups did not.

Burkhardt (1991) found attitude similarity among structurally equivalent actors, and Walker (1985) found that structurally equivalent individuals had similar cognitive judgments of means-ends relationships regarding product success. Galaskiewicz and Burt (1991) found similar evaluations of nonprofit organizations among structurally equivalent contributions officers, and structural equivalence explained these contagion effects better than a relational cohesion approach. Structural equivalence does not hinge on direct interaction/communication among actors. Rather, the similarity in attitudes stems from actors occupying similar positions, or roles, in the network. According to Burt (1982), actors cognitively compare their own attitudes and behaviors with those of others occupying similar roles rather than being influenced by direct communications from others in dissimilar roles.

Taking a slightly different approach, Dean and Brass (1985) argued that highly central employees, by virtue of their greater number of links, would be exposed to more diversity of opinion than peripheral employees. They found that central employees' attitudes about job characteristics were more similar to observable reality as measured by the perceptions of an outside observer. They argued that increased social interaction leads to a convergence of perceptions similar to observable reality.

Although the above evidence suggests that employees who interact or who occupy similar positions in the network will have similar attitudes, a great many questions about the effects of social influence on attitudes remain (see also the following section on job design). Attitude formation is obviously a complex process requiring further research.

Job Satisfaction

Perhaps the most frequently researched attitude in organizational studies is job satisfaction (O'Reilly, 1991). Despite the attention to job satisfaction in the small group laboratory network studies of the 1950s (see Shaw, 1964, for a review), there have been surprisingly few social network studies addressing job satisfaction in organizations. The early laboratory studies found that central actors were more satisfied than peripheral actors in these small (typically five-person) groups. In one of the few organizational studies, Roberts and O'Reilly (1979) found that relative isolates (zero or one link) in the communication network were less satisfied than participants (two or more links).

However, Brass (1981) found no relationship between centrality (closeness) in the work flow of work groups or departments and employee satisfaction. Centrality within the entire organization's work flow was negatively related to satisfaction in this sample of nonsupervisory employees. Brass (1981) suggested that this latter finding may be due to the routine jobs associated with the core technology of the organization. He found that job characteristics mediated the relationship between work-flow network measures and job satisfaction. Similarly, Ibarra and Andrews (1993) found that centrality in advice and friendship networks was related to perceptions of autonomy. Moch (1980) also found that integration in the work network (two or more links) was associated with job characteristics and internal motivation. However, isolates with high growth needs reported high job involvement.

In a recent study of 47 managers in an entrepreneurial firm, Kilduff and Krackhardt (1993) found a negative relationship between centrality (betweenness) in the friendship network and job satisfaction. However, they also found that managers whose cognitive maps of the social networks were more schema-consistent were more satisfied and committed. *Schema consistency* referred to the tendency to perceive friendship ties as reciprocated (symmetric) and transitive. Combining these findings, Kilduff and Krackhardt (1993) argued that mediating the relationships between actors (betweenness centrality) who are not themselves friends may create conflicting expectations and stress.

Following this line of reasoning, it is also possible that multiplex relationships may create similar sources of stress and thereby limit job satisfaction. Failure to maintain one relationship may result in the loss of the other. Thus an employee may feel "forced" to agree to the work-related demands of a friend in order to maintain the friendship.

